Enhancing Supply Chain Efficiency: Digitalization Case Study of a Canadian Private

Limited Company with Challenges and Roadmap

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Abstract

Purpose – This research aims to develop a roadmap for initiating the digital transformation strategies within the supply chain of M/s Pattison Food Group by addressing the identified challenges and recommending relevant digital transformation technologies and strategies to uplift the supply chain performance.

Design/methodology/approach – The study employs an exploratory approach, combining a review of existing literature. Data is collected through literature findings on the Scopus database and systematic analysis done through the Biblioshiny utilizing relevant inclusion and exclusion criteria.

Findings – The research identifies four key challenges in the supply chain digitalization of M/s Pattison Food Group, including an increase in stakeholder involvement, AI (Artificial intelligence)/IT (Information technology) adoption with security concerns, acquiring a skilled workforce, and resistance to change. It also outlines actionable strategies for incorporating digital technologies such as Blockchain technology, sustainable development, and waste management.

Practical implications – The findings provide M/s Pattison Food Group with a clear roadmap for digital transformation within the supply chain, which offers steps for the implementation of technologies that can streamline supply chain processes while mitigating the current concerns they face.

Social implications – The study highlights the potential social benefits of digital transformation in the supply chain, including more sustainable practices through waste reduction, improved resource management, and greater transparency. Additionally, the integration of advanced technologies could create new job opportunities in IT, data analysis, and supply chain management, while also enhancing consumer trust through improved authenticity verification.

Originality/value – The research focussed on the supply chain of M/s Pattison Food Group which is not exposed to many literatures and findings of the paper aimed the major Canadian retail chain which need specific considerations within the process of digitalization.

Limitations - The reliance on existing literature reviews may not capture all perspectives of digitalization as the subjected field is evolving regularly. Future research could involve more extensive field studies and case analyses to validate the findings.

Keywords - Digital transformation, supply chain management, Blockchain, sustainability, operational efficiency, waste management

Paper type – Case study

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Abbreviations

IoT – Internet of Things

AI – Artificial Intelligence

IT – Information Technology

RFID – Radio Frequency Identification

GDPR - General Data Protection Regulation

DT- Digital transformation

1. Background and Introduction

The concept of digital transformation become a vital concept in the contemporary landscape of business and technology. Digital transformation enables organizational growth, innovation, and adaptability (Bozkus, 2023) where Denmark become the most digitally competitive country by 2022, and Canada stands at tenth (Taylor, 2022). Digital transformation encapsulates the profound integration of digital technologies into all aspects of an organization, fundamentally altering how it operates and delivers value to its stakeholders. From streamlined processes to enhanced customer experiences, the potential benefits of digital transformation are vast and compelling (Frendiana and Soediantono, 2022).

However, the journey towards digital transformation is not without its challenges. Many organizations struggle in many phases of digital transformation such as integrating, and maintaining data privacy, fragmented landscape, etc. which are arising from legacy systems, cultural resistance to change, and the rapidly evolving technological landscape. For instance, in an August 2023 survey conducted among Chief Marketing Officers (CMOs) in Canada and the United States, approximately 33% of participants identified the integration of emerging technological solutions such as Artificial Intelligence (AI) and Augmented Reality (AR) as one of the key challenges anticipated in media transformation within the subsequent 12 months (Navarro, 2023).

As per the preliminary discussion (informal consultation) with M/s Pattison Food Group members, we were enabled to identify, that they face many challenges in the different stages of their supply chain optimization, where they are willing to incorporate digitalization more, to overcome the concerns. When considering leading retail chains in Canada by 2022, M/s Pattison Food Group holds the 9th place and generates revenue of 7.7 billion US Dollars (Smith, 2022). Most of their production facilities are located within British Columbia which

is recognized as the 3rd largest province (Figure 1) and supplies inputs and products for companies (Tam et al, 2022) which indicates that M/s Pattison Food Group can optimize their supply chain to gain competitive advantages.

Figure 1

Regions within Canada Businesses sources inputs, products, or supplies
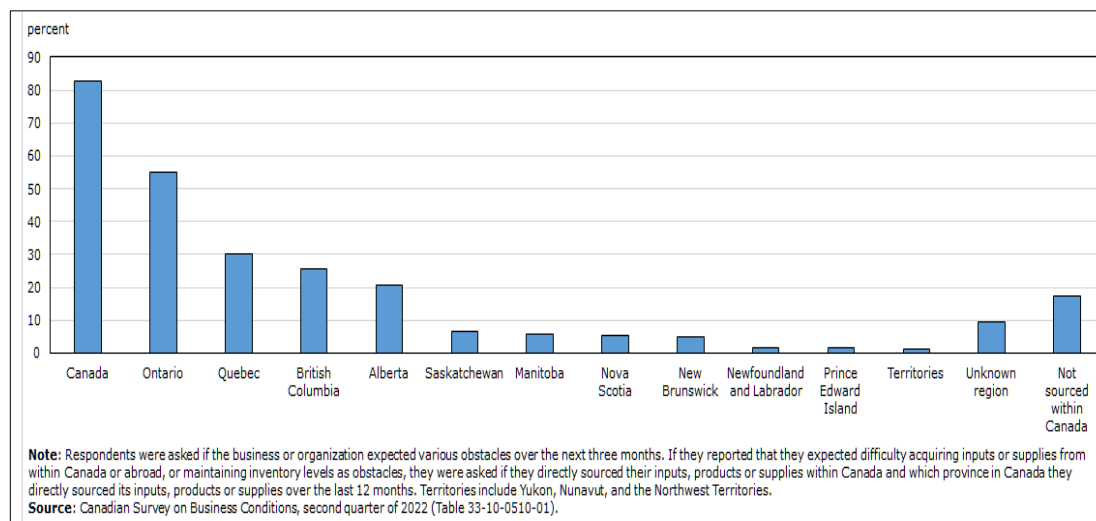
Note. Regions within Canada Businesses sources inputs, products, or supplies from Analysis on Supply Chains in Canada, the second quarter of 2022 by Tam, Sood, and Johnston, 2022 (https://www150.statcan.gc.ca/n1/pub/11-621-m/11-621-m2022008-eng.htm).

The requirement for periodic analysis of supply chain management and digitalization stems from various forces that affect on subject area of the study. The recent analysis found that the impact of climate changes, evolving concerns on food safety, shifts of customer preferences, and volatility of the economic landscape increase the need of informative and proactive decision making on food supply chain of retail industry (RBC, 2024) specially companies such as M/s Pattison Food Group need to provide more focus on these forces. Moreover, when considering the population growth, it identified that the total food consumption will increase approximately by 51% by 2050 (Dijk et al., 2021) which serve as a

cause for the scarcity of resources as available farmland is diminishing. Therefore, the significant changes need to be adapted by the food system to maintain the supply for the demand as current methods are not sustainable. Therefore, the research is conducted to layout the possible solutions that can be adapted by the companies operates in food retailing industry.

Accordingly, the purpose of our research program is threefold. The study will start with an exploratory study identifying the different issues and limitations facing by M/s Pattison Food Group in terms of optimizing its supply chain. Therefore, the research paper will identify digital strategies to improve supply chain efficiency and create a roadmap for adopting these technologies. This will include steps from using basic ERP systems and simple RFID sensors to fully integrating IoT and Blockchain technologies. This will also cover advanced applications like smart contracts for verifying authenticity, as described in existing research. The study comes as both timely and relevant given the ongoing major concerns of the company with improving and optimizing operations of the supply chain.

The research can provide M/s Pattison Food Group with actionable strategies to streamline their supply chain processes, leading to increased operational efficiency. The costs associated with manual processed can be reduced by adopting digital technologies. Effective ERP systems, IoT, Blockchain and RFID sensors enable to enhance the real time decision-making, effective data tracking and data accuracy. A competitive edge can be gained by the M/s Pattison Food Group by leveraging advanced technologies which optimize the supply chain. Furthermore, reduction of waste, enhanced transparency to customers, job availability will raise the positive social implications. Improved transparency and authenticity verification through technologies as Blockchain can enhance consumer trust in the brand. By optimizing operations and reducing costs, the company can potentially reinvest savings into community development projects, benefiting the broader society.

By considering above factors the study conducted with the aim of analysing four research questions defined to provide in depth outcome in terms of supply chain management and digitalization. The data and information for the analysis on research questions and roadmap are collected through the findings of literatures. As the conclusion, future research avenues and limitations of current study is provided.

2. Research Aims and Objectives

2.1 Problem Statement

M/s Pattison Food Group (Pattison Food Group, 2023), a prominent Canadian retail company, is currently facing considerable difficulties in optimizing their supply chain management in response to the demands of digital transformation. Although the company has achieved market success, it encounters obstacles in adopting modern technologies such as blockchain, IoT, AI, and data analytics within its supply chain operations. These difficulties arise from outdated systems, concerns about data privacy, and the rapidly changing technological landscape. This article aims to confront these issues through the identification of primary challenges in the company's supply chain, reviewing accessible digital transformation solutions and developing a roadmap for flawless integration of these technologies.

The first objective of the paper examines and organize existing literature to tackle discover and understand the key challenges that M/s Pattison Food Group faces when managing the digitalization process of their supply chain. This consist of complete evaluation of various factors that may be obstruct the efficiency and effectiveness of their supply chain such as obsolete systems, confidentiality concerns, inefficiency in logistics and lagging the technology adaptions. By collecting and evaluating the insights from collected articles, the research will strategize areas within the supply chain that are mostly affected by the identified challenges.

The secondary objective of the research is exploring technologies and strategies of digital transformation that can be effectively implement at M/s Pattison Food Group at various stages of supply chain. This will be done by exploring innovative digital initiatives like blockchain, IoT, AI and data analytics. The study will seek to identify the possible advantages that may be realised from these technologies. By identifying relevant digital solutions, the research will offer a comprehensive overview of the digital tools available to optimize the company's supply chain.

The final objective of the paper is to develop an extensive plan for implementing digital strategies within the supply chain of M/s Pattison Food Group. The roadmap will guide step by step to integrate technological aspects while addressing the challenges. It identifies the measures on the aspects that need to be closely considered including resistance to change while optimizing the requirement of digital transformation within the supply chain.

2.2 Research Questions

RQ1: What are the key challenges faced by M/s Pattison Food Group, Canada in its supply chain management in terms of specific areas affected?

RQ2: What digital transformation technologies and strategies are currently available for improving supply chain management?

RQ3: How can technologies such as blockchain, IoT, AI, and data analytics be applied to different stages of the supply chain?

RQ4: How can the identified digital transformation strategies be integrated into existing supply chain processes and systems?

This research aims to achieve the following objectives:

- Evaluate and compile the literature to analyze the challenges faced by M/s Pattison Food Group, Canada, in supply chain management.

- Identify digital transformation strategies that can be effectively applied in different stages of the supply chain.

- Construct a roadmap to implement the identified strategies to optimize and mitigate the associated challenges.

3. Literature Review

The literature review conducted based on different aspects which navigate the research process to more informative analysis as supply chain management and digital transformation became more timely discussions among scholars. Therefore, is essential to have analysis on every possible direction.

3.1 Supply chain management practices in retail sectors of the food industry

In business, supply chain management involves coordinating a network of activities including purchasing, operations, logistics, and marketing channels. These activities help transform raw materials into finished products (Dubey et al., 2020). Moreover, the Supply Chain Management identified as the process which involves coordinating, monitoring and controlling to remove barriers on communication and elimination of redundancies (Power, 2005).

In retail business environment, Supply Chain Management plays a significant role as it provides many advantages such as it enabled to optimize the inventory management process. Managing inventory efficiently is crucial for retailers as it accounts for significant costs (Agrawal and Smith, 2015). At the same time, automation of supply chain enables to reduce expenses as supply chain automation employs software and machinery to manage various

supply chain tasks, reducing manual labor and costs (Salam et al., 2016). Streamlining processes enhances the overall efficiency of operations by maintaining flexibility. Automation allows retailers to adapt quickly to changing market conditions while ensuring uniformity across products which showcase the consistency in product lines is essential for maintaining customer satisfaction and brand reputation (Alvarado and Kotzab, 2001).

Unlike typical supply chain networks, the Food Supply Chain is exceptionally responsive to speed, emphasizing the need for harvested or produced goods to reach consumers before their final expiration date (Zhong et al., 2017). The food industry plays a crucial role in providing essential sustenance to support a variety of human activities and behaviors (Allen, 2015). As civilization has progressed through the ages, the food system has similarly advanced, developing into a vast and intricate global network (Floros et al., 2010). When consider the main process of food retailing, after being gathered or manufactured, food must undergo storage, transportation, and retail processes to ensure timely delivery to the end consumers which emphasize the requirement of efficient supply chain management (Mastos and Gotzamani, 2022).

When consider the Canadian Food Supply Industry, the collaboration among suppliers and retailers are very close which ensure a steady and reliable flow of products. This involves strategic sourcing from local and international suppliers, focusing on quality, cost, and sustainability (Hobbs, 2020). This drives complexities within supply chains due to the increase of stakeholders. Many retailers of Canada prioritize local sourcing to reduce transportation costs and support domestic agriculture. Furthermore, retailers in the Canadian food industry are increasingly adopting digital tools such as ERP systems, IoT, and data analytics to enhance visibility and traceability throughout the supply chain which with optimize inventory management, reducing waste, and ensuring product freshness. Besides, sustainability become

a core aspect as many retailers in Canada implementing approaches with the aim of managing energy consumption, reduce food wastage and minimize carbon footprint of their supply chains. Waste-to-energy initiatives, donations of unsold food to charities and usage of efficient packaging can be identified as common practices (Government of Canada, 2024). Food safety regulations across the supply chain is well observed by Canadian retailers in accordance with the national requirements and accreditations. This consist of measures such as audits, quality checks and compliance to food safety measures (Government of Canada, 2020). When considering logistics aspects, efficient practices are essential to manage the vast distance and varying climate conditions across Canada. Techniques such as cross-docking and just-in-time delivery have adopted by companies to maintain product availability and reduce costs. With the growth of e-commerce and e-retailing the customer behavior also changed and companies paying more attention to navigate their supply chain with customer-oriented strategies (Charlebois and Music, 2019).

3.2 Complexities and concerns of supply chain management in retail sector of the food industry

When considering both processed food and beverages, the Canadian consumer product industries made up nearly one-third of Canada's manufacturing Gross Domestic Product (GDP) and contributed to 40% of total employment in the country (Government of Canada, 2024). But on the contrary, as per Statistics Canada, 57.3% of businesses anticipate challenges in procuring inputs, products, or supplies domestically within Canada for a duration extending six months or longer whereas 68.8% of companies operate on wholesale industry expected supply chain challenges in 2nd quarter of 2022 (Tam et al., 2022).

Due to the challenges and complexities of the supply chain of food retailing, food wastage increased and become a global concern during last decade (Teller et al., 2018). Scholars broken down the food supply chain into six main processes by considering the process, sub process and wastage types (Xue et al., 2017) as depicts in Figure 2.

Figure 2

Process of Food Supply Chain
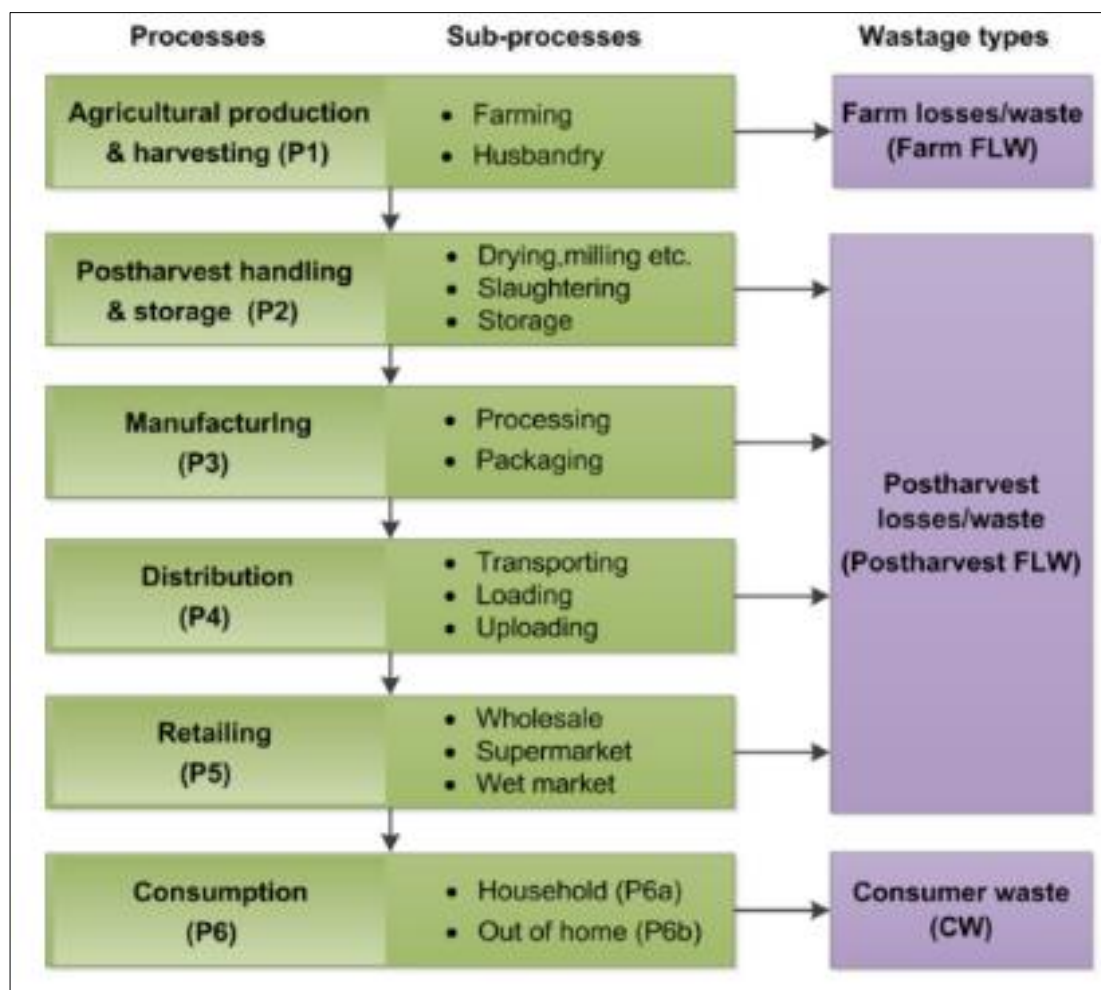
Note. Breakdown of Food Supply Chain. From Missing Food, Missing Data? A Critical Review of Global Food Losses and Food Waste Data by Xue et al., 2018.

On the other hand, it is found out that majority of the food losses occur during the consumption which is followed by production and distribution and retail services (Figure 3). (Gunders & Bloom, 2017)

Figure 3

Food Losses at each step in the Supply Chain in North America

Note. Food and Agriculture Organization 2011. Percentages calculated collectively for USA, Canada, Australia, and New Zealand (NRDC: Wasted - How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill (PDF))

At the distribution stage, a significant issue arises with rejected shipments, particularly with perishable goods. If shipments are rejected, they may end up being discarded if an alternative buyer cannot be secured promptly. Even if they do reach a store, their shelf life is significantly reduced by the time they arrive (Jedermann et al., 2014). Based on the Retail Food Waste Guide, the food wastage within retail stores also identified as a considerable percentage as it reported that 8 million tons of waste occur in a year in distribution centres and stores (Retail Food Waste Guide, 2018).

Above stated complexities arise due to several challenges such as multiple stakeholder involvement, rapid technology changes, reluctant to change etc. (Ros-Tonen et al., 2018).

Indeed, companies in the retail and wholesale industry face greater challenges as limited visibility, increased cost, limited scalability, inefficient communication, etc. due to the lack of digitalization of the supply chain (Ivanov et al., 2019). Moreover, 67.9% of businesses have experienced challenges which are worsened in 2022 (Figure 4) (Tam et al.,2022). To overcome these challenges businesses are encouraged to establish a sustainable supply chain by focusing on its adaptability, collaborative capacity, and innovative practices (Mangla et al., 2019).

Figure 4

Change in Supply Chain Challenges experienced over the last 3 months, second   quarter of 2022.

4.5

27.6

67.9

- Supply chain challenges have worsened
- Supply chain challenges have remained about the same
- Supply chain challenges have improved

Note: These results are based on the survey that was in collection from April 1 to May 6, 2022, and respondents were asked what the business or organization experienced in the last three-month period. As a result, those three months could range from January 1 to May 6, 2022, depending on when the business responded.
Respondents were asked if the business or organization expected various obstacles over the next three months. If they reported that they expected difficulty acquiring inputs or supplies from within Canada or abroad, or maintaining inventory levels as obstacles, they were asked how supply chain challenges experienced by the business or organization have changed over the last three months.
Source: Canadian Survey on Business Conditions, second quarter of 2022 (Table 33-10-0508-01).

Note.

Change in Supply Chain Challenges experienced over the last 3 months, second quarter of 2022

from Analysis on Supply Chains in Canada, second quarter of 2022 by Tam, Sood, and Johnston, 2022 (https://www150.statcan.gc.ca/n1/pub/11-621-m/11-621-m2022008-eng.htm).

M/s Pattison Food Group, Canada, a venture of Jim Pattison, stands as the foremost supplier of food and health goods in Canada's Western region, boasting the largest market share (Pattison Food Group, 2023). However, in 2022, M/s Pattison (the founder of Jim Pattison Group) outlined the struggle of manufacturing sectors to produce and maintain supply-chain efficiencies during external and internal environment fluctuations (Chiang, 2022). Furthermore, the company engaged with many acquisitions where they aimed to enhance their manufacturing and warehouse capabilities. However, they are still struggling to leverage the synergies which they hope to gain through shared supply chains and integrating information technology (Johne, 2022). For instance, M/s Pattison stated "Within the automotive industry, they are facing challenges in acquiring vehicles due to production delays caused by shortages of parts or workforce availability. This situation extends beyond automotive to various manufacturing sectors, posing significant difficulties" (Chiang, 2022), which could be managed through the efficient digital transformation process.

Moreover, with the increased collaborations with different parties within value chain, the stakeholder involvement and researchers have recognized that engaging stakeholders is essential for understanding their needs, promoting cooperation, and aligning goals and the process of stakeholder engagement become complex due to the increase of stakeholders (Veskioja et al., 2022). At the same time, adapting to new AI and IT technologies identified as another concern as it requires to develop new security policies and regular updates are essential to be comply with the evolvement of technology. To maintain and develop the implemented changes the workforce of the company should have the strong interest on changing nature of the technological advancements, and they should adapt to the changes with minimum resistance (Gutu et al., 2023).

By considering above aspects 4 main concerns were identified which faced by M/s Pattison Food Group during different stages of digitalization initiatives on supply chain. As per the scholar findings the impact of each concern can be scaled as below, Table 1 (Gezgin et al., 2017), (McArthur et al., 2020), (IDC, n.d.), (Baethge-Kinsky, 2020) and (Aziz and Jean, 2023).

Table 1

Impact of Identified Issues during each step of implementing digital initiatives.

Steps	Impact of Identified Issues			
	Increase of Stakeholder Involvement	**AI/IT Adoption with Security Concerns**	**Acquiring Skilled Workforce**	**Resistance to Change**
1). Assess Current Status	4	2	2	3
2). Select Appropriate Technologies	4	5	4	4
3). Process Redesign and Optimization	4	4	4	5
4). Change Management	5	4	5	5
5). Implementation	4	5	5	4
6). Monitor, Evaluate, and Iterate	3	4	4	3

Note. The impact of identified issues is scaled as follows: 5 - High impact, 3 - Moderate impact, 1 - Low impact. Table generated by the author.

3.3 Digital transformation initiatives within the broader context of supply chain management

Researchers have employed various terms to discuss digital strategies and their associated concerns. For instance, they have explored topics such as Digital Transformation Strategies (Matt

et al., 2015), Requirements Engineering for the Digital Transformation (Ebert and Duarte, 2016), Strategic Information Systems Planning (Kamariotou and Kitsios, 2019), Synergy for Digital Transformation (Zinder and Yunatova, 2016), Embracing Digital Technology (Fitzgerald et al., 2013), and Transformation of Business Models (Schallmo et al., 2017). However, this diversity of terminology has led to ambiguity in understanding digital strategy.

Digital transformation offers numerous benefits for companies in the retail and wholesale industry across various aspects of their operations. Scholars have identified that digital initiatives enhance operational efficiency by automating repetitive tasks, streamlining processes, and improving productivity. Moreover, digital transformation facilitates enhanced customer engagement and satisfaction through personalized experiences, effective communication channels and responsive customer service (Zhang et al., 2022). Therefore, management of the companies started to implement a connected system of processes, relationships, and technologies that foster interdependence and a shared future (Power, 2005) which is defined as the Integrated Supply Chain which evolved through Digital Transformation Platforms (Shcherbakov and Silkina, 2021). Furthermore, developing an automated food quality monitoring system presents a complex challenge that demands a comprehensive approach. Collaboration among professionals specializing in sensor systems, communication science, predictive biology, and food technology is essential, along with cooperation from transport operators and supply chain managers. To address this challenge, initiatives like the 'intelligent container' project have been launched in recent years (Jedermann et al., 2014).

It is found that 60% of organizations across various sectors globally anticipate significant or moderate effects from robotic process automation on supply chains by 2025. When incorporated thoughtfully into supply chain operations, robotic process automation has the potential to enhance productivity and efficiency (Placek, 2022). Additionally, digital transformation fosters innovation

within the supply chain, allowing them to adapt to market changes swiftly, stay competitive, and drive growth (Pelletier and Cloutier, 2019). Overall, embracing digital transformation empowers organizations to optimize their operations, scale their businesses, and thrive in today's rapidly evolving digital landscape. In the realm of digital business, fostering a digital culture is imperative, alongside nurturing literacy and skills among the workforces. This ensures that personnel possess the necessary digital competencies to effectively manage and utilize technology resources (Reim et al., 2022). As per Statistics Canada, (Figure 5) 10%-15% of companies planned to navigate the supply chains by utilizing technological improvements to overcome the supply chain challenges in 2022 (Tam et al., 2022).

Figure 5

Plans to adjust Supply Chain over the next 12 months, the second quarter of 2022.
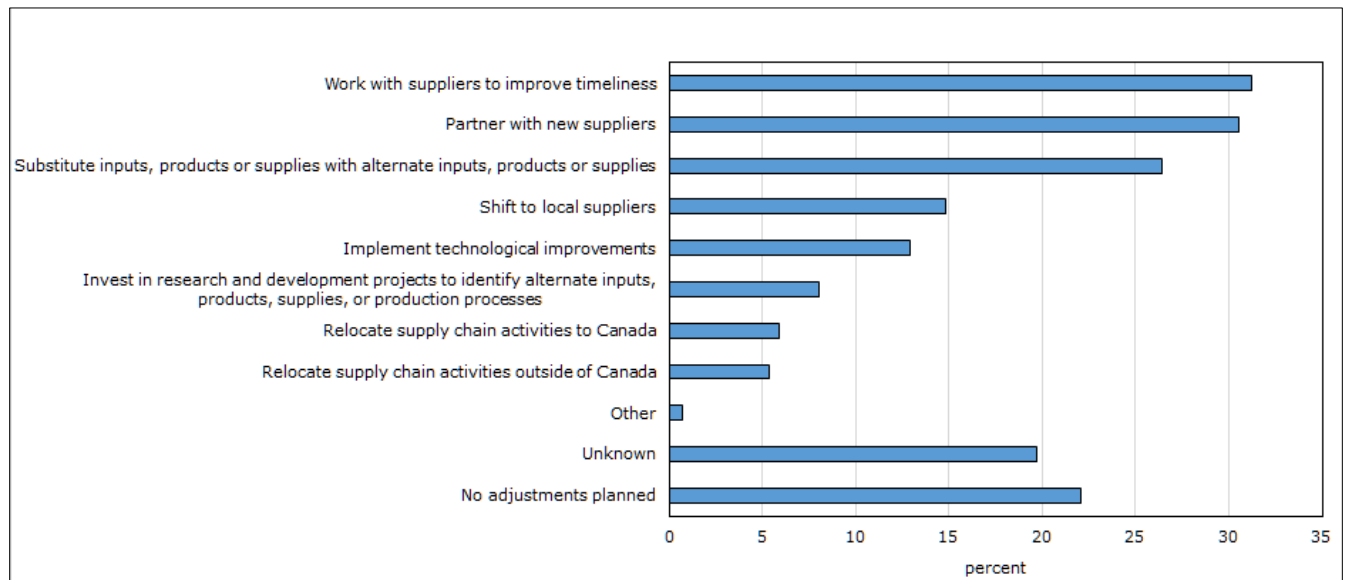
Note. Plans to adjust Supply Chain over the next 12 months, second quarter of 2022 by Tam, Sood, and Johnston, 2022 (https://www150.statcan.gc.ca/n1/pub/11-621-m/11-621-m2022008-eng.htm).

On the contrary, retail companies face obstacles when implementing and maintaining digital initiatives throughout the supply chain (Mahroof et al., 2019) which hinder effective supply chain management. Scholars identified that these concerns can be eliminated through Digital Technology solutions and People-led solutions (Bressanelli et al., 2019). Under Digital Technology companies tend to utilize IoT technology, Blockchain, Robotics, Artificial Intelligence, etc. (Wade, 2016) to increase the effectiveness and efficiency of the supply chain.

For instance, Walmart implemented the IBM Food Trust blockchain platform with the partnership with IBM which enabled to improve the traceability of food contamination. This enables to reduce the time to trace by 7 days to 2.2 seconds (Nguyen and Do, 2018). Moreover, to speed up the process of picking and packing, Amazon employs thousands of robotics (Allgor et al., 2023) which proves effective collaboration between humans and robots. DHL also utilises collaborative robots alongside humans in picking and packing which improve their productivity and reduce errors (Lambrechts et al., 2021).

3.4 Significance of adopting a strategic approach to digital transformation through the utilization of a roadmap

The advent of digital technologies, including the internet and mobile platforms, has led in a significant transformation across various industries, leading to the emergence of novel operational and organizational paradigms. While there are compelling reasons to embrace these rapidly evolving technologies, such as cost reduction and enhanced customer engagement, the adoption of digitalization poses unique challenges for small and medium-sized enterprises (SMEs) with limited resources (Karltorp, 2017). Scholars identified that there is a notable gap regarding the specific digital transformation strategies tailored to small and medium-size enterprises. Most of the research right now is mainly about how to use digital technologies, not about the specific changes that companies need to make inside their organization to make those technologies work

well (Zaoui and Souissib, 2020). Managers must develop a clear plan and understanding of the various factors, issues, and obstacles involved in their journey towards digital transformation which can be directed through a Digital Transformation Roadmap (Korachi and Bounabat, 2020).

Hence, the significance of utilizing the Digital Transformation roadmap becomes essential as it provides a strategy to guide the implementation process, facilitate efficient resource allocation, and enhance scalability in flexibility (Sreenidhe, 2022). Isaac Sacolick who is the founder and president of StarCIO, already outlined the procedures required to establish a search center of excellence, which can strategically position a business to attain revenue, cost, and brand advantages through the utilization of AI-powered search platforms through the White Paper (Isaac, 2022) which is not specified on supply chain management. Moreover, Contemporary businesses must adopt a fresh IT talent model to effectively expand their digitalization endeavors (Renganathan, 2023). Hence, the M/s Pattison Food Group also can gain more advantages and avoid supply chain concerns through the roadmap for Digital Transformation.

For instance, Nike rolled out a digital roadmap for its supply chain that incorporated RFID technology and predictive analytics. This overhaul led to a 20% boost in delivery speed and cut the time from order to shipment by 30% (Adamek, 2022). Unilever formed a digital roadmap that incorporated IoT, predictive analytics, and AI throughout their supply chain. This strategy allows them to decrease in cost of inventory and enhance customer service. Additionally, by streamlining logistics and lowering carbon emissions sustainability is improved (Unilever, 2023). Therefore, it can be stated that there is a significant impact of using a roadmap in the process of implementing digital initiatives. A roadmap for digitalization that fits one company may not be effective and suitable for another due to differences in industry-specific needs, business models, organizational structures and strategic objectives. For instance, while a retail company might prioritize improving customer experience through e-commerce, a manufacturing firm may focus on automating

production. Additionally, companies have different level of technological readiness, available resources and markets. Therefore, it is essential to tailor digital strategies to each organization's unique scenarios (Zaoui and Souissi, 2020).

4. Methodology

After doing a preliminary literature review of M/s Pattison Food Group, the authors presented a research proposal to the company. The company officials accepted the proposal and authorized the authors to proceed with the research. During the preliminary discussion (informal consultation), the company identified a few current challenges to address. The objective of this research is to provide a comprehensive solution that effectively addresses these challenges.

The process of analyzing information and developing the roadmap involves few steps:

- The first stage involved the critical analysis of literature to identify gaps in existing knowledge.
- Complement the literature review, scientometric analysis performed using Biblioshiny which is a tool within the bibliometrix R package.
- Enhanced the effectiveness of the literature review through various types of quantitative analyses.
- Developed a digitalization roadmap based on comprehensive data collection and analysis.
- The roadmap is designed to guide the successful implementation of digital transformation initiatives within the company.

4.1 Research Design

A systematic review was carried out which was supported by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Protocol. This enables to ensure the replicability and transparency of our review process (Sohrabi et al., 2021). Under the different stages of the review, an exploratory study was conducted by examining existing literature and undertaking a critical analysis to identify knowledge gaps. The scientometric analysis conducted utilizing Bibliometrics to have a more effective literature review (Figure 6). The objective of this research is to conceptualize Digital Transformation as a corporate strategy influenced by specific characteristics and methodologies discussed earlier, contingent upon the support of a digital roadmap for successful implementation.

Figure 6

Research Design
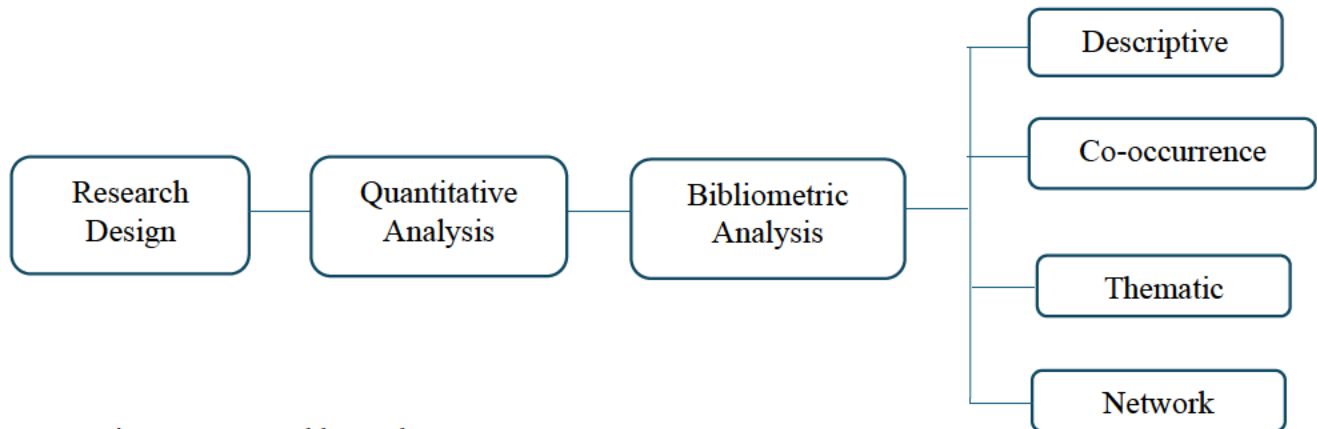
Note. Figure generated by author

4.2 Literature Review Analysis

A structured literature review is undertaken to evaluate existing studies on supply chain digitalization, with a particular focus on the challenges, advantages, and best practices. This review positions the case study within the larger context of industry trends and guides the creation of the digitalization roadmap. Biblioshiny was employed for the analysis of systematic literature review.

Biblioshiny is a web-based application that comes as a part of the bibliometrix R package, designed to simplify bibliometric analysis. It provides a user-friendly interface for performing various types of analyses on bibliographic data (Farooq, 2024). Research articles collection involved utilizing Scopus, recognized as the world's most extensive curated research database (Schotten et al., 2017) and the analysis was done in terms of descriptive analysis, Citation analysis, Co-occurrence analysis, Thematic analysis and Network analysis.

4.3 Data Collection

Information is gathered using a blend of methods. A preliminary discussion (informal consultation) with an IT project manager of M/s Pattison Food Group was commenced. Following preliminary discussions, the data were collected through the company's website (Pattison Food Group, 2023). Additionally, the data collection for the literature involved utilizing Scopus, recognized as the world's most extensive curated research database (Schotten et al., 2017). To gather pertinent literature on the digitalization of food supply chains, the research questions and objectives were first clearly defined. This process led to the identification of key concepts, including "Food Supply Chain," "Complexity of Supply Chains," and "Digitalization," as well as associated keywords. The 3 data sets are searches within Scopus database using the keywords as revealed in Table 2.

Table 2

Key word usage on Scopus

Data Set	Used Keywords
1	• Food

	• Supply
	• Chain
	• Management
	• Issues
2	• Food
	• Supply
	• Chain
	• Technological
	• Complexities
3	• Technological
	• Solutions
	• Supply
	• Chain
	• Management

Note. Table generated by author

These keywords were strategically combined using the Boolean operator "AND" within each data set to narrow down the search results. The search resulted in 621 articles, which were subsequently filtered using inclusion and exclusion criteria as depicted in figure 7 to ensure both relevance and quality. Non-peer-reviewed articles were excluded to ensure the credibility and reliability of outcome (Farooq, 2024), and only those published from 2014 onwards, written in English are filtered to have more up to date information which led to increase the relevance and academic standards of the analysis.

Figure 7

Process of selection based on inclusion and exclusion criteria.

Data Base search (Scopus) n = 621
- Articles downloaded after searching on 10 keywords

Scholarly reviewd Articles n = 562
- Exclusded non-scholarly reviewd articles

Articles Publishes within 2014-2024 n = 491
- Exluded articles publiched before 2014

Articles written in English n = 479
- Excluded articles written in Spanish and Chinese
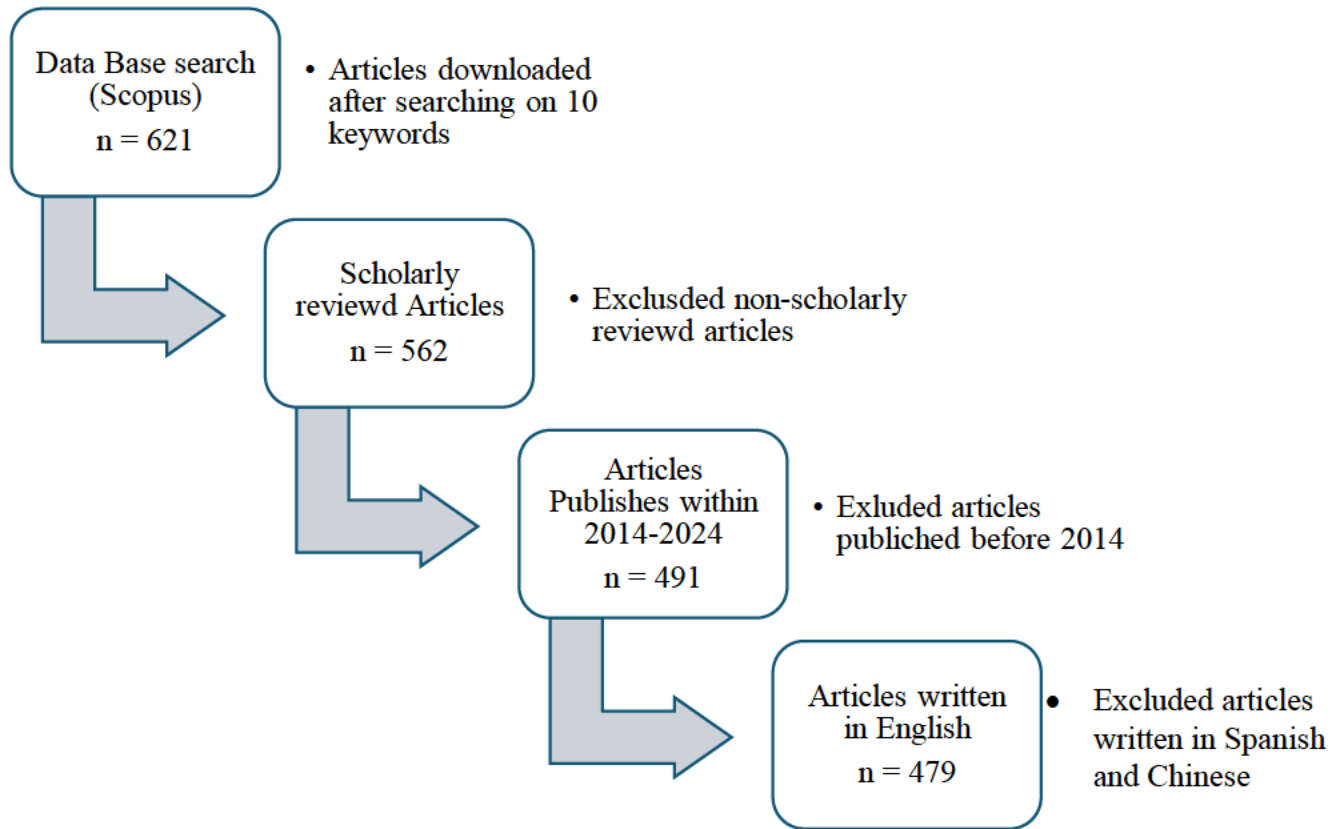
Note. Figure generated by author using smart art tool in MS Word

4.4 Development of the Digitalization Roadmap

Based on the findings from the literature review and case study, a digitalization roadmap is developed. This roadmap outlines the steps required to follow when implementing digital transformation initiatives or tools. The roadmap suggested as a path to overcome identified challenges, enhance supply chain efficiency, and achieve the company's strategic goals.

5. Analysis on Research Questions

Analysis of the research can be elaborated based on the defined research questions as below.

5.1 RQ1: What are the key challenges faced by M/s Pattison Food Group, Canada in its supply chain management in terms of specific areas affected?

The challenges and concerns raised within the process of digitalization the supply chain of M/s Pattison Food Group was identified through the preliminary discussion (informal consultation) and literature review. The following sections provide a detailed explanation of the four identified issues.

5.1.1 Increase of Stakeholder Involvement

The supply chain of M/s Pattison Food Group consists of many stakeholders especially retail chains such as Save on Foods, Price Mart Foods, Urban Fare, Buy-Low Foods, Nesters Market, Quality Foods etc. and the communication and information sharing with these companies are enabled through the M/s Pattison Food Group Partner Portal (Pattison Food Group, 2023). At the same time the increase of stakeholder involvement during their project initiation and deployment stage directs to few issues that increase the complexity of improving the supply chain through digitalization. As the digitalization of supply chains progresses, the involvement of multiple stakeholders such as suppliers, logistics providers, and customers increases (Yang at al., 2021). This can lead to more complex coordination challenges. Each stakeholder may have different priorities, levels of technological adoption, and expectations (Schniederjans et al., 202), making it difficult to align objectives and processes.

On the other hand, when there is a higher involvement of stakeholders with the increase of higher number of connected stakeholders, the need of greater transparency and data sharing through the whole supply chain also become an essential consideration. Therefore, data security concerns, proprietary information issues and concerns on trust between parties can be raised (Sobb et al., 2020). Additionally, decision making process can be complicated due to the increase in

stakeholder involvement as more parties need to be consulted, which may slow down decision-making process and lead to conflicts if there are disagreements (Schniederjans et al, 2020).

5.1.2 AI/IT Adoption with Security Concerns

When implementing AI and IT technologies in supply chain, it creates risk of cyberattacks. As it leads for operational disruptions, damages to company reputation and data breaches (Pandey et al., 2020). And new AI and IT solutions demands more smooth and flexible process which become a challenge when integrating with existing systems as they may not align effectively. Inefficient management on these concerns mat lead to security risks to the supply chain (Mazilescu, 2020). When adapting AI technologies, the organizations need to have the ability to handle vast amounts of data which includes critical information as well. And the management of these data need to be complied with regulations such as GDPR (General Data Protection Regulation). However, with the evolvement of technology the be compliant with all related aspects can be difficult (Issalillah and Hardyansah, 2024). Therefore, the company need to follow better data management strategies and provide more attention to ensure that data practices and well aligned with regal requirements.

5.1.3 Acquiring Skilled Workforce

The digitalization of supply chain requires a highly skilled workforce which is specialised in AI, IT, Data analytics and other advanced technologies. But due to the shortage of required skilled employees' significant challenges can be raised (Muktiarni et al., 2019). As per the current process of M/s Pattison Food Group acquiring skilled employees become a critical challenge when digitalizing their supply chain. The digital transformation efforts can be delayed and disturbed due to the skill gap and companies struggle to integrate and manage technologies without the right talent. Besides, continuous learning and adaptation is vital due to the rapid change in technological

industry which lead the existing skilled employees to have regular training and learning sessions to be updated (Abe et al., 2021). Moreover, in a competitive job market, attracting and retaining these skilled professionals adds another layer of difficulty. The risk of losing top talent to other companies or industries can create instability and slow down the overall digitalization process (Muktiarni et al., 2019). This underscores the importance of not only acquiring but also developing and retaining a skilled workforce as a fundamental part of the M/s Pattison Food Group's digital strategy.

5.1.4 Resistance to Change

Resistance to change is inevitable when implementing new schedules, technologies and structures within an organization which become an issue for M/s Pattison Food Group as well (Pattison Food Group, 2023). This happens mainly due to the fear of job losses, narrow understanding, cultural barriers, preference for familiar ways of working etc. This enables to lower the effectiveness of digitalization process and slow down the implementation (Farouk et al., 2024). Resistance can be raised after the introduction as well. Therefore, partial adaption to new changes become a common concern. This can prevent the company from gaining advantages such as enhanced supply chain responsiveness and increased operational efficiencies (Sarilo-Kankaanranta and Frank, 2021).

Strong change management practices need to be adapted to address these challenges timely manner. However, implementing such programs can be both costly and time-consuming. The expenses involved in training, communication, and providing incentives for adoption are significant, but necessary to ensure a smooth transition. If resistance to change is not effectively managed, it can lead to delays in the project timeline and escalate costs, further complicating the digital transformation process (Wang, 2022). For the M/s Pattison Food Group, addressing these challenges is essential to the successful digitalization of its supply chain (Pattison Food Group,

2023). This involves a combination of strategic planning, investment in both technology and talent, and a strong focus on change management. By proactively managing these cultural barriers and adoption challenges, the company can better position itself to leverage the full potential of digital technologies in its operations (Table 3).

Table 3

Issues within Supply Chain Digitalization of M/s *Pattison Food Group* (Pattison Food Group, 2023).

Challenge	Forces	Impact
Increase of Stakeholder Involvement	Higher Complexity and Coordination	Difficult to align objectives and processes
	Data Sharing and Transparency requirement	Raise concerns about data security, proprietary information, and trust between parties
	Complicated Decision-Making Processes	Slow down decision-making and lead to conflicts
AI/IT Adoption with Security Concerns	Cybersecurity Risks	Lead to disruptions in operations, data theft, and damage to the company's reputation.
	Integration Challenges	Incompatibility with different technologies
	Data Privacy and Compliance	Reduce the effectiveness of the digital initiatives
Acquiring Skilled Workforce	Skill Gaps	Hinder the company's ability to fully realize the benefits of digitalization
	Regular Training and Development	Place additional demands on the company's resources

	Talent Retention	Create instability and slow down the digital transformation process
Resistance to Change	Cultural Barriers	Depend on existing technologies without updating
	Adoption Challenges	Inefficiencies and undermine the benefits of digitalization
	Change Management Costs	Lead to project delays and increased costs

Note. Table generated by the author

5.2 RQ2: What digital transformation technologies and strategies are currently available for improving supply chain management?

Corresponding to the quantitative analysis done through Biblioshiny there are few aspects of digital transformation technology that gained more attention during past 10 years. As per the figure 8 which depicts the Words Frequency Over Time, the annual frequency of specific phrases related to supply chain management (SCM) from 2014 to 2024 can be identified. This visualization helps to identify trends in the focus areas of the field and illustrates the impact of digital transformation over time (Farooq, 2024).

Figure 8

Words Frequency Over Time
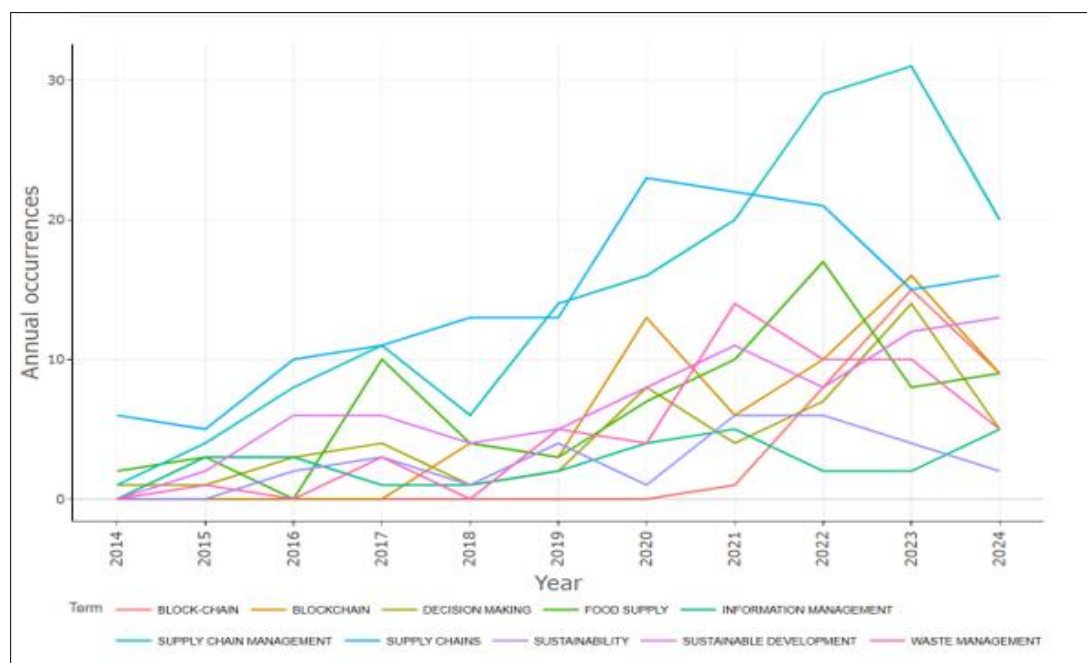
Note. Figure generated by Biblioshiny under descriptive analysis

When analyse only the mostly recognized digital transformation technologies and strategies from words which gained more attention on research and analysis field, below findings can be highlighted that are currently available with M/s Pattison Food Group to improve the supply chain management through digitalization (Table 4).

Table 4

Available technologies and strategies to improve SCM

Available Technology	Available Strategies
Blockchain	Sustainable Development
	Waste Management

Note. Table generated by the author

5.2.1 Blockchain Technology

Blockchain is a technology that offers a distinctive set of features, including a decentralized architecture, distributed nodes and storage systems, consensus algorithms, smart contracts, and asymmetric encryption. These attributes work together and guarantee network security, transparency, and visibility (Dutta et al., 2020).

The terms such as "Smart Contract" and "Information Management" become leading aspects which are different aspects of Blockchain (Figure 9) which showcase that the more focussed examination on digital technologies and its implementation. Smart Contracts enable to leverage the usage of blockchain technology while proving access to automate, streamline the processes, and remove the need of more intermediaries (Chowdhury et al., 2023). Smart contracts are directly associated with blockchain technology, as it facilitates the blockchain's decentralization process to execute automatically and enforce agreements (Turjo et al. 2021)

Figure 9

Trend Topics Graph
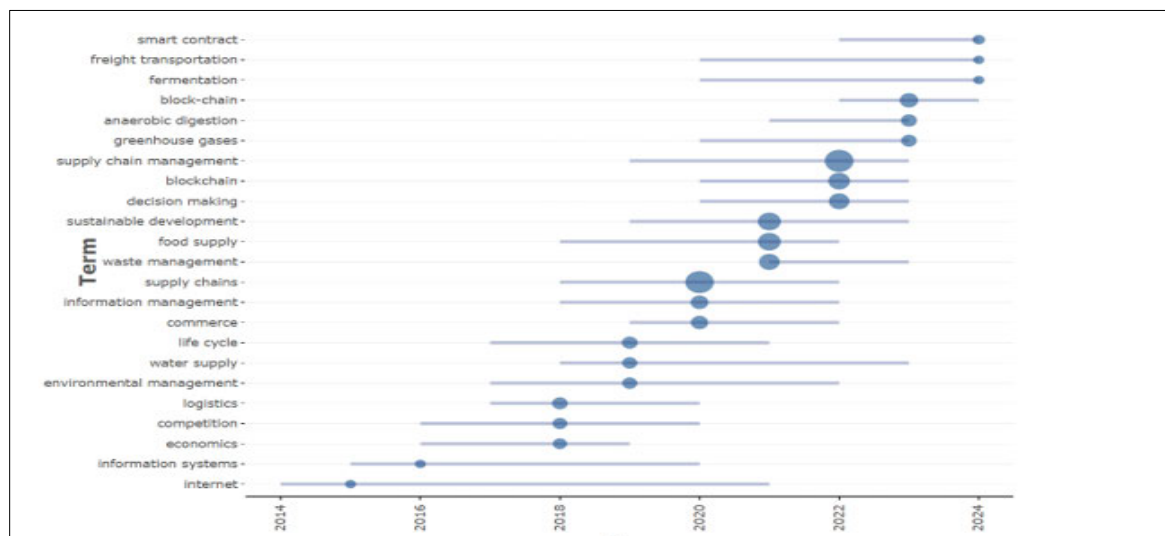
Note. Figure generated by Biblioshiny under descriptive analysis

Significant advantages can be gained by the M/s Pattison Food Group after integrating blockchain technology into the supply chain activities. Because secure and transparent systems for tracking, tracing, and recording transactions across supply chain from suppliers to retailers offered by the blockchain. The feature of productive trackability ensure that real-time and reliable information can be accessed by relevant parties while reducing risk of fraud and errors. Therefore, to improve the efficiency of the supply chain, gain more trust from stakeholders and to ensure better alignment with industry standards the M/s Pattison Food Group can implement blockchain.

5.2.2 Practice Sustainable Development

The environmental consideration and sustainable practices through the supply chain is emphasised through the increased frequency of terms such as "Sustainability", "Environmental Management" and "Waste Management" within past 10 years. This eventually reflects the rising awareness on importance of addressing and focussing on environmental impacts of supply chain which can be identified as greenhouse gas emissions and increased wastage etc. At the same time, this highlights the need of resource optimization using advanced technologies in information systems and logistics (Sarkis et al., 2021). This trend denotes a broader transition within supply chain management to focus on prioritizing responsibility towards the environment while increasing operational efficiency.

By considering above facts M/s Pattison Food Group can initiate digital tools to support the sustainable development practices within their supply chain. The waste can be minimised, and carbon footprint can be reduced by employing AI and data analytics. Digital platforms can also be employed to monitor and report on sustainability metrics, helping the company align its supply chain practices with environmental goals and regulations. These sustainable practices not only

contribute to environmental protection but also enhance the company's reputation and ensure compliance with global sustainability standards.

5.2.3 Practice Waste Management strategies

The rise in waste management awareness increased overtime and the waste management related strategies within food supply chains in Canada can be attributed to several key factors. Such as, Environmental Impact and Sustainability Goals of organizations, Regulatory and Policy Changes done by government, economic fluctuations, increase of Collaboration and Partnerships etc.

Following the Co-Occurrence Network showcase in figure 10, "waste management" is closely linked with "supply chain management". The 3 different colors of Co-Occurrence Network exhibit the 3 clusters as below:

- Cluster 1 – Supply chain, food supply, supply chain management, sustainable development, and food safety.

- Cluster 2 – Blockchain, Internet of Things, Information management and distributed ledger.

- Cluster 3 – Waste management, food waste, risk assessment, catering service and recycling.

Nodes that are central or highly connected represent keywords that are essential to the field of study and often signify key themes. According to the generated graph, "supply chain management" emerges as the most connected keyword, acting as a bridge between the identified clusters, especially linking closely with "blockchain" and "waste management". On the contrary, "Sustainable development" indicates a strong interconnection with "Blockchain" and "Recycling"

which shows that the better focus on waste management and technological aspects is a key to gain advantages of sustainable food supply chains.

For an example, when consider the "Eden" which is the AI based technology developed by Walmart to monitor the freshness of food and predict the level of spoilage of food. By analysing the images of the vegetables and fruits the tool determine the quality which allow Walmart to take more proactive actions through informative decision making on inventory and this facilitates the reduction of food wastage as well. After implementing "Eden", Walmart enable to lower the level of food wastage in their supply chain by 50% by saving their revenue and ensuring freshness of products (Kleinman et al., 2018). This not only improves efficiency but also aligns with sustainability goals by minimizing the environmental impact of food waste.

Figure 10

Co-Occurrence Network Graph
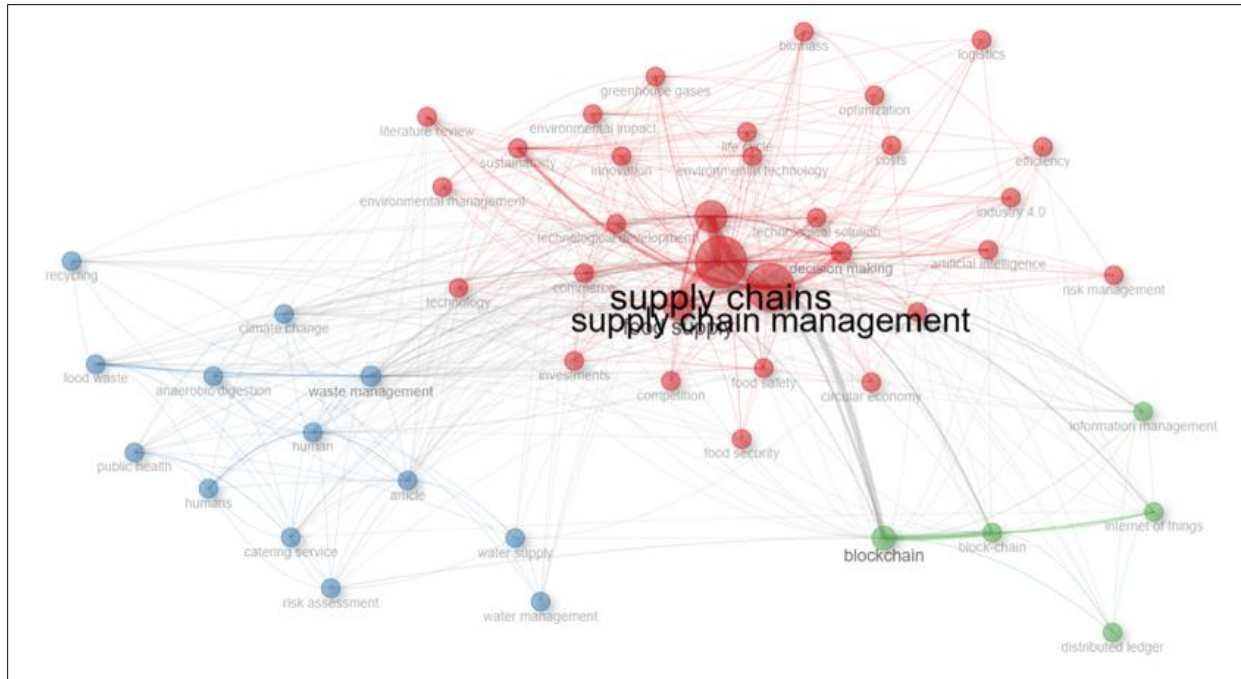
Note. Figure generated by Biblioshiny under co-occurrence analysis

Another important sector that can be improved through digitalization in supply chain of the M/s Pattison Food Group is waste management. IoT and AI can be used to monitor and manage waste generation in real time. And company can track and control the amount of waste that is produced in the organization which lead the M/s Pattison Food Group to identify inefficiencies and implement strategies to mitigate the issues. Additionally, the use of digital enables recycling and reuse of materials employed in operations of the company, thus enhancing circular economy.

5.3 RQ3: How can technologies such as blockchain, IoT, AI, and data analytics be applied to different stages of the supply chain?

As per the findings gained through the literature review, it is possible to justify that the supply chain effectiveness and efficiency can be increased and maintained through integration of digital transformation initiatives with a paradigm on sustainability and waste management.

5.3.1 Application of Blockchain

Blockchain can be applied for procurement and sourcing stage and inventory management stage of supply chain as it offers a powerful solution for enhancing transparency and traceability. It ensures the formation of a distributed and secure registry for all the transactions that occur with suppliers in the real time with the reach across the entire supply chain and it enable to reduce disputes by 50% (Helo and Shamsuzzoha, 2020). This transparency builds trust by making every step of the procurement process visible and verifiable. It allows M/s Pattison Food Group to track products from origin to destination, ensuring authenticity and adherence to sustainability standards, such as confirming organic certifications. Blockchain also verifies the authenticity of sourced materials, meeting regulatory requirements and assuring customers of product quality (Raja and Muthuswamy, 2022). Moreover, it increases the supplier responsibility regarding all the activities within supply chain which enable M/s Pattison Food Group to take corrective actions is standards are not met.

By incorporating blockchain into the supply chain of M/s Pattison Food Group, it allows them to have a live database of the inventory that is being managed across the supply chain. This visibility helps make informed decisions about restocking and production planning. Synchronous data provided by blockchain also reduces instances of overstocking which can result in lost sales. This directs the company to coordinate the supply with the demand and to have the necessary products available (Dutta et al., 2020). Blockchain also helps to supply chain integration which allows all stakeholders to get same information at same time which increase coordination and initiates the replenishment process where required. Blockchain ensures secure and secure and unalterable inventory records, reducing the risk of fraud and errors. Smart contracts can automate processes like reordering, further streamlining operations (Turjo et al., 2021).

5.3.2 Application of IoT

IoT technology is transforming supply chains by enabling immediate monitoring, automation, and data-driven decision-making across various stages of supply chain. IoT devices can be installed on vehicles that transport the products, pallets, and containers where the food is stored during transportation to monitor the conditions of perishable goods. Because, the IoT sensors can track vibration, humidity and temperature which are critical information to maintain the quality and standard of food items. By providing real-time data on the environmental conditions during transportation, IoT devices help ensure that products arrive at their destination in optimal condition (Khan et al., 2022). For instance, when a specific temperature limit is crossed, the system can provide notifications within seconds to relevant workers or employees for rectifications that can be made before the quality of products is affected. Moreover, the ability to monitor and control environmental factors during transportation directly contributes to waste reduction (Ivankova et al., 2020). Real-time interventions prevent spoilage and damage, reducing the amount of perishable goods that go to waste and enhancing the overall efficiency and sustainability of the supply chain.

During the process of warehouse management IoT technology can be incorporated to provide an auto tracking of the stocks. RFID tags, smart shelves, and sensors can track the position and change of products within the stores without interruption. These initiatives minimize the use of other manual methods that can be easily influenced by human errors and lead to a 15%-20% reduction in equipment downtime (Jarasuniene et al., 2023). By providing detailed insights into the location and status of inventory, IoT systems enable better space utilization within warehouses. The management can discover some of the spaces that are not well utilized and determine the best possible store arrangement (Khan et al., 2022). These advantages are important for stores that have minimum space as with IoT tracking the employees can locate and retrieve products within

minimum time by reducing the time needed to fulfil orders. The faster order processing leads to shorter delivery time and better customer satisfaction with the improvement of operational efficiency (Mostafa et al, 2020). On time updates on inventory levels minimize the discrepancies between physical stock and recorded data which is a crucial information for effective inventory management. And supports better forecasting of demand and inventory planning.

5.3.3   Application of AI

Artificial Intelligence become a vital aspect in enhancing the forecasting of demand by analyzing a wide range of data points. Analysis of large volumes of historical data and identifying patterns and trends are allowed by AI systems that are not facilitated by traditional methods (Mediavilla et al., 2022). Other than historical information, external factors such as weather patterns, social trends, market conditions, and economic indicators can be predicted by AI with a higher level of accuracy and increase forecasting accuracy by 20-50% (Ivanov et al., 2019). For example, AI can predict a surge in demand for certain products during specific weather conditions or holidays, helping the M/s Pattison Food Group anticipate and prepare for these spikes. Through AI-driven technologies M/s Pattison Food Group can optimize its production schedules more efficiently. The risk of overproduction can be eliminated which can lead to avoiding excess inventory and waste.

To mitigate the risks associated with the supply chain, AI-driven tools provide invaluable support which strengthens the supplier relationships. Due to the wide capacity that AI technology enables a company can analyse vast amounts of data including quality of goods, delivery times, and historical reliability. By identifying patterns and anomalies, AI can help the M/s Pattison Food Group assess which suppliers consistently meet their commitments and which may pose a risk (Wong et al., 2024). For example, if a supplier is in a region prone to political instability or natural disasters, AI can flag this as a potential risk, allowing the company to prepare contingency plans

(Baryannis et al., 2019). By absorbing the AI-driven technologies into the supply chain management M/s Pattison Food Group can take more accurate and enable to maintain proactive decision-making process about their supplier base. This involves diversifying supplier structure to reduce the dependency on one or few sources, renegotiating contracts to incorporate risk mitigation clauses or investing in relationships with more resilient suppliers. This allow the M/s Pattison Food Group to secure strong supply chain, which is critical for maintaining consistent operations, especially in the face of disruptions, and ensures that the company can continue to meet customer demands even in challenging circumstances.

5.3.4   Application of Data Analytics

Data analytics is also identified as a critical aspect for optimizing supply chain operations by identifying inefficiencies, enhancing resource allocation, and improving overall operational efficiency. M/s Pattison Food Group can uncover the concerns that may need more costly and time-consuming solutions by employing data analytics across the entire supply chain (Anitha and Patil, 2018). As an example, data analytics enable to discover the bottlenecks in the production process, delays in transportation, inventory management issues etc. that allow the organization to take actions proactively and address them better. Data analytics facilitate the company to allocate resources more effectively by providing a clear understanding of where they are mostly needed (Wang et al., 2016). By analysing demand patterns and trends, the management of the company can ensure that resources are allocated optimal manner to products and locations based on the demand requirements. This helps in reducing waste, lowering costs, and ensuring that resources are used where they will have the greatest impact.

The operations across the supply chain can be streamlined with the insights gained from data analytics. This involves resourceful production schedules, optimized inventory control, and proficient logistics and transportation processes. By making data-driven decisions, the M/s

Pattison Food Group can achieve greater efficiency which improves overall supply chain performance and improves accuracy by 20%-50% (Hallikas et al., 2021). Data analytics become a day-to-day support mechanism for strategic decision-making while providing a comprehensive view. As an example, the impact of potential changes such as introducing new products or entering new markets can be critically analyzed and enable to align the impact of them with long-term business goals.

5.4 RQ4: How can the identified digital transformation strategies be integrated into existing supply chain processes and systems?

Integrating digital transformation strategies into the existing supply chain processes and systems at M/s Pattison Food Group involves a combination of strategic planning, technology adoption, and change management.

5.4.1 Strategic Planning

- **Assessment of Current Systems**: The initial stages consist of the process of assessing current processes and systems in the supply chain with an in-depth review which leads to identify areas that can benefit from digital transformation. Mapping out existing workflows and pinpointing inefficiencies or gaps that digital technologies could address will be involved in the assessment of status.

- **Alignment with Business Goals**: Any digital transformation initiative must align with the broader business objectives of M/s Pattison Food Group. For instance, if sustainability is a key focus, the company need to prioritize integrating technologies that reduce waste and optimize resource use.

5.4.2   Technology Adoption

- **Phased Implementation**: Integrating new technologies should be done in phase by phase to minimize disruptions. For example, blockchain can be first implemented in the procurement process before expanding to inventory management. This approach allows for testing and refining processes before full-scale adoption.

- **Integration with Legacy Systems**: When incorporating new technologies, it is necessary for them to be compatible with existing systems to ensure smooth transition which may involve replacing or updating existing systems to create a more interconnected supply chain network.

5.4.3   Change Management

- **Training and Development**: To maximise the positive outcomes of new initiatives the workforce need to be trained with required skills and knowledge. And need to educate the employees on the benefits and importance of digital transformation as well.

- **Stakeholder Engagement**: The process of digitalization may affect to many stakeholders including suppliers, partners, customers, employees etc. Therefore, it is cruscial to engage all the affected parties during the digital transformation process. Clear communication can foster the collaboration.

5.4.4 Continuous Monitoring and Improvement

- **Performance Metrics**: Key performance indicators need to be established to monitor the impact and progress of transformation process. This directs the M/s Pattison Food Group to measure success, identify the areas that need to be improved and allow them to make data-driven decisions.

- **Feedback Loops**: Feedback from all the related or affected parties need to be taken regularly to identify the progress during each stage of implementation of digital transformation. This ensure that the supply chain remains responsive to changing market conditions.

M/s Pattison Food Group can achieve greater success by following above strategies and techniques which position the company for enduring milestones.

6. Proposed Road Map

6.1 Step 1 – Foundation and Preparation

6.1.1 Status in terms of available resources (Feasibility analysis)

M/s Pattison Food Group owns a diversified array of food-related industries. The first stage is a complete feasibility review of existing supply chain technology. For instance, assessing the company's present Enterprise Resource Planning (ERP) systems and their connectivity with suppliers and distributors might reveal digital capability gaps.

Reviewing the organization's supply chain structure, it was identified that significant portion of company's supply chain activities are being managed using legacy systems that are partially linked, resulting in inefficiencies.

Controlling the supply chain

It has designed to be more efficient, with lower operating and product costs accounting for most of the effectiveness improvements that were targeted. "We are still in the very early stages of this and learning how we can bring all our synergies together, explains Ben Harrack who is a senior vice president with M/s Pattison Food Group. He said that such efficiencies are expected to stem from the group's increased purchasing power, shared supply chains and marketing

capabilities as well as information technology (IT), warehousing-fulfillment infrastructure. Darrell Jones, President has identified other efficiencies that can be obtained through centralization such as payroll (ERP application) and non-retail real estate related services as site selection & leasing to Grocery Business magazine a primary Canadian grocery B2B publication journal, featured A Bold Vision article (Johne, 2022).

Data analytics has allowed to identify trends that were beginning to benefit the organization in data-driven decision making, says Jamie Nelson, Chief operating officer of M/s Pattison Food Group and EVP at Save-On-Foods, to the Grocery Business, The Canadian epitome journal. To add, Save-On-Foods Operations Senior Vice President, Mr. Paul Cope discusses on Nature's Fare Markets, in B.C.'s Okanagan and Lower Mainland regions and their expertise into the supplier network and the advent of the digital channels benefit.

The data driven program based on data analytics, More Rewards (the company's loyalty program which became its own business unit and reports to the organization President Darrell Jones in 2019) has powered an evergreen stream of customer engagement data that would not have been possible without widescale adoption of digital tools (AI, IoT, Block Chain) as part of a new digitalization model for corporate. More Rewards now counts about 85 per cent of Save-On-Foods regular shoppers as members and up to 15 per cent of members are "highly engaged" in the program as stated by President, Darrell Jones as reported by Grocery Business magazine, a B2B publication. McKinsey's research shows, up to 30% operational expenses reduced and a 75% reduction in missed sales are predicted. Along with a 75% decrease in stocks, all while greatly enhancing the supply chain agility with the Digital transformation technologies AI, IoT, and Block Chain (Alicke et al., 2016).

Agreeing to a recent McKinsey study (Figure 11), supply chains have the lowest level of digitization across five areas that examined with an average of 43%. Just 2% of the executives surveyed reported that digitizing their supply chains was at the heart of their digital strategy. Or do they have other priorities? Perhaps. In fact, the same McKinsey research indicates that those companies with very well digitized supply chains can add 3.2% in annual EBIT and 2.3% from digital revenue penetration, by far the highest return on any of the digital business areas (Gezgin et al., 2017).

Figure 11

Digital Supply-chain levers can unlock significant improvements across multiple performance dimensions.
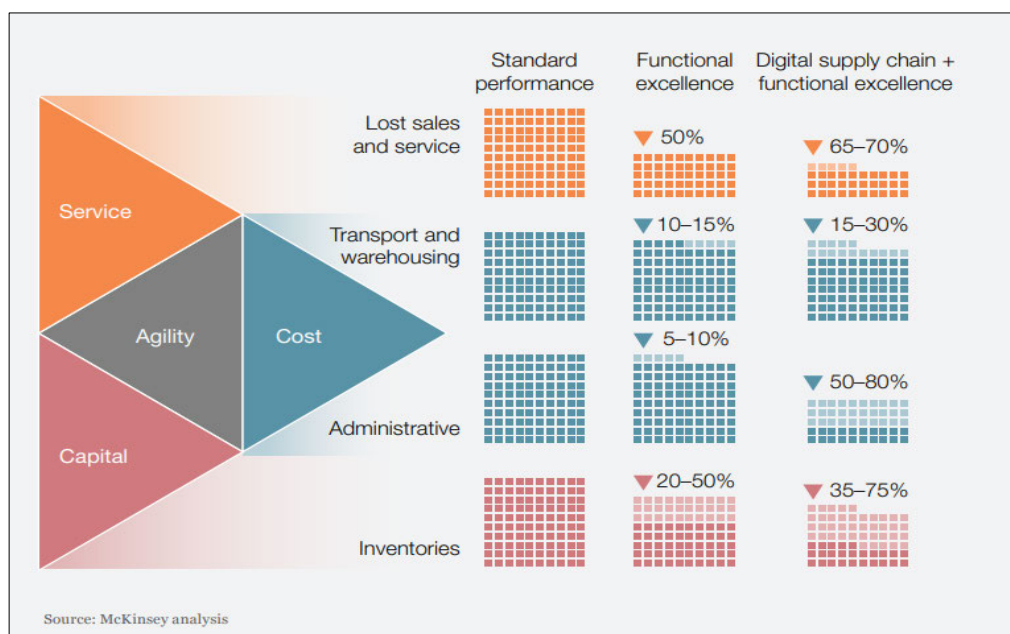

Note. From Digital Transformation: Raising Supply-Chain Performance to New Levels by McKinsey & Company (https://www.mckinsey.com/capabilities/operations/our-insights/digital-transformation-raising-supply-chain-performance-to-new-levels)

On investigating the success stories, the tangible Return on Investment (ROI) involved a leading healthcare company whose supply-chain service levels had been in decline for some time due to an outdated enterprise-resource planning (ERP) system. However, the service levels started dipping but its other services continued to take a hit and after one year it redefined their processes with data analytics tools. For instance, demand forecasting, falls under Digital transformation. Restoring operations without managing complementary technology upgrading can be evenly challenging. For instance, a large consumer-goods company has enhanced supply-chain service swiftly succeeding in a series of operational deviations but soon returned to its novel level as the technologies were not in place to support those new operations (Gezgin et al., 2017). These instances indicate how important is digital transformation for an organization like M/s Pattison Food Group to continue its operation successfully in the long term.

The below pie chart (Figure 12) is the percentage of current systems that are completely integrated, somewhat integrated, or not integrated throughout the supply chain as per McKinsey. Gartner's research on supply chain digital transformation trends helped the company understand how prominent organizations are tackling comparable difficulties.

Figure 12

Current system integration across the Supply chain

Fully Integrated 30.0%
Not Integrated 20.0%
Partially Integrate 50.0%
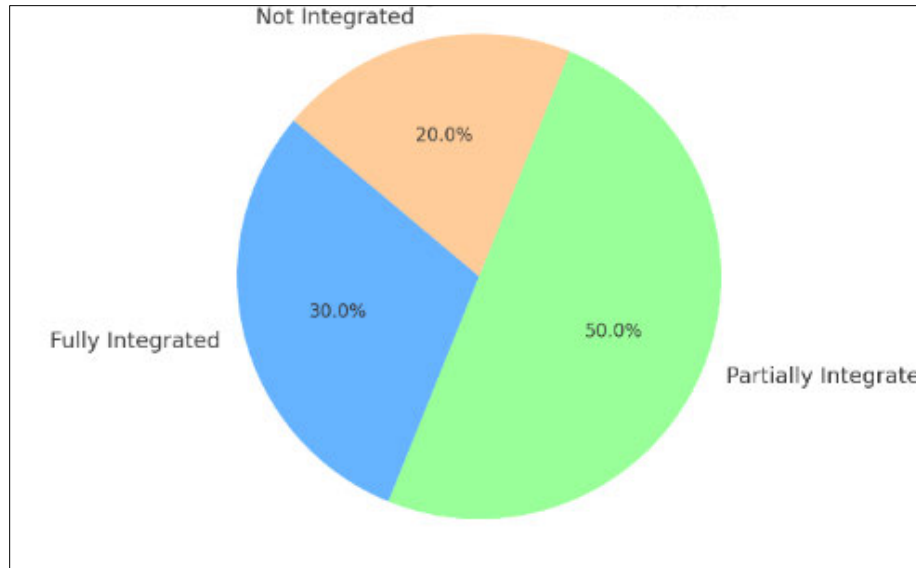
Note. Generated by author using MS Excel sheet based on the McKinsey Analysis

6.1.2 Stakeholder engagement

M/s Pattison Food Group's stakeholders include suppliers, logistical partners, and internal departments and employees, Finance firms etc. Engaging these groups in seminars, socially responsible activities and surveys provide insights into their needs and aspirations. Major stakeholders in a comparable case study reported increased satisfaction following digitalization due to greater communication and data openness. Because it is a type of large-scale transformation (Solberg et al., 2020), yet not just a mere localized technological change, digital transformation (DT) necessitates changing more than some processes and practices at only one unit in the organization. DT initiatives are frequently delivered by a constellation of interrelated stakeholders with varied views, motivations, and objectives; some literature refers to these players as participating in an innovation ecosystem (Guinan et al., 2019; Kozanoglu & Abedin, 2020). To make such collaborations more efficient and successful, the interpretations of stakeholders about how changes are introduced may need to be compatible with a common interpretation regarding this process in DT. Thus, stakeholder engagement and success are utmost important to the M/s

Pattison Food Group for implementing the DT into their supply chain management for long run growth.

6.1.3 Implementing Communication Plan and Feedback mechanism.

Creating a communication strategy that includes frequent updates via internal newsletters and a dedicated digital transformation site will be critical. Quarterly surveys help develop feedback loops. And frequent reminder emails would also help the feedback mechanism. Companies that maintained weekly communication during digital transformation had a 20% better success rate with stakeholder alignment as per Culturemonkey review on successful communication methods for company changes and figure 13 illustrates the changes in communication effectiveness during a digital transformation over five months and it indicates a significant improvement in communication (S, 2024).

Figure 13

Communication Effectiveness During Digital Transformation
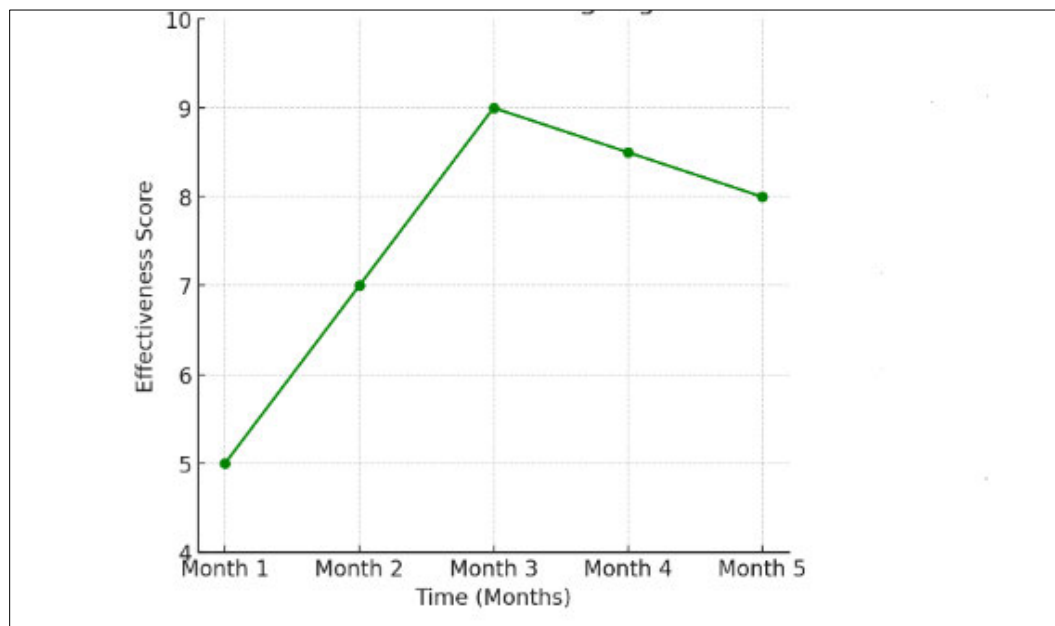
Note. A line chart showing the frequency and efficacy of communication touchpoints during the transformation process from Feedback Mechanisms: Definition, Types, and Ways to Improve the Process in the Workplace by Culturemonkey (https://www.culturemonkey.io/employee-engagement/feedback-mechanisms/).

6.2 Step 2 – Planning and Development

6.2.1 Training Schedule

Creating a customised training plan for different workforce levels is crucial. For example, warehouse employees may require training on new inventory management software, whilst management may benefit from sophisticated analytics courses. Businesses who engage in phased training programs experience a 30% decrease in operational disturbance throughout the changeover as per The Supply Chain Management Association (SCMA) which provides online training resources and best practices. Given that more than 56% of global enterprises experience a supply chain interruption each year, businesses have begun to take supply chain disruptions more seriously (BCI-Business Continuity Institute, 2019). As a result, it is critical to build robust Supply Chains and plan for contingencies (Katsaliaki et al., 2021).

Figure 14

Training schedule for digital transformation
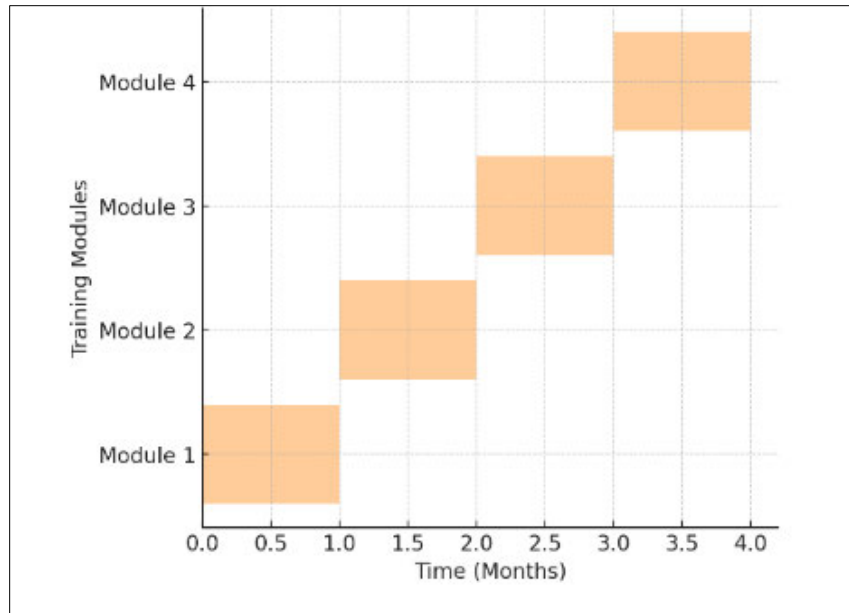
Note. A Gantt chart illustrating the training timetable, displaying skill development phases that correspond to implementation milestones sourced by the Supply Chain Management Association (SCMA) from Supply Chain Disruptions and Resilience: A Major Review and Future Research Agenda - Annals of Operations Research (https://link.springer.com/article/10.1007/s10479-020-03912-1#ref-CR12).

6.2.2 Recruiting Skilled Workforce

M/s Pattison Food Group seeks digital supply chain management specialists, such as data analysts and IT professionals with food logistics experience. In a similar transition, hiring skills-first based experts rather qualified has resulted in quicker implementation of new systems and diverse workforce for greater success as per Linkedin Workforce Reports, this skill-based recruitment has grown to 50% (Paasch, 2023). LinkedIn's Workforce Reports can help influence recruiting tactics for technical skills in supply chain management.
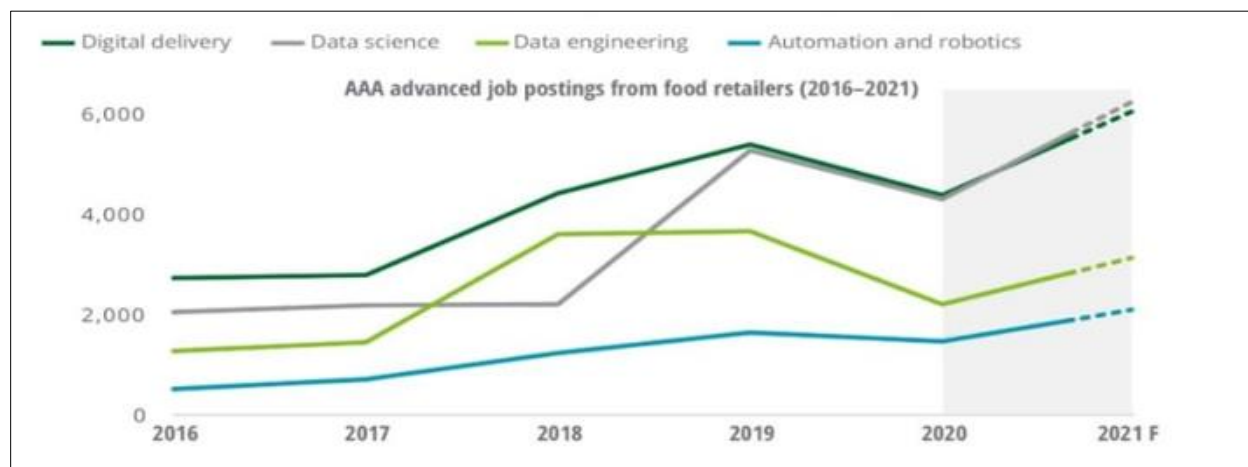
The prominent skilled job openings have increased from year 2016 to 2021 as shown in figure 15. The recruitment and requirement have drastically increased and can be seen multi-folds.

Considering the Data science positions, it has increased from 2000 jobs in 2016 to close to 6000 job openings in 2021 as per Deloitte study (Renner et al., 2021).

Figure 15

Recruiting Skill clusters job posting pattern in food industry

Note. From Future of work: Digital Skills in the Food Industry by Deloitte Insights (https://www2.deloitte.com/us/en/insights/industry/retail-distribution/digital-skills-food-industry.html)

6.2.3 Change Management Process Design

Designing a change management approach with frequent workshops, leadership training, and employee support programs can assist overcome opposition in employees. A Prosci research found that effective change management can avoid resistance experienced by employees up to 41% and altogether 43% manager resistance which they experienced could be avoidable which depicts in figure 16 (Kempton, 2024). Prosci's Change Management Toolkit is an online resource that provides practical tools and templates.

Figure 16

Effective Change Management and Resistance avoidance Percentage

Note. From the Case for Resistance Prevention in Change Management   by Prosci (https://www.prosci.com/blog/the-case-for-resistance-prevention-in-change-management#:~:text=In%20Prosci%E2%80%99s%20benchmarking%20research%2C%2041%25%20of%20respondents%20reported,half%20the%20manager%20resistance%20they%20experienced%20was%20avoidable.)

6.3 Step 3 – Implementation and migration

6.3.1 Core System Upgrades

M/s Pattison Food Group prioritises upgrading ERP systems, data analytics to a cloud-based platform for real-time data analytics. This will allow for improved decision-making and more flexible supply chain operations. As per McKinsey & Company studies, these technologies and Cloud-based integrations boost supply chain demand forecast accuracy and efficiency by 30 to 50 percent by making data more accessible, lowering the forecasting error (Alicke et al., 2016).

6.3.2 Integrate Scope Management Tools

Using tools such as Microsoft Project or JIRA to monitor the digital transformation's scope may keep the project on track at M/s Pattison Foods. Companies that use advanced scope management solutions are more likely to complete projects on schedule. Project Management Institute (PMI) has published white papers on successful scope management in large-scale projects. JIRA's tailored workflows enforce organisations to map existing processes and automate repetitive tasks. By designing process rules, triggers, and conditions, teams can remove recurrent human efforts, downsize mistakes, and assure consistent execution (Yevdokymova, 2023).

Project Scope Management consists of the following parameters and attributes during the implementation process as shown in Figure 17. The Project Charter is a formal document that authorises a project and defines its objectives, scope, and key stakeholders, signing the project's official start (PMI, 2017). It provides a clear project description that defines the project's purpose and aims, assisting the team's comprehension (Kerzner, 2019).

The project goals are broad objectives that govern the project's direction and expected outcomes (Lock, 2013). The business case supports the project by outlining its anticipated benefits, expenses, and alignment with organisational strategy (Schwalbe, 2018). High-level criteria specify the main characteristics or circumstances that project deliverables must satisfy (PMI, 2017). Assumptions are planning conditions that are assumed to be true, whereas constraints are project execution limits (Kerzner, 2019).

Identifying high-level risks or possible concerns assists in establishing mitigation strategies (Schwalbe, 2018). Deliverables are outputs or items to be produced and describing them explicitly ensures that all team members understand what has to be accomplished (Lock, 2013). Stakeholders are persons or organisations who are interested in the project's result, and managing their

expectations is critical to project success (PMI, 2017). The Requirements Traceability Matrix monitors the fulfilment of requirements throughout the project lifetime (Schwalbe, 2018). The Project Scope Statement specifies the project's boundaries and clarifies what is included and omitted, whereas the acceptance criteria specify the requirements that deliverables must fulfil to be considered acceptable (Kerzner, 2019). Microsoft project tool can identify and define all the phases to ensure project flow and progress can be visualised throughout the project life cycle with the integration of Jira tool. These both tools can bring smoothness and transparency in M/s Pattison Food Group's SCM digitalization.

Figure 17

Project Scope Management during the implementation process
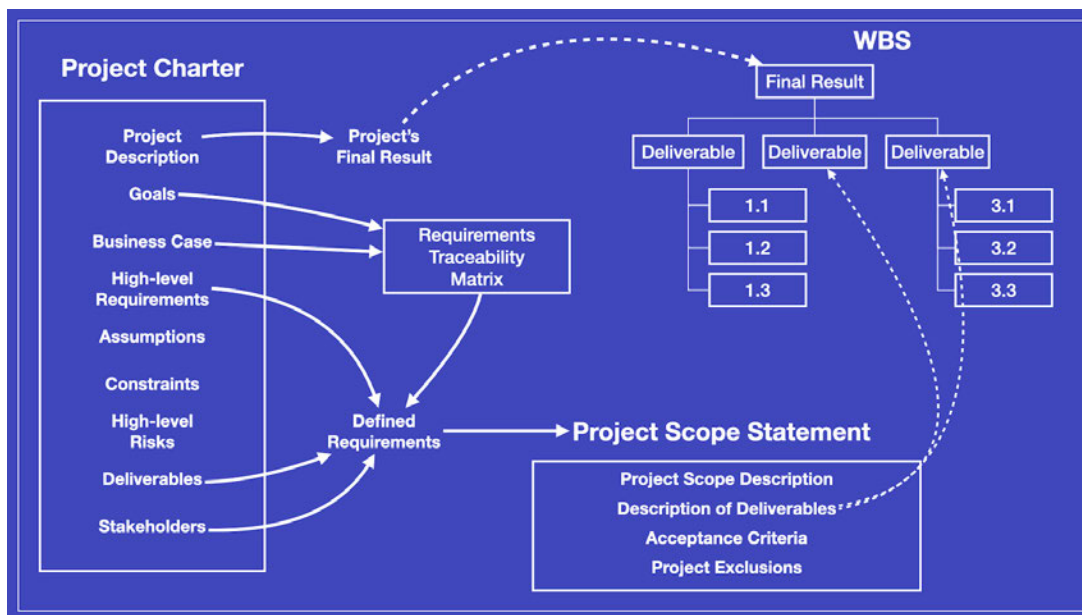
Note. From *How to Control Project Scope and Avoid Scope Creep by* Nizhebetskyi, 2023

(https://itpmschool.com/control-scope-creep/)

6.3.3 Data Security Compliance Standards & Implementation

Implementing data security regulations, including GDPR, is crucial for digital transformation in the food business. GDPR compliance has become a norm in supply chain digitalization, with noncompliance resulting in fines where an administrative fine is preferred, up to 10,000,000 EUR or up to 2 % if the total worldwide annual turnover of an undertaking under Article 83(4)(a) of the GDPR. The online resource, GDPR compliance instructions from the European Data Protection Board (EDPB). Hence following Data Security Compliance Standards and Implementation is a key element that M/s Pattison Food Group must prioritize while implementation of Digital transformation phase.

Key Software for Data Security Compliance: The below-mentioned software and tools need to be integrated into the current business of the company for Data Protection and compliance.

- Data Loss Prevention (DLP) tools - Symantec DLP and McAfee Total Protection.

- Encryption tools like BitLocker and VeraCrypt.

- Security Information and Event Management (SIEM) systems like Splunk and IBM QRadar.

- Identity and Access Management (IAM) solutions like Okta and Microsoft Azure AD.

- Vulnerability management software like Nessus and Qualys.

6.4 Step 4 – Change Management Implementation

6.4.1 Resistance Management Plan

Developing a Resistance Management Plan involves identifying and resolving possible causes of resistance, such as fear of job loss from automation, through targeted communication and support initiatives. Companies that aggressively handle opposition, experience a one-fourth of increase in employee adoption of new technology. Forbes articles about overcoming opposition to digital revolutions illustrate the ratios (Jackson, 2022).

Visualizing employee feedback becomes crucial during the change management process. A heatmap in figure 18 depicts parts of the organization that are most likely to oppose change, based on employee feedback surveys. It displays data by representing each demographic category as a delta (or difference) from the overall company's aggregated ratings. The demographic categories with the largest populations are listed first since they have the greatest impact on the total score. This also implies that when you proceed to groups on the right side of the heatmap, their deltas may increase due to the limited sample size (Jackson, 2022).

For example, Customer Service is the largest department with 699 employees out of a total of 2,131. The company's overall engagement rate is 75% with the Finance department having the lowest score by 10 points. This example demonstrates that there may be a problem with the finance department as their scores are consistently poor. The ability to observe how various groups are performing briefly is what makes the heatmap so effective. Brian Christman, former Senior Vice President of People & Workplace at Etsy, says the heatmap report is his favourite feature in Culture Amp. He clarifies, "I find them a quick and easy way to scan the organisation and understand where our hot spots or problem areas are" (Jackson, 2022).

Figure 18

Heat map of Employee Feedback survey on resistance to change

Δ DELTA % SCORE	Overall Hooli	Customer Service	Product	Sales	Marketing	Operations	Finance	Human Resources	IT	Not Specified
NO. OF RESPONSES	2131	699	635	395	210	89	46	38	18	1
Engagement	75%	4	-2	2	-6	-1	-10	3	-2	n/a
Company Confidence	76%	3	-1	2	-4	3	-19	-2	-6	n/a
Action	67%	3	0	0	-4	-1	-15	3	-10	n/a
Leadership	77%	2	-1	1	-4	1	-16	4	-9	n/a
Management	83%	1	-2	1	0	3	-12	2	-8	n/a
Collaboration & Communication	72%	2	-2	0	-2	-2	0	0	-9	n/a
Teamwork & Ownership	81%	2	0	1	-4	1	-11	-1	-9	n/a
Alignment & Involvement	77%	2	-1	2	-2	5	-17	-5	-7	n/a
Work & Life Blend	85%	3	-1	1	-3	-1	-10	-3	-5	n/a

Note. Sourced from Culture Amp by Jackson on How the culture AMP heatmap visualizes employee survey data. Culture Amp. https://www.cultureamp.com/blog/heatmapping-your-engagement-results

6.4.2 Share Success Stories

Sharing early wins, such as better inventory accuracy or shorter lead times, helps generate momentum. Sharing success stories raised staff engagement by 15% in a similar transformational initiative. For instance, Deloitte's online resource features success stories from other food sector firms. Also, the firm explains how they have helped the revival on California's central coast with their success "From Crisis to Coalition to the Cosmos" has boosted their employees' self-esteem (Nisbet, 2024) - Deloitte success stories.
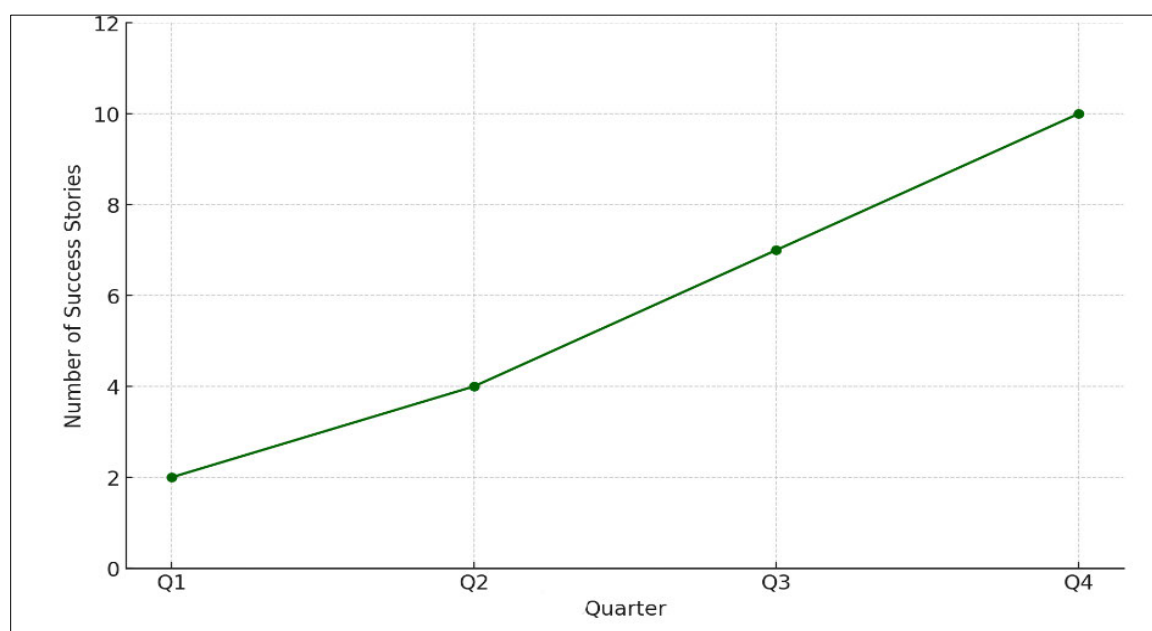
Story: Melissa James of the SLO County Chamber of Commerce launched an initiative in 2019 to address an economic crisis on California's Central Coast, where the area's largest private-sector company was about to close. Recognising the widespread impact across numerous counties, she convened corporate, government, academic, and community leaders to debate solutions,

emphasising a regional strategy that extended beyond local boundaries. This partnership led in the formation of the Hourglass Project; a group devoted to tackling urgent economic issues. Faced with the complexity of the work, James sought external support, eventually collaborating with Deloitte's Government and Public Services division to help move the project ahead.

Impact: The REACH 2030 plan, followed by the VSFB Commercial Space Master Plan, are more than simply roadmaps; they are realities. And they're being made possible by a one-of-a-kind collaboration that began with the Hourglass Project and now includes REACH, the Space Force, California Polytechnic State University (Cal Poly), the Governor's Office of Business and Economic Development, the County of Santa Barbara and Deloitte.

Figure 19

Success Stories Shared Overtime

Note. From Deloitte's online features success stories by Nisbet et al., 2024

(https://www2.deloitte.com/us/en/pages/about-deloitte/articles/from-crisis-to-coalition-to-the-cosmos.html)

6.5 Step 5 – Monitor and Adjust

To monitor progress, use project dashboards to measure key performance indicators (KPIs) such as order fulfilment rates, inventory levels, and supplier performance. Continuous monitoring and modification can result in a swift increase in supply chain agility. Tableau and Power BI's Supply Chain Analytics tools allow for real-time monitoring and visualisation. These tools implementation can enhance the monitor and adjust capabilities at M/s Pattison Food Group for their sustained long-term business.

PepsiCo chose Tableau, reducing report creation time by up to 90%. The CPFR team used Trifacta to organise fragmented data and pull it into Tableau for forecasting and analysis, decreasing PepsiCo's analytical run time by up to 70% and report generation time by up to 90%. PepsiCo gains a competitive edge in the retail market and provides consumers with best-in-class service through faster, more accurate reporting. A sample dashboard can be shown in figure 20 (Riegling, 2024).

The below sample graphs illustrated the different stages and data points in the projected roadmap for enhancing supply chain efficiency through digitalization at M/s Pattison Food Group

Figure 20

A sample CPFR dashboard from PepsiCo.
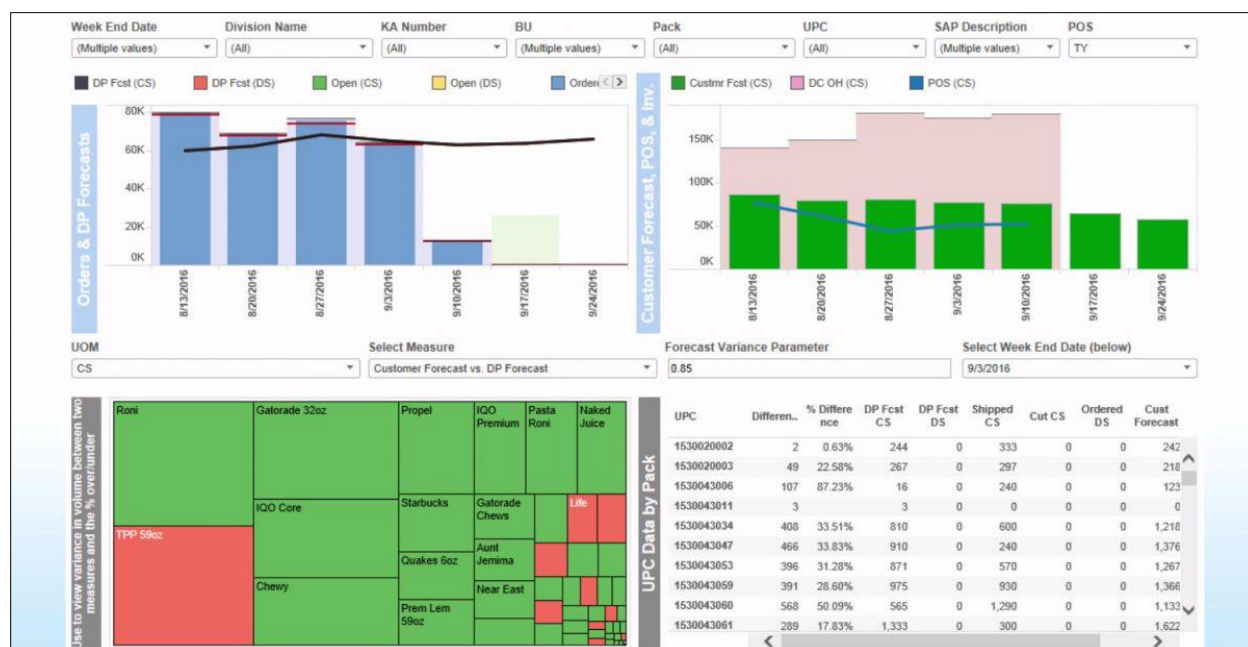
Note. From Pepsico Cuts Analysis Time By up to 90% with Tableau + Trifacta by Riegling, M. (https://www.tableau.com/solutions/customer/pepsico-cuts-analysis-time-90-tableau-trifacta)

Overall, M/s Pattison Food Group's digital transformation strategy outlines a staged approach to handle present difficulties and create the groundwork for future development. By utilizing data-driven insights, stakeholder involvement, and change management best practices, the firm may improve supply chain efficiency and sustain its competitive advantage in the Canadian food sector.

6.6 Project Initiation and Implementation Stages

According to the analysis done on the roadmap, project initiation, and implementation stages can be visualized (Figure 21) (Nizhebetskyi, 2023).

Figure 21

Project initiation, and implementation stages

Months 1-6: Project Initiation and Implementation

• Resource Allocation
• Agile Workshops
• Procurement

Months 7-12: Agile Implementation and Knowledge Sharing

• Agile Transformation
• Data Integration
• Change Management

Months 13-18: Operational Optimization and Collaboration Enhancement

• Enhanced Efficiency
• Optimized Processes
• Knowledge Sharing

Months 19-24: Realization of Benefits & ROI

Note. Generated by the author by analyzing the information gathered from the article "How to Control Project Scope and Avoid Scope Creep" by Navarro, 2023

6.7 Estimated Budget

The estimation of budget can be calculated by identifying the costs for agile transformation, data integration, project management office set and contingency reserve. Based on the estimations and information gathered (Table 5) the whole agile transformation cost (across segments) is

$ 474,297 CAD.

Table 5

Estimated Budget Breakdown

Item	Description	Estimated Cost (CAD)

Agile Transformation		
Scrum Master	Hire a certified Scrum Master for **12 months** to lead the Agile transformation process, conduct training sessions, facilitate Scrum events, and ensure adherence to Agile principles and practices.	$90,000 (payscale.com, 2024)
Developers	Hire an experienced project developer with Agile experience for **12 months** to work on the transition and implementation of Agile practices within the organization.	$80,000 (payscale.com, 2024)
Agile Workshops	Organize Agile workshops and training sessions for team members to educate them on Agile methodologies, practices, and tools such as Scrum and Kanban.	$10,000 (payscale.com, 2024)
Agile Tools and Software	Procure licenses for Agile project management tools such as **Jira (12 months)** to support Agile implementation. Customize and configure these tools according to the project needs to facilitate Agile project tracking, task management, and collaboration.	$9,600 (jira/pricing, 2024)
Data Integration		
Data Security & Compliance Specialists	Employ specialists (**12 months**) to ensure data security and compliance throughout the transition and software integration process. They will develop and implement data security protocols, conduct regular audits, and ensure compliance with relevant regulations such as Personal Information Protection and Electronic Documents Act (PIPEDA).	$76,000 (glassdoor.ca. 2024)

Data Analysts	Hire a data analyst (**12 months**) to train staff on efficient data utilization and analysis of Al-driven insights. They will also be responsible for developing guidelines for demand forecasting in inventory management and ensuring real-time data access and reporting capabilities.	$75,579 (ca.indeed.com. 2024)
Project Management Office (PMO) Setup		
PMO Consultant	Engage a PMO consultant (**6-month contract**) to assist in setting up and enhancing the Project Management Office (PMO). The consultant will guide establishing governance frameworks, reporting structures, and change management strategies to oversee the digital transformation initiatives effectively.	$45,000 (ca.talent.com, 2024)
Change Management Expert	Employ a change management expert (**6-month contract**) to develop change management plans.	$45,000 (ca.talent.com, 2024)
Contingency Reserve		
Contingency Reserve	Allocate a contingency reserve of **10%** to accommodate unforeseen expenses or scope changes during implementation. This reserve will ensure that the project remains within budget constraints while addressing any unexpected challenges that may arise during the transformation process.	$43,118
Total Estimated Budget		**$474,297**

6.8 Realization of Tangible and Intangible Benefits

By adopting the proposed roadmap, the M/s Pattison Food Group can achieve both tangible and intangible benefits as it allows the company to improve agility and collaboration which leads to better decision-making. On the other hand, the company can gain operational excellence as the workflow can be streamlined and the roadmap initiation can enhance knowledge sharing as well (Beattie et al., 2024).

6.8.1 Return On Investment (ROI)

- A positive return on investment is **126.5%** based on the (returns) are CAD 600,000 (Beattie et al., 2024)

6.8.2 Payback Period

- Payback Period is approximately 0.79 years (or about 9.5 months).

- Payback Period = Investment required/ Net annual cash inflow (Javed, 2024).

- The investment will be fully recovered in just under ~ 10 months, with a strong return on investment.

7. Conclusion

In conclusion, this research successfully addresses the key questions and achieves its objectives by identifying and analyzing the challenges faced by M/s Pattison Food Group, Canada, in the digitalization of its supply chain management. It also explores the digital transformation technologies and strategies available to enhance supply chain efficiency, particularly blockchain, IoT, AI, and data analytics. Furthermore, the research provides a clear roadmap and tactics for integrating identified technologies and strategies into existing supply chain management.

7.1 Findings

The researchers were able to address the key research questions successfully by achieving the primary objectives. Specifically, the research highlighted the challenges faced by M/s Pattison Food Group in their supply chain operations and analyzed them (RQ1). The available digital transformation technologies and strategies were examined with their advantages and main considerations of to improve supply chain management (RQ2). Furthermore, it explores how technologies such as blockchain, IoT, AI, and data analytics can be applied at different stages of the supply chain (RQ3). Lastly, the research outlines a roadmap for integrating these digital transformation strategies into existing supply chain processes, ensuring the optimization and resolution of identified challenges (RQ4). Through these efforts, the research aims to provide a comprehensive framework for enhancing the supply chain efficiency of the company.

7.2 Future Research

Researchers noted a significant rise in discussions on supply chain management, food supply, and blockchain. A thematic map (Figure 22) was used to identify future research directions. Central clusters represent broad, well-connected themes, while peripheral clusters highlight more specialized areas. The upper-right quadrant, or motor themes, includes well-developed topics like supply chains, sustainable development, and technology. In contrast, specialized themes like Human Catering services are less connected. Basic themes like waste management, sustainability, and food safety are important but underdeveloped, while supply chain management, food supply, and blockchain are categorized as emerging or declining themes (Rusydiana, 2021).

Figure 22

Thematic Map
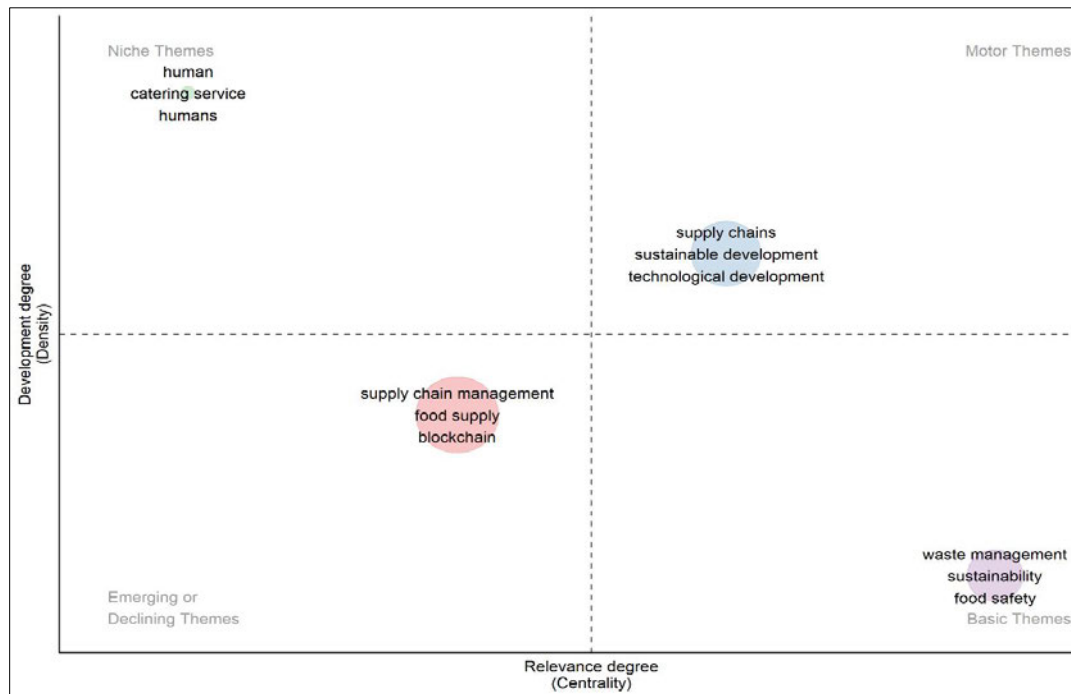
7.2.1 Food Catering Services

Based on the gathered data, human catering services have been relatively under-researched. However, Figure 23 shows that food catering services and contractors are projected to grow by 8.2% by 2026 (Statista Research Department, 2023). Additionally, the sustainable development of the food supply chain has a significant impact, as indicated by the thematic map, which highlights it as one of the most interconnected fields. Eco-friendly packaging and sustainable practices in catering services contribute to reducing the carbon footprint (Garayoa et al., 2011). Therefore, it is suggested that human catering services hold substantial potential for further research, with findings that could greatly influence food supply chain management.

Figure 23

Global market size for catering services and food contractors from 2021 to 2026
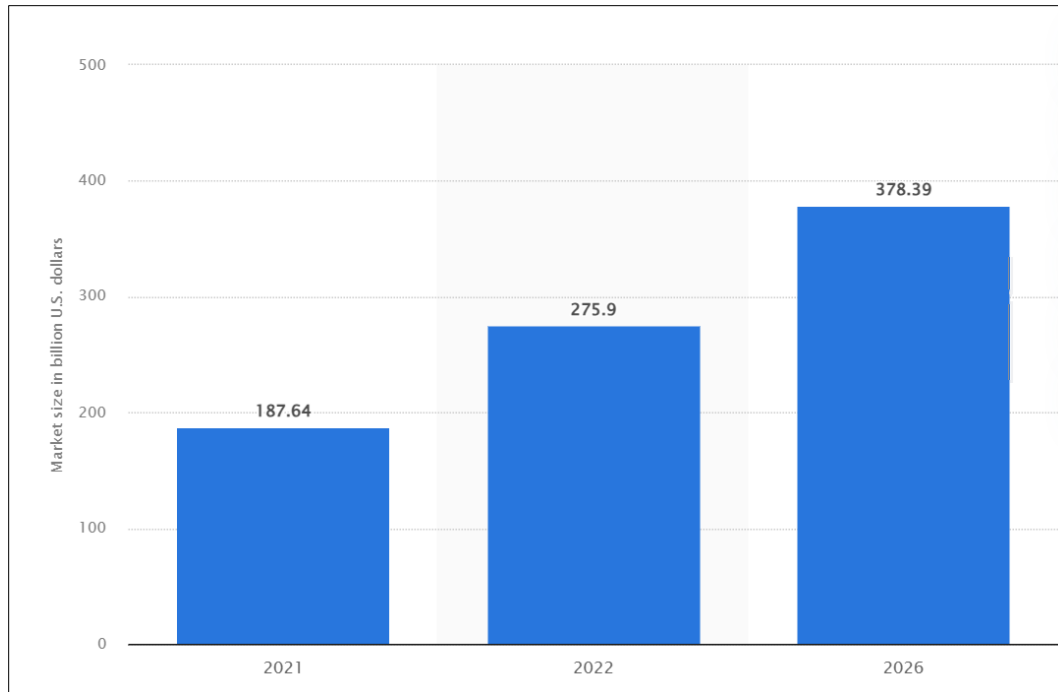
Note. From Catering Services and Food Contractors Market Size Worldwide 2021-2026. Statista

by Statista Research Department, 2023 (https://www.statista.com/statistics/1309756/catering-

services-market-size-

worldwide/#:~:text=In%202021%2C%20the%20global%20market,(CAGR)%20of%208.2%20p

ercent)

7.2.2 Food Waste Management

While waste management, sustainability, and food safety are underdeveloped fields in the

Thematic map, food waste is a significant concern in maintaining a sustainable food supply chain

(Marimuthu et al., 2024). Global statistics show that about one-third of all food intended for human

consumption is lost or wasted annually, with $680 billion in losses in industrialized countries and

$310 billion in developing nations (Houghton, 2021). Two-thirds of food waste occurs within the

supply chain during harvesting, delivery, and storage. To address this, shortening supply chains

through digital solutions is recommended Since 2000, supply chain security has gained more attention due to food safety concerns, but there is limited research on effective organizational strategies for safety and security (Min, 2019). Therefore, waste management and food security offer significant potential for future research and development.

7.2.3 Limitations

While qualitative research is highly valuable for providing deep insights and understanding complex issues, it naturally comes with certain limitations. These often arise from its dependence on subjective interpretation, the context-specific nature of its results, and the possibility of researcher bias. In the case of the paper "Enhancing Supply Chain Efficiency: Digitalization Case Study of a Canadian Private Limited Company with Challenges and Roadmap," these common limitations are further amplified by aspects of the study's design and methodology. This research was based on a systematic literature review, which extensively examines supply chain challenges when digitalization transformation, but few limitations can be recognised to fully grasp the findings' scope and relevance. These include the span of the literature review, the concentration on a single case study, the use of secondary data, and the rapidly changing technological environment. Acknowledging these limitations is essential for understanding the study's conclusions and their broader implications.

The paper's analysis is incorporated with articles publish within 2014 to 2024 which consist of past 10 years, which may omit earlier foundational studies or emerging research not yet available, potentially limiting the breadth of insights. To further elaborate, the research relies mostly on secondary data, which may not fully reflect the current state of the supply chain or the latest developments in digital transformation technologies which may lead to possible gaps in analysis or recommendations. The rapid pace of technological advancement also poses a challenge,

as the identified strategies may quickly become outdated, necessitating continuous updates to remain relevant. Furthermore, the selection of literature sources could introduce bias, particularly if the review favours perspectives or regions where a significant portion of the literature originates from specific countries or industries. Lastly, the paper provides a static analysis, offering a snapshot of current challenges and strategies, but it may not account for dynamic changes in the supply chain environment, or the evolution of challenges as digital transformation progresses.

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