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Agile e-commerce and supply chains in a change phase of retail and distribution

Impacts of Agility and Omnichannel on the Global Retail Environment

Metropolia University of Applied Sciences^{[L]_{SEP}}

Bachelor of Business Administration^{[L]_{SEP}}

International Business and Logistics

Bachelor's Thesis

6 May 2024

Abstract

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Title:	Agile e-commerce and supply chains in a change phase of retail and distribution: Impacts of Agility and Omnichannel on global retail environment
Number of Pages:	94 pages
Date:	6 May 2024
Degree:	Bachelor of Business Administration
Degree Programme:	International Business and Logistics
Specialisation option:	Supply Chain Management and Logistics
Instructor(s):	Heikki Heponiemi, Senior Lecturer

Today, e-commerce plays a substantial role in the global retail industry since more and more customers are switching to online platforms due to smoother and more accessible shopping experiences. Nevertheless, to stay competitive in the current fast-developing digital environment modern retail businesses must apply complex approaches that stand out from the sales-centered way of thinking; as the main competition tends to happen in the last mile, corporate entities are now focusing on new digital-orientated methodologies to combine all the existing sales channels into unified one since the end goal for the majority of retail companies is to meet customers' expectations, increase sale and optimize logistics-related costs. The study supports this by analyzing secondary data. The study contains multiple sources, including books, journal articles, websites, reports, and case studies; the study relies on quantifiability and scientific explicability.

The study emphasizes the importance of customer experience and satisfaction, as well as the significance of agile methodologies relying on adaptability and flexibility. Agile project management for e-commerce integrates development and operations to help businesses generate revenue. Agility in supply chains improves logistics responsiveness and flexibility. The study discovers that agility helps organizations adapt to new opportunities and threats in dynamic environments. According to this study, agility is spotting and seizing new opportunities while avoiding unexpected risks. Omnichannel commerce integrates digital and traditional channels to overcome the limitations of single-channel or multichannel strategies. Redirecting attention from the channel to the consumer helps businesses understand customer demands and behaviors at various touchpoints. Omnichannel shopping helps merchants stay competitive and meet customers' changing expectations as consumers easily switch between channels. Additionally, applied tools such as OKRs, Scrum, Kanban, Industry 4.0, CRO, and fuzzy logic are listed and described.

Keywords: E-commerce, Supply Chain Management, Agility, Omnichannel.

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Glossary

WOW	Way of Work
B2C	Business to Customer
WIP	Work in Progress
SLA	Service Level Agreement
ERP	Enterprise resource planning
OKRs	Objectives and Key Results
KPIs	Key Performance Index
CRO	Conversion Rate Optimisation

UX	User Experience
DMP	Data Management Platform
DSP	Demand Side Platform
ASC	Agile Supply Chain
R&D	Study and Development
LM	Lean management
IDT	Information and digital technologies
IoT	Internet of Things
CIM	Computer Integrated Manufacturing
CPS	Cyber-Physical System
TPS	Toyota Production System
SEO	Search engine optimization
PPC	Pay-per-click
CRM	Customer Relationships Management
IQRs	Interquartile ranges
AR	Augmented reality
CEO	Chief Executive Officer
LSQ	Logistics service quality
BSSD	Buy-in-store-ship-direct
PDSQ	Physical distribution service quality
BOPS	Buy-online-pickup-in-store
PLS-SEM	Partial-least squares structural equation modeling
AVE	Average variance extracted
SKU	Stock keeping unit
DC	Distribution Center

1 Introduction

By 2023, the size of the world's e-commerce industry had grown to 21.1 trillion US\$. IMARC Group projects that the market will increase at a compound annual growth rate (CAGR) of 27.16% from 2024 to 2032 when it reaches US\$ 183.8 trillion (Imarcgroup 2023). Some of the key drivers of the market growth include the broad acceptance of various e-commerce and online retail platforms, the notable rise in cross-border trade prospects, and the creation of safe digital payment methods. Electronic commerce, or e-commerce, is the purchasing and selling of a wide range of goods and services via the Internet. It has become a crucial aspect of contemporary corporate operations, revolutionizing how goods are advertised, acquired, and delivered (Imarcgroup 2023). It encompasses a wide range of activities, including business-to-business transactions, digital markets, and online retail establishments. By using computers and cell phones, customers may peruse merchandise, make purchases, and finish transactions either at home or on the way. It also provides several benefits, such as ease of use, a large assortment of products, and the opportunity to evaluate products and compare costs before purchasing. The increasing use of the internet is the main factor driving the industry (Imarcgroup 2023).

Mobile apps and user-friendly websites made shopping easy, allowing users to browse, compare prices, and buy; the COVID-19 pandemic hastened the shift to online shopping and increased sales. Lockdowns and other social distancing tactics drove many customers to e-commerce, which boosted industry growth. E-commerce allows companies to enter foreign markets without storefronts, which boosts customer growth and market outlook (Imarcgroup 2023). According to PrecedenceResearch (2022), smartphone penetration has increased due to the widespread application of technical breakthroughs, expanding the global reach of e-commerce platforms. Corporate investments in IT and telecommunications infrastructure have also increased internet usage worldwide. By 2021, there will be 4.9 billion internet users, or 63% of the world's

population, up 782 million in two years from 4.1 billion in 2019; Due to internet use, B2C e-commerce is growing faster. Global social media use is also boosting e-commerce platforms' revenue. Amazon, Wal-Mart, eBay, and Flipkart have driven market growth over the past decade. These companies offer consumers a wide range of products and brands from home, with generous discounts and easy return, replacement, and payment policies (PrecedenceResearch 2022).

Customers' busy schedules drive business-to-consumer e-commerce growth while the market growth is driven by e-commerce's convenience. The major companies' aggressive digital and social media marketing has also helped expand the market. Online shopping is popular due to its simplicity and convenience, large discounts and offers, simple payment methods, door-step home delivery, simple refund and replacement options, and one-day delivery. Since most internet users use smartphones, the rapid transition to m-commerce has helped online shopping grow (PrecedenceResearch 2022). The COVID-19 pandemic has increased consumer acceptance of e-commerce for food and medicine. Global online pharmacy growth is expected to accelerate market growth shortly. Online payment and shopping are also helping the market grow. The industry has grown dramatically due to Google Pay and Paytm's huge discounts and cashback on online purchases. The rising number of urbanites, online transactions, and e-commerce platforms are driving this area. The rapid shift from offline to online shopping, improved logistics, ease of doing business, and globalization of enterprises are also driving market growth. However, the classifieds are expected to be most advantageous over the projected period; the rise of mobile classified ads and cheap web ads drive the market (PrecedenceResearch 2022).

1.1 Study questions and objectives

The topic of this study was chosen based on the interests of the author while the main objectives were developed after discussions with the director of e-

commerce at Elkjøp Nordic and head of procurement at Retta+. The main insight they shared was that today the most intense competition tends to happen in the last mile, with a direct link to customer experience and loyalty; it refers to the delivery of goods and services to the final consumer in the most efficient way. This stage is crucial as it is the last step before the product is delivered to the client. Multiple factors influence the level of competitiveness in the last mile such as customer experience, speed of delivery and cost efficiency, innovation, and logistics optimization.

The first objective of this study was to investigate the correlation between agility and digital sales success within the framework of e-commerce platforms while investigating the impact of agility on the responsiveness and flexibility of supply chain operations. The study examines the mechanisms by which agility enhances customer satisfaction and loyalty in digital sales and supply networks. The study determines the effective methods and approaches for incorporating agility into the operations of digital sales and supply chain management.

The second objective was to assess the importance of omnichannel strategies in influencing customer experiences across many touchpoints in the digital sales environment. The study examines the effects of omnichannel integration on supply chain visibility, customer experience, and loyalty. The objective is to examine consumer preferences and behaviors regarding omnichannel shopping experiences and how they impact purchasing decisions.

The third objective is to discover cutting-edge technologies and techniques used to enhance the effectiveness of supply chain operations and e-commerce. The objective is to analyze the patterns of adoption and the obstacles related to the implementation of relevant solutions in digital sales and supply chain management. The objective is to describe the influence of technologies such as OKRs, CRO, IoT, and SCO on improving customer experience, traceability, and agility in supply chains and e-commerce.

The study questions are the following:

RQ1. What impact does Agility have on both digital sales and supply chains?

RQ2. What role does the Omnichannel play?

RQ3. What innovative tools are being used to enhance supply chain operations and e-commerce efficiency?

1.2 The scope of the study

This study examines agile practices in online retail and assesses agile approaches used by e-commerce players to increase flexibility and responsiveness; analyzes the use of agile software development techniques in online commerce as well as examines how agile project management techniques, such as Scrum and Kanban, might improve e-commerce operations. The study covers the retail supply chain's agile production and logistical procedures, and the impact of agile approaches on retail and distribution with an evaluation of the effects of agile methods on corporate success, customer experience, and operational effectiveness. Moreover, omnichannel is defined within the study, revealing how it ensures sales channels' development and affects customer experience and modern retailing by turning multiple channels into a unified one.

1.3 Study Methodology

The approach used in this study is a secondary data reanalysis of quantitative and qualitative studies conducted by other authors. It refers to the collection and analysis of data that has previously been conducted by other studies or organizations for objectives other than the present investigation. This choice was made since most businesses maintain their operational data related to supply chains and e-commerce behind nondisclosure agreements. This study presents and analyzes Multiple source (Area-based and Time-series-based) and Documentary (Written materials) secondary data. The study makes a specific focus on secondary case studies/reports, topic-related books, journals,

and websites. This approach to data collection is time and money-efficient, as well as easily accessible. The information gathered may not be reliable or suit the current study's aim since it is being used for other purposes (Saunders 2009: 250-259).

2 Literature review

The literature review provides a summary of the literature explored about the study objectives and questions. Firstly, an overview of agile and its history is provided to explain why this approach is crucial for modern software development and how it enables e-commerce to stay efficient. Then, agile e-commerce development and Way of Work methodology are studied to reveal how specialists within the field manage projects and operations. Secondly, the agile supply chain concept is covered to show the effect of digitalization on supply chain management from both lean and agile perspectives. Furthermore, fuzzy logic is implemented as a way to measure supply chain agility. Thirdly, the literature review deeply connects omnichannel to systemize both approaches by studying the future of omnichannel retail and investigating logistics service quality.

2.1 Agility

Considering the convenience of e-commerce as a way to make purchases and generate sales, it's always important not to neglect the fact that modern user-friendly applications and the digital environment itself are available to us due to the contribution of software development teams all over the world. To stay efficient, the e-commerce industry demands relevant software solutions, combining front-end user-friendly interface and back-end well-organized functionality. The way to combine these two features appears to be the method called Agile. The agile methodology is a project management approach that

involves breaking the project into phases and emphasizes continuous collaboration and improvement, based on an Agile manifesto (Atlassian 2019). Agile development methodologies provide faster and better products since agile emphasizes adaptability and flexibility and doesn't demand a pre-description of every solution, dividing the problem into little pieces and testing them on individuals. Agile, intended for modern organizations, helps team members take charge and solve problems. Agile teams are more productive, hence software is better. Engineers decide how to display and how much to do. Customers buy software that meets their demands, and in the current competitive market, organizations need software expertise to provide great digital experiences (Sacolick 2023).

2.1.1 Pre-agile software development

Before agile, waterfall software development required extensive documentation to code (Sacolick 2023). Business analysts typically prepare a comprehensive document explaining the firm's application needs, including functional requirements, GUI designs, and strategy. Technologists defined the program's architecture, data structures, object-oriented functional designs, user interfaces, and nonfunctional needs from the business requirements document. Software development tools require specific talents and have fewer possibilities, so failing to perform a vital item on page 77 of a 200-page document may result in criticism. All low-level functions, such as database connections, were manually written. Even simple projects featured big teams, inadequate communication, and a lengthy corporate management review and approval procedure for changing requirements. (Sacolick 2023). Tired of the status quo, several 1990s software development teams introduced Scrum, Rapid Application Development, Extreme Programming, DSDM, Feature-Driven Development, and Pragmatic Programming to their product planning and delivery methods. Leaner solutions are flexible and require less preparation. In the spring of 2000, 17 software engineers—Martin Fowler, Jim Highsmith, Jon Kern, Jeff Sutherland, Ken Schwaber, Bob Martin, and others met in Oregon to discuss

accelerating development to release new software faster. Agile approaches leverage iterative development and user feedback to improve apps in today's fast-paced digital world. (Sacolick 2023).

2.1.2 Agile Tools: Scrum

Scrum, an agile project management framework, helps teams organize and manage their work using values, principles, and practices; scrum is a key agile tool (Atlassian 2019). Scrum encourages teams to self-organize, learn from mistakes, and reflect on their successes and failures to grow. Most software development teams use the scrum structure. Scrum helps teams organize and manage their work with meetings, roles, and tools. Sprints—brief, time-limited periods in which a scrum team completes a task—form the basis of scrum project management. Sprints are key to agile and scrum teams' ability to deliver a better product with fewer issues. Scrum sprints are often confused with agile software development, but scrum is a workflow paradigm, and agile is a collection of concepts. Many similarities between scrum procedures and agile ideals suggest a correlation. Sprints help teams practice "responding to change over following a plan" and "delivering working software frequently". Scrum's openness, scrutiny, and flexibility are key to sprinting and agile (Atlassian 2019). The team asks two key questions during sprint planning: what can be done in this sprint and how will it be done? In a sprint, the team reports on progress during the daily scrum. This meeting will identify any obstacles that could prevent the team from meeting the sprint target. The team presents their progress during the sprint review showing collaborators and stakeholders their work before production.

Well-organized agile backlogs publish everything the team plans to work on, even internal tasks the client will never see. This simplifies release and iteration planning, making engineering time a fixed asset while setting stakeholder and team expectations. A product backlog is a development team's prioritized list of tasks based on requirements and plans. The product backlog prioritizes

important items so the team knows what to deliver first. The product backlog is based on a team's plan and needs, and the development team works from it continuously (kanban) or iteratively (scrum). Epics contain user stories and criteria for each roadmap initiative. The product backlog must be updated after creation to stay current with the program—agile calls regular backlog reviews "backlog grooming" (Atlassian 2019).

The growing backlog is divided into near-term and long-term items. Before being called near-term, items must be well-developed. This means user stories, design-development coordination, and development estimates have been created. Long-term items may remain unclear, but the development team can provide an estimate to help prioritize them; estimates will change as the team works on longer-term issues and understands them. Product owners can reorder backlog priorities based on new needs, estimates, or customer feedback. Once work begins, modifications should be minimized to avoid upsetting the development team and affecting morale, flow, and concentration (Atlassian 2019).

2.1.3 Agile Tools: Kanban

Kanban visual work management simplifies process flow as it displays work in progress (Bhaskar 2022). Kanban identifies and fixes workflow bottlenecks for faster, cheaper work. In the early 1940s, industrial engineer and businessman Taiichi Ohno invented Japan's first Toyota vehicle Kanban system. It was designed as a simple planning system to manage production activities and inventory. The Kanban method was designed because Toyota fell behind American automakers in production and efficiency. The flexible and successful Kanban just-in-time production control method used by Toyota reduced expensive raw materials, semi-finished components, and completed product stocks and increased productivity. Kanban systems should manage the value chain from supplier to customer to avoid overstocking and supply chain interruptions. Kanban demands ongoing process monitoring while avoiding

manufacturing bottlenecks. The Kanban Method improves software development, IT/ops, staffing, recruitment, marketing and sales, procurement, etc. gradually (Bhaskar 2022).



Figure 1 Kanban board (Brandner 2021)

The four foundational principles and six Core Practices of the Kanban Methodology are provided below:

4 Foundational Principles:

- Start with what you are doing now.
- Agree to pursue incremental, evolutionary change.
- Initially, respect current roles, responsibilities, and job titles.
- Encourage acts of leadership at all levels.

1. Start with what you are doing now:

The Kanban Method places a significant emphasis on delaying making any changes to the current setup or procedure. The present process must be directly impacted by Kanban. Any necessary adjustments may be made gradually over time at a speed that works for the team (Bhaskar 2022).

2. Agree to pursue incremental, evolutionary change:

Kanban advises against making drastic changes that can encounter opposition from the team and organization in favor of tiny, gradual adjustments (Bhaskar 2022).

3. Initially, respect current roles, responsibilities, and job titles:

Kanban does not, by itself, force any organizational changes, in contrast to other approaches. Thus, if current responsibilities and duties are functioning properly, there's no need to modify them. Any necessary adjustments will be identified and carried out by the team in concert. These three concepts aid organizations in overcoming the common emotional pushback and change-averseness that often accompanies change attempts (Bhaskar 2022).

4. Encourage acts of leadership at all levels:

Kanban states that leadership actions don't always have to come from top managers and promote continuous development at all organizational levels. To continuously enhance the way, they provide goods and services, people at all levels may offer suggestions and demonstrate leadership in putting those ideas into practice (Bhaskar 2022).

6 Core Practices of the Kanban Method:

1. Visualize the flow of work
2. Limit WIP (Work in Progress)
3. Manage Flow
4. Make Process Policies Explicit
5. Implement Feedback Loops
6. Improve Collaboratively, Evolve Experimentally

1. Visualize the flow of work

Enhancing workflow visibility is essential for identifying areas that require improvement. Kanban boards indicate which tasks have commenced, completed, or are in the process of being completed. This enables the team to

comprehend the steps required to complete an item from request to completion and to identify areas where workflow optimization is necessary (Vasiliauskas 2022).

2. Limit WIP (Work in Progress)

The fundamental objective of implementing Kanban boards is to optimize project efficiency through the elimination of superfluous time and resources. The establishment of Kanban WIP limits is critical as they dictate the upper limit of work that can coexist within a workflow. A "Work In Progress" (WIP) quota restricts the quantity of work items that are currently in progress (Vasiliauskas 2022).

3. Manage Flow

The Kanban board facilitates the observation of work as it progresses between columns. An examination of the task flow as it traverses the columns on the board brings to light any possible obstacles. It enables managers to concentrate on mitigating disruptions to the normal flow and identifying potential areas that require additional resources (Vasiliauskas 2022).

4. Make Process Policies Explicit

Define, disseminate, and publish the company's policies and processes. In that manner, all team members are informed of the work process and the objectives. This ensures that all individuals involved are aligned in their approach when proposing enhancements. This should also contribute to more objective and dispassionate team discussions, preventing subjective opinions and emotions from influencing the decision-making process (Vasiliauskas 2022).

5. Implement Feedback Loops

The Kanban method promotes evolutionary, incremental, and small-scale modifications. The ability to identify necessary modifications is contingent upon the establishment of dependable feedback cycles. Kanban involves the collection of feedback at various phases of an undertaking. This may occur

during risk assessments, delivery, or operational meetings. Where and how often input is gathered is typically determined by the characteristics of the undertaking and what is most effective for the team (Vasiliauskas 2022).

6. Improve Collaboratively, Evolve Experimentally

The Kanban Method helps teams make incremental improvements at a manageable rate and scale. It promotes the scientific process of formulating a hypothesis, testing it, and adjusting based on the results. A team implementing Lean/Agile ideas must regularly evaluate and improve the process. Team managers can track and quantify the effects of all team member changes using Kanban's many indicators. These signals help management decide whether to keep a change or try something else by determining if it's working. Many Kanban system performance metrics can be gathered automatically using SwiftKanban or manually using a physical board. Data and metrics help the team produce and make system adjustments by quickly assessing performance (Vasiliauskas 2022).

2.2 Agile e-commerce

Agile Methodology is ideal for the e-commerce sector since new technologies enable the creation of even more cutting-edge technology (Bluent 2018). Among these innovations is the Agile technique, which was developed specifically for e-commerce websites, applications, and software. The Agile approach, which uses the newest technology in response to the constantly shifting consumer and competitive trends, collaborates with a mix of technical and business SMEs in e-commerce to guarantee excellent performance and seamless operation. Agile is the greatest choice for e-commerce websites, but it is also extensively employed for other types of projects including operational systems and ERP deployments. Agile project management for e-commerce addresses the functionality and efficiency of the whole system by leveraging development and operations to create new revenue streams for the company; a well-planned, streamlined production, even in its early phases, offers a

considerably faster rate than traditional web development programs. By emphasizing non-essential qualities and seeing whether there is a genuine need for the product (Bluent 2018).

Marketers may keep using the product even after it has been launched by taking into account the consumer input that has been gathered. For instance, Spotify, a digital music platform, uses the Agile technique to stay competitive against major players in the e-commerce space such as Flipkart and Amazon. Marketers can simply incorporate changes and retain openness during development via the Agile approach utilization. As soon as the basic design is successful, products are created and integrated while meeting customer criteria and generating revenue via a variety of self-funded ventures. These precautions have significantly decreased the chance of failure, accelerated product delivery and release, and expedited analysis of consumer feedback. The key to lowering risks is giving each department a distinct assignment to do on its own. Every step of a product's creation, from idea to development, implementation, and final analysis, is handled. Quality assurance tests are necessary for every product launch to be successful and as soon as the product is built, it is thoroughly tested, allowing marketers to address faults from the outset. To focus on future development and enhancement, it is supplied after testing and sprint. High-quality products, prompt upgrades, effective product demos, and quicker delivery are essential for an Agile e-commerce website development and client satisfaction (Bluent 2018).

2.2.1 WOW universe flow

To remain competitive in today's market and become the preferred choice for customers, modern retail businesses have to adapt to the digital environment and apply the most efficient methodology. According to Julia Paulsen and Marte Dille (2021), using the Way of Work (WOW) methodology is one of the ways to achieve these goals; this technique explains why you are a team and how your team's strategy fits into the larger plan. It covers how to apply concepts such as

OKRs, the Operating Model, the Agile Framework, and Retrospect to daily work life to produce more value at a quicker pace.

WOW universe is made of 5 steps to practice and follow:

- Step 1: Turn strategy into action - get the team on board and connect strategy to day-to-day work with OKRs.
- Step 2: Decide how the team wants to work together - structure daily work and connect it to OKRs through Operating model and Backlog exercises.
- Step 3: Choose the right tools - find the right tools for the team inside the agile framework that reflect the starting point and the challenges to solve.
- Step 4: Make sure that data is used for decision-making and that the status quo is constantly challenged by testing, learning, and failing.
- Step 5 Constantly evaluate and change- don't stop the change journey to meet the first Objectives. Focus on nurturing the process of change itself through conducting regular Retrospectives with the team and making necessary changes to WOW.

2.2.1.1 Step 1: Turn strategy into action

To begin, having a clear plan in place will help the organization keep focused on the correct tasks; having the backing of those who make the decisions is essential as the highest-paid individual's viewpoint counts. Objectives and Key Results, or OKRs as they are abbreviated, should be the first tool used. OKRs are effective goal-setting and leadership tools that help to articulate objectives and significant benchmarks. OKRs are used by some of the world's biggest organizations to create and carry out their plans. Originally developed in Silicon Valley as an alternative to standard KPIs, OKRs have quickly taken over as the go-to targeting strategy at trendy workplaces such as Google and Zalando. OKRs are made up of two components: key outcomes and goals. The "what do you want to achieve?" issue should be addressed in the objectives while important outcomes should address the question: "How will you know you have

achieved it?". OKRs are typically established every three months but depending on the tasks at hand and with certain of them, it makes sense to have them for six months or even longer (Paulsen & Dille 2021: 11-19).

Setting the difficulty level is crucial once the whole team has aligned on measurable Key Results, determining how difficult or achievable it will be to reach them. For example, they could be built this way: A- Extremely ambitious, B- Difficult, but attainable, and C- Achievable with normal effort. Furthermore, grading OKRs is important to revisit and monitor the progress of Key Results regularly. This is carried out through a grading scale from 0 to 100%, where: 60-70% is Good, <40% is Problems, and 100% Sandbagging. OKRs are not a performance evaluation tool and are designed to support the team in maintaining focus, growing, and identifying difficult areas that require action. Prioritizing chores becomes simpler as team members take more responsibility for them. From the standpoint of the leader, knowing that all team members were actively working towards achieving objectives and that the OKRs had been unanimously agreed upon made it simpler to proceed further. OKRs and KPIs should be distinguished since they are used in various ways. While the management team sets KPIs, which are essentially based on concrete data, OKRs assist in bridging the gap between actual participation and the anticipated outcomes of engagement. KPIs are a tool used by organizations and activities in case they are essentially driven by data and are usually defined top-down, making them non-actionable. OKRs are good for change or product development initiatives, they help close the gap between output and result and show what the team has determined will matter from the bottom up (Paulsen & Dille 2021: 20-22).

The team leader makes sure the team is on board by checking that everyone is aware of what OKRs are and how to use them by starting with a team introduction. There are two options: either the leader does it himself/herself or, if this person is fortunate to be working with someone who has worked with OKRs before, takes advantage of their skills and knowledge (Paulsen & Dille 2021: 23). Additionally, the team leader appoints an OKR Master, to lead the OKR

process. This is essential, particularly if the leader is unfamiliar with this mode of thinking. After some time, using OKRs to track progress, identify roadblocks, and adjust priorities as necessary becomes a natural element of the meeting framework. However, the supervisor needs to be in control, particularly at first. In addition, by making sure that OKRs are consistently and appropriately used, he or she must recognize the significance of Objectives and Key Results, and be enthusiastic about them to motivate others. The responsibilities of an OKR master include encouraging OKRs throughout the team and company, conducting OKR workshops, and leading biweekly team meetings to discuss how each team is doing with their OKRs; OKR Master also teaches individuals how to incorporate OKRs into their daily workdays (Paulsen & Dille 2021: 23).

OKRs and the company's strategy must be tightly related; team leaders should think about the most crucial areas in which impact can be made and how to make sure that the desired outcome is produced. Team leaders make sure to provide enough time for questions and debates, and set priorities. Once the team's OKRs are established, the team leader chooses whether to establish individual OKRs for every team member. On a personal level, OKRs are a tool for individual growth. To get the most out of OKRs, team members need to be able to trust one another and provide constructive feedback to help each other develop and improve as a collective (Paulsen & Dille 2021: 25).

2.2.1.2 Step 2: Decide how you want to work together

The second step is to conduct an Operating Model exercise with the core team that will identify in what manner team members need to collaborate. The operating module discusses how the support functions and value chain activities are interconnected to form the organizational structure. Cross-structure governance refers to the management and oversight of activities and processes that traverse the organizational structure, with a specific focus on information relations. Decision rights is the procedure by which the organization's most critical decisions are made. Management rhythm meetings are utilized to establish objectives, formulate plans, and oversee performance,

and at what frequency. How individuals are compensated and motivated, the standards of accountability that govern their conduct, and the values that shape the organization's agenda are all exemplified by individuals. It also identifies which entities qualify as partners as opposed to transactional suppliers, and the nature of the partnership that must be established with each of them (Campbell 2016). To start producing results as soon as possible, the first step is to concentrate on smaller achievements.

Typical criteria:

1. Maximum benefits for the customer (the customer is anyone who uses the service externally or internally)
2. Minimum effort for the team (resources, time, or money)
3. High return on investment

Discover these fast gains by using as much data as possible. For example, a sales funnel – a significant portion of the website visitors leave at a certain stage of the buying process. The solution is to provide a contact center with consumer feedback obtained from satisfaction surveys or often-asked queries. Placing the items on a workflow board is the next step; Trello or Jira might be used. By using a workflow board business stakeholders, the management team, and others may access the board and learn about the projects under development. The nicest benefit is that stakeholders are updated without millions of emails being sent—all the information they want is conveniently located in one location. To make sure sight of the customer's viewpoint is never lost, items should always be presented as user stories (Paulsen & Dille 2021: 35-48).

When writing user stories, everyone who reads the user story must understand who the team wants to help and what should be achieved. Sketches/prototypes can be used, especially when IT is involved to make it easier for the developer to understand what the team leader is aiming for.

User stories consist of two parts: a headline and a description

Headline

(An explanation of what the team leader wants to achieve)

Example: As a customer [who] I want to be followed up when I have calculated the price of insurance [what], so I don't have to worry about it anymore and get the insurance fixed [why].

Description

- Background: What is the problem? Why time/money/resources should be used to fix it? What data supports it?
- Proposed solutions: What the team is doing to solve the problem? (Here the team leader should load sketches/prototypes where applicable)
- Acceptance criteria: How do we know the user story is complete? (Solution requirements) (Paulsen & Dille 2021: 49-50).

2.2.1.3 Step 3: Choose the right tools

Building strong relationships with frontend devs is crucial since they are involved in many jobs; thus, setting up a meeting with the IT department to learn about their workflow is the priority. These days, Scrum—one of the most popular agile frameworks—is heavily used in IT. Based on the predetermined backlog priorities, the team selects the tasks they will work on and adds them to a workflow board. The procedure may be seen on this workflow board, which also allows tasks to be assigned to team members or non-team members who need to complete them. The length of the sprint varies depending on the kind of work, and perfecting it will need some practice. For instance, sprints are examined ranging from two to five weeks. Three weeks is the industry standard, and that's typically a decent place to start. The next part is to discuss the Sprint Cycle and the significance of several roles (Paulsen & Dille 2021: 51-56):

Product Owner - the holder of Product Value who controls the work, determines what needs to be done, and sets the priorities to deliver the highest value. The Product Owner is expected to: Translate strategy into roadmaps with clear priorities and set a direction for the team, make sure the backlog is prioritized at all times, help open blockers, and make sure everyone can focus on their tasks and progress (Paulsen & Dille 2021: 57).

Scrum Master - the servant leader, protecting the Scrum process and preventing distractions. The Scrum Master is expected to: Drive agile transformation and set the framework for the way of working, be a strict facilitator, and make sure everyone follows the rules the team has agreed on. Follow up workflow and blockers on the workflow board, manage standups and retrospectives while having an overview of the IT developers' capacity, and prioritize their backlog (Paulsen & Dille 2021: 57).

Development Team- the self-organizing group, takes on and determines how to deliver chunks of work in frequent increments, and gets told what to do by the project manager. Team Members are expected to: Prioritize the backlog with their stakeholders, and make sure their part of the backlog is always up-to-date. Focus on learning culture and utilizing each other's strengths and use the Scrum Master and Product Owner, who both need to be included in everyday work life (Paulsen & Dille 2021: 57).

To ensure everyone was on the same page, Scrum is the chosen method because it enables working smoothly with IT and using the same tools. Using the Scrum workflow board would provide the whole organization with a real-time overview of what the team was working on. The board could be shared with everyone, no matter if it was a stakeholder who wanted to see priorities, senior management who wanted to see progress and results, or someone in the organization to ensure work was not duplicated. By assigning tasks directly on the workflow board, people could just tag the person to the task, reducing the amount of emails circulating. To make meetings more efficient, the board would help us stay focused on priorities, spot potential

blockers, and form a good agenda. Although Scrum emphasizes time-boxed sprints and deliverables, the team must keep techniques such as Kanban restricting the number of tasks, therefore focusing on work-in-progress. One advantage is that there is no need to work on many projects with deadlines, which frees up the team's attention. There are no clear roles in Scrum; instead, everyone collaborates to complete the tasks listed on the board. It's not necessary to adhere to a strict agile structure; instead, what matters most is to remain situationally aware, identify the goals needed to be accomplished, and locate the resources to support in achieving them (Paulsen & Dille 2021: 74-77).

2.2.1.4 Step 4: "Always be testing"

Since data is the new oil, work on building data is crucial. The fact that all users have access to the same data is the greatest feature of this data flow. Everyone is working towards the same objectives and seeing the same performance measures, whether they are in operations, marketing, or IT. Because there is no conflict between goals, workdays are easier; team members made many of the decisions, which for example allowed Zalando to grow quickly and provide positive client experiences. This is a relevant aspect, even if it may be very difficult to accept when the best idea/approach is rejected since the data indicates that the client does not share your opinion (Paulsen & Dille 2021: 79). E-commerce experts should be able to identify areas where clients are having difficulties by using data to listen to them and still unsure of the causes of these problems and how to resolve them; experimentation is the only way to find the answers to these problems. The Conversion Rate Optimisation, or CRO, exists to meet such demands. Every team member should be clear on two things: a) what is testing, and b) what CRO is before we can describe how the CRO team operates and how testing is conducted in real-world scenarios. A solid hypothesis about the demands of business clients and data are the foundations of any excellent testing; A/B testing is the most widely used method of testing in the internet environment. This is when one version of the test is provided to half of the site users, such as a page with attractive pictures, and the other version to the other half of webpage visitors, such as a page with no photos. Next, the

version that performed better is assessed by comparing two outcomes (Paulsen & Dille 2021: 83).

To make testing come to life, let's move on to conversion rate optimization and explain the meaning behind CRO with an example.

Based on the data, there are two issues:

1. Only 20% of customers who visit the website add items to their shopping basket
2. Only 5% of those customers make a purchase

Now it's vivid where customers are dropping off- 80% at the basket stage and then a whopping 95% at the purchase stage. The next step is to investigate this further and figure out (Paulsen & Dille 2021: 83):

1. Why are more customers not adding items to the basket?
2. Why is only 5% of that 20% buying the product?

To find answers to those questions the team leader needs to:

- 1) Ensure everything works correctly on the website from a technical point of view - can visitors access all pages properly? Do pages load correctly and quickly? Are there any security issues causing barriers to payment?
- 2) Start digging into customer behavior- what pages are the most popular? Where else on the website do customers go besides products - do they visit the company page or FAQ section? Think about what could be done differently.
- 3) Start testing different solutions to improve conversion rates. Add secure payment logos to the checkout screen to install trust, include related products to increase average basket values, or drop shipping rates (Paulsen & Dille 2021: 83).

Roles and Descriptions of the CRO team:

CRO developers advise on performance, scalability, extensions, web elements, and more in addition to technical examinations of the client's infrastructure. A UX designer is responsible for addressing the contact points where app or website visitors often abandon the interface. Customer journeys are optimized through the implementation of high-performing visuals, controls, and other elements by the UX specialist. Quality Assurance fixes problems and constitutes an intrinsic aspect of product development or optimization throughout the entire project, monitoring the progress of the UX Expert and Web Developer as they incorporate new features or make modifications. Data Analyst conducts a comprehensive evaluation of the website, encompassing functional metrics, user data, engagement metrics, and revenue metrics. Primarily, this position entails transforming analytical insights into recommendations for improvement. CRO Manager oversees the entire process, from initial requirements to final optimizations, to ensure that business objectives are met. The manager, on the other hand, will be responsible for the tactics, including task allocation and progress monitoring. In this role, the manager is responsible for translating isolated inputs into specific strategies and assignments and handles clarifications of the specialists (Insight Whale 2019).

2.2.1.5 Step 5: Constantly evaluate and change

Transformation requires the correct mentality; realizing that the team leader must begin operating differently is never easy, but it becomes much more difficult when a company implements changes that the team leader is unaware of and doesn't know why they were implemented in the first place. If the business is doing badly, this will be easy to address. However, what if business performance is strong but management is still making significant adjustments to prevent a Kodak-like situation? The business culture is critical to a successful transition journey. The key is to approach the task at hand with the right

mindset: one that is open, inquisitive, and eager to learn. Many management teams mistake this for concentrating only on using and learning about new technology, especially during digital transformation. Therefore, team leaders should put people first when developing DMP and DSP tactics. How can one adopt the proper mentality for change? That question has no right or wrong response because the topics that have been discussed are slightly complicated (Paulsen & Dille 2021: 95-99).

2.3 Agile Supply Chain

Businesses seek to maintain a competitive edge in various industries due to change and globalization management. The supply chain includes production, distribution, and recycling while successful corporate performance is also shown by effective supply chain management, which allows businesses to adapt quickly to industrial changes. Thus, supply chain arrangements must be reviewed periodically. The agile supply chain has been examined as a framework with several roles about its benefits for organizational performance and the need for an integrated supply chain to combat unpredictability. Agility is the ability to see a chance in a new situation and take precautions to protect oneself from unanticipated risks and obstacles. It refers to the organization's ability to use its resources swiftly and flexibly to respond to opportunities and issues in both its internal and external environments proactively and reactively. Due to market volatility, changing customer preferences, and the demand for customized products, supply chains must be flexible. Agile supply chain and manufacturing allow an organization to adapt its structure to changes in its internal and external environments and market expectations (Çelikkol, Sağbaş & Yikilmaz 2021: 2-5).

Supply chain agility, also known as agile supply chain (ASC), is the ability to identify rapid, transient market changes throughout the supply chain process. Lean and agile manufacturing fundamentally affect organizational supplier networks. Lean support emphasizes time-sensitive processes and waste elimination from value chain activities. A lean value production chain with cost

transparency and relationship assessment is part of the lean supply chain to boost productivity (Celikkol, Sagbas & Yikilmaz 2021: 6).

Agile supply chains prioritize empowered employees and efficient processes to quickly respond to supply and demand changes. Agile allows quick decision-making, which benefits larger businesses and generates stable revenue even in tough situations. Due to their rigidity, non-agile supply chains force employees to figure out how to handle unexpected events. This increases the likelihood of a bad choice. Lean and agile logistics management can help to outperform less adaptable competitors by allowing them to make quick, smart decisions without relying on intuition or incomplete data (Koepke 2022).

Supply chain agility requires receiving and acting on the most important data quickly. Thus, the company's business plan may need to be adjusted to give staff the tools they need to quickly collect and transmit correct data and reduce response time to enhance options. Better information helps businesses move faster and smarter, leading to better customer experience. Agile companies deliberately acquire control using new technologies and data-driven operations. Policies and procedures that enable quick decisions are needed to build an agile supply chain that can seize new opportunities and adapt to industry volatility. Now that firms can manage vast volumes of data, employees can act rapidly. Agile supply chain management executives immediately detect emergency risks to shipments and orders and backup and recovery resources. Supply chain issues will endure beyond COVID-19 and leaders must address these concerns. This highlights why organizations need modern technology and trustworthy data for unexpected events. Logistics management frequently experiences issues with bottlenecks, delays, and interruptions, making supply and demand management challenging. This leads to companies' need for better data to track items as demand rises. Lean or agile supply chain firms may migrate here to enhance reaction times. Manual and old track and trace procedures are insufficient. Agile supply chain teams must prioritize their most critical and vulnerable loads (Koepke 2022).

2.3.1 The Effect of Digitalization on Supply Chain Management

The manufacturing industry is growing globally because it introduces new products and ideas that improve the technology of many companies and institutions, including digital technology. Many companies quickly implement operations and transformation processes to compete in the market. Industry 4.0, or digital transformation, has been extensively studied in business. Its many corporate processes include cloud computing, big data analytics, 3D printing, and industrial resource integration and enhancement. Demand for new products requires the market to be more competitive while making it harder to sell existing ones. Due to the manufacturer's capabilities, increasing market share or sales growth will reveal the need for new products and services. Every feature is dependent on every other, so manufacturing industries must adapt and become nimbler as the market for new products grows rapidly (Anderson 2022: 4).

Supply chain agility is the ability to introduce a new product with more customization while minimizing the trade-off between the supply chain performance of multiple items. A firm can implement its plan to control supply chain management strategies and activities. This supply chain plan, crucial to an organization's competitiveness, impacts the entire company. Many supply chain agility applications allow businesses to adapt to unexpected events. It also helps to efficiently integrate the supply chain to meet customer needs. Combining many supply chain strategies is necessary to understand supply chain management. Even with lean and agile supply chain strategies, businesses face fierce global competition because many innovative ideas don't necessarily benefit the organization; digital technology affects many business activities, including supply chain management. Lean management is a social management method that eliminates or minimizes internal or external variability to increase efficiency and reduce waste. Agile management, on the other hand, responds quickly to consumer needs (Anderson 2022: 5).

Digitalization is changing organizational operations, and those who can't keep up will fall behind. Cutting-edge digital technology trends can improve supply chain strategy and encourage accountability for operational issues. This study examines how lean techniques and industry 4.0 adoption affected supply chain performance. Industry 4.0 technology may affect lean management manufacturing processes through organizational sustainability. "Lean supply chain management" involves using lean methods in the supply chain to cut costs and meet consumer needs. Applying lean management to business intervals is similar to supply chains. Money flow regulation requires the most coordination and involvement from many entities. Internet connections enable new information and digital technologies. Digitalization's connection to information and digital technologies is used to calculate business value. "Industry 4.0" describes the greater digital transformation that occurs when digital and information technologies are used in industry. Modern and future digital technologies include "Industry 4.0 includes Cloud Computing, Big Data, and the Internet of Things (IoT) as well as traditional technologies such as Computer Integrated Manufacturing. CPS, which links virtual and physical frameworks, uses these technologies to create smart factories. Industry 4.0 digital technologies enable real-time information sharing, decision-making processing, and supply chain integration (Anderson 2022: 6-7).

2.3.2 Supply Chain Strategies

The notion of lean and agile strategies and the hybrid approach of the leagile strategy are explained via the introduction of various supply chain strategies. The following are these tactics:

SCM regarding Lean perspectives:

The Toyota Production System (TPS)-based lean method emphasizes "efficient use of resources via level scheduling". Low-demand, volatile, and inconsistent products are not well-suited for lean management, which is growing in supply chain management. The "supplier→ producer→ distributor→ final customer"

model is used for lean supply chain management. The goal is to reduce supply network waste while providing low-cost customer demand consultancy. "Lean supply chain management" is a collection of companies directly linked by the upstream and downstream flow of products, services, funds, and information that collaboratively work to reduce cost and waste by efficiently pulling what is needed to meet individual customer needs; every business strategy must include it due to its importance. It meets client needs quickly and efficiently to boost customer satisfaction. Some strategies can be used at two supply chain levels, while others can only be used at one. Supplier assessment depends on customer feedback and supplier-customer relations (Anderson 2022: 7-8).

SCM regarding Agile perspectives:

Agile emphasizes quick response and system adaptability to the changing market; even in volatile markets, agile strategy moves supply and demand. In the manufacturing industry, agility is "an enterprise's ability to thrive in a competitive environment of continuous and unanticipated change by responding quickly to rapidly changing markets driven by customers' valuation of products and services." Swafford defines agility as the supply chain's ability to quickly adapt to market changes. Lean management reduces waste, while agile strategy adapts to market changes. The agile supply chain management method maximizes profits while satisfying customer needs to cut costs. Lean increases the benefits and profitability of any waste reduction strategy during the supply chain lead time gap, while agility allows quick and flexible client response (Anderson 2022: 9).

SCM regarding Leagile perspectives:

The Pareto Rule (80/20) states that 80% of a company's revenue comes from 20% of its products, so "liability" refers to hybrid agile-lean methods. Second, using a lean-agile hybrid approach, peak demand is generated for the fewest temporary capabilities. A lean strategy that uses the company's production to maintain highly effective operations can satisfy most firms' year-round base demand. Delays—the third hybrid—interest the company's employees most. This method can finish standard-material items that need finishing. This adapts

to client needs and provides variation. Toyota introduced "lean thinking"; this is agility in action (Anderson 2022: 9).

2.3.3 Results and Discussion

The ongoing assessment uses an agile and lean methodology to investigate how supply chain management is impacted by digitalization. A range of publicly available online data sets have been used to compile pertinent material. Resources such as Google Scholar, PubMed, ScienceDirect, and other important and real-world materials were utilized to fully comprehend the issue (Anderson 2022: 10). Most supply chain executives have invested in digital technology to boost productivity and adaptability to changing market conditions, so lean and agile inventory networks are essential. The former improves functional efficiency by eliminating waste, while the latter allows for market flexibility. Industry 4.0 and related advancements may improve functional competence; lean and agile methodologies are used to improve functionality with industry 4.0 upgrades. This center's discovery that store network businesses use specific IDT of I4.0 as a roadmap to applying Lean concepts is exciting and compatible with the IT-Lean connection (Anderson 2022: 10).

Modern technologies must be included in assembly and production network duties for businesses to succeed in the modern global economy. In enterprises that are erratic and irregular, the former modifies market demand, while the latter encourages efficient resource use by preventing waste. This study investigates the links and interactions between industry 4.0 advances and lean and agile supply chain methodologies. As it illustrates the traditions that have emerged from innovations, this study assists the links between industry 4.0 innovations and lean and agile supply chain techniques via a single system. Subsequent assessments may involve revisions to the financial and functional execution records after the implementation of Industry 4.0 innovations to support supply chain activities. This might help administrators embrace the

innovations to improve their present administrative operations and see the potential efficiency gain (Anderson 2022: 11).

2.4 Implementation of fuzzy logic to measure supply chain agility

Organizations are now more competitive due to changes in the market environment, customer demands, and technological improvements. Such a critical stage results in a reevaluation of the company's objectives and strategic prospects, as well as a decrease in reliance on the existing models. To thrive in a setting this competitive, flexibility and responsibility must be developed along with agility. Because of this, companies need to work together with suppliers and customers to improve their business operations and achieve a certain level of supply chain agility if they want to beat off rivals in the global market. An agile supply chain is made up of several companies that rely on one another for operations but are otherwise independent. These companies are connected via the forward and feedback flows of information and materials. Increased flexibility and adaptability are necessary for the agile supply chain to respond quickly and effectively to changes in the market. The agile supply chain is proposed as the supply paradigm of the twenty-first century and is considered the winning strategy for companies trying to dominate both home and international markets (Karimimalayer & Saibani 2016: 1).

The majority of supply chain agility approaches now in use assess an institution's internal agility features by looking at the end supply and demand of the network. These techniques include changing the manufacturing process of the supply chain, studying the communication and behavioral patterns among its players, and physically synchronizing the network with market and competitive needs. Although agility cannot be avoided, businesses that operate in complex environments struggle to define it; the supply chain industry is often the most impacted by changes. Changes in the supply rapidly become a restriction on the whole business since, in most cases, the operational constraints of a supply chain are connected to its agility. Supply chain flexibility

is seen as critical to strategy; the capacity of a supply chain to perceive changes in demand and respond quickly, simply, predictably, and with exceptional quality is what determines an institution's ability to survive. However, issues connected to supply change management have been disregarded in the vast majority of finished studies on the topic of agile manufacturing. The purpose of this study is to develop a method for measuring supply chain agility (Karimimalayer & Saibani 2016: 1).

2.4.1 Case Literature Review

Overseas goods, new rival products, dwindling product life, unexpected consumer preferences, production, and communication technology breakthroughs, privatization of state-owned businesses, economic data, and investor repayment demands put businesses under unprecedented pressure. Production pressure is greatest when balancing higher-level outsourced performances with lower-level delivery performances. One of the biggest paradigm shifts in company management is the shift from institution to supply chain as the competitive unit. Today, suppliers of one store's trademark compete with suppliers of another store's trademark, or one supply chain against another. Agility is the ability to respond quickly and effectively to changes and seize opportunities. Thus, agility is an institutional response to a dynamic and competitive environment that promotes competitive engagement, wealth sharing, uncertainty and change control, and human resource capability. Agile organizations use high-quality manufacturing, operations, and consumer-focused goods and services to navigate a dynamic and segmented market. A supply chain's main logistical processes are sourcing, manufacturing, and delivery. The paradigm Swafford and colleagues examined views the supply chain from a process-oriented perspective. Figure 2 shows some of the attributes of an agile supply chain (Karimimalayer & Saibani 2016: 2).

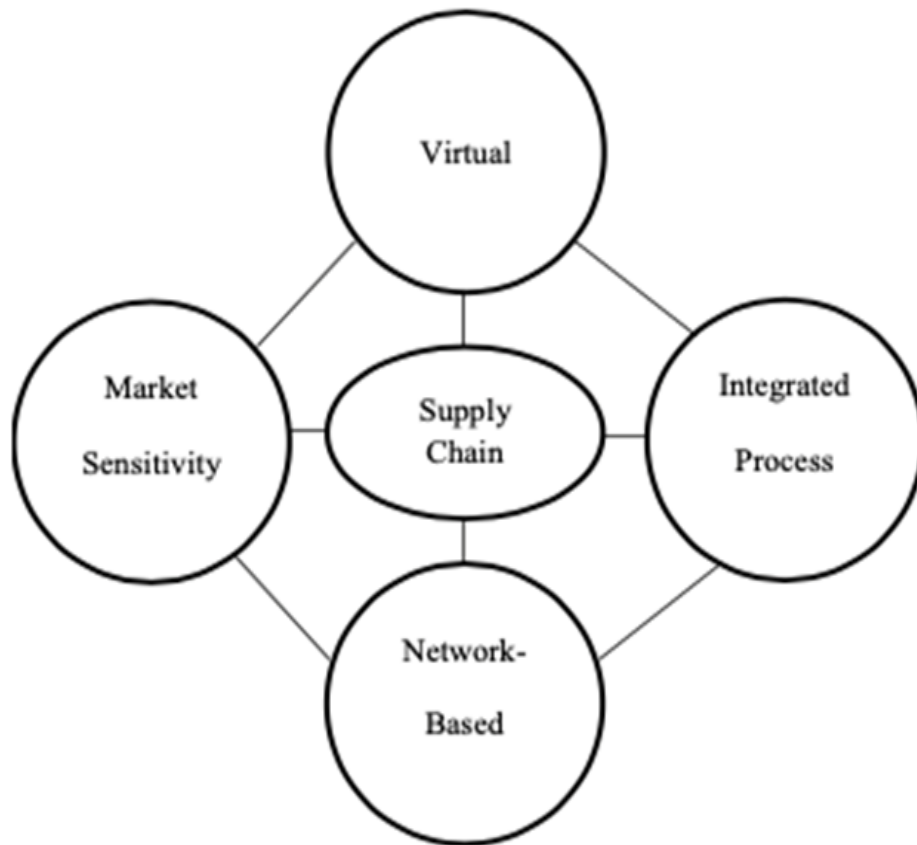


Figure 2 Agile supply chain attributes (Karimimalayer & Saibani 2016: 2)

The conceptual model shown in Figure 3 was developed based on an examination of the literature on agile supply chains; consequently, agility may be defined as "a managerial concept related to responding to the turbulent and dynamic market and customers' demands". Utilizing changes is much more important to agility than just responding to customers. It must be flexible in many domains, including product development, creation, and logistics, to respond to the companies.

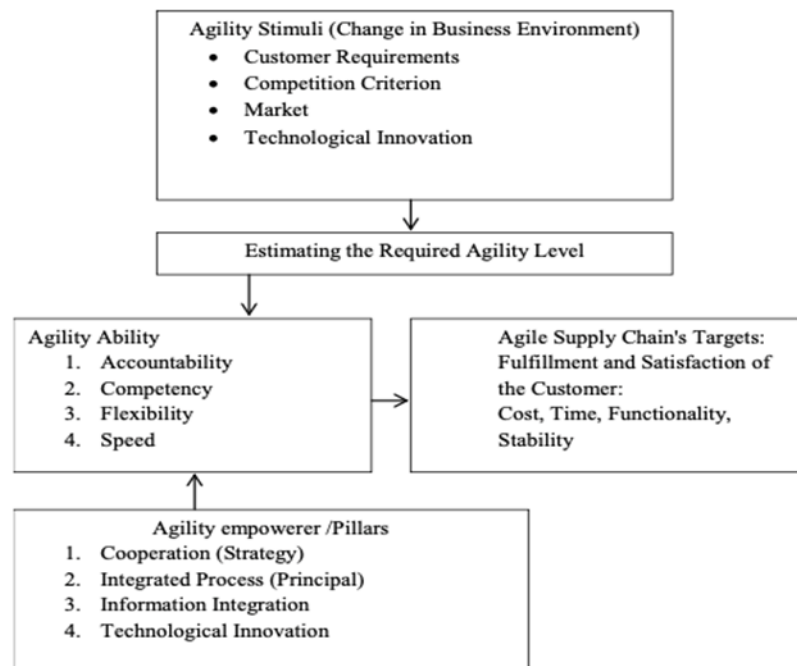


Figure 3 The conceptual model (Karimimalayer & Saibani 2016: 3)

The agile supply chain includes companies that are legally separate from one another yet depend on one another for operational assistance (Karimimalayer & Saibani 2016: 3). Manufacturers, suppliers, designers, and production facilities are a few of these companies. These business entities are linked to one another via the reciprocal flow of goods and information; an agile supply chain needs more flexibility and agility to respond quickly and effectively to changing market circumstances. The traditional linear organizational structure is replaced by an array of institutions formed by network technologies in the agile supply chain. Additionally, companies that use agile supply chain practices are better able to balance supply and demand, react to changes in the marketplace, and finish work faster. Given that the organization's supply chain's agility directly affects the production of new goods and their delivery to customers, it is possible to argue that supply chain agility is a vital component that affects overall competitiveness. Certain well-known writers have defined agility as a mix of enabling criteria and agility assessment; nevertheless, different quantitative methodologies based on a hierarchical analytic process have been provided. The main tenets of the agile supply chain, however, are integration, customer sensitivity, organization, protocols, networks, and informational systems. In

cases when assessors could not get a precise evaluation, confusing themes would be evaluated using linguistic phrases. The "vague" and "inaccurate" nature of enabled agility qualities makes agility measuring a subjective procedure including linguistic vocabulary. Agility evaluation is seen as difficult as it is complex and lacks defined criteria for assessing characteristics related to agility. It is indicated that customer sensitivity is very important in today's business. Different types of employed methods in this study are shown below in Figure 4 (Karimimalayer & Saibani 2016: 3).

Survey Field	Methodology	Resources
Institution Agility	Conditional Rules	[5]
Supply Chain Agility Measurement	Fuzzy Method of the Agility Evaluation	[9]
Agility Evaluation	Fuzzy Logic	[17]
Supply Chain Agility	Fuzzy Association Rules Mining	[18]
Supply Chain Agility	Graph Theory and Matrix Models	[19]

Figure 4 Types of employed methods (Karimimalayer & Saibani 2016: 4)

- 1) Conditional Rules [5] (Tsourveloudis & Valavanis 2002)
- 2) Fuzzy Method of the Agility Evaluation [9] (Lin, Chiu H. & Chu P. Y. 2006a)
- 3) Fuzzy Logic [17] (Lin, Chiu H. & Tseng 2006b)
- 4) Fuzzy Association Rules Mining [18] (Jain, Benyoucef & Deshmukh 2007)
- 5) Graph Theory and Matrix Models [19] (Faisal, Banwet & Shankar 2007)

2.4.2 Agility measurement

According to the model under the title of "A balanced approach to building agile supply chains" (Ismail & Sharifi 2006), the competence, flexibility, speed, and responsibility indexes are the main indices used in this study to measure agility. The ability to detect changes and respond as quickly as possible in a reflexive, preventive, and recuperative manner is known as responsiveness. An accountable supply chain is "a network of institutions which can produce wealth for their stockholders in a competitive environment and respond quickly and effectively in costs to the changing market requirements."

A. Using a Fuzzy Approach to Quantify the Sub-indexes

- 1) Competency: The ability to set institutional goals effectively and sufficiently.
- 2) Flexibility/Adaptability: The ability to implement different processes and employ various facilitations to accomplish a goal.
- 3) Speed: The ability to finalize an activity in the shortest possible time.

For measuring sub-indexes, two questionnaires have been used, one for environment agility weight evaluation and another for measuring supply chain agility indexes (Ismail & Sharifi 2006),

B. Variables and Linguistic Terms

In the current study, based on the “Agility Evaluation of Mass Customization Product Manufacturing, *Journal of Materials Processing Technology*” review (Yang, S.L., Li & T.F. 2002) and considering a way that concentrates on different humans, a seven-based fuzzy spectrum has used for rating the condition and determining the level of importance in Figure 5.

Linguistic Terms (Importance) (xj, yj, zj)	Fuzzy Number	Linguistic Term (Company Condition)	Fuzzy Number
Very Low	(0, 0.05, 0.15)	Worst	(0, 0.05, 0.15)
Low	(0.1, 0.2, 0.3)	Very Bad	(0.1, 0.2, 0.3)
Middle Low	(0.2, 0.35, 0.5)	Bad	(0.2, 0.35, 0.5)
Middle	(0.3, 0.5, 0.7)	Normal	(0.3, 0.5, 0.7)
Middle High	(0.5, 0.65, 0.8)	Good	(0.5, 0.65, 0.8)
High	(0.7, 0.8, 0.9)	Very Good	(0.7, 0.8, 0.9)
Very High	(0.85, 0.95, 1)	Best	(0.85, 0.95, 1)

Figure 5 Agility Evaluation of Mass Customization Product Manufacturing, *Journal of Materials Processing Technology* (Karimimalayer & Saibani 2016: 4)

There are several models, such as the arithmetic average, median, and mode, that may be used to combine decision-maker assessments. The arithmetic operator is employed in this study to incorporate the viewpoints of critics as it has been used more often than the other ways. When a committee consisting of m evaluators E_t considers $t = 1, 2, \dots, m$ as factors for evaluating agility, evaluator E_t assigns $W_{tj} = (x_{jt}, y_{jt}, z_{jt})$ fuzzy numbers related to the weights of linguistic significance to F_t and $R_{tj} = (a_{jt}, b_{jt}, c_{jt})$ fuzzy numbers appropriate to

related linguistic rates to critic Et. Equations (1) and (2) are therefore used to compute the average fuzzy evaluation R_j , balanced fuzzy weight W_j , or the integration of critics' viewpoints (figure 6) (Karimimalayer & Saibani 2016: 5).

$$R_j = (a_j, b_j, c_j) = (R_{j1}(+)R_{j2}(+) \dots (+)R_{jm})/m \quad (1)$$

$$W_j = (x_j, y_j, z_j) = (W_{j1}(+) W_{j2}(+) \dots (+)W_{jm})/m \quad (2)$$

Figure 6 Equations are used to compute the average fuzzy evaluation (Karimimalayer & Saibani 2016: 5)

At this point, the obtained index is an informative mixture of all the components' fuzzy weights and ratings. The primary index increases as a result of this index's growth. As a result, the primary index's level is shown by function membership, which is established for this condition. Equation (3) from Figure 7 defines the whole index if W_j and R_j are, respectively, indications between fuzzy rank and fuzzy weight average assigned to the factor j by the committee (Liu H. & Kong F. 2005):

$$FXI = \frac{\sum_{j=1}^n (W_j \times R_j)}{\sum_{j=1}^n W_j} \quad (3)$$

Figure 7 Equation that defines the whole index (Karimimalayer & Saibani 2016: 5)

(Instead of X the value which is measured, is placed, for instance, in the case of flexibility measurement, F takes the place of X , hence FXI becomes FFI or fuzzy index of flexibility).

1. Adjusting Fuzzy Ranking To Its Suitable Linguistic Level

The acquired index has to be modified to the appropriate linguistic level once the FXI has been calculated. At this point, the linguistic level is either the closest level to FXI or equivalent to it, with complete compatibility. This study calculates a fuzzy number's Euclidean distance from another fuzzy number. In natural language, $UFXI$ and $UXli$, respectively, are indicators of the FXI fuzzy function and natural language index l , if XL is the indication of index level X . Equation (4)

from Figure 8 is used to compute the separation between UFXI and UXLi (Lin CT., Chiu H. & Chu P Y. 2006a):

$$d(FXI, XLi) = \left\{ \sum_{x \in p} (UFXI(x) - UXLi(x))^2 \right\}^{1/2} \quad (4)$$

Figure 8 The equation used to compute the separation between UFXI and UXLi. (Karimimalayer & Saibani 2016: 6)

2. Converting Fuzzy Numbers to Absolute Values

They must be turned into absolute numbers once each branch has been adjusted to fuzzy values, Euclidean distance has been determined, and linguistic level has been applied. This is because the matrix constant value calculation requires an absolute number. Fuzzy literature suggests several techniques, such as the center of mass, minimal average, least maximum, and others, to do this (9). This study employs a right-left ranking type (Chen, C.T., Peng & S.T. 1999). To get an absolute number, fuzzy sets must be compared (figure 9) to fuzzy minimum and fuzzy maximum sets (max fuzzy and min fuzzy, respectively) (5) and (6) define these two sets (Liu H. & Kong F. 2005):

$$\mu_{\max}(x) = \begin{cases} x, & 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases} \quad (5)$$

$$\mu_{\min}(x) = \begin{cases} 1 - x, & 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases} \quad (6)$$

Figure 9 Fuzzy sets compared to fuzzy minimum and fuzzy maximum sets (Karimimalayer & Saibani 2016: 7)

Right-side ranking returns to the fuzzy set's intersection or max fuzzy.

$$\mu_R(M) = \sup[\mu_M(x) \wedge \mu_{\max}(x)] \quad (7)$$

Similar to this, left ranking M is calculated by (8).

$$\mu_L(M) = \sup[\mu_M(x) \wedge \mu_{\min}(x)] \quad (8)$$

By acquiring left and right values of M final number is achieved.

$$\mu_T(M) = \frac{[\mu_R(M) + 1 - \mu_L(M)]}{2} \quad (9)$$

Figure 10 Right ranking M calculations (Karimimalayer & Saibani 2016: 7)

Right ranking M could be calculated as (7) (8) (9).

2.4.3 Fuzzy Case Conclusion

Only companies with flexible supply chains will succeed in fast-changing markets while improving supply chain agility requires measuring it. Studies suggest agile supply chains enhance production, delivery, quality, cost, and customer service; each component promotes competitiveness separately. Analysis of the study's findings reveals numerous intriguing aspects, including organizational agility variances. A "more agile" corporation prioritizes customers and adapts by maximizing customer happiness. "More agile" organizations use the internet to innovate, satisfy customers, and capitalize. Thus, less agile firms prioritize internal operations to customer satisfaction. Strategic planning, sensitivity, and virtuality suggest supply chain sub-indices are effective; this occurs when all supply chain agility subindices are high. Each index impacts others equally and differently except competency-responsibility. Even if the organization is capable and responsible, supply chain agility may indirectly affect deposits, delivery delays, and customer satisfaction (Karimimalayer & Saibani 2016: 6).

Speed and flexibility determine agility, so both should be improved. Information sharing across the supply chain is crucial to agility. Sales data updates, search functionality improvement, use of web-based software, and facilitation of inter-organizational data exchange are used to improve demand response. With resource flexibility, the company should be able to meet market demands for new and different products quickly and improve its custom manufacturing. The company must also be able to delay the launch of a product with a lot of supplier involvement while maintaining the supply chain information flow. Modular designing uses adaptable segments and materials to create products that meet customer needs. Given the lower competence index and specific sub-index of shared culture and decision-making, an appropriate foundation should be considered for establishing a shared culture among members and procedures for shared decision-making. The members' cooperation, involvement in policies, programs, and operations, and culture of risk-taking and

mutual reliance create the ideal environment for shared decision-making and insight. In this case, supply chain players must determine client needs, meet them, and build forward-thinking relationships. (Karimimalayer & Saibani 2016: 7-8).

2.5 Omnichannel

Digital and conventional consumer engagement channels are combined in omnichannel retailing; this refocuses multichannel retailing on customers. Retailers obtain a competitive edge, consumer loyalty, profit, etc. from such retailing. The study compares omnichannel commerce to multichannel retailing and discusses customer behavior and needs. Trade entails creating, acquiring, selecting, storing, selling, and reselling things in numbers and according to the trader's preferences for profit. Wholesale, retail, or internal and external are trade categories. Retail tailors its offerings to customers' preferences and production-related technical advances. Because retailers are continually in touch with consumers and end customers buy retail products, producer-retailer collaboration is vital to meeting goals. By telling companies what consumers want and showing them their new products, retail may affect consumer behavior. Manufacturers perceive retailers as consumers' advocates, whereas customers see makers as their representatives (Dadic, Perkusic-Malkoc & Simic 2023: 1).

Because of this, manufacturers and retailers must communicate continuously. Retailers tell manufacturers about customer demands, needs, and habits, and manufacturers tell retailers about new products. The merchant uses an "assortment list" to record end-user demands he couldn't fulfill and better serve them in the future. Wholesalers can only buy from particular manufacturers and importers, while retailers can choose the number of goods they acquire and the range of products they sell to restrict procurement costs and other economic aspects that are vital to their success; retail is vital to the supply chain because it's the last connection. Merchants connect manufacturers and end users,

communicating directly. Retail's position gives it the best insight into client needs. In 2019, the retail sector registered 21 billion US dollars in transactions, with the 250 largest retail chains accounting for 4.85 billion US dollars. This shows the importance of the retail industry. Transactions rose 4.4% from 2018 to 2017 and 4.1% from 2017; the average net margin was 3.1%. Consumer goods made up 66% of retail transactions in 2019, while home décor and entertainment made up 19% (Dadic, Perkusic-Malkoc & Simic 2023: 2).

2.5.1 Peculiarities of retail and its economic significance

All manufacturers, suppliers, wholesalers, and other market intermediaries that supply retailers are part of the retail supplier network. Usually, a wholesaler connects the manufacturer and retailer or the product maker and the retailer. Retailers may also go through market intermediaries to buy goods, which add value through negotiation. Retailers can hire financial, advertising, insurance, and transport companies to handle all distribution needs. The biggest role of a retail business is to connect makers and customers since retailers understand customers' needs best. The retail store often serves all supply chain participants. As customers express their opinions and dissatisfaction with products in retail, retailers should protect customers under their manufacturer contracts. Retail stores need storage rooms to bridge time and regroup quantities. Retail, a tertiary industry, has specific needs that cannot be met by product acquisition, so it must have a certain inventory on hand. Retail sales are affected by annual, seasonal, monthly, weekly, and daily demand changes. Retail's performance and impact on economic statistics determine its economic importance. Retail shops increase their value by acquiring and building an assortment, shipping, storing, taking on financial risk, educating the public conducting promotional activities, selling products, and providing management advice (Dadic, Perkusic-Malkoc & Simic 2023: 3).

2.5.2 Channel development in retail

Retail is a segment of the supply chain where businesses purchase products in bulk from producers or wholesalers and resell them to final customers.

Marketing or distribution channels are groups of companies that collaborate to produce goods or services that end users or businesses will be able to purchase; marketing channels are thus middlemen. Maintaining certain inventory levels, sales, distribution, post-purchase servicing, and financial cycle closure are among the roles played by marketing channels. Products must be advertised to be sold, and this may be done via physical or digital channels. Companies reach clients directly via physical channels; however, consumers locate the things provided to them on their digital platforms. Printed media, printed materials, fairs, presentations, posters, and other events stand out among the physical channels such as conventional television and radio networks (Dadic, Perkusic-Malkoc & Simic 2023: 3).

Furthermore, these channels are more effective at reaching elderly customers who, to a larger degree, do not keep up with technological advancements and do not know how to utilize the Internet. Similarly, customers are more likely to trust physical channels. Conversely, the drawbacks of physical channels include exorbitant expenses, a small market, and a reduced audience penetration rate among younger individuals who are more inclined toward digital platforms. Digital channels include using a variety of digital gadgets to communicate with customers and promote items. The following are the most crucial digital marketing strategies: Email marketing, Search engine optimization (SEO), Pay-per-click (PPC) advertising, Social Media Advertising, Mobile advertising, and Blogs (Dadic, Perkusic-Malkoc & Simic 2023: 4).

Display advertising can include text, graphics, flash, audio, and video. This advertising aims to inform website visitors about general offers and corporate messaging. Digital channels allow for 24/7 consumer communication, global market penetration, and easy comparison of results to physical channels. Digital

channels offer more options and may reach younger audiences than physical channels. Digital channels have high maintenance costs, technology dependence, intense competition, and data exploitation risks. Retailers can reach customers via digital and physical media. These physical and digital channels can be classified by several users and integrated into other channels as single, multi, cross, or omni-channel. Single-channel communication involves only one channel between the retail firm and the customer. People can communicate online, via catalogs, in a business branch, or a shop. This type of customer communication strategy is ineffective today, so few retail businesses use a single channel. Integrating a demand or distribution network into the supply network allows retailers to distribute items to end users in various ways. The multi-channel strategy involves retail and customer contact via multiple channels (in-store, email, chat, social media, etc.); many customer interaction channels must be integrated (Dadic, Perkusic-Malkoc & Simic 2023: 4).

The channels by which the customer and the retail firm may interact with one other are completely unconnected, even if the customer can communicate with the company via several channels. As a result, the business is unable to access a specific customer's prior requests, purchases, and the items they have manufactured, among other information. Cross-channel communication, which occurs via mutually integrated channels between the retail firm and the customer, differs as well. In contrast to multi-channel, these channels for communication are interconnected, giving the business knowledge about past interactions and purchases made by a particular customer. Unfortunately, this cannot be employed effectively since the departments of a particular organization are not coordinated as much as is required. Channels that are completely interconnected with one another enable omnichannel communication. Accordingly, the user can select the channel that best suits his needs and communicate with the company via a variety of means. The company can also leverage its history of interactions with the user to leverage its data in future communications, thereby increasing the user's satisfaction with the services (Dadic, Perkusic-Malkoc & Simic 2023: 4-5).

2.5.3 Introduction to Customer Relationship Management

Seller-buyer relationships used to be based on trust and understanding of the goods. Mass manufacturing changed this relationship, causing businesses to prioritize sales and promotion so the buyer-seller bond disappears. Businesses have realized they must focus on customers, identify and meet their needs, and create a CRM marketing strategy. Retailers must manage customer relationships to attract new customers and retain existing ones. This innovative marketing approach keeps the retail firm and customer in touch after the sale, opposite to traditional marketing. Even though customer relationship management is expensive, it implies that customers drive retail operations (Dadic, Perkusic-Malkoc & Simic 2023: 6).

Market segmentation, which manages customer relationships, is essential to the concept's execution. Market segmentation determines the marketing plan's target market. It involves segmenting the market into smaller customer groups with different wants, behaviors, and product needs, requiring different marketing strategies or products. Due to customer preferences, interests, and buying habits, it's hard to satisfy everyone with the same product. Relationship-building marketing builds profitable, long-term consumer relationships. It means shifting from acquiring new customers to retaining existing ones. Repeat purchases are crucial because market share will decline without them; it's easier and more profitable to keep customers than to attract new ones (Dadic, Perkusic-Malkoc & Simic 2023: 6).

A customer relationship-oriented approach is influenced by many factors; humanity, corporate procedures, and technology matter most. Technology helps the firm with daily operations and provides consumer data for strategic goal-setting. Companies are organizing themselves according to consumers and connecting their business operations to serve consumer wants and wishes

since customers have different demands, preferences, buying behaviors, etc. Customer relationship management begins with a database of customer behavior, needs, wants, purchasing patterns, and promotional responses. After collecting database data, statistical and mathematical methods are used to analyze it. Since building profitable, long-term consumer relationships is the strategy's main goal, customer satisfaction must be continuously assessed and marketing initiatives adjusted to exceed expectations. One more important aspect is strategy effectiveness monitoring. It helps modify customer relationship management strategies and assess a firm's strategic goals. Since customers are smarter, pickier, and more demanding, it's hard to keep them. Because of this, businesses must quickly identify customer needs and develop a plan to meet them (Dadic, Perkusic-Malkoc & Simic 2023: 6-7).

2.5.4 Advantages of simultaneous sales through multiple channels

The advent of digital channels has presented new difficulties for the retail industry as many retailers have been drawn to these platforms and have incorporated their online stores as additional digital channels. Retailers established new markets, such as online ones, and used new services and procedures by selling via several channels at the same time. There are emerging new consumer-facing websites offering new services and sharing information: firstly, tools for comparing product characteristics, prices, and terms of sale as well as tools for adapting the content, the offer, and the product itself to the consumer. Secondly, portals, where offers from various suppliers, are combined. Thirdly, product control service and online certificate issuance, as well as product tracking service. Lastly, highly specialized intermediaries for certain aspects of commercial business (Dadic, Perkusic-Malkoc & Simic 2023: 8).

The benefits of expanding retail channels by merging conventional and digital channels include increased sales potential and a wider selection. Sellers are driven to sell products and provide the best possible service since customers

are making more and more purchases. To be more precise, every new channel that merchants use to do business may be thought of as a brand-new interactive touch point. Furthermore, as was previously said, the advent of digital channels has made it easier to gather consumer data to identify target customers and segment the market, better satisfying the demands and preferences of today's consumers. Similarly, the inclusion of new channels made it possible to engage and communicate with customers more successfully. It should be mentioned that the arrival of new channels has allowed users to choose the ones that best suit their preferences and requirements (Dadic, Perkusic-Malkoc & Simic 2023: 8-9).

2.5.5 Definition of omnichannel

A modern sales model called "omnichannel retailing" integrates all sales channels. Consumers who shop across multiple distribution channels get an "integrated and consistent shopping experience" at any time. All sales data is centralized in this retail approach, so online and offline sales work similarly. Many sales channels allow consumers to start a search on one and finish it on another; this lets customers choose their shopping method. Retailers began multichannel sales when they relied on direct catalog sales and storefronts. The company's management ignored these suggestions because they didn't see the need for channel integration. Multi-channel sales can work without integration if the merchant offers the same selection online and offline and if not, it has fully integrated both channels. Retail companies with a limited but deep product selection can build a long-term customer base by fully integrating two or more marketing channels. Asymmetric channel integration works well for companies with a wide product selection. Multi-channel sales development is currently called omnichannel retail, or multi-channel retail, in the literature. Omnichannel retail eliminates the natural division between current and new internet-based channels; the lines separating channels overlap (Dadic, Perkusic-Malkoc & Simic 2023: 9-10).

2.5.6 Comparison of omnichannel and multichannel retailing

Omnichannel retailing contains two distinct marketing tactics, but the literature sometimes describes it as an extension of multichannel sales; omnichannel and multichannel retailing must be distinguished. Using at least two distribution channels to sell items to end customers is called multi-channel retailing. Multi-channel sales fall into online and offline channels. Retailers integrate physical stores, online stores, and catalog sales. Multichannel sales involve selling goods at different prices in different situations. Multichannel retail aims to boost sales through channel integration. Retailers use two or more marketing channels in multi-channel and omnichannel sales, but the main difference is that multi-channel channels are managed separately, while omnichannel channels are managed centrally and have no boundaries. Marketing channels that are not integrated affect product offer and price, consumer communication, supply chain, and shopping experience (Dadic, Perkusic-Malkoc & Simic 2023: 10).

Multi-channel retailing has advantages over single-channel retailing, such as increased market coverage, lower costs, and more customization. Omnichannel commerce makes regional restrictions and customer demands obsolete by eliminating sales channel borders, making it even better than multichannel sales. Omnichannel retailers must personalize shopping, strengthen relationships with current customers, and attract new ones while acting as middlemen in product sales; customers prefer personalized, valuable products. Modern mobile devices that customers always carry and retailers that offer the best shopping experience across multiple channels and adjust to mobile device shopping help omnichannel retailing and customers grow. A well-functioning supply chain is also important because product returns can affect customer satisfaction, availability, and delivery options (Dadic, Perkusic-Malkoc & Simic 2023: 10-11).

2.5.7 Consumer behavior in omnichannel retailing

Today's customers want a consistent, integrated experience across channels; they will switch between conventional shops, the internet, and mobile devices depending on their preferences, the situation, the time of day, or the goods. Technology and mobility allow consumers to be in multiple channels at once. These new shoppers want to use their own devices to search, compare, ask for advice, and find cheaper options to take advantage of each channel's benefits. Modern customers feel more in control and think they know more about the purchase than the seller. Customers can use marketing channels' benefits and avoid their drawbacks. Thus, customers can choose a marketing channel during the buying process. They may also speed up shopping, find a good deal, and read product reviews. Retail management increasingly targets all consumers who use multiple marketing channels. In omnichannel sales, ease of use, product and sales channel characteristics, consumer personality and sociodemographic traits, trust, past shopping experiences, the perception of shopping's usefulness and efficiency, and situational factors all affect customer behavior (Dadic, Perkusic-Malkoc & Simic 2023: 12).

2.5.8 Omnichannel Case Conclusion

The study tests respondents' awareness of omnichannel commerce and its benefits. The study used a survey questionnaire with 15 questions prepared for the final paper; the target audience was 18–36-year-old males and women. This demographic was chosen for the online survey because they use the internet, and support both brick-and-mortar and online businesses. Simple random sampling was employed to pick respondents because everyone had an equal chance of being selected. The study found that 56.5% of participants cannot define omnichannel commerce because they are unfamiliar with the concept. Over 55.1% correctly identified omnichannel commerce as centralized. According to the survey, 36.2% of respondents are 26–30, however, they prefer traditional commerce (68.1%) over "modern" or internet trading. 40.6% would

buy pricey products in person rather than online. This validates the fact that 34 respondents (49.3%) buy physical things and 31.9% online. Over 36% of respondents bought from internet ads, while 24.6% did not. Retail stores must monitor client requirements and habits to meet them and influence consumer behavior. Modern multichannel retailing combines offline and online sales, blending in with omnichannel buying. These mediums connect customers, improve experiences, and boost satisfaction (Dadic, Perkusic-Malkoc & Simic 2023: 13-14)

Physical routes help firms locate customers, whereas digital channels help buyers find products. Conventional channels include radio and TV while tablets, cellphones, and PCs are used for digital channels. Information technology and customer sophistication have led to omnichannel commerce. Technology and mobility allow customers to communicate with companies via many channels. Omnichannel commerce lets customers choose the channel and when to utilize it, saving time and making product pricing and user reviews easy to find; it demands a consistent, distinctive, and integrated service, therefore personalizing the approach with extra value regardless of the marketing medium. Omnichannel marketing requires empowerment, agility, consistency, and relevance. After integrating these parts into the marketing plan, strategize the consumer's experience, segment the market, convey the correct message to the right customers at the right time, and focus on the customer (Dadic, Perkusic-Malkoc & Simic 2023: 15)

2.6 The future of omnichannel retail: A four-stage Delphi study

The internet and the creation of new online channels have played a major role in the retail industry's evolution during the last 20 years (Briel 2018: 217-218). The internet changed traditional storefront-based (i.e., brick and mortar) stores into multi-channel retailers and gave rise to wholly online retailers such as Amazon and eBay, changing the way that customers behaved when making purchases and how loyal they were. As a result, customers began to peruse

products in-store before buying them online, which increased industry competition and compelled many retailers to include online channels in their assortment. More than 80% of US merchants were operating several channels by 2008, and the number of new channels is constantly expanding due to ongoing advancements in digital technology. Consequently, if in the early 2000s, a more binary differentiation between online and offline channels was enough, a more sophisticated understanding of online channels now needs to differentiate between web shops, mobile applications, and social media (Briel 2018: 217–229).

The Delphi technique, on which this work is based, has shown promise for predicting in a variety of domains, such as information systems, international business, and innovation management. The traditional Delphi technique is used with its open-ended questions because, considering the early phases of the omnichannel study, it enabled predictions to develop organically and did not limit them to topics already addressed in the body of existing literature. The traditional Delphi approach uses a guided, iterative process of group communication to ask participants—who are often subject matter experts—for their opinions on a given topic. Through the use of individually administered questionnaires, the facilitator gathers participant feedback, consolidates it, and gives it back to each participant separately. At that point, each participant can amend their response in light of the comments of other participants, leading to the development of a group opinion—or forecast. To avoid problems associated with traditional group communication processes, such as groupthink—“the psychological drive for consensus at any cost that suppresses dissent and appraisal of alternatives” and domination of the discussion by one or a few individuals—participants in this process remain anonymous during the process. Until response stability is reached, until participant answers no longer substantially differ across iterative feedback rounds—the iterative Delphi method is usually repeated (Briel 2018: 218-219).

2.6.1 First stage: expert selection and brainstorming

Global retail experts as study participants were selected. To determine whether a person was an expert, their length of retail experience, publications in international academic or practitioner-oriented retail outlets, presentations at international retail conferences or congresses, awards from professional societies, and membership in professional societies were considered. Single-retailer experts to avoid basing our findings in favor of certain merchants' omnichannel initiatives were excluded. 18 of 104 diverse professionals who met the selection criteria participated. Thus, only 17% of respondents responded, which is low but consistent with Delphi's studies. The time commitment of multi-stage Delphi study project participants may explain the low response rate. Another thirteen experts declined to participate because they could not commit to the entire study period. Twelve men and six women participated among 18 experts. Twelve Americans participated, followed by four Brits, one Canadian, and one New Zealander (Briel 2018: 218-219).

During the first phase of the study, four open-ended questions were asked to participants to predict the most important omnichannel retail trends, challenges, technologies, and customer touchpoints over the next ten years. The participants were asked to name three statements for each category and explain them briefly. A web-based questionnaire sent open-ended questions, allowing respondents to respond at their convenience. Following questionnaire design standards ensured the validity of the open-ended questions. To reduce confusion and complexity, each question should only cover one subject, and positive and negative item wordings should be removed to avoid affecting respondents (Briel 2018: 218-219).

Information about individual participants and the stages they participated in.

Job role	Exp	Gender	Country	Stg 1	Stg 2	Stg 3	Stg 4
Consultant 1	15	M	UK	X	X	X	X
Consultant 2	20+	M	US	X	X	X	X
Consultant 3	35	M	US	X	X	X	X
Consultant 4	20+	W	US	X	X	X	X
Consultant 5	20+	M	US	X	X	X	X
Consultant 6	25+	W	UK	X	X		
Consultant 7	35+	M	US	X	X	X	X
Consultant 8	30+	M	US	X	X	X	
Consultant 9	10	W	US	X	X	X	
Professor 1	40+	M	UK	X	X	X	X
Professor 2	15+	M	NZ	X	X	X	
Senior Editor 1	15	M	US	X	X	X	X
Senior Editor 2	15+	M	US	X	X		
Senior Editor 3	20	M	UK	X	X	X	X
Senior Editor 4	15+	M	US	X	X	X	X
Reporter	30	W	Canada	X	X	X	X
Analyst 1	35+	W	US	X	X	X	X
Analyst 2	15	W	US	X	X	X	X

Exp = Industry experience in years; Stg = Stage of participation.

Figure 11 Potential study participants (Briel 2018: 219)

Questions with three practitioners and two academics with backgrounds and competence levels similar to invited experts were tested (Briel 2018: 219-220).

2.6.2 Second stage: coding and feedback on coding

After receiving the open-ended responses, they were categorized to find themes and group responses with similar meanings. The open-coding stage uses in vivo codes or the words and phrases participants used to identify relevant codes, going over each response line by line. Three co-located participants should code simultaneously to ensure inter-coder dependability. The three studies coded each response separately and then discussed discrepancies until they all agreed. During their discussions, the studies reviewed their coding to see if combining codes with similar meanings affected their key claims and if linked text segments would change lines that had been

coded independently. New codes and improved codes emerged until all studyers agreed on every code and further combining was impossible. A text element may contain many types of information, so multiple codes and sub-codes to balance parsimony and specificity were provided. After this, 284 coded text segments with 206 unique codes were created. These codes were merged into 157 more thorough codes using axial coding. To ensure code rigor, designed open-ended questions using the same guidelines were made. The figure shows (many) text-based sub-codes linked to the primary "physical stores" code using examples from our data (Briel 2018: 219).

Illustration of coding.

Text element	Sample code 1	Sample code 2
Fixed stores will remain a major, probably the major, consumer touchpoint for purchasing.	Physical stores: For immediate purchasing	
The traditional in-store experience will always be the back-up.	Physical stores: As key destinations for unique shopping experiences	
Brick and mortar retail is not going away. Too many people see it as a form of immediacy and entertainment	Physical stores: For immediate purchasing	Physical stores: As key destinations for unique shopping experiences

Figure 12 Sub-codes (Briel 2018: 220)

Coding with participants to ensure accuracy was validated. Participants were sent their responses with our codes so they could rate coding and provide feedback on specific codes. Coding satisfaction ranged from 1 to 10, with 10 being the highest. As shown by the median satisfaction rating of 9 for the coding related to major trends, problems, and primary consumer touchpoints and 8 for classification related to significant technologies, coding accurately reflected participant responses. The coding of thirty-six text pieces was criticized, but some were supported and clarified. The rare time a respondent was unhappy with a code, possibly better code from the current coding book, and worked with them to build a new code. Eight existing codes were enhanced, two text components with existing codes were reclassified, and eight new codes were added after verification. After the second phase, the study contained 165 codes that summarised 38 major technology developments, 44 major challenges, 29 primary consumer touchpoints, and 54 major trends (Briel 2018: 220).

2.6.3 Third stage: first ranking

The second stage's key issues, technologies, trends, and consumer touchpoints were then presented to participants. Next, they were asked to rate each statement on an ordinal 5-point scale from strongly disagree (1) to strongly agree (5). Allowing participants to comment on claims provided additional feedback. Most importantly, participants could now see, evaluate, and comment on each other's claims; sixteen responses were provided, including seven from four participants who praised coding. Late responders and non-respondents using a Mann-Whitney test, assuming they were equal were compared. No non-response bias because the results were not statistically significant was identified. The mean of the sixteen responses for each statement and how each answer deviated from the group's central tendency to determine the group's opinion were calculated (Briel 2018: 220).

2.6.4 Fourth stage: second ranking

In the second step, each group member was informed of the overall perspective and how their response differed from the group average. Participants were asked to reconsider their responses in light of the majority response and clarify any topics they thought needed more explanation. Thirteen people completed this level and responded, while three quit without explanation. Next, the responses of participants who quit during the third stage to the mean of those who continued to see if disagreement was the cause were compared. The two quitting participants' responses were similar to those of the continuing participants. Continuing participant responses varied greatly on sixteen questions, suggesting disagreement. Due to cognitive dissonance, one person may have stopped participating. Seven of the remaining 13 participants changed their ratings, and three gave ten explanations (Briel 2018: 220).

It starts with response stability between phases and uses hierarchical stopping¹. Response stability shows how much participants' responses change.

Long-term forecasters rarely revise their initial assessments because it's hard to evaluate alternatives. Stability seemed such as a better-stopping criterion than consensus or a set number of rounds. To evaluate the stability of ordinal data responses from the same participants before and after, the Wilcoxon matched-pairs signed-ranks test is used. The significance ratings for the individual statements did not significantly change between the third and fourth phases, indicating stability and data collection completion. Between the third and fourth phases, examining the average convergence rate, or standard deviation change, %. In this study, participant responses on major challenges (-7%), critical technologies (0%), and main consumer touchpoints (-1%) showed some convergence but did not change. Competent experts make fewer changes to their responses than non-competent people because they are more accurate from the start and less influenced by others (Briel 2018: 221).

Second, stability in the responses was investigated: consensus, majority agreement, majority disagreement, and bipolarity. This strategy yielded 29 statements: 6 significant issues, 3 significant technologies, 6 primary customer touchpoints, and 14 notable trends. Next, the majority of claims were identified. Over 50% agreement indicates majority agreement. However, advised removing claims with less than 70% agreement. To improve forecast accuracy, the focus was put on comments that at least 69% of participants gave a 5. This method yielded 17 more assertions, including 4 significant trends, 2 significant obstacles, 4 significant technologies, and 7 significant consumer touchpoints. The same method as majority agreement was used to determine which propositions received majority disagreement. This suggests that after a decade, participants had similar views of omnichannel retail. The remaining statements, or those that did not meet the consensus or majority agreement criterion were examined to test for bipolarity, which occurs when participants make two contradictory predictions, suggesting two different future states. Interquartile ranges (IQRs) were calculated to measure dispersion for assertions without majority agreement, considering 10 claims with IQR over 1 bipolar. Histograms were used to verify these 10 statements' bipolarity. No histogram showed a significant spread across the 5-point response scale, indicating that none of the

claims were bipolar (oppositional) (Briel 2018: 221).

2.6.5 Delphi study results

The results of the investigation are presented in this section. The final lists of assertions that have either attained consensus or high agreement among the majority of participants are presented, along with quotes from the replies of the study participants. In rare situations, statements are supplemented with information if they barely missed the consensus requirements (i.e., one person disagreed) but made a substantial contribution to comprehending the viewpoints of the participants.

Key trends in omnichannel retail over the coming decade.

Statement	Stability		Result	Ratings					5	4 & 5
	Z	p		1	2	3	4	5	(%)	(%)
Omnichannel will be the new normal	.000	1.000	N/C	0	0	1	3	9	69	92
Omnichannel will be the new normal: Also for perishable goods	.678	.534	N/C	0	0	1	7	5	38	92
Omnichannel will be the new normal: Necessity to adapt	-.262	.968	N/C	0	0	1	3	9	69	92
Shift from focusing on channels to points-of-contact	.000	1.000	N/C	0	0	0	9	4	31	100
Balanced integration of digital commerce with brick-and-mortar retail	.000	1.000	N/C	0	0	0	6	7	54	100
Physical stores: As key destinations for unique shopping experiences	.000	1.000	N/C	0	0	0	6	7	54	100
Physical stores: Reinvent with digital technologies to enable omnichannel fulfillment	-.175	1.000	N/C	0	0	0	7	6	46	100
Physical stores: Reinvent with digital technologies to improve consumer experience	-.175	1.000	N/C	0	0	0	6	7	54	100
Role of store associates will change	-.175	1.000	N/C	0	0	0	6	7	54	100
Role of store associates will change. Store associates will be empowered through digital devices	-.227	.971	N/C	0	0	1	7	5	38	92
Digital mobile devices: Creating seamless consumer experiences	.000	1.000	N/C	0	0	0	6	7	54	100
Digital mobile devices: Location based marketing	.000	1.000	N/C	0	1	0	3	9	69	92
Digital mobile devices: Better access to consumer data	.000	1.000	N/C	0	1	0	3	9	69	92
Payment methods: Increasing use of digital personal devices at POS	.000	1.000	N/C	0	0	0	6	7	54	100
Cross-channel integration: Increasing operational productivity	.000	1.000	N/C	0	0	0	7	6	46	100
Cross-channel integration: Enabling integrated (multi) brand management	.000	1.000	N/C	0	0	0	11	2	15	100
Cross-channel integration: Personalizing consumer experience	.000	1.000	N/C	0	0	0	5	8	62	100
Cross-channel integration: Enabling real-time inventory management	.000	1.000	N/C	0	0	0	6	7	54	100
Faster fulfillment	.000	1.000	N/C	0	0	0	5	8	62	100
Product customization as a service	-.255	.888	N/C	0	0	0	10	3	23	100

Z = Standard score; N/C = No significant change; Ratings = 5 point Likert scale, ranging from (1) strongly disagree to (5) strongly agree; 5 and 4&5 = Relative frequencies of individual ratings.

Figure 13 Key trends in omnichannel retail (Briel 2018: 222)

The statistical findings for the first criterion, stability. Wilcoxon matched-pairs signed-ranks test is used to determine if answers changed substantially between the third and fourth stages.

Major challenges in omnichannel retail over the coming decade.

Statement	Stability		Result	Ratings					5	4 & 5
	Z	p		1	2	3	4	5	(%)	(%)
Achieving functional integration	-.462	.772	N/C	0	0	0	7	6	46	100
Balancing digital commerce with brick-and-mortar retail: Re-purposing surplus retail space	.000	1.000	N/C	0	0	1	9	3	23	92
Cross-channel integration: Real-time inventory management	.000	1.000	N/C	0	0	0	8	5	38	100
Cross-channel integration: Personalizing consumer experience	.000	1.000	N/C	0	0	1	7	5	38	92
Cross-channel integration: In-store customer profiling	.000	1.000	N/C	0	1	0	8	4	31	92
Cross-channel integration: Conversion rate optimization	.000	1.000	N/C	0	0	1	9	3	23	92
Developing omnichannel capabilities: Adjusting the organizational mindset	.000	1.000	N/C	0	0	0	7	6	46	100
Developing omnichannel capabilities: Adjusting C-level skills	.000	1.000	N/C	0	0	1	6	6	46	92
Developing omnichannel capabilities: Adjusting store associate skills	.000	1.000	N/C	0	0	1	7	5	38	92
Ensuring information and data privacy	.000	1.000	N/C	0	0	0	6	7	54	100
Ensuring information and data security	.000	1.000	N/C	0	0	0	6	7	54	100
Ensuring information and data security: Managing across-channels despite channel specific issues	-.367	.902	N/C	0	0	1	7	5	38	92
Increasing assortment breadth: Managing product variety	.000	1.000	N/C	0	0	0	11	2	15	100

Z = Standard score; N/C = No significant change; Ratings = 5 point Likert scale, ranging from (1) strongly disagree to (5) strongly agree; 5 and 4&5 = Relative frequencies of individual ratings.

Figure 14 Major challenges in omnichannel retail (Briel 2018: 222)

The replies for all of the claims at $p < .05$ did not significantly change (N/C) between stages three and four, as the tables demonstrate. The absolute frequencies of individual ratings in stage four, or the number of participants who gave a certain rating (such as agree or strongly agree) to a statement.

Important technologies in omnichannel retail over the coming decade.

Statement	Stability		Result	Ratings					5	4 & 5
	Z	p		1	2	3	4	5	(%)	(%)
Digital mobile devices: Enabling new services	.000	1.000	N/C	0	0	0	6	7	54	100
Digital mobile devices: Mobile apps to improve in-store consumer experience	.000	1.000	N/C	0	0	1	3	9	69	92
Technologies improving in-store consumer experience	.000	1.000	N/C	0	0	2	2	9	69	85
Wireless technologies to enable in-store message transmission	.000	1.000	N/C	0	0	1	7	5	38	92
Payment technologies to improve the checkout	.000	1.000	N/C	0	0	1	3	9	69	92
Technologies improving online purchase convenience	-.367	.902	N/C	0	0	1	3	9	69	92
Technologies enabling cross-channel integration: Real-time inventory management	.000	1.000	N/C	0	0	0	6	7	54	100
Technologies enabling cross-channel integration: Real-time analytics	.000	1.000	N/C	0	0	1	5	7	54	92
Technologies enabling cross-channel integration: Real-time information dissemination	.000	1.000	N/C	0	0	0	5	8	62	100

Z = Standard score; N/C = No significant change; Ratings = 5 point Likert scale, ranging from (1) strongly disagree to (5) strongly agree; 5 and 4&5 = Relative frequencies of individual ratings.

Figure 15 Important technologies in omnichannel retail (Briel 2018: 222)

The 69% of respondents who strongly agree indicate majority agreement, whereas 100% of respondents who agree or strongly agree indicate consensus. Participants expect "the line between [channels] will blur to the point where no distinction is made" and omnichannel to become the norm in ten years. Retailers must adapt to provide a complete consumer experience rather than just the right products to stay competitive. Retailers will now prioritize points of contact over channels. Instead of seeing themselves as merchants with routes to market, firms will view every client encounter as a major activity. Additionally, product customization services help personalize the customer experience. Retailers must combine traditional and digital retailing, with physical stores becoming more important in unique shopping experiences. Given this shift and the growing need for customization, retailers will need to rethink their physical storefronts in light of digital technologies that improve customer experience and enable omnichannel fulfillment (Briel 2018: 222-223).

Participants' predictions for important technologies focused more on functionality than features because new technologies replace old ones quickly. Future multichannel shopping will be impacted by in-store consumer experience technologies. Wireless technology allows businesses to communicate with customers in-store, and mobile apps let customers pay and email receipts instantly without waiting at a checkout desk. Technologies that simplify and speed up online shopping will also be crucial. Examples include real-time inventory displays for online and physical stores, devices that alert users when an item they're browsing is available at the nearest store, and the Amazon Echo, which allows voice commands for online orders. Additionally, technologies that enable cross-channel integration will become indispensable from an operational perspective. It will be essential to have technologies that enable real-time inventory management and information sharing across the whole organization. To enable retailers to view inventory as a shared asset within the company and to compile fragmented customer data from various channels into a single location for "disseminating to those who need it when they need it," certain technologies are needed. The store must offer an

engaging experience that matches the new customer service standard or competes with showrooming. Mobile devices will allow customers to shop online and compare prices in the store's aisles as a showroom gateway. Finally, advanced desktop and mobile websites will keep the web a major touchpoint. Website customer service must be improved to help customers navigate the system and receive orders and shop updates (Briel 2018: 223).

2.7 Investigating logistics service quality in omnichannel retailing

Omnichannel consumers have changed retail forever. Omnichannel shoppers are informed and empowered and want a seamless experience that combines the best of online and in-store shopping. Fulfilling omnichannel customer expectations is challenging. However, successful merchants increase revenue and customer retention. Omnichannel customers spend 15–30% more than conventional shoppers, so retailers with strong omnichannel customer service strategies retain more customers. Retailers are rethinking customer service and turning to supply chain and logistics experts for ideas on how to provide personalized care, flexible order fulfillment, and on-time delivery. The leading "omnichannel winners" of 2016's 10-K filings demonstrate the importance of an integrated customer experience and the opportunity for studies to illuminate omnichannel "workings". An omnichannel strategy requires efficient logistics, and a store's success depends on it. A poll of 410 retail and consumer goods CEOs worldwide found that 19% of the top 250 retailers could financially support omnichannel needs. 88% of CEOs said logistics and transportation were the most important areas to address to meet omnichannel consumer needs. Logistics managers are at the forefront of retailers' efforts to stand out and must better understand how to use logistics services to meet omnichannel customer expectations (Murfield, Rutner, Boone & Thomas 2017: 263).

Thus, investigating the connections among logistics service quality (LSQ), customer happiness, and customer loyalty in an omnichannel environment is the goal of this study. Understanding customers' perceptions is crucial for

businesses to determine where to allocate resources to adapt their logistics operations to execute an omnichannel fulfillment strategy. Studying customer satisfaction and loyalty as indicators of consumers' response to these logistics service requirements has not yet been addressed in the context of omnichannel fulfillment. Retailers now face new distribution issues as well as new consumer groups as a result of the omnichannel environment. Researchers have, for instance, pointed out that more thought needs to be given to how various omnichannel consumer contact points may impact interactions between customers and retail channels. Analogously, current inquiries into omnichannel logistical concerns underscore the distinct characteristics of omnichannel distribution and the need to examine client reactions to the transition from conventional to omnichannel distribution procedures. Furthermore, extracts from the 10-K filings of the leading omnichannel retailers demonstrate how quickly consumer expectations are evolving and how the definition of LSQ in an omnichannel setting differs from that of a pure e-commerce or conventional brick-and-mortar business. Managers and students must therefore clearly comprehend the service needs of distinct omnichannel customers. The following study question, which aims to solve the problem, guides this study (Murfield, Rutner, Boone & Thomas 2017: 264-265):

It should be emphasized that concentrating on "customer touch points" to maximize the customer experience is crucial. This is because omnichannel marketing integrates activities across various channels so that customers can freely navigate between them during a single transaction process. The quality of related logistics services and delivery alternatives was shown to be a vital contact point and the single largest effect on a customer's decision to buy. The two most popular channel "hybrids" for omnichannel retailers are using the store as a showroom to access product information and make purchases, then having the product delivered directly to the customer (referred to as "buy-in-store-ship-direct" (BSSD) in this study), and accessing product information online but picking up the product in-store (referred to as "buy-online-pickup-in-store" or BOPS in this study). Even though many shops are integrating their online and offline channels via BOPS and BSSD options has been called the "hat trick" that

many merchants find difficult to implement. The two omnichannel situations that are most often seen in practice are the BSSD and BOPS omnichannel scenarios, which are the subject of this study (Murfield, Rutner, Boone & Thomas 2017: 265).

2.7.1 A shift to omnichannel retailing

Retailers need to reconsider their tactics for competing as the lines between physical and online shopping grow more blurred and customers' expectations rise. Omnichannel distribution may be seen as the logical and natural progression from multichannel distribution from this evolutionary point of view. The need to use many, discrete distribution channels to meet consumer expectations gave rise to multichannel distribution. The choice of fulfillment method (e.g., in-store pickup or home delivery) and mode of purchase (e.g., online or in-store purchases) largely impacted these channels. While providing goods or services to customers across several channels is a part of multi-channel retail, it does not always mean that marketing or operational efforts are integrated across all channels. Highlight a few of the crucial "back end" adjustments and choices that must be made regarding the physical distribution strategy and related procedures, such as: weighing the pros and cons of integrated vs separate inventory in fulfillment centers, retail stores, and distribution centers; experimenting with different delivery options across channels; figuring out how to make the most of store infrastructure for in-store pickup and/or fulfillment from the store; and assessing how supplier relationships are evolving and being used (Murfield, Rutner, Boone & Thomas 2017: 266-274).

LSQ: an evolution

Over the last several decades, the study of logistics customer service and its significance to business success has grown. The physical distribution service quality (PDSQ) construct was first created to gauge how businesses provide value to customers via logistics. Later on, this was expanded upon to create the

LSQ scale, which consists of nine distinct dimensions and has served as the basis for many additional studies of LSQ scales. Kept working on this area and eventually looked at LSQ as a procedure that was divided into parts for order placing and order reception. Since then, several studies have looked at LSQ as a two-dimensional entity consisting of relational and operational performance. A comprehensive account of the development of the LSQ construct is given by the review and the meta-analysis. As the traditional model of pure brick-and-mortar distribution has evolved to multi-channel and now omnichannel distribution, so must the focus of LSQ study. "the producer performs most of the distribution functions internally" in business-to-business (B2B) settings, where the majority of LSQ study has been conducted so far. Retailers are not the only supply chain participants that distribute directly to end consumers in their stores; as technology has made it possible for businesses to reach customers through a variety of channels, relationships between supply chain partners are evolving as they co-create value with customers. Thus, as omnichannel distribution develops, the significance of LSQ analysis in a business-to-consumer (B2C) setting increases (Murfield, Rutner, Boone & Thomas 2017: 267-271).

Many retail supply chains developed when e-commerce first gained traction to avoid using traditional brick-and-mortar channels for distribution. Studied "electronic LSQ" in B2C e-commerce by utilizing a study on logistics customer service, PDSQ, and electronic PDSQ (e-PDSQ), and if typical features of LSQ explored in B2B study apply to B2C study. Furthermore, an increasing number of studies have looked at the significance of order fulfillment in online shopping. The several "product-to-consumer paths" that are accessible, each of which will impact LSQ differently, provide a barrier for defining and quantifying LSQ in an omnichannel context. For instance, the logistical concerns involved in a pure e-commerce model or a conventional brick-and-mortar distribution strategy may vary from those of LSQ in a "BOPS" model. This study aims to conceptualise LSQ in an omni-channel supply chain, in which customers get items via many channels in a single transaction. This necessitated using a study on fulfillment and logistics in a multi-channel setting together with a study conceptualizing LSQ in a B2C environment as a basis. In keeping with previous studies, the

three components of LSQ that make up this study's conceptualization are availability, timeliness (of delivery), and product condition as perceived by the customers. Although LSQ has been assessed as both a second-order construct and three distinct first-order constructs, these three dimensions of LSQ are in line with the current study on LSQ in B2C scenarios. In line with conventional LSQ studies conducted in the B2B domain, the study formulates hypotheses based on the three distinct aspects of LSQ (Murfield, Rutner, Boone & Thomas 2017: 271-274).

Overview of performance outcomes for LSQ:

For many years, a sizable body of study has focused on the significance and effects of LSQ on company performance. The current study indicates that the performance of a company and logistics services are positively correlated. They divided studies on logistics customer service into two categories: financial performance and customer-focused performance in their meta-analysis of the field. Customer satisfaction and loyalty, customer retention and future purchase intentions, and referral behavior have all been studied about the effects of LSQ on consumer perceptions of performance. The three components of LSQ—availability, timeliness, and condition—that consumers perceive as having an influence on customer satisfaction and loyalty in an omnichannel setting are the subject of this study, as seen in Figure 16 (Murfield, Rutner, Boone & Thomas 2017: 274).

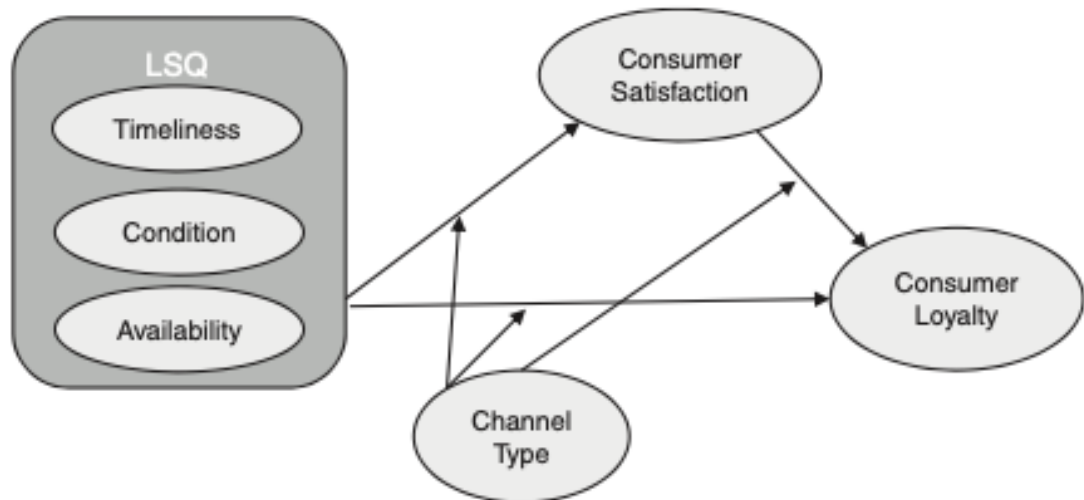


Figure 16 Three components of LSQ (Murfield, Rutner, Boone & Thomas 2017: 274)

The significance of the customer viewpoint in supply chain study has lately come under scrutiny, particularly in online retail supply chains. There aren't many instances of study that look at "consumer satisfaction" as a result of logistical operations, despite demands for more. The effects of e-LSQ on customer satisfaction and retention in online retail supply chains are examined, looking into the effects of transportation carrier strategy on online consumer satisfaction. LSQ provides a significant impact on consumer satisfaction in omnichannel supply chains, engaging businesses with customers via various channels (often both online and in-store) in a single transaction.

Whether satisfaction is with a product, service, or store, it is often seen as an assessment of performance as a whole. The happiness of the customer with a particular purchasing experience in comparison to their perceived standard is the main emphasis of this study. LSQ and customer satisfaction are positively correlated in an online-only retail environment. Emphasize the significance of timeliness as the primary metric for evaluating order fulfillment quality, and demonstrate its noteworthy influence on customer contentment within the context of online transactions. In an online retail environment, item availability

and timely delivery are essential elements of e-PDSQ that have a substantial impact on consumer purchase satisfaction. Furthermore, the existing study indicates that product condition is a crucial element of e-PDSQ for businesses to completely satisfy consumer needs in an online purchase context, in addition to timeliness and availability. Consequently, in an omnichannel setting, where supply chain skills and logistics services play a crucial role, these correlations will still hold when merging conventional and internet channels (Murfield, Rutner, Boone & Thomas 2017: 275).

LSQ and consumer loyalty:

In multi-channel distribution, studies are starting to tackle the logistical and fulfillment issues brought on by Internet channels. Though logistics play a crucial part in the omnichannel customer experience, the function of LSQ in fostering customer loyalty in this context has not yet been explored in academic studies. There is evidence from a study conducted just in the setting of business-to-consumer online transactions that availability and timeliness have a favorable impact on customer loyalty metrics including retention, referral behavior, and loyalty intentions. concentrate on the whole quality of service for in-store purchases, and discovered that integrated pickup is an important aspect of in-store service quality, which has a big impact on customer loyalty intentions. One "product-to-consumer path" of an omnichannel strategy is site-to-store (referred to as "BOPS" in this study), which requires excellent integration of product fulfillment and information distribution across channels. Customer loyalty in an omnichannel context is increasingly connected to the value-added services made possible by the consumer-facing supply chain, even though this relationship has not previously been explored in academic literature (Murfield, Rutner, Boone & Thomas 2017: 275-276).

Consumer satisfaction and consumer loyalty:

While obtaining client pleasure does not necessarily translate into customer loyalty, a substantial body of study identifies customer satisfaction as a critical predictor of customer loyalty. Several moderating and mediating factors have

been investigated, such as perceived value, trust, commitment, and consumer attitudes. Furthermore, prior studies have indicated variations in the relationship between satisfaction and loyalty, as well as the strength of this relationship in an online versus an offline context; switching barriers influence this relationship and satisfaction is not always a reliable indicator of e-store loyalty. Given the contradictory findings of the study that has already been done on the subject, it is crucial to take into account how customer happiness and loyalty interact in an omnichannel setting.

In an omnichannel scenario, customer satisfaction directly promotes customer loyalty, despite discrepancies in results among the studies that have previously been undertaken on the issue. The cross-channel integration strategies used by multi-channel merchants have a major impact on consumers' inclinations to stay with them. Customer retention in a multi-channel situation has been demonstrated to be highly impacted by satisfaction. Since they think the integrated pickup option adds value to their purchase, customers who make online purchases and pick them up in-store (BOPS) have greater intentions to stay loyal (Murfield, Rutner, Boone & Thomas 2017: 276).

Moderating impact of channel type:

Investigate PDSQ in an e-commerce context and wonder whether order fulfillment enhancements are crucial for all kinds of businesses. Overall, it has been shown that in online vs offline contexts, several components of multi-channel service quality influence customer satisfaction and loyalty intentions. Discovers variations in the correlation between loyalty and pleasure in online and offline environments; not all channels are equally valuable, and there will also be differences across various product-to-consumer paths in an omnichannel environment (Murfield, Rutner, Boone & Thomas 2017: 276-277).

2.7.2 Variables and measures

A meta-analysis that examined various operationalizations of logistics service quality (LSQ) and related constructs was conducted, including order fulfillment and physical distribution service. The study revealed that a significant portion of the study on LSQ and related constructs in logistics customer service has been conducted from a business-to-business (B2B) standpoint, focusing on logistics services between industrial buyers and sellers. One popular method of measuring LSQ separated into operational and relational performance does not make sense for a B2C study because the relational component is not as relevant when looking at LSQ in B2B relationships. Consequently, this study modified metrics, examining how consumers perceived local service quality (LSQ), which was defined as having three primary components: availability, timeliness, and condition. The dependent variables of interest in this study are customer satisfaction and loyalty. This study focuses on pleased consumers with a certain shopping experience at the perceived standard. The measurements were utilized with slight revisions to align with the B2C context of this study rather than the B2B focus (Murfield, Rutner, Boone & Thomas 2017: 277-278).

2.7.3 Analysis and Results

Partial-least squares structural equation modeling (PLS-SEM) methods were used to analyze the data. PLS is a component-based modeling approach that has been widely used in social and behavioral studies in fields such as information systems, operations management, and marketing.

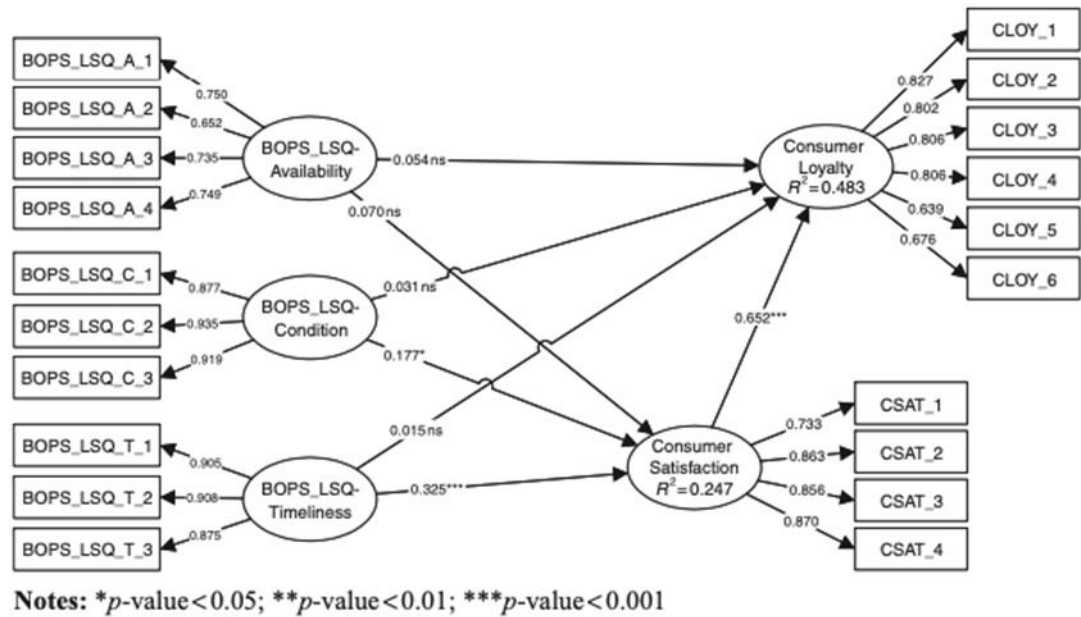


Figure 17 T-values testing sample 1 (Murfield, Rutner, Boone & Thomas 2017: 278)

More sophisticated models in logistics study are also starting to be assessed using this method. PLS-SEM may be performed with very small sample sizes and does not need data to match the condition of multivariate normality, in contrast to covariance-based structural equation modeling. This approach may be used to evaluate the impact of both group and continuous moderators and is suitable for models that include both formative and reflective indicators. Additionally, since it circumvents identification problems that sometimes arise when using covariance-based approaches, it is particularly suitable for assessing complicated models. Availability, timeliness, and condition are the three distinct first-order criteria that make up the present paradigm of LSQ. A group moderating effect between the BOPS and BSSD populations is another hypothesis. PLS-SEM is a suitable analytical method for this model a result (Murfield, Rutner, Boone & Thomas 2017: 278).

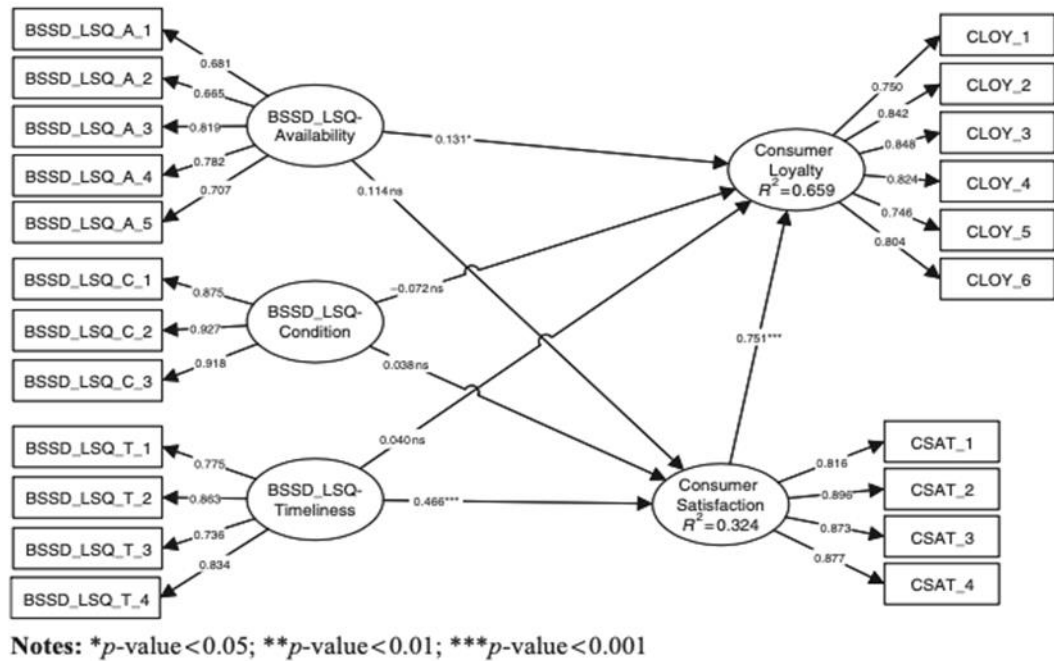


Figure 18 T-values testing sample 2 (Murfield, Rutner, Boone & Thomas 2017: 278)

For the data analysis, used the SmartPLS software. By mapping manifest items to their latent variables and constructing associations between latent variables based on the provided hypotheses, the first model was generated in SmartPLS. The route coefficients for structural linkages and item loadings were calculated using the PLS technique with the path weighting scheme. 5,000 samples were utilized in a bootstrapping method to get the t-values needed for significance testing.

2.7.4 Measurement assessment

By looking at data confirming convergent and discriminant validity as well as internal consistency reliability, the psychometric qualities of the measures were evaluated. For both the BOPS and BSSD samples, figure 19 displays the loadings of manifest items on all structures. Except for LSQ_A2, all item loadings are higher than the suggested threshold of 0.70, indicating convergent validity. In both the BOPS and BSSD samples, LSQ_A2 was marginally below

the suggested cutoff threshold, at 0.685 and 0.682, respectively. Furthermore, the loadings of items on their alleged factors for all manifest items are greater than any cross-loadings, hence supporting discriminant validity (Murfield, Rutner, Boone & Thomas 2017: 279-280).

	BOPS_LSQ-Availability	BOPS_LSQ-Condition	BOPS_LSQ-Timeliness	Cloy	CSat
BOPS_LSQ_A_1	0.764	0.535	0.553	0.255	0.314
BOPS_LSQ_A_2	0.685	0.274	0.410	0.194	0.161
BOPS_LSQ_A_3	0.727	0.396	0.404	0.220	0.260
BOPS_LSQ_A_4	0.715	0.368	0.397	0.249	0.297
BOPS_LSQ_C_1	0.465	0.883	0.442	0.277	0.311
BOPS_LSQ_C_2	0.539	0.938	0.514	0.280	0.371
BOPS_LSQ_C_3	0.515	0.912	0.538	0.333	0.390
BOPS_LSQ_T_1	0.525	0.464	0.906	0.347	0.398
BOPS_LSQ_T_2	0.568	0.526	0.917	0.300	0.404
BOPS_LSQ_T_3	0.566	0.482	0.865	0.341	0.445
CLOY_1	0.314	0.272	0.294	0.827	0.558
CLOY_2	0.236	0.235	0.259	0.802	0.577
CLOY_3	0.264	0.312	0.324	0.806	0.579
CLOY_4	0.248	0.311	0.371	0.807	0.632
CLOY_5	0.148	0.134	0.193	0.639	0.347
CLOY_6	0.228	0.169	0.186	0.676	0.387
CSAT_1	0.280	0.342	0.398	0.424	0.732
CSAT_2	0.308	0.300	0.402	0.627	0.863
CSAT_3	0.264	0.326	0.355	0.570	0.856
CSAT_4	0.351	0.350	0.395	0.654	0.872
	BSSD-LSQ-Availability	BSSD_LSQ-Condition	BSSD_LSQ-Timeliness	Cloy	CSat
BSSD_LSQ_A_1	0.700	0.449	0.418	0.270	0.225
BSSD_LSQ_A_2	0.682	0.337	0.380	0.296	0.189
BSSD_LSQ_A_3	0.818	0.479	0.520	0.330	0.366
BSSD_LSQ_A_4	0.739	0.395	0.516	0.416	0.480
BSSD_LSQ_A_5	0.747	0.388	0.470	0.233	0.171
BSSD_LSQ_C_1	0.502	0.869	0.485	0.258	0.356
BSSD_LSQ_C_2	0.475	0.931	0.533	0.266	0.299
BSSD_LSQ_C_3	0.536	0.920	0.547	0.295	0.345
BSSD_LSQ_T_1	0.475	0.487	0.790	0.308	0.381
BSSD_LSQ_T_2	0.484	0.471	0.863	0.428	0.486
BSSD_LSQ_T_3	0.512	0.405	0.735	0.388	0.395
BSSD_LSQ_T_4	0.559	0.489	0.823	0.467	0.516
CLOY_1	0.372	0.216	0.374	0.749	0.624
CLOY_2	0.380	0.279	0.432	0.842	0.671
CLOY_3	0.357	0.295	0.440	0.849	0.689
CLOY_4	0.290	0.287	0.397	0.826	0.721
CLOY_5	0.383	0.132	0.368	0.744	0.530
CLOY_6	0.296	0.216	0.388	0.804	0.615
CSAT_1	0.214	0.297	0.431	0.636	0.815
CSAT_2	0.381	0.288	0.466	0.697	0.895
CSAT_3	0.367	0.299	0.540	0.712	0.874
CSAT_4	0.442	0.385	0.487	0.733	0.877

Figure 19 Loading of manifest items for both the BOPS and BSSD (Murfield, Rutner, Boone & Thomas 2017: 280)

Figure 20 presents Cronbach's α , internal consistency reliability, and average variance extracted (AVE) for every construct. Every AVE above the suggested 0.50 level, and every dependability metric surpasses the suggested 0.70 barriers.

	AVE	Composite reliability	Cronbach's α
BOPS_LSQ-Availability	0.523	0.814	0.698
BOPS_LSQ-Condition	0.830	0.936	0.898
BOPS_LSQ-Timeliness	0.803	0.925	0.877
Consumer loyalty	0.582	0.892	0.857
Consumer satisfaction	0.693	0.900	0.851
BSSD_LSQ-Availability	0.546	0.857	0.793
BSSD_LSQ-Condition	0.823	0.933	0.892
BSSD_LSQ-Timeliness	0.647	0.880	0.817
Consumer loyalty	0.645	0.916	0.890
Consumer satisfaction	0.750	0.923	0.889

Figure 20 Cronbach's α , internal consistency reliability, and AVE (Murfield, Rutner, Boone & Thomas 2017: 280)

Furthermore, the discriminant validity was evaluated by contrasting each component's square root of AVE with its correlations with every other construct in the model. Discriminant validity is confirmed in every instance when the square root of AVEs is greater than the inner construct correlations. As a result, we can say that the measuring scales show respectable reliability and validity.

2.7.5 Structural results

The correlations between the three LSQ components—timeliness, availability, and condition—and customer satisfaction and loyalty were examined to evaluate the hypotheses. By examining the connections between the availability, timeliness, and condition components of LSQ and customer happiness, H1, which indicated a positive association between the three components of LSQ and customer satisfaction, was assessed. Condition and punctuality have a strong positive correlation with customer satisfaction in the BOPS sample. The only construct in the BSSD sample that has a meaningful relationship with customer satisfaction is punctuality. These findings indicate that H1 has limited support; the data indicate that H1a is supported in the BOPS and BSSD samples, while H1c is supported in the BOPS sample. Similarly, H2 anticipated that there would be a positive correlation between all three LSQ components and customer loyalty. There is no evidence for H2 because timeliness, availability, or condition are unrelated to customer loyalty in either

the BOPS or BSSD datasets. H3 forecasted a favorable correlation between customer loyalty and satisfaction. Positive, significant route coefficients for this association (H3) are found in both the BOPS and BSSD samples (Murfield, Rutner, Boone & Thomas 2017: 280-284).

In addition to structural correlations, consumer pleasure mediates the relationship between each of the three LSQ components and customer loyalty. According to mediation theory, customer satisfaction can help explain the relationship between a predictor and an outcome. The indirect impact between the predictor and outcome variable is first examined in this study. Without a statistically significant indirect impact, mediation does not exist. Large indirect effects indicate competitive, complementary, or indirect-only mediation. If the predictor has a significant direct effect on the outcome variable, the direct routes from the mediator to the result and the mediator to the predictor must be examined to distinguish them. When the predictor has a significant direct effect on the outcome, complementary and competitive mediation (formerly partial mediation) are recommended. They also suggest an incomplete theoretical framework, suggesting an unidentified mediator variable. The sign of the direct pathways from predictor to mediator and mediator to result distinguishes these two mediation types. If those routes are both positive or negative, complementary mediation is advised. If roads go in opposite directions, competitive mediation is advised. Finally, a non-significant direct route from predictor to outcome implies indirect-only or complete mediation given a strong indirect influence. This mediation makes an omitted mediator and supports the theoretical framework best (Murfield, Rutner, Boone & Thomas 2017: 281-282).

The BOPS model's implicit mediation of customer satisfaction is assessed first; LSQ dimensions that indirectly affect customer loyalty were examined. The direct impact of the predictor on the mediator path multiplied by the mediator-to-result route determines the indirect effect. Calculating a percentile-based bootstrap confidence range determines the indirect effect's significance. The indirect effect of satisfaction on availability and customer loyalty has a 95%

confidence range of -0.022 to 0.132. The condition's indirect effect on customer loyalty is 0.010-0.217. The indirect effect of timeliness on customer loyalty is 0.086-0.323. Thus, condition and timeliness have significant indirect effects, but availability does not. Next, how quality and punctuality directly impact customer loyalty were studied. The BSSD model assessed mediation similarly. The model's indirect effects had percentile-based 95% confidence intervals: availability (-0.064 to 0.250), condition (-0.146 to 0.225), and timeliness (-0.203 to 0.476). These results show that timeliness indirectly affects customer loyalty more than the other two predictor factors. No correlation exists between timeliness and customer loyalty. Instead, timeliness only indirectly affects consumer loyalty. H4 states that channel type moderates the correlations between the three LSQ components—customer satisfaction, loyalty, and satisfaction. PLS multigroup analysis tests this hypothesis. This method uses a modified two-independent-samples t-test to compare route coefficients across data groups. H4 is not supported because the path coefficients between the BOPS and BSSD groups for each structural link in the model were not statistically significant (Murfield, Rutner, Boone & Thomas 2017: 283-284).

2.7.6 Discussions and Implications

The study found differences in LSQ, satisfaction, and loyalty among omnichannel customers. Omnichannel clients value availability, condition, and timeliness above LSQ components, according to the study. BOPS and BSSD omnichannel studies agreed. Prior B2B and B2C studies have shown that product availability, condition, and fast delivery increase customer satisfaction and loyalty. In multichannel contexts, promptness is always the most crucial logistical service component for pleased and loyal clients. Neither BOPS nor BSSD have significant product availability independent variables. Product condition was minor in BOPS and weaker in BSSD. The study found that omnichannel clients are distinct and focused on time, contrary to a prior study that says service quality is a bundle of attributes (Murfield, Rutner, Boone & Thomas 2017: 285).

Omnichannel customers' qualities affect management, whereas all consumers value timely delivery. Omnichannel clients value time over availability, condition, and timeliness. This demands retailers to invest heavily to achieve time-pressed client delivery expectations. Omnichannel logistics providers must prioritize dependability and efficiency. Retailers risk losing this large and growing customer base if managers ignore omnichannel service requirements. LSQ improvements may reduce availability and condition outcomes. Customers expect omnichannel purchases to be available and in good condition after years of exceptional service. Despite discrepancies, this study increases the understanding of the long-standing relationships between LSQ, satisfaction, and loyalty. This study challenges LSQ, satisfaction, and loyalty theories. B2B and B2C studies have linked service, satisfaction, and loyalty, but this omnichannel study offers a new perspective. Fast service makes omnichannel customers satisfied and loyal, according to the study. Modern life is fast, leaving many homeowners late. Thus, major changes in consumer preferences and service concepts may require LSQ reevaluation. Studyers must monitor this developing market since time-pressed consumers will certainly employ omnichannel settings for convenience. Omnichannel customers are unique and value timeliness, warranting more study (Murfield, Rutner, Boone & Thomas 2017: 286).

The study concluded that merchants must put punctuality first to keep multichannel customers pleased and loyal. To prioritize time-based success, merchants may need to revamp their logistics and supply chain strategy. Improved real-time supply and demand data demands cross-channel integration. Transportation may move from waiting to aggregate cargo to smaller, faster premium services. Distribution centers may convert from consumer-level fulfillment to store-level replenishment, requiring more specialized picking and packing. Decentralized networks can carry merchandise faster to place it closer to customers. Online omnichannel orders can be picked up or delivered by store staff. Internet-connected smart home gadgets can give

inventory management real-time demand data for consumer replenishment orders. Forecasters may leverage computing power, big data analysis, and other demand data sources to estimate customer demand for SKUs. Various future state supply chain improvements are already underway to accommodate time-sensitive clients. Since this market group grows and requires omnichannel merchants to simplify their lives, LSQ's timeliness will transform supply chains (Murfield, Rutner, Boone & Thomas 2017: 286).

2.7.7 Service Quality Case Conclusion

Despite the importance of omnichannel customers to businesses and the fact that LSQ often affects their purchasing behavior, studies in these areas are scarce. This study attempts to fill a knowledge gap on consumers' impact on retail supply chains to begin with. Most LSQ study focuses on B2B interfaces, ignoring B2C partnerships' importance. Most B2C LSQ or PDSQ studies have focused on e-commerce "pure players," with little attention paid to cross-channel logistics service concerns. More B2C study is needed as omnichannel commerce grows. Study shows that loyalty, satisfaction, and LSQ are not always correlated in omnichannel environments, highlighting the need for a more consumer-focused supply chain study. Managers can improve supply chain processes to meet customer needs by understanding these differences. To effectively provide logistics services in omnichannel retail, businesses must understand these challenges (Murfield, Rutner, Boone & Thomas 2017: 287).

3 Findings and results

The study's conclusions and outcomes will be covered in this chapter, with an emphasis on providing answers to the study questions. At first, the impact of agile on both e-commerce and supply chains will be discussed. Then, the overall role of the omnichannel will be presented and described. Next, the

innovative tools being used to enhance supply chain operations and e-commerce efficiency will be defined and listed.

3.1 Impacts of Agility

In this sub-section, the first study question is answered:

RQ1. What impact does Agility have on both digital sales and supply chains?

Agile methodologies in e-commerce directly contribute to the last mile and overall customer satisfaction. E-commerce software solutions are crucial and systems that seamlessly integrate user-friendly front-end interfaces with well-structured back-end functions are remarkable. Agile development methodologies are essential to meeting this business's ever-changing needs. Agile methodologies emphasize adaptability and flexibility to produce high-quality applications quickly. Agile software development can quickly change projects and allocate resources. Engineers working in an agile framework have more freedom to showcase their work and can better manage their jobs. Product owners can change priorities to meet changing needs and quickly realize their software solution vision. In the competitive world of e-commerce, software solutions are essential for customer acquisition and retention.

Agile approaches, designed for e-commerce websites, apps, and software, manage functionality and efficiency across the system for a strategic advantage. Agile project management for e-commerce integrates development and operations to help businesses generate revenue. The study also suggests that agile methodologies can help create a well-organized and efficient coding process from the start. This speeds up delivery compared to traditional web development. Agile methodologies allow for seamless changes while maintaining transparency and accessibility throughout development. Prioritizing essential characteristics and regularly assessing item demand achieves this. The findings show how agile methodologies benefit e-commerce. The benefits include lower failure rates, faster product delivery and release cycles, and faster client feedback analysis. Agile development can transform e-commerce firms'

competitiveness and responsiveness in today's rapidly changing digital landscape.

Second, this study emphasizes the need for companies to adopt an agile supply chain (ASC) structure to improve performance and address market unpredictability. The study found that agility helps organizations adapt to new opportunities and threats in dynamic environments. According to this study, agility is spotting and seizing new opportunities while avoiding unexpected risks. It involves using resources efficiently to address internal and external issues proactively and reactively. Supply chains must be flexible to accommodate unpredictable market conditions, changing consumer preferences, and the growing demand for personalized products. The concept of supply chain agility emphasizes staff empowerment and efficient operations. Flexible supply networks can quickly and efficiently respond to supply and demand changes. The study also stresses the importance of timely access to critical information for supply chain decision-making.

To achieve supply chain agility, organizations must strategically adjust their business goals and allocate resources to quickly collect and share reliable data. The study emphasizes the importance of understanding the supply chain, including all key participants and enablers, to provide the best customer experience. Businesses must engage in strategic discussions using developing technology and data-driven procedures to gain precise control over business operations and have rules and protocols that enable prompt decision-making to seize new opportunities and adapt to unexpected disruptions. The study lists bottlenecks, delays, and disruptions as logistics management issues. Better data management is needed to track goods throughout their journey. Agility improves organizational performance and resilience in market turbulence, according to the study. An agile supply chain structure helps companies anticipate disruptions, use resources efficiently, and adapt to market changes, giving them a long-term competitive edge.

3.2 Role of Omnichannel

In this sub-section, the first study question is answered:

RQ2. What role does the Omnichannel play?

The ever-changing retail industry uses omnichannel retailing to improve the customer experience. Omnichannel commerce integrates digital and traditional channels to overcome the limitations of single-channel or multichannel strategies. Redirecting attention from the channel to the consumer helps businesses understand customer demands and behaviors at various touchpoints. Omnichannel shopping helps retailers and manufacturers collaborate. This relationship helps businesses quickly adapt to changing consumer behaviors and technology by sharing vital customer preferences and industry trends. Merchants can tailor experiences, optimize processes, and improve customer focus, competitiveness, and corporate growth by using omnichannel tactics. Retailers and customers communicate seamlessly under the omnichannel strategy. Omnichannel communication lets merchants provide a consistent and personalized experience across all channels, maximizing consumer engagement and data use. Integration meets customer tastes and gives companies a deep understanding of consumer interactions and purchase histories. Omnichannel shopping collects and analyses consumer data to personalize customer interactions. By strategically using technology and human capital, firms can manage and maintain customer relationships, increasing customer satisfaction, loyalty, and repeat business. Selling through multiple channels, including physical and digital platforms, increases sales, product selection, and customer service. Omnichannel shopping has benefits such as increased market reach, cost reduction, and personalization, but it also has drawbacks.

Consumer satisfaction depends on a smooth distribution network and product return management. Despite these challenges, omnichannel commerce is essential for merchants looking to strengthen relationships with customers,

attract new ones, and adapt to modern buying habits. Omnichannel commerce is crucial in today's consumer environment, where marketing is less centralized. Modern customers expect a consistent, unified experience across brick-and-mortar stores, online platforms, and mobile devices. Omnichannel shopping helps merchants stay competitive and meet customers' changing expectations as consumers easily switch between channels; the future of retail is omnichannel. Omnichannel adoption is expected to become the norm within ten years as channels converge and become less distinct. This change requires retailers to prioritize customer experiences over product sales. Omnichannel marketing prioritizes consumer convenience and competitiveness at every touchpoint. Digital mobile devices enable personalized, location-based interactions.

3.3 Innovative tools

In this sub-section, the first study question is answered:

RQ3. What innovative tools are being used to enhance supply chain operations and e-commerce efficiency?

The study shows how Scrum, an agile project management paradigm, improves team performance and product delivery. The study emphasizes that Scrum fosters a cooperative and flexible work environment that helps teams organize and manage their work. It was discovered that Scrum allows teams to autonomously organize while tackling complex problems, fostering ownership and responsibility. Self-organization allows people to actively contribute their knowledge and insights to shared goals, improving decision-making and problem-solving. Scrum's values of transparency, examination, and adaptability encourage team openness and development. Scrum encourages reflection on successes and failures to foster learning and adaptation. Teams can improve their processes and results this way. Well-run sprints allow agile teams to create better solutions with fewer challenges. Decomposing work into digestible segments and prioritizing activities by importance helps teams meet client

needs and produce incremental value in each sprint. A well-structured agile backlog, which stores all scheduled tasks, was stressed in the study. Tasks, epics, and user stories in the backlog help prioritize and plan releases; this streamlines iterative development. The Scrum framework's Product Owner, Scrum Master, and Development Team are crucial to agile project success. As the keeper of product value, the Product Owner ensures the team prioritizes consumer value. The Scrum Master is a servant leader who ensures the Scrum process runs smoothly and reduces team productivity disruptions. The self-governing Development Team delivers work increments and chooses the best strategy to achieve goals. The results show that Scrum encourages teamwork across operations, marketing, and IT. Scrum reduces conflicts and improves work processes by aligning everyone around shared goals and performance indicators, making workdays easier and decision-making faster.

Kanban, a visual work management method, is tested for its ability to streamline workflow and reduce costs. Kanban helps identify and resolve issues quickly by visualizing ongoing activities and the workflow process. This ensures that work moves quickly and efficiently. Kanban can manage the entire value chain, from suppliers to consumers. Kanban improves resource utilization and streamlines operations by reducing commodity stockpiling and supply chain interruptions. Kanban's continuous surveillance prevents production bottlenecks.

Organizations can reduce delivery lead times and increase throughput by proactively detecting and addressing issues. The study found Kanban's non-disruptive and evolutionary change management approach significant. Kanban promotes gradual process changes and continuous improvement, reducing the risk of large-scale changes in an organization. Incremental procedure development reduces team and stakeholder resistance and fosters flexibility and creativity. The study also highlights the benefits of Kanban in technology teams, where visualization, uninterrupted output, and customer feedback are crucial. Kanban helps teams meet customer expectations quickly and accurately, delivering high-quality products and services and increasing customer satisfaction. This study found that Kanban is a realistic and effective

way to manage work processes, maximize resource use, and promote organizational development. Its emphasis on visual representation, ongoing observation, and gradual modification makes it ideal for meeting the changing needs of modern corporations and promoting effectiveness and creativity.

OKRs are a powerful tool for defining goals and guiding leadership, according to a study. OKRs are a popular targeting method in many organizations, offering an alternative to KPIs. OKRs effectively communicate goals and provide relevant benchmarks for teams. OKRs clearly define objectives and key results to help everyone understand and achieve goals. This high level of openness helps teams coordinate and allocate resources to achieve goals, improving efficiency and effectiveness. OKRs improve team focus and progress, according to the study. OKRs encourage goal evaluation and adjustment to promote continuous development. Teams can adapt to changing circumstances, seize new opportunities, and overcome growing challenges with this iterative approach. OKRs are often useful for change initiatives and product development. OKRs help teams align their efforts with desired results, closing the input-output gap. This focus on results ensures that efforts are directed towards important and company-boosting activities. This collaborative approach encourages teamwork, accountability, and commitment.

By giving employees control over their work hours, the operating module changes the hierarchical structure of the business. This method gives team members ownership and leadership, increasing engagement and productivity. Instead of being micromanaged, workers are encouraged to use their skills and creativity to improve work processes. The operating model exercise relies on teamwork to determine information flows and identify critical data for efficient operation. Effective stakeholder mapping identifies, prioritizes, and engages internal and external stakeholders. This comprehensive method informs key stakeholders immediately, promoting transparency and goal consensus. Stakeholder mapping identifies synergies among stakeholders with similar

goals. This consolidates meetings, optimizes communication channels, and maximizes efficiency by minimizing unnecessary connections.

The organization may improve decision-making and resource distribution by encouraging cooperation among people with similar goals. The operational module maximizes customer benefits while minimizing team effort. The company empowers employees to make informed decisions and improves stakeholder collaboration to meet consumer expectations and provide high-quality products and services. This customer-centric approach boosts customer satisfaction, loyalty, and company growth. User stories explicitly state the audience, outcome, and rationale. Prototypes improve team leader-engineer communication, especially in IT projects. To clarify and agree on expectations, visual aids show the desired outcome. The operating module transforms worker empowerment, stakeholder cooperation, and consumer focus. In a fast-changing, competitive environment, self-governance, transparency, and strategy alignment help the organization thrive. The operating module promotes innovation, efficiency, and growth through continuous improvement.

Conversion Rate Optimisation (CRO) emphasizes the importance of understanding testing and CRO basics before starting operations. The data shows that client-driven hypotheses and thorough data analysis are essential for successful testing. The CRO team's success depends on understanding testing protocols, especially A/B testing. Digital companies often use A/B testing to show different groups different versions of a website or feature. This method helps evaluate performance, with the best version being considered better. Additionally, the findings emphasize the need for website efficiency and usability. User experience and conversion rates depend on page load speed, navigation, and security. Technical barriers must be removed to improve website performance and user engagement. The study stresses consumer behavior analysis. Data on user browsing habits, page popularity, and website engagement can help target optimization efforts. Improving conversion rates requires identifying areas for improvement and testing different solutions. The

CRO team's duties demonstrate the complexity of CRO operations. The team has experts in data science, web analytics, front-end programming, UX design, behavioral analysis, and administrative supervision. Each person has unique skills and perspectives that improve organizational optimization. A comprehensive Conversion Rate Optimisation (CRO) strategy requires a deep understanding of testing methodologies, meticulous data analysis, technical proficiency, and a collaborative team setting, according to the study. The CRO team aligns operational objectives with client expectations, uses data-driven insights, and encourages collaboration to improve conversion rates and website performance.

Industry 4.0, or digital transformation, has a major impact on modern business environments, according to this study. Internet access ushered in a new era of information and digital technology. Digitalization in enterprises is increasingly recognized for its economic value, according to IDT. Industry 4.0 refers to the digital revolution in several industries. The widespread use of digital and information technology in industry marks this transformation. Industry 4.0 is dynamic because it integrates cutting-edge technologies such as Cloud Computing, Big Data, and the IoT with traditional systems such as Computer Integrated Manufacturing (CIM). Industry 4.0 relies on the Cyber-Physical System (CPS), an advanced network that links virtual and physical systems. CPS is essential in integrating digital technologies and managing the shift to intelligent production. Companies use digital technology to efficiently transmit data, perform complex assessments, and integrate into supply chain networks. This study examines current literature and data to prove digital transformation's importance in modern business models. Industry 4.0 relies on digital technologies to boost productivity, innovation, and competitiveness. Digital and information technology improves operational abilities and creates new value-creating and market-differentiating opportunities. The results show that firms must prioritize digital transformation as a strategic need. Industry 4.0 technology can help companies navigate modern markets and position themselves for long-term growth and flexibility in a digital world.

Fuzzy logic can represent imprecise or ambiguous data, making it suitable for assessing complex and dynamic systems such as supply chains. The importance of environmental agility and supply chain agility indices were assessed using fuzzy logic. One questionnaire assessed environmental agility, while the other measured supply chain agility indices. The surveys collect data from supply chain participants in a systematic way, allowing for a broad agility analysis. This promotes holistic agile supply chain improvement. This method evaluates supply chain agility based on competence, flexibility, speed, and responsibility. Responding to changes in a reflexive, preventive, and recuperative manner is key to agility. Competence is an institution's ability to advance its organizational goals. Flexibility and adaptability mean using different methods and resources to achieve these goals. In a competitive market, a supply chain's accountability is its ability to generate economic value for its stakeholders and adjust expenses to meet market demands. These sub-indices were quantified using fuzzy logic. Fuzzy logic and survey data were used to assess supply chain flexibility. This methodology revealed supply chain agility's strengths and weaknesses, laying the groundwork for further study and the development of agile supply chain strategies.

4 Conclusion

This study reveals the impacts of Agility on e-commerce and supply chains, what innovative tools are utilized within those industries to enhance efficiency as well as the role of omnichannel in the current retail environment. The study was formed of theoretical parts supported by a secondary case study. The theoretical part contained a comprehensive literature review regarding agile, e-commerce, supply chain, and omnichannel-related literature. The study covered the history of agile, pre-agile software development, agile manifesto, agile e-commerce, WOW methodology, agile supply chains, the effect of digitalization

on supply chain management, fuzzy logic to measure supply chain agility, omnichannel, a four-stage Delphi study and logistics service quality in omnichannel retailing. Secondary case studies provided a deeper understanding of those fields, supporting the study with insights and relevant data.

4.1 Discussion

The findings and outcomes of this study present a strong connection with the listed literature. The main discovery of this study is that implementing agile methods in e-commerce and supply chains, as well as adopting an omnichannel approach, directly enhances the last mile of the retail and distribution process. This aligns the retail and distribution environment with the expectations and aspirations of consumers. Agile e-commerce strategies enable organizations to quickly adapt to changing customer demands and market conditions. E-commerce platforms may enhance product offerings and manage inventory levels by using real-time data and user feedback. This allows them to guarantee that the accurate things are accessible at the suitable time and location for final delivery. Agile supply chain management emphasizes flexibility and rapid responsiveness throughout the whole supply chain network. This approach allows companies to optimize inventory control, boost logistical efficiency, and cultivate strong partnerships with suppliers and collaborators. As a consequence, companies effectively manage inventory across many fulfillment centers or warehouses, leading to reduced transit times and increased efficiency in last-mile delivery operations.

Moreover, omnichannel strategies use a variety of sales channels, such as online marketplaces, brick-and-mortar stores, and mobile apps, to provide customers with a seamless and unified buying experience. Companies may enhance order fulfillment and reduce the distance for final delivery by offering several options, such as using their physical network of locations for ship-from-store, online purchases with in-store pickup, or same-day delivery. Companies improve the speed, accuracy, and cost-effectiveness of their final delivery

operations, resulting in higher customer satisfaction and loyalty, by using agile e-commerce, agile supply chain management, and omnichannel strategies.

4.2 Future study

Additional studies might explore qualitative methodologies, such as conducting interviews with retail organizations willing to disclose their agile e-commerce and supply chain processes and tools. This study could also investigate how these companies use an omnichannel strategy to maintain competitiveness in the last stages of product delivery. Furthermore, the study might investigate the interdependence of the e-commerce and supply chain businesses, for as by examining the use of common agile technologies in both domains.

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