

***Impact of Technological Initiatives that Influence Digital Distribution  
Efficiency in FMCG Sector***



**By:**

**Affan Azam**

**01-322222-002**

**MBA(Weekend)**

**Supervisor:**

**Tanveer Illahi**

**Department of Business Studies**

**Bahria University Islamabad**

**Spring 2024**

*Majors: SCM  
S.No. 6*

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# **FINAL PROJECT/THESIS APPROVAL SHEET**

## **Viva-Voce Examination**

Viva Date   /  /  

**Topic of Research:** Impact of Technological Initiatives that Influence Digital Distribution Efficiency in FMCG Sector

<b><u>Names of Student(s):</u></b>	Enroll #
• Affan Azam	01-322222-002
•	
•	

**Class:** MBA (Weekend)

**Approved by:**

---

**Tanveer Illahi**  
Supervisor

---

**Javeria Aftab**  
Internal Examiner

---

**Khalid Abdul Ghafoor**  
External Examiner

---

**Dr. Syed Haider Ali Shah**  
Research Coordinator

---

**Dr. Khalil Ullah Mohammad**  
Head of Department  
Business Studies

## **Acknowledgement**

Gratitude and praise belong to Allah, the epitome of compassion and mercy, whose benevolence knows no bounds. His blessings in this life are vast and immeasurable. May His Prophet be surrounded by peace and blessings. I wish to extend my heartfelt appreciation to all those who supported me during this significant phase. Foremost, I express profound gratitude to my dear ones. I am deeply indebted to my parents, siblings, and teachers, who consistently demonstrated interest in my endeavors, displaying immense patience and understanding as my time was dedicated to research and work rather than family moments. Their unwavering support and care were instrumental in the fruition of this research project. My gratitude extends to my supervisor, Mr. Tanveer Ilahi, for his invaluable academic guidance and his ability to offer a broader perspective. Above all, I admire him for setting lofty standards that impelled me to strive harder in the pursuit of my objectives. His unwavering encouragement propelled me to give my utmost effort.

## Abstract

The main purpose of this research is to find Impact of technological initiatives that influence digital distribution efficiency in FMCG sector, this research was conducted on the city of Rawalpindi and Islamabad Pakistan, this research was conducted to check and get the idea whether the factors of the technological initiatives like EDI, RFID, ERP and MRP impact on the digital distribution efficiency. There are four independent variables and one dependent variable chosen for this study. For this research have used the quantitative research method of study and the data was gathered with the help of a questionnaire. To lead this examination, the poll was finished up by the various workers of the inventory network of the 5 significant stores of the FMCG sector. The quantity of respondents to lead this exploration was 152, after inspiring them to finish up the poll the investigation was finished through SPSS programming. The table and their examination were utilized in expressive investigation and the relapse technique has been utilized in inferential investigation so speculation can be tried effectively, these strategies were utilized to know profound about the idea of the subject and to look at the realness of the exploration. The finding of this examination is to track down the Effect of mechanical drives that impact computerized conveyance productivity in FMCG sector, and the consequence of this exploration is that it decidedly affects the association, and it is a decent profit from speculation. The organizations managing FMCG products ought to put resources into this innovation. This exploration can be huge for the organizations managing in the FMCG sector, it tells the elements and routes through the execution of which can expand the advanced dispersion effectiveness of the FMCG sector.

**Keywords:** Technological initiatives, Digital distribution efficiency, EDI (Electronic Data Interchange), RFID (Radio Frequency Identification), ERP (Enterprise Resource Planning), MRP (Material Requirements Planning), Fast Moving Consuming Goods (FMCG)

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## **Chapter 1**

### **Introduction**

#### **1.1 Background Study**

With regards to computerized dispersion effectiveness, the development of business systems and mechanical headways has altogether affected how organizations work and contend. Before, the essential spotlight was on cost decrease through huge scope creation and economies of scale. This was pointed toward balancing out the economy by limiting expenses and augmenting benefits (Rondeau, 2018). Notwithstanding, over the course of the following twenty years, the market elements moved towards a more prominent accentuation on quality as the vital differentiator for organizations trying to beat their rivals (McKinney, 2021). This accentuation on cost decrease prompted the reception of methodologies like huge scope creation and economies of scale. The objective was to limit creation costs and amplify benefits (Allen and Boynton2020). In any case, as market elements developed, there was a recognizable shift towards focusing on quality over cost. This change happened over the range of twenty years, with quality arising as a urgent variable for organizations planning to outflank their rivals (Reman and Farooq, 2020).

A hearty mechanical framework has become significant in upgrading organization development and execution. A very much planned innovative framework can emphatically increase results, while an ineffectively executed one can unfavorably influence hierarchical execution (Miloslav et al., 2023). Adaptability in mechanical frameworks, however not another idea, is pivotal for upgrading organization and production network abilities, for example, dexterity in answering business sector changes (Loukas et al., 2022). The fluctuation in mechanical foundation assumes a critical part in empowering firms to adjust and reconfigure their resources for expanded gains through creative production network tasks (Duncan et al., 2021). Ability to use both hands, the capacity to adjust investigation and double-dealing, is pivotal for keeping up with seriousness. The joint utilization of new investigation and double-dealing guarantees reasonability in both current and future periods (Tushman, 2019).

In the domain of advanced appropriation productivity, the joining of Data Innovation presents new open doors for associations to succeed in exceptionally cutthroat worldwide business

sectors (Ghazi, 2021). Endeavor Frameworks (ESs, for example, Enterprise resource planning (ERP) frameworks, have become vital devices for organizations in the past twenty years (Javeria, 2019). These frameworks, contained equipment and programming, plan to normalize, and coordinate business cycles and information assortment for hierarchical improvement (Davenport, 2018). Associations embrace ESs to accomplish the most extreme proficiency and answer market pressures (Ghazi and Tara 2021). ERP frameworks, which coordinate different divisions like Promoting and Deals, Bookkeeping and Money, Supply chain. The executives are especially advantageous for little and medium-sized endeavors (Cotler 2020). They give command over inward and outer cycles, working with cooperation among offices and workers for hire (Repel and Graves, 2022). As indicated by the resource-based view (RBV), packaging substantial and elusive assets through ERP frameworks yields a bigger number of advantages than utilizing assets separately (Hult et al., 2018).

To improve client care in the production network space, all branches of an association must coordinate into a solitary stage and work cooperatively (Ellinger, 2020). This reconciliation works with better coordination in showcasing and transportation, at last prompting further developed client care (Jacquie, 2022). Computerized dispersion productivity depends intensely on a very much planned IT foundation, especially ERP frameworks, that empower organizations to adjust development and proficiency, normalize processes, and convey unrivaled client support (Cinthya, 2019). The shift from cost to quality has made it basic for organizations to zero in on giving excellent items proficiently. By utilizing advances like ERP frameworks, organizations can smooth out their tasks, answer market changes rapidly, and meet the developing requirements of clients in the computerized time.

## **1.2 Research Gap**

The research gaps in the context of the FMCG sector in Pakistan is the inefficiency and lack of modernization in supply chain and distribution practices, leading to challenges for local industry. While international FMCG players are actively adopting modern tools and technologies to enhance their supply chains, the situation in Pakistan remains largely traditional and outdated.

### **1.2.1 Theoretical Research Gap**

While extensive research exists on the implementation and benefits of advanced technological tools like RFID, ERP, MRP, and EDI in global FMCG supply chains, there is a

significant theoretical gap in understanding the unique challenges and impacts of these technologies within the specific context of developing countries, such as Pakistan (Munawar, 2023). Existing studies primarily focus on developed markets, leaving a gap in theoretical models that address the socio-economic and infrastructural variables influencing technology adoption in Pakistan's FMCG sector. Siddiqui et al. (2023) noted the inefficiencies in Pakistani supply chains but did not provide a theoretical framework tailored to the unique dynamics of emerging markets. This research aims to develop such a framework, bridging the gap between global technological advancements and local industry needs.

### **1.2.2 Practical Research Gap**

Despite the known benefits of technologies such as RFID, ERP, MRP, and EDI in improving supply chain efficiency, there is a lack of empirical studies and practical implementations within the FMCG sector in Pakistan. The practical application of these technologies remains limited, as highlighted by Arfin et al. (2023). While international FMCG players have successfully integrated these tools to mitigate issues like the bullwhip effect and inventory inaccuracies, local Pakistani retailers continue to rely on outdated practices (Usman, 2021). This research aims to fill this practical gap by providing empirical evidence on the effectiveness of these technologies in the Pakistani context, offering actionable insights and recommendations for local retailers to modernize their supply chains.

### **1.2.3 Contextual Research Gap**

There is a contextual research gap in understanding how local conditions in Pakistan, such as infrastructure, economic constraints, and cultural factors, impact the adoption and effectiveness of technological initiatives in the FMCG sector. Studies like Ahmed et al. (2021) and Azeem and Danish (2020) discuss the benefits of ERP and other technologies but do not delve into the contextual challenges specific to Pakistan, such as infrastructural limitations, market readiness, and economic barriers. This research will address this gap by examining these local conditions and their influence on technology adoption, thereby providing a nuanced understanding of how these factors can be managed to enhance digital distribution efficiency in Pakistan's FMCG sector.

## **1.3 Problem Statement**

The FMCG sector in Pakistan faces significant challenges in supply chain and distribution efficiency due to the persistent use of outdated practices and a lack of modernization (Usman, 2024). Despite the proven benefits of advanced technological tools such as RFID, ERP, MRP, and EDI in improving supply chain performance globally, these technologies are underutilized in Pakistan (Javeria, 2023). This underutilization results in issues like the bullwhip effect, inventory inaccuracies, stockouts, back-orders, and reduced profitability, which collectively hinder the growth and stability of the FMCG sector (Rehmani, 2022).

Existing research primarily focuses on the implementation and benefits of these technologies in developed markets, leaving a theoretical gap in understanding how socio-economic and infrastructural variables in developing countries, like Pakistan, influence technology adoption (Khetab, 2022). Furthermore, there is a practical gap in empirical studies and real-world implementations of these technologies within Pakistan's FMCG sector. Additionally, contextual challenges, such as local infrastructural constraints, economic barriers, and cultural factors, are not adequately addressed in the current literature (Najam, 2021).

Therefore, this study aims to fill these gaps by exploring the extent of digital distribution inefficiencies in Pakistan's FMCG sector and evaluating how modern information technology tools such as RFID, ERP, MRP, and EDI can mitigate these supply chain challenges. This research will provide valuable insights for policymakers and industry stakeholders on the necessity of modernizing supply chain practices to enhance the competitiveness and sustainability of Pakistan's FMCG sector.

#### **1.4 Research Question**

- **RQ1:** What is the impact of Radio Frequency Identification (RFID) on digital distribution efficiency?
- **RQ2:** What is the impact of Enterprise Resource Planning (ERP) on digital distribution efficiency?
- **RQ3:** What is the impact of Material Requirement Planning (MRP) on digital distribution efficiency?
- **RQ4:** What is the impact of Electronic Data Integration (EDI) on digital distribution

efficiency?

## **1.5 Research Objectives**

- 1) **RO1:** To investigate the impact of Radio Frequency Identification (RFID) on digital distribution efficiency.
- 2) **RO2:** To investigate the impact of Enterprise Resource Planning (ERP) on digital distribution efficiency.
- 3) **RO3:** To investigate the impact of Material Requirement Planning (MRP) on digital distribution efficiency.
- 4) **RO4:** To investigate the impact of Electronic Data Integration (EDI) on digital distribution efficiency.

## **1.6 Significance of Research**

This study's theoretical, practical, and contextual significance collectively aim to address the pressing challenges faced by Pakistan's FMCG sector. By developing a comprehensive theoretical framework, offering practical solutions, and highlighting the broader economic implications, the research seeks to contribute significantly to the modernization and growth of the FMCG sector in Pakistan, ultimately benefiting the country's economy.

### **1.6.1 Theoretical Significance**

The theoretical significance of this study is deeply rooted in addressing the existing gap in understanding the unique socio-economic and infrastructural challenges that hinder the adoption of advanced technological tools in the FMCG sector of Pakistan. While extensive research has explored the benefits of technologies like RFID, ERP, EDI, and MRP in developed markets, there is a notable lack of theoretical models that account for the specific conditions of developing countries. This study aims to bridge this gap by developing a framework that includes variables unique to Pakistan, such as economic constraints, infrastructural limitations, and cultural factors. By doing so, it will provide a more comprehensive understanding of how these technologies can be effectively integrated into supply chains in similar emerging markets, thereby enriching the academic discourse on supply chain modernization.

### **1.6.2 Practical Significance**

Practically, this research seeks to provide actionable insights and empirical evidence on the effectiveness of technological solutions in addressing the inefficiencies in the supply chain and distribution practices of Pakistan's FMCG sector. The problem statement highlights significant challenges due to outdated practices, leading to issues like the bullwhip effect, inventory inaccuracies, stockouts, and back-orders. This study will demonstrate how the implementation of advanced technologies can mitigate these challenges, resulting in smoother operations and reduced wastage. By offering practical recommendations, the research will serve as a valuable guide for FMCG companies in Pakistan, helping them to adopt modern technological tools, improve their supply chain and digital distribution efficiency, and ultimately enhance their competitiveness in the rapidly evolving market.

### **1.6.3 Contextual (Academic) Significance**

The contextual significance of this research lies in its potential to contribute to the broader economic development of Pakistan by enhancing the efficiency of the FMCG sector, a vital component of the country's economy. The problem statement underscores the sector's substantial contribution to employment and GDP, and the need for modernization to unlock its growth potential. By illustrating the positive impact of technological integration on operational efficiency and profitability, the study will highlight the potential for higher revenues, greater tax contributions, and overall economic prosperity. Furthermore, the findings will provide valuable insights for policymakers, emphasizing the importance of supporting technological advancements in the FMCG sector. This, in turn, can help formulate strategies that promote sector-wide modernization, leading to sustained economic growth. Additionally, the research will underscore the role of digital distribution and technology in catalyzing growth, thereby positioning the FMCG sector as a driver of economic development and competitiveness.

## Chapter 2

### Literature Review

#### 2.1 Introduction

The supply chain is a sort of grid of various substances of various firms that are mindful to convey the administrations and items from the upstream chain of exercises to the downstream chain of exercises, aside from that it should direct and control the trading of data and various exercises in it. (Thompson, 2023). The supply chain is remarkable, same as an alternate framework with a bunch of capabilities which likewise incorporates arranging, controlling, and coordinating the entire cycle in the grid of the inventory network. The production network likewise contains various associations among associations and accomplices in troublesome and startling circumstances. (Efstathiou, 2023).

The primary approach to coordinating and controlling the framework of the inventory network really is to control the course of the association between the organization part of the production network organization and the progression of the production network organization. (Angelino, 2020). The various variations in the supply chain comprise of the data streams of funds, and the component of the item (Granger, 2019). The thing stream comprises of the sharing of completed merchandise among various channels, for example trade of unrefined substance or buyer making purchasing of the items to the organizations like deals orders (Wagner, 2022). The progression of the data comprises of the technique for sharing of data among the individuals from the inventory network this data incorporates the natural substance bought by the organizations, for example, buy orders or the quantity of orders got by the organization, for example, deals request, its season of conveyance and the timetable of shipment (Nelson, 2021)

Consistent change in the inward and external environment of organizations is one of the main attributes of the time in the present business world. In such a situation, the business' exhibition is more reliant upon get-together information and examining it. It is smarter to involve it as per business targets than to depend on elements, capital and workforce (Shivani, 2019). Technology, financials, political, social, and natural impacts, as well as changes in market the board, are the essential elements that require the utilization of innovative consider supply chain,

which makes significant commitments to organizations in managing developing worldwide contest (Robina, 2020). Under hazard and vulnerability, data frameworks can incorporate operations, client, cost, and on-time conveyance, as well as changes in business cycles and works (Tamara, 2019).

The point of data and correspondence innovation the board is to work on the quality and efficiency of the organization's production network and business organization, in this manner expanding the company's pay as well as the whole association's result at each level (Kache, F., 2018). At any level of the production network, information sharing, knowledge, and legitimate compelling correspondence assume a basic part in helping organizations in gathering, procuring, and deciphering information to determine business challenges (Surinder, S. 2022). Calculated organizations can now screen their freight and armada utilizing innovation. This meaningfully affects the freight and armada's security. The necessity for all drivers in different areas of the planet to introduce the Electronic Freight Global positioning framework was met with resistance from the beginning.

The utilization of new advances, for example, standardized identifications and RFID considers more precise stock subtleties to be gotten to (Bhattacharya, 2023). The remote non-contact utilization of radio-recurrence electromagnetic fields to send information for the motivations behind consequently distinguishing and following labels appended to objects is known as radiofrequency recognizable proof (Hussain, 2020). One of the main advantages of radio-recurrence ID is that information dividing among labels and perusers is quick and programmed, requiring no immediate contact or view. This will take into consideration more itemized stock administration information to be gotten to. This naturally converts into an expansion in functional productivity of the organizations (Zephania, J. 2019). Data advances that have developed in the business world over the long haul and are based on additional pragmatic bases and needs can now create significant income and permit organizations to accomplish guaranteed efficiency levels.

With its open design, minimal expense contrasted with esteem added networks, use without extraordinary guidelines, and worldwide access capability, the technological assets basic part in the spread of electronic cycles among organizations (Temima, 2020). There are two vital purposes behind organizations to utilize the Web at this stage. One of them is the shorts technological startup



and application costs, which are because of its inborn qualities. The other is that, because of its huge ecological impact, the Web more proficiently increments potential open doors emerging from new helpful connections Magyar, W. (2021). Karmani (2019) noticed that the effective interoperability between the various associations dealing with the significant data is straightforwardly corresponded with the productive progression of data between cycles, frameworks, and people. Numerous impending difficulties and amazing open doors portray the fate of data innovation to strategic execution; the coordinated operations market has likewise become more serious and capricious (Nurmala, 2022).

The capacity of IT reception to oversee information stream, work with hierarchical cycles, and help navigation can be evaluated by taking a gander at what specialized production network means for strategies effectiveness. As per Kochan (2019), the supply chain joining and coordinated factors system are straightforwardly affected by innovation and data sharing capacities. The benefit of constant data sharing is that it makes electronic associations that work with coordination and participation across the inventory network (Muneeb, 2023). Temporarily, the information is utilized by chiefs to dispense and utilize accessible assets productively and actually, consequently expanding the unwavering quality and adequacy of customary strategies activities.

At the point when an association has more information, the troubles of data the executives are that it is challenging to address, assess, respond, and guarantee accessibility to the individuals who need it. At the point when specialists carry out correspondence legitimate assembling cycles and data innovation in the supply chain, they should constantly foster the benefits and hindrances of these techniques and advancements, as well as fabricate a control design to boost the advantages of data and innovation (Hugos, M. H. 2018). Correspondence and information are called oxygen for supply chain board since they permit you to see from one side of the line to the next (Christopher, 2021).

## **2.2 Digital Supply Chain in FMCG Sector**

The Fast-Moving Consumer Goods (FMCG) sector is experiencing profound change throughout the world, spurred by technological innovations, and increasing client preferences. In Pakistan, like in many other parts of the world, this business is undergoing significant transformation as consumers want greater convenience, variety, and accessibility in their everyday purchases (Tarafdar, M., 2021). This transition is primarily impacted by rising internet access,

globalization, and the expanding trend of online purchasing. Consequently, FMCG firms are modifying their strategies to match these evolving expectations, notably by embracing digital technology to better their supply chain processes. One of the significant technical developments altering the FMCG supply chain in Pakistan is Radio-frequency Identification (RFID). RFID technology uses radio waves to track and trace things across the supply chain (Zhang, X., & Zhao, Y. 2021). Organizations may trace the flow of goods in real time by marking them with RFID chips, which increases visibility and reduces errors. This strategy is especially useful in the FMCG industry, where products have a short shelf life and high turnover. RFID allows firms to better monitor inventory levels, eliminate stockouts, and optimize replenishment methods, which leads to increased customer satisfaction and income (Gunasekaran, 2019).

Enterprise resource planning (ERP) advances are additionally significant for digitizing Pakistan's FMCG supply chains. ERP frameworks consolidate a few organization processes, like assembling, deals, money, and stock administration, on a solitary stage (Bajeer, 2020). By offering constant information and bits of knowledge across the business, ERP frameworks help FMCG firms to go with taught choices and adjust quickly to changing economic situations (Agarwal, 2022). For instance, a partnership might use ERP information to gauge interest, change creation plans, and improve dissemination courses, bringing about expanded functional proficiency and cost investment funds. Material Requirement Planning (MRP) is one more basic computerized innovation used in FMCG supply chains. MRP frameworks empower firms to design and oversee material prerequisites in view of interest projections, creation timetables, and stock levels (Zeynap, 2021). Via computerizing the arranging system, MRP frameworks guarantee that associations have the legitimate supplies open with perfect timing, disposing of stockouts and abundance stock. This increments production network proficiency as well as diminishing expenses and advances productivity (Jason, 2019).

Notwithstanding advanced innovation, Pakistan's FMCG enterprises are centered around supportability and ecological obligation (Shakuntla, 2023). With expanded stresses over environmental change and asset exhaustion, FMCG firms are doing whatever it may take to diminish their ecological impact (Norman, 2021). This incorporates endeavors to limit fossil fuel byproducts by further developing transportation courses and putting resources into environmentally friendly power sources (Devi, 2020). Organizations are additionally searching for

ways of lessening bundling waste utilizing eco-accommodating bundling materials and reusing programs.

FMCG firms that utilization economical practices can bring down their ecological effect, yet additionally further develop their image notoriety and appeal to naturally delicate clients. Electronic Data Integration (EDI) is one more common innovation utilized in Pakistan's FMCG supply chains (Tabriz, 2021). EDI works with the electronic correspondence of business archives buy requests, solicitations, and shipment notices between exchanging accomplices (Benjimen, 2019). By supplanting manual paper-based exercises with electronic exchanges, EDI increments correspondence, limits mistakes, and paces up request handling. This helps FMCG undertakings to perform more productively and really, bringing about expanded purchaser fulfillment and more grounded coordinated efforts with providers and wholesalers (Svetlana, 2020).

The use of digital technology and sustainability initiatives in Pakistan's FMCG sector has resulted in significant improvements in supply chain efficiency, product quality, and environmental sustainability. Accepting these trends allows FMCG enterprises to remain competitive in the sector and position themselves for long-term success.

### **2.3 FMCG Sector of Pakistan**

The FMCG (Fast-Moving Consumer Goods) sector is a cornerstone of Pakistan's economy, embodying both significant opportunities and notable challenges shaped by the country's economic landscape and market dynamics. This sector's role is crucial due to its extensive reach and contribution to the national GDP and employment. However, several factors characterize this sector, including a strong emphasis on cost reduction over quality, fragmented supply chains, and logistical inefficiencies, all of which shape the sector's growth trajectory.

In Pakistan's developing economy, FMCG companies are predominantly focused on cost reduction as a primary strategy to remain competitive. This approach stems from the cost-sensitive nature of Pakistani consumers, who often prioritize lower prices over product quality (Azeem & Danish, 2020). Research shows that in developing markets, cost reduction strategies are prevalent due to lower disposable incomes and high price sensitivity among consumers (Alam et al., 2021). While this focus helps companies stay competitive, it can lead to compromises in product quality, which is a challenge for maintaining product standards while keeping costs low (Ali et al., 2022).

This trade-off between cost and quality is a common theme in developing economies, where economic constraints drive businesses to seek the lowest-cost solutions (Javed et al., 2023).

The fragmented nature of Pakistan's FMCG market further exacerbates the challenges faced by the sector. The market consists of numerous small-scale retailers and distributors who operate independently, which complicates efforts to achieve effective supply chain integration (Khan et al., 2022). The lack of coordination among these various stakeholders often leads to inefficiencies such as stockouts, excess inventory, and delays in product delivery (Siddiqui et al., 2023). This fragmentation hinders the development of a seamless and efficient supply chain, a problem frequently observed in emerging markets where supply chains are often disjointed and inefficient (Akram et al., 2021).

Efficient logistics management is crucial for FMCG companies, as it directly impacts the timely and efficient delivery of goods to meet consumer demand and maintain market competitiveness. However, Pakistan's logistics sector faces several challenges, including inadequate transportation infrastructure, limited warehousing facilities, and unreliable supply chain services (Rashid et al., 2022). These logistical issues are exacerbated by the country's geographical terrain, which includes mountainous regions and remote areas that further complicate logistics operations and lead to higher transportation costs and longer lead times (Ahmed et al., 2021). The World Bank's Logistics Performance Index (LPI) highlights that while Pakistan's logistics performance is relatively better than some regional counterparts, significant improvements are still needed (World Bank, 2023).

Despite these challenges, the FMCG sector in Pakistan is experiencing rapid growth driven by factors such as a large population base, increasing urbanization, rising disposable incomes, and evolving consumer preferences (Awan et al., 2024). The large and youthful population presents a substantial market opportunity for FMCG companies, which are expanding their operations to meet increasing consumer demand (Qureshi et al., 2023). This growth trajectory is further supported by urbanization trends that drive increased demand for FMCG products (Khan et al., 2022).

To address the challenges faced by the FMCG sector, companies are increasingly investing in technology to enhance distribution efficiency. Technologies such as RFID (Radio Frequency Identification), ERP (Enterprise Resource Planning), MRP (Material Requirements Planning), and EDI (Electronic Data Interchange) have shown promise in improving supply chain operations (Khan et al., 2022; Ahmed et al., 2021). RFID technology, for example, improves inventory visibility and reduces errors, which leads to fewer stockouts and backorders (Javed et al., 2023). Similarly, ERP systems streamline supply chain processes, leading to better demand forecasting, inventory management, and order fulfillment (Ali et al., 2022). The use of MRP systems helps in planning and managing materials, which optimizes production schedules and reduces excess inventory (Alam et al., 2021). EDI systems facilitate better communication and coordination among supply chain partners, enhancing overall efficiency (Siddiqui et al., 2023).

Efforts to improve digital distribution efficiency in the FMCG sector involve significant investments in infrastructure and technology. Developing infrastructure such as roads, ports, and warehouses is essential for facilitating the smooth movement of goods across the supply chain (Rashid et al., 2022). Technological advancements like GPS tracking and route optimization software also play a crucial role in streamlining logistics operations, improving shipment tracking, and enhancing demand forecasting (Azeem & Danish, 2020). The adoption of these technologies can lead to reduced operational costs, improved service levels, and more efficient supply chain management (Qureshi et al., 2023).

The FMCG sector's growth potential in Pakistan is substantial, provided that companies address existing logistical and supply chain inefficiencies. By investing in modern infrastructure, adopting advanced technologies, and fostering collaboration across the supply chain, FMCG businesses can overcome these challenges and position themselves for sustainable growth (Akram et al., 2021). Embracing these strategies will enable companies to meet growing consumer demands, enhance their competitive edge, and contribute to the broader economic development of Pakistan (Javed et al., 2023)

## 2.4 Technological Initiatives that Influence Digital Distribution

The Fast-Moving Consumer Goods (FMCG) sector operates within a dynamic environment characterized by fluctuating consumer preferences, evolving market trends, and rapid technological advancements. As the sector adapts to these changes, retailers are increasingly leveraging technological innovations to enhance their supply chain operations and gain a competitive edge. This essay explores the transformative impact of technology on FMCG supply chains, focusing on demand-driven supply chains, outsourcing non-core activities, and the use of advanced technologies for improved efficiency and responsiveness.

One of the most significant shifts in the FMCG sector is the move from traditional production-driven supply chains to demand-driven models. Historically, FMCG supply chains were structured around production schedules, which often resulted in high inventory levels and inflated costs due to overproduction and stock imbalances (Tama, 2022). However, the advent of advanced forecasting tools and analytics has enabled retailers to adopt demand-driven supply chains that are more responsive to consumer behavior and market conditions (Ferine, 2021).

By utilizing sophisticated demand forecasting tools and big data analytics, retailers can better anticipate consumer needs, align inventory levels with actual demand, and reduce instances of stockouts and excess inventory (Sparkles, 2020). For example, modern demand forecasting techniques leverage historical sales data, market trends, and predictive analytics to create more accurate demand forecasts, which helps retailers manage inventory more efficiently and meet customer expectations (Khan et al., 2022). This shift towards a demand-driven approach not only lowers operational costs but also enhances supply chain efficiency and overall customer satisfaction (Siddiqui et al., 2023).

Another strategic shift in the FMCG sector involves the outsourcing of non-core activities to specialized service providers. This approach allows retailers to focus on their core competencies while leveraging the expertise and resources of third-party providers to manage functions such as warehousing, transportation, and logistics (Abdulla, 2019). Outsourcing these activities can lead to cost reductions, improved efficiency, and better service delivery (Svetlana, 2018).

For instance, third-party logistics (3PL) providers offer advanced warehousing solutions, transportation management, and supply chain optimization services that can enhance operational efficiency and reduce costs for FMCG companies (Elmar, 2021). By partnering with 3PL providers, retailers can access state-of-the-art logistics technologies and expertise, enabling them to streamline their supply chain operations and improve service levels (Farhad, 2019). This strategic move not only helps FMCG companies manage costs but also allows them to adapt to changing market demands and focus on their primary business objectives.

The integration of advanced technologies is pivotal for improving supply chain efficiency in the FMCG sector. Technologies such as Electronic Data Integration (EDI), Radio Frequency Identification (RFID), and Enterprise Resource Planning (ERP) systems have revolutionized supply chain management by enhancing visibility, communication, and coordination across the supply chain (Aboubakar, 2021).

EDI systems facilitate the electronic exchange of business documents between trading partners, automating processes such as order placements and invoice management (Santino, 2018). This automation reduces manual errors and accelerates transaction processes, leading to improved supply chain efficiency (Markus, 2020). Similarly, RFID technology enables real-time tracking of products throughout the supply chain, providing visibility into inventory levels, shipment status, and product locations (Farhad, 2019). RFID systems help retailers manage stock more effectively, respond quickly to supply chain disruptions, and ensure accurate inventory records (Khan et al., 2022).

ERP systems integrate various business functions into a unified platform, allowing retailers to manage inventory, procurement, sales, and finance from a single system (Anand & Grover, 2022). This integration enhances operational efficiency, improves decision-making, and supports collaboration among supply chain partners (Waheed, 2019). Additionally, cloud-based platforms and advanced analytics tools offer real-time insights into market trends and consumer behavior, enabling retailers to adapt to market changes and offer personalized products and services (Siraj, 2020).

As consumer expectations evolve, FMCG companies are increasingly relying on technology to meet these demands. The rise of e-commerce and digital platforms has transformed consumer shopping behaviors, creating opportunities for retailers to engage with customers through online channels and personalized experiences (Ellram, 2021). Technological innovations such as advanced analytics, cloud computing, and GPS tracking are essential for meeting these expectations and achieving supply chain excellence (Svetlana, 2018).

Advanced analytics tools enable retailers to analyze customer data and predict future purchasing patterns, which helps in designing targeted marketing strategies and improving customer satisfaction (Abdulla, 2019). GPS tracking and route optimization technologies facilitate efficient transportation management, reducing delivery times and enhancing service quality (Weber, 2019). These technological advancements are crucial for FMCG companies to remain competitive in a rapidly changing market and to deliver value to consumers (Siraj, 2020).

The FMCG sector in Pakistan is navigating a dynamic environment shaped by changing consumer preferences, market trends, and technological advancements. The shift from production-driven to demand-driven supply chains represent a significant transformation, enabling retailers to manage inventory more effectively and respond to market demands (Ferine, 2021). The strategic outsourcing of non-core activities has allowed FMCG companies to leverage external expertise and improve operational efficiency (Abdulla, 2019). Additionally, the adoption of advanced technologies such as EDI, RFID, and ERP systems has revolutionized supply chain management, offering new opportunities for enhancing efficiency and meeting consumer expectations (Mentzer, 2018; Farhad, 2019). As the FMCG sector continues to evolve, the ongoing integration of these technologies and strategies will be essential for achieving long-term success and sustainability in a competitive market (Weber, 2019).

## **2.5 Electronic Data Interchange (EDI)**

Electronic Data Interchange (EDI) has revolutionized supply chain operations, particularly within the Fast-Moving Consumer Goods (FMCG) sector, by enabling the electronic sharing of information among different departments and trading partners. This technology enhances efficiency, fosters better customer relationships, and improves overall supply chain performance.



EDI offers numerous benefits, including cost savings, increased effectiveness, and reduced inaccuracies in data handling. By eliminating the need for physical stationery and paperwork, EDI helps companies save on costs associated with traditional document handling (Abdullah, 2019). It also ensures timely and accurate data entry, which reduces errors that can occur with manual processing. The increased speed of transaction processing improves cash flow and reduces inventory levels, enabling companies to operate more efficiently (Rain, 2020).

Research indicates that EDI can significantly enhance supply chain benefits. For instance, EDI improves on-time delivery performance by facilitating the timely exchange of critical information between buyers and sellers (Dearing, 2022; Markus, 2019). This timely information sharing helps align supply chain activities with market demands, thus enhancing overall responsiveness.

EDI is particularly beneficial in improving customer-vendor relationships. By enabling real-time communication and data exchange, EDI allows organizations to provide better customer service and foster long-term relationships (Usman, 2021). For example, through EDI, customers can receive timely updates on order status, shipping information, and inventory availability, which improves transparency and trust between trading partners.

Research on EDI's effectiveness has primarily focused on production facilities, where the added value to products serves as a crucial measure of performance. Studies have shown that organizations utilizing EDI often demonstrate superior delivery performance compared to those that do not (Tiffany, 2020; Agarwal, 2022). EDI enables timely information sharing across all supply chain departments, making organizations more responsive to market risks and dynamics. This integration fosters better coordination and reduces lead times, which are critical for maintaining competitive advantage in the FMCG sector (Jabile, 2023).

EDI is increasingly vital for conducting business in environments that require rapid responses to market changes (Mukhopadhyay, 2019). The FMCG sector, characterized by high demand variability and short product life cycles, benefits greatly from the flexibility and responsiveness that EDI offers. Traditional measures like lead time and throughput time are

optimized through EDI, allowing producers to react promptly to customer demands and deliver products quickly (Christopher, 2020).

EDI facilitates the electronic exchange of various business documents, including purchase orders, shipping notices, invoices, and remittance advice. This increases the speed of transaction processing and ensures timely product delivery, which is essential for enhancing customer service (Norman, 2021). Improved customer service leads to higher customer satisfaction, a key advantage of EDI in the FMCG sector. By ensuring that products are delivered on time and orders are processed accurately, EDI helps companies meet customer expectations and maintain competitive market positions (Markram, 2020).

EDI is a transformative technology for the FMCG sector, enhancing supply chain efficiency and responsiveness. By facilitating the electronic exchange of information, EDI reduces costs, improves accuracy, and speeds up transaction processing. Its benefits extend to improved customer-vendor relationships, better coordination across supply chain departments, and enhanced customer satisfaction. As the FMCG sector continues to evolve, the adoption and integration of EDI will remain crucial for achieving long-term success and maintaining competitiveness in a dynamic market environment.

## **2.6 Enterprise Resource Planning (ERP)**

In the fast-paced FMCG sector, organizations handle vast amounts of information across various departments, making data management and transfer increasingly challenging (Ghazi, 2021). Often, crucial data remains siloed within specific departments, obstructing decision-making due to the unavailability of comprehensive information and reliance on manual data management (Kanzie, 2020). To address these issues, many organizations have turned to Enterprise Resource Planning (ERP) systems, which streamline processes, ensure timely delivery of goods, cut costs, and improve customer satisfaction (Häkkinen, 2018).

ERP systems enable retailers to receive order information via web services technology and a central website, managing both downstream and upstream data flows (Hong & Jeng, 2022). This capability allows suppliers to access information in formats compatible with their systems, fostering integration between retailers and vendors across various environments without the need

for conventional standards (Pramatari, 2021). ERP software comprises different modules such as finance, logistics, fulfillment, orders, and manufacturing, which connect information from different departments. This comprehensive view allows managers to make informed decisions based on a holistic understanding of the organization's operations (Vikram, 2023).

One of the primary benefits of ERP software is process automation, which significantly improves efficiency and reduces operational costs (Ismaili, 2021). However, it is crucial for organizations to evaluate their existing processes before implementing ERP systems. Automating inefficient processes can lead to persistent performance issues, making it challenging to revert to more effective states (Sheikh, 2019). Properly integrated ERP systems establish an informational infrastructure that facilitates data exchange among partners within the supply chain. This includes sharing information on inventory levels, orders, and production rates efficiently and at minimal cost (Kaminsky, 2022).

The implementation of ERP systems has a profound impact on supply chain efficiency and effectiveness. ERP streamlines operations by providing a centralized platform for managing various business processes, including inventory management, order processing, and production planning (Marques, 2020). This centralization enhances the flow of information between different stages of the supply chain, enabling better coordination and synchronization of activities (Bertoline, 2022). As a result, lead times are reduced, allowing organizations to respond more quickly to customer demands (Tunc & Parker, 2021).

ERP systems also improve visibility into supply chain operations, enabling organizations to identify bottlenecks, anticipate demand fluctuations, and optimize inventory levels (Aly & Naik, 2020). By providing real-time access to critical data and analytics, ERP systems enhance decision-making capabilities (Sokolov, 2023). Managers can generate reports and analyze performance metrics, facilitating informed decisions that improve operational efficiency and profitability (Venkataramanan, 2022). Moreover, ERP systems help ensure compliance with regulatory requirements and industry standards, thus maintaining legal and quality standards (Raghu & Vinod, 2021).

The implementation of ERP systems in the FMCG sector revolutionizes digital distribution by enhancing supply chain efficiency, improving decision-making, and ensuring compliance. By streamlining operations and facilitating information exchange, ERP software enables organizations to meet customer demands promptly, reduce costs, and maintain competitive advantages in today's dynamic market environment. This transformation is crucial for FMCG companies aiming to thrive amid increasing competition and ever-evolving consumer demands.

## **2.7 Radio Frequency Identification (RFID)**

Radio Frequency Identification (RFID) is an advanced automatic identification and data capture technology that aims to recognize, track, and direct items across the supply chain (Kamaladevi, 2021). Comprising three key components—tag, reader, and host server—RFID systems streamline the management of products from production to delivery. The tag, also known as a transponder, contains a chip and can be affixed to various physical objects such as products, cases, pallets, or containers (Srivastava S. K., 2022). The reader, equipped with antennas, communicates with the tag to obtain information, which is then transmitted to the host server installed in the middleware application for data updating (Attaran M., 2020). The data stored in RFID tags is managed via an Electronic Product Code (EPC), which enables seamless information exchange across the supply chain by integrating objects, information, people, and computers (Burgess & Hawking, 2023).

RFID is both a technological system and a physical product utilized by numerous organizations to label and track items (Suriya, 2022). It employs a specific identifier that transmits signals from the device to the reader via radio waves (Vekas, 2023). The RFID system incorporates a microprocessor with designated memory space, making it an essential tool for various supply chain management functions (Angelina, 2020). RFID facilitates inventory management in warehouses, shipment tracking, avoidance of stock-outs, monitoring of production phases, reduction of paperwork, increased production efficiency, clearer product development processes, decreased labor costs, and more accurate forecasting (Srivastava B., 2021). This technology allows for the efficient tracking of tagged products across the supply chain, thereby improving overall operational efficiency (Rajah, 2022).

RFID technology enables different departments within organizations to monitor and track products as they move through the system (Haris, 2021). The tags carry essential information, allowing products and materials to be located at various stages of the supply chain. Initially considered underdeveloped, RFID is now a crucial component of information communication technology, helping users collect data at each point of sale, analyze advertising patterns, and enhance service quality and delivery times. Retailers leverage RFID to monitor stocks, trace orders, and boost productivity (Doukidis, 2019).

Despite its numerous benefits, RFID also presents several challenges that organizations must address. One major concern is privacy due to the data stored in RFID tags (Nystrom, 2022). According to a study by Spiegelman (2023), 73 percent of customers would prefer to remove RFID tags from purchased products at checkout due to data privacy issues (Megan, 2020). Additionally, the data stored in RFID tags may not follow a standard format understood by all organizations within the supply chain, leading to potential inaccuracies in partner firms' databases (Natine, 2021).

RFID technology offers significant advantages for supply chain management, including enhanced tracking, improved efficiency, and increased productivity. However, to fully realize these benefits, organizations must address privacy concerns and ensure data compatibility across the supply chain. By overcoming these challenges, RFID can continue to play a pivotal role in modern supply chain operations, driving greater efficiency and customer satisfaction.

## **2.8 Material requirements planning (MRP)**

Material Requirements Planning (MRP) is a critical system in supply chain management, designed to ensure the availability of materials for production, maintain minimal inventory levels, and plan manufacturing activities, delivery schedules, and purchasing. MRP software is often implemented using the SAP Materials Management (MM) module. By adopting SAP MM for MRP, organizations can efficiently manage and procure goods with secure lead times, allowing for the prioritization of essential materials through methods like ABC analysis, which categorizes inventory into groups based on importance and usage frequency (Kumar, 2023; Shamedus, 2020).

Implementing MRP tools in various sectors, such as the furniture industry, can significantly reduce inventory costs, increase production efficiency, and improve data accuracy. However, the successful implementation of MRP requires internal personnel and organizational changes (Karen et al., 2021; Santosh, 2022). The MRP system utilizes a mixed integrated software model to determine optimal lead times, relying on a set of integrated constraints to generate planned orders while considering capacity and part availability. Experimental results using data from manufacturers show that this method of determining planned lead time in MRP outperforms commonly used methods, thus enhancing overall efficiency (Gerhard, 2023).

In modern distribution systems, new customer orders with unique processing requirements enter the make-to-order manufacturing system. This system focuses on diverse-purpose machines and multi-product production environments without prior knowledge of resource allocation. Basic iterative algorithms are used to estimate lead times in these scenarios (Gerhard, 2020). Research conducted on a Greek manufacturing company emphasizes the strategic context of MRP adoption, noting its significant impact on the entire organization, including its policies, culture, and competitive capability. While MRP is crucial for data processing and priority planning, it does not involve scope management functions directly (Panagiotis and Maro, 2021).

The integration of MRP software, especially when combined with SAP, offers substantial benefits for managing materials, reducing costs, and improving production efficiency. However, implementing MRP systems necessitates organizational changes and the use of advanced software models to optimize lead times effectively. Additionally, MRP adoption should be approached strategically to ensure alignment with the organization's goals and competitive positioning in the market (Kumar, 2023).

One of the primary advantages of MRP is inventory reduction, which helps in maintaining optimal inventory levels, reducing carrying costs, and minimizing the risk of obsolescence (Karen et al., 2021). By ensuring the timely availability of materials, MRP increases production efficiency and reduces downtime. MRP systems enhance data accuracy and provide reliable information for decision-making, which is crucial for managing complex manufacturing processes. Advanced models used in MRP systems can optimize lead times, ensuring that production schedules are met without delays, thereby enhancing overall operational efficiency (Gerhard, 2023).

Despite these benefits, implementing MRP systems comes with challenges. Significant organizational changes are required to adopt MRP, which can be challenging to manage (Santosh, 2022). Effective MRP implementation also necessitates training personnel to use the new systems and processes efficiently. Integrating MRP with existing systems, such as Enterprise Resource Planning (ERP), requires careful planning and execution to ensure seamless data flow and functionality. Moreover, MRP adoption should be strategically aligned with the organization's goals to maximize its benefits and support competitive advantage (Panagiotis and Maro, 2021).

MRP systems are indispensable in modern manufacturing and supply chain management, optimizing material requirements, reducing costs, and enhancing production efficiency. Successful implementation of MRP systems requires careful planning, organizational changes, and strategic alignment with company goals. As technology continues to evolve, MRP systems will likely become even more integral to managing complex manufacturing processes and supply chains effectively.

## **2.9 Digital Distribution Efficiency**

In the context of supply chain management, digital distribution efficiency is vital for aligning an organization's strategy to meet market demands effectively (Turkulainen and Ketokivi, 2022). The marketing strategy of a company aims to fulfill consumer needs through its products and services (Delery and Roumpi, 2020). In the retail industry, companies adopt specific strategic approaches tailored to their capabilities and resources (Nector, 2021). Some companies prioritize delivering high-quality products at premium prices, while others focus on offering a wide range of reasonably priced products. The success of these strategies hinges on aligning supply chain management with competitive strategy (Delery and Roumpi, 2020).

Achieving strategic fit requires a harmony between consumer needs and competitive strategy (Chopra, 2007). Companies employ various techniques and tools to enhance supply chain flexibility, with models developed to measure supply chain flexibility based on factors such as profit, production speed, and travel costs (Gimenez et al., 2020). Operational flexibility, encompassing adaptability, cost, network, and responsiveness, has been explored to improve supply chain performance (Vanichchinchai, 2023). Streamlining operations, reducing order

variability, and accelerating inventory flows enhance organizational efficiency (Westbrook, 2021). Technological innovation and process creativity significantly impact operational flexibility (Hult et al., 2022).

Connecting supply chain practices and structures with business strategy helps organizations gain a competitive edge (Sadikoglu, 2018). Supply chain strategies should focus on delivering exceptional value to end-users, as the success of an organization heavily depends on the flexibility of its supply chain (Zelbst et al., 2019). Analyzing Porter's business strategies, such as cost reduction and differentiation, strengthens an organization's competitive position, with the capabilities of the supply chain directly influencing company success (Wheelen and Hunger, 2022).

Digital Distribution flexibility plays a crucial role in overall supply chain performance. Utilizing external collaboration and flexibility measurements enhances end-user value (Bowersox et al., 2021). Operational flexibility indicators support internal and external relationships among organizations (Harrison and New, 2022). Evaluation metrics across cost, customer experience, efficiency, asset management, compliance, time, innovation, size, flexibility, collaboration capability, supplier profile, and marketing behavior drive organizational efficiency (Vaidya and Hudnurkar, 2020).

Distribution efficiency standards, such as resilience and service quality, contribute to organizational success (Cao et al., 2021). Supply chain operating efficiency is measured through attributes like flexibility, speed, productivity, and costing (Cao et al., 2021). These attributes enhance supply chain performance by streamlining processes, reducing lead times, increasing productivity, and managing costs effectively. In today's digital age, technological initiatives play a crucial role in enhancing supply chain efficiency. For example, RFID enables real-time tracking of inventory, reducing stockouts and improving inventory management (Kamaladevi, 2022). ERP systems integrate various departments and functions within an organization, providing a holistic view of operations and enhancing decision-making (Lo et al., 2021). MRP systems optimize inventory levels, reduce costs, and improve production planning (Karen et al., 2020).



Technological initiatives are essential to improving digital distribution efficiency in supply chains. By aligning with strategic objectives, enhancing operational flexibility, and leveraging advanced technologies, companies can streamline processes, reduce costs, and deliver exceptional value to customers. These initiatives enable organizations to remain competitive in today's dynamic market landscape while meeting the ever-changing demands of consumers. Effective digital distribution through technologies like RFID, ERP, and MRP allows companies to enhance efficiency, responsiveness, and overall supply chain performance, positioning them for sustained success in the marketplace.

## **2.10 Theoretical Framework**

Understanding and managing the complexities of the supply chain network in any sector can be challenging (Bode & Wagner, 2021). The Fast-Moving Consumer Goods (FMCG) sector faces intricate challenges due to the wide variety of products it encompasses, necessitating a digital record of the entire system. This study aims to explore the impact of information technology on supply chain management in the FMCG sector. Information technology is considered as an independent variable with significant effects on efficiency, cost, and collaboration. Meanwhile, Material Requirements Planning (MRP), Enterprise Resource Planning (ERP), Electronic Data Interchange (EDI), and Radio Frequency Identification (RFID) are treated as dependent variables, contingent upon operational flexibility.

### **2.10.1 Theory of Constraints**

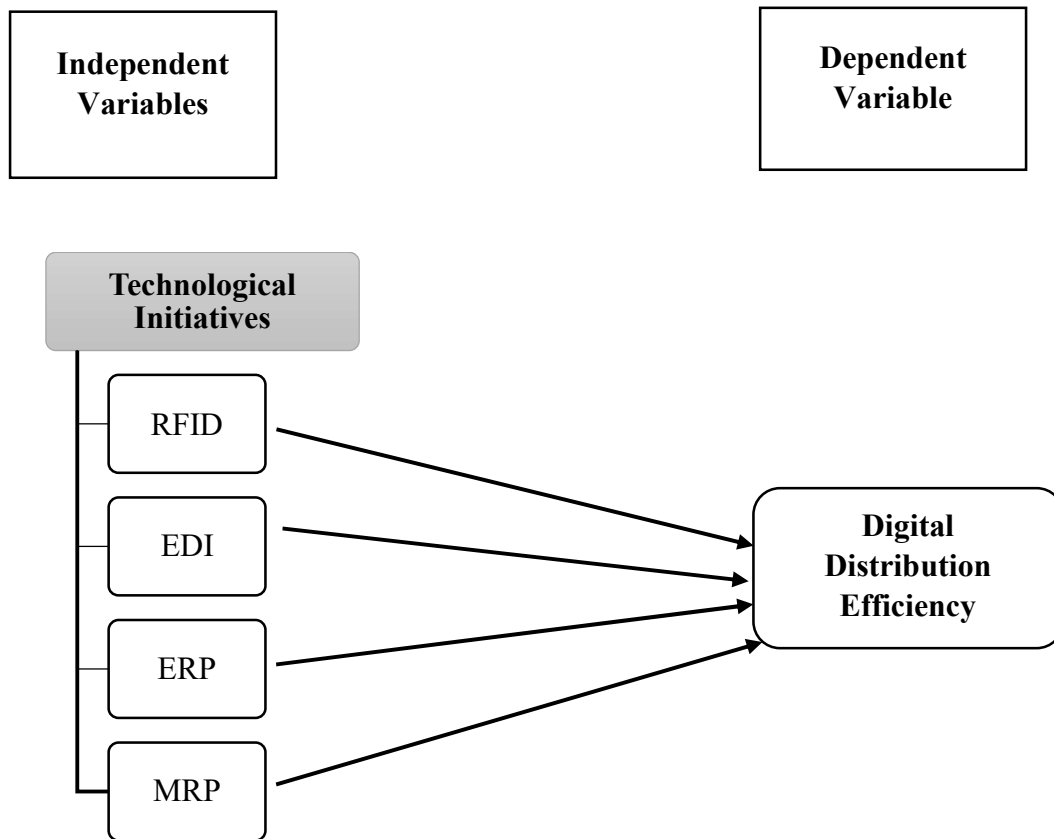
The Theory of Constraints (TOC), introduced by Goldratt (1990), is a management philosophy aimed at driving improvements by identifying and addressing constraints that hinder a system from achieving optimal performance. According to Goldratt and Cox (2021), a constraint is anything that prevents an organization from reaching its established goals. While the head of an organization sets the overarching goal, typically centered around profitability, other stakeholders also contribute by defining important conditions necessary for the organization's continued operation.

In the context of the FMCG or retail sector, challenges such as product variety, tracking goods, managing costs, and forecasting profits can be effectively addressed with the help of information technology (IT) tools. IT components play a crucial role in collecting qualitative data within the supply chain process and disseminating it among stakeholders. Technologies like

enterprise resource planning (ERP) systems are implemented to streamline supply chain operations, and they align with the actor-network theory (Hegseth, 2022). Additionally, supply chain technology supports the theory of social exchange by facilitating mutually beneficial relationships to enhance organizational performance (Ambrose, Marshall, & Lynch, 2020).

Moreover, the combination of supply chain management (SCM) activities and technology tools reinforces the organizational information processing theory, leading to improved information sharing and quality among supply chain members (Gunasekaran & Blome, 2018). The relationship between buyers and suppliers is also influenced and refined by transaction cost economics (Ambrose, 2021).

### 2.11 Research Framework



## **2.12 Research Hypothesis**

**H1:** EDI has a positive impact on digital distribution efficiency.

**H2:** ERP has a positive impact on digital distribution efficiency.

**H3:** RFID has a positive impact on digital distribution efficiency.

**H4:** MRP has a positive impact on digital distribution efficiency.

## Chapter 3

### Research Methodology

#### 3.1 Introduction

This section outlines the methodology for assessing the impact of technological initiatives on digital distribution efficiency in the Fast-Moving Consumer Goods (FMCG) sector. The research employs both qualitative and quantitative methods, using primary data from surveys and interviews with supply chain professionals and secondary data from industry reports and academic literature. Surveys will gather broad insights into the adoption and effects of technologies like RFID, ERP, and MRP, while in-depth interviews with experts will provide detailed qualitative data on challenges and benefits. Additionally, case studies of FMCG companies will illustrate real-world applications and outcomes of these technologies. The collected data will be analyzed using statistical tools for quantitative data and thematic coding for qualitative data to identify trends and patterns. The analysis will focus on improvements in inventory management, lead time reduction, and customer service. The results will be interpreted within the context of existing literature, highlighting both advantages and potential drawbacks of these technologies. Findings will be communicated through comprehensive reports and presentations, offering actionable insights for FMCG sector stakeholders. This approach aims to demonstrate how adopting RFID, ERP, and MRP can enhance digital distribution efficiency, ultimately contributing to better supply chain performance and competitive advantage.

#### 3.2 Research Method

We have employed a quantitative data analysis methodology for our research, focusing on statistical data collection and detailed analytical analysis. By utilizing quantitative research techniques, we have aimed to objectively compare and find results regarding the impact of technological initiatives on digital distribution efficiency in the FMCG sector. This approach has allowed us to reach a considerably wider sample group. In our quantitative study, we have systematically tested hypotheses to ensure the robustness of our findings. The outcomes of our quantitative approach have been recorded digitally for accuracy and ease of analysis. We have gathered data and findings using a closed-ended survey-based questionnaire with a 5-point Likert scale, disseminated to respondents via Google Forms. This methodology has enabled us to collect precise and reliable data, providing a comprehensive understanding of the technological initiatives' impact on distribution efficiency.

### **3.3 Research Approach**

In this study, the deductive research approach has been employed to validate hypotheses concerning the impact of technological initiatives on digital distribution efficiency in Pakistan's FMCG sector. This approach has involved starting with a general theory or hypothesis, derived from existing literature and theoretical frameworks, about how technological advancements might influence distribution efficiency. We have then tested these hypotheses through systematic data collection and analysis. By using the deductive approach, we have aimed to either confirm or refute these pre-existing hypotheses through empirical evidence, ensuring a structured and logical progression from theory to data, and finally to conclusions. This method has allowed us to draw specific inferences about the relationship between supply chain strategies and productivity in the FMCG sector, grounded in real-world data and rigorous analysis.

### **3.4 Research Design**

In this study, a descriptive research design has been utilized to systematically describe the impact of technological initiatives on digital distribution efficiency in Pakistan's FMCG sector. This research design has involved collecting quantitative data to provide an accurate representation of current practices, challenges, and outcomes related to technological advancements in supply chain management within the FMCG industry. By employing a descriptive research design, we have aimed to create a detailed picture of how these technological initiatives are influencing various aspects of digital distribution, such as inventory management, order processing, and overall operational efficiency. This approach has allowed us to gather detailed, information from a wide sample group through structured methods like closed-ended surveys, which have provided a comprehensive overview of the current state and effectiveness of digital distribution strategies in the FMCG sector. The findings have thus offered valuable insights into existing patterns and relationships, serving as a basis for further research and practical improvements in the industry.

### **3.5 Target Population**

In this study on the impact of modern supply chain techniques on productivity in Pakistan's FMCG business sector, we have chosen a specific target population to ensure the relevance and accuracy of our findings. The target population comprises employees, supervisors, and managers from Nestle, Unilever, and P&G, specifically within the twin cities of Islamabad and Rawalpindi. We

have selected these cities due to their significant industrial and commercial activities, making them representative of the broader FMCG sector in Pakistan.

The decision to focus on Nestle, Unilever, and P&G is based on their substantial market presence and advanced supply chain operations, which are critical to examining the impact of modern supply chain techniques. By targeting a sample of 250 individuals who are directly or indirectly involved in supply chain operations and activities, we aim to gather insights from those with practical, on-the-ground experience. This population includes employees at various levels within the companies, ensuring a comprehensive understanding of how supply chain innovations are influencing productivity. By focusing on this specific population, we aim to provide a detailed and accurate analysis of how modern supply chain techniques are being implemented and their resulting impact on productivity within the FMCG sector in Pakistan.

### **3.6 Unit of Analysis**

In this study on the impact of modern supply chain techniques on productivity in Pakistan's FMCG sector, the unit of analysis has been defined as a single person, specifically targeting FMCG supply chain employees, supervisors, and managers at Nestle, Unilever, and P&G in Islamabad and Rawalpindi. This approach means that everyone involved in supply chain operations serves as a sampling unit for collecting and analyzing data. By focusing on individual employees, we gather specific, detailed insights into their personal experiences and perceptions regarding the effectiveness of modern supply chain techniques. This unit of analysis allows us to explore how different roles within the supply chain—from frontline employees to higher-level managers—experience and respond to innovations in supply chain practices. Collecting data at this level helps us capture a diverse range of perspectives and understand the direct effects of supply chain techniques on productivity. For instance, insights from a warehouse worker might differ from those of a supply chain manager, providing a comprehensive view of how modern techniques impact various facets of the supply chain. This individual-focused approach ensures that our findings reflect real-world applications and implications, offering valuable data to assess and enhance supply chain strategies in the FMCG sector

### **3.7 Sample Size**

In this study on the impact of modern supply chain techniques on productivity in Pakistan's FMCG sector, sample size refers to the number of individual respondents chosen from the target

population to participate in the research. We have selected a sample size of 152 respondents based on the Krejcie and Morgan (1970) formula, which is a standard method for determining an adequate sample size for research based on the total population size. This sample size ensures that the data collected from FMCG sector employees, including those from Nestle, Unilever, and P&G in Islamabad and Rawalpindi, are statistically significant and representative of the broader population. A sufficient sample size is critical because it ensures that the study's findings are reliable and can be generalized to reflect the experiences of the entire FMCG sector in the twin cities. By using the Krejcie and Morgan table, we have ensured that our sample size balances the need for accuracy and the practical constraints of data collection, thus providing a solid foundation for analyzing how modern supply chain techniques affect digital distribution efficiency.

### **3.8 Sampling Technique**

In this study on the impact of modern supply chain techniques on productivity in the FMCG sector of Pakistan, sampling technique refers to the method used to select participants for the research. We have utilized a convenience sampling technique, which involves selecting participants who are most accessible and willing to participate in the study (Shelton, 2018). This method is particularly suited for our research because it allows us to collect data from FMCG sector employees, including those from major companies like Nestle, Unilever, and P&G, who are conveniently reachable in the twin cities of Islamabad and Rawalpindi. Convenience sampling is a non-probability sampling method where respondents are chosen based on their availability and willingness to engage in the study, rather than through a random or systematic selection process (Thornhill, 2021). This technique was adopted for our study due to practical constraints such as time, resources, and accessibility challenges. By focusing on individuals who are readily available and willing to participate, we have been able to gather relevant data on how modern supply chain techniques affect productivity in the FMCG sector. While this approach is convenient and efficient, it does have limitations, including potential biases and a lack of generalizability, which are acknowledged as part of the research design (Bougie, 2021).

### **3.9 Data Collection Procedure**

Data Collection Procedure refers to the systematic method employed to gather information for a research study. In our research, we have utilized an online survey approach to distribute a structured questionnaire to FMCG sector employees in Islamabad and Rawalpindi. We have

carefully designed the questionnaire to ensure it elicited accurate and reliable responses. Over a 10-day period, we collected 152 valid responses through Google Forms, which was chosen for its ease of use and efficiency in reaching a broad sample of respondents (Sekaran & Bougie, 2021). We have used IBM SPSS Statistics to analyze the collected data, which helped us perform detailed statistical analyses to evaluate the impact of modern supply chain techniques on productivity in the FMCG sector (Field, 2018). By ensuring that no responses were omitted, and all data was synchronized and analyzed effectively, we have aimed to obtain meaningful insights and reliable conclusions for the study.

### **3.10 Analysis**

In this study, the analysis phase involved the use of quantitative data processing methods to interpret the results from a structured questionnaire distributed to FMCG sector employees. We have employed SPSS software to perform regression and correlation analyses, which are well-established statistical techniques used for exploring relationships between variables (Pallant, 2020). Through regression analysis, we have examined how ERP, MRP, RFID, and EDI impact productivity, while correlation analysis has helped us understand the strength and direction of these relationships (Field, 2018). These methods have enabled us to systematically analyze the data and draw valid conclusions about the effectiveness of modern supply chain techniques in enhancing productivity in the FMCG sector.

### **3.11 Research Instrument/Measurement/Scale Used**

In this study, the research instrument is a standardized questionnaire developed to gather information on how different supply chain technologies affect productivity. The questionnaire has been adapted from existing research instruments to ensure its relevance and accuracy. For RFID, the study has used Binh's (2022) questionnaire to measure the effectiveness of RFID in supply chain management. For EDI, the questions have been adapted from Fatorachian's (2020) research on EDI's role in improving supply chain performance. The MRP section is based on Millicent's (2022) work on MRP systems, while ERP-related questions are drawn from Rickard & Erik's (2020) study on ERP implementation. Lastly, the productivity performance metrics are adapted from Naseer's (2021) framework for assessing productivity in the context of technological advancements. By utilizing these validated tools, the study ensures that the data collected is



reliable and relevant for analyzing the impact of modern supply chain techniques on efficiency of digital distribution.

## Chapter 4

### Results and Analysis

#### 4.1 Introduction

In this study, data was gathered from various stakeholders in the FMCG sector of Pakistan, including managers, supervisors, owners, and staff. The main aim was to understand how technological initiatives impact digital distribution efficiency. Digital distribution efficiency was chosen as the focus, representing how effectively goods are distributed digitally within the sector. The study looked at several modern supply chain techniques as independent variables: Enterprise Resource Planning (ERP), Material Requirements Planning (MRP), Radio Frequency Identification (RFID), and Electronic Data Interchange (EDI). These variables were seen as potential factors influencing digital distribution efficiency.

To gather information, a survey was planned and directed, with respondents giving their viewpoints on the effect of these mechanical drives on computerized conveyance productivity. The poll utilized a 5-point Likert scale, permitting respondents to rate their understanding or conflict with different proclamations. Moreover, segment data was gathered to see any possible relationships between's elements like work job or experience and view of computerized dispersion proficiency. Once the data was collected, it was analyzed using statistical methods in SPSS (Statistical Package for the Social Sciences). Several analyses were conducted to explore relationships and patterns in the data.

**Reliability Test:** This assessed the consistency and stability of responses to ensure the questionnaire was reliable.

**Correlation Analysis:** This examined the relationships between different variables. For example, it could reveal whether there was a correlation between the use of RFID technology and digital distribution efficiency.

**Regression Analysis:** This determined the strength and nature of the relationship between independent variables (technological initiatives) and the dependent variable (digital distribution efficiency). It helped identify which technological initiatives had the most significant impact on digital distribution efficiency.

**ANOVA (Analysis of Variance):** This statistical test assessed whether there were statistically significant differences in digital distribution efficiency based on different demographic factors, such as job role or experience level.

**Coefficients Analysis:** This examined the coefficients of the regression model, providing insight into the direction and strength of the relationships between variables.

Overall, these analyses helped to understand how different technological initiatives influenced digital distribution efficiency in the FMCG sector. They provided valuable insights for managers and decision-makers in optimizing supply chain processes and leveraging technology to enhance efficiency and effectiveness.

## **4.2 Demographic of the Respondents**

Approximately 180 surveys were delivered to the target group, with 152 correct responders returning the completed form. Data were obtained from respondents in Pakistan's FMCG sector. To make it easier to understand, the analyst for this study divided the collected data into many categories. The members were remembered for the examination because they answered these questions correctly.

### **4.2.1 Education Level**

Under this section, education level was categorized into 5 sections which were namely Matriculation, Intermediate, Bachelors, Masters and PHD respectively.

### **4.2.2 Managerial Position**

Employees' managerial positions were also divided into five categories: front-line manager, executive, supporting staff, middle-level manager, and senior manager. We received 41 replies from top management, 67 from middle management, and 42 from lower management.

### **4.2.3 Respondents Experiences**

The respondents' experiences were divided into five categories. The first was less than a year, the second was 1-3 years of experience, the third was 4-6 years of experience, the fourth was 7-9 years of experience, and the fifth was for those with more than 9 years of experience.

### 4.3 Reliability test

The reliability test has been utilized to decide the consistency and unwavering quality of survey things for each review variable. As per Chang (2022), there are four degrees of unwavering quality regarding Cronbach alpha qualities. Cronbach's alpha upsides of 0.9 or more show brilliant dependability, 0.70-0.9 demonstrates high unwavering quality, and 0.50-0.70 demonstrates moderate unwavering quality, while values beneath 0.50 demonstrate low dependability. As per the numbers displayed beneath in the tables on account of the SPSS reliability test, the five factors utilized in this review have sensible unwavering quality.

**Table 4.1**

<b>Variables</b>	<b>Cronbach's Alpha</b>	<b>N of Items</b>
<b>Radio Frequency Identification (RFID)</b>	.725	5
<b>Electronic Data Interchange (EDI)</b>	.639	5
<b>Enterprise Resource Planning (ERP)</b>	.754	5
<b>Material Requirement Planning (MRP)</b>	.760	5
<b>Digital Distribution Efficiency (DDE)</b>	.760	5

Overall, Cronbach's alpha values for all variables fall within the range of moderate to high reliability. While RFID and EDI show moderate reliability, ERP, MRP, and DDE exhibit high reliability. These results suggest that the questionnaire items for all variables, except for EDI, have reasonable internal consistency and reliability. However, further validation and refinement of the questionnaire items for EDI may be necessary to improve its reliability. Cronbach's alpha scores clearly suggested a greater level of reliability and consistency with the questionnaire employed in the study's primary research. Cronbach's alpha values are extremely near to one, indicating the reliability of the questionnaire employed as well as the dependability of the respondents' replies; they fall within the specified threshold of 0.7 and 0.9. However, dependability is adequate. This Cronbach alpha demonstrates more consistency in the Likert scale, and the floating questionnaire for this quantitative study is authentic and straightforward.

#### 4.4 Correlation Analysis

The correlation analysis conducted in this study aimed to assess the relationships between the various technological initiatives (RFID, EDI, ERP, and MRP) and digital distribution efficiency in the FMCG (Fast-Moving Consumer Goods) sector. Connection estimates the strength and heading of the connection between two factors, demonstrating whether they move together (positive connection), move in inverse bearings (negative relationship), or have no relationship (zero relationship).

**Table 4.2**

		<b>Correlations</b>					
		<b>RFID</b>	<b>EDI</b>	<b>ERP</b>	<b>MRP</b>		<b>Digital Distribution Efficiency</b>
<b>RFID</b>	<b>Pearson Correlation</b>	1	.				
<b>EDI</b>	<b>Pearson Correlation</b>	.755**	1				
<b>ERP</b>	<b>Pearson Correlation</b>	.803**	.830**	1			
<b>MRP</b>	<b>Pearson Correlation</b>	.721**	.814**	.707**	1		
<b>Digital Distribution Efficiency</b>	<b>Pearson Correlation</b>	.794**	.818**	.776**	.818**	1	
	<b>Sig. (2-tailed)</b>	<.001	<.001	<.001	<.001		
	<b>N</b>	152	152	152	152	152	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The correlation table provided presents the Pearson correlation coefficients among five variables: RFID, EDI, ERP, MRP, and Digital Distribution Efficiency, using data from 152 respondents. Each value in the table represents the strength and direction of the linear relationship between pairs of variables, with a significance level of  $p < 0.001$  indicating that the correlations are statistically significant.

RFID has a significant positive correlation with all other variables, with the highest correlation observed with ERP ( $r = 0.803$ ) and Digital Distribution Efficiency ( $r = 0.794$ ). This

implies that as the effectiveness of RFID increases, there is a strong positive relationship with both ERP and overall digital distribution efficiency. EDI shows strong positive correlations with RFID ( $r = 0.755$ ), ERP ( $r = 0.830$ ), and MRP ( $r = 0.814$ ), indicating that improvements in EDI are associated with increases in RFID efficiency, ERP effectiveness, and MRP performance. ERP has high correlations with RFID ( $r = 0.803$ ), EDI ( $r = 0.830$ ), MRP ( $r = 0.707$ ), and Digital Distribution Efficiency ( $r = 0.776$ ), suggesting that ERP systems are integral to enhancing RFID, EDI, MRP, and overall digital distribution efficiency. MRP correlates strongly with RFID ( $r = 0.721$ ), EDI ( $r = 0.814$ ), ERP ( $r = 0.707$ ), and Digital Distribution Efficiency ( $r = 0.818$ ), reflecting that effective MRP practices positively impact the success of other technologies and the efficiency of digital distribution. Finally, Digital Distribution Efficiency exhibits the highest correlation with MRP and EDI (both  $r = 0.818$ ), demonstrating that advancements in MRP and EDI are strongly associated with improvements in digital distribution efficiency.

The correlations suggest that all the technological initiatives (RFID, EDI, ERP, MRP) are positively related to each other and to the overall effectiveness of digital distribution efforts in the FMCG sector. These findings highlight the interconnected nature of these technologies in enhancing supply chain performance and efficiency.

#### 4.5 Regression Analysis

**Table 4.3**

<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
<b>1</b>	<b>.747</b>	<b>.664</b>	<b>.614</b>	<b>.3218</b>

Dependent Variable: Digital Distribution Efficiency

Predictors: (Constant), Radio Frequency Identification (RFID), Electronic Data Interchange (EDI), Enterprise Resource Planning (ERP), Material Requirement Planning (MRP)

**R (Correlation Coefficient):** The value of R is **0.747**, which indicates a strong positive correlation between the independent variables (EDI, ERP, MRP) and the dependent variable (Digital Distribution Efficiency). This high R value suggests that the model's independent variables have a substantial relationship with Digital Distribution Efficiency, meaning improvements in EDI, ERP, and MRP are closely linked to better digital distribution outcomes.

**R Square (Coefficient of Determination):** The  $R^2$  value is **0.664**, which means that approximately **66.4%** of the variance in Digital Distribution Efficiency can be explained by the combination of EDI, ERP, and MRP. This indicates that the model does a good job of accounting for the variations in digital distribution efficiency based on these three technologies.

**Adjusted R Square:** The adjusted  $R^2$  value is **0.614**, which is slightly lower than the  $R^2$  value. The adjusted  $R^2$  adjusts the  $R^2$  value for the number of predictors in the model and is used to provide a more accurate measure of model fit. An adjusted  $R^2$  of **0.614** suggests that the model, while still robust, accounts for **61.4%** of the variance in Digital Distribution Efficiency, adjusting for the number of independent variables used.

**Std. Error of the Estimate:** The standard error of the estimate is **0.3218**. This value measures the average distance that the observed values fall from the regression line. A smaller standard error indicates that the model's predictions are closer to the actual values. In this case, a standard error of **0.3218** suggests that while there is a reasonable fit, there is still some variability between the predicted and actual efficiency levels.

#### 4.6 ANOVA

**Table 4.4**

Model		Sum of Squares	DF	Mean Square	F	Sig.
1	<b>Regression</b>	60.467	4	15.117	24.62	<.001 <sup>b</sup>
	<b>Residual</b>	15.476	144	.614		
	<b>Total</b>	75.943	148			

a. Dependent Variable: Digital Distribution Efficiency

b. Predictors: (Constant), Radio Frequency Identification (RFID), Electronic Data Interchange (EDI), Enterprise Resource Planning (ERP), Material Requirement Planning (MRP)

The ANOVA table assesses the impact of four independent variables—RFID, EDI, ERP, and MRP—on Digital Distribution Efficiency. The F-value of 24.62 with a p-value of <0.001 indicates that the model is statistically significant, meaning the combined effect of RFID, EDI, ERP, and MRP significantly influences Digital Distribution Efficiency. The Sum of Squares for Regression (60.467) quantifies the variance in Digital Distribution Efficiency that is explained by

these four variables, while the Residual Sum of Squares (15.476) represents the variance not accounted for by the model. The Mean Square for Regression (15.117) is calculated by dividing the Sum of Squares for Regression by its degrees of freedom, which is 4 in this case. Similarly, the Mean Square for Residual (0.614) is found by dividing the Residual Sum of Squares by its degrees of freedom, which is 144. By comparing these mean squares, the F-statistic measures how well the model explains the variance in Digital Distribution Efficiency compared to the unexplained variance. The high F-value and the significant p-value indicate that the independent variables (RFID, EDI, ERP, and MRP) together have a substantial effect on Digital Distribution Efficiency, affirming that improvements in these areas can enhance efficiency in the FMCG sector's digital distribution processes.

#### 4.7 Coefficient

**Table 4.5**

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
<b>RFID</b>	.240	.093	.242	2.599	.001
<b>EDI</b>	.391	.045	.230	3.739	.001
<b>ERP</b>	.217	.043	.221	2.392	.001
<b>MRP</b>	.282	.050	.239	1.938	.001

**a. Dependent Variable:** Digital Distribution Efficiency

The Coefficient table provides detailed insights into how each independent variable—RFID, EDI, ERP, and MRP—affects the dependent variable, Digital Distribution Efficiency.

The table lists the Unstandardized Coefficients (B), which show the amount of change in Digital Distribution Efficiency for a one-unit change in each independent variable while keeping all other variables constant. For instance, the B value for RFID is 0.240, meaning that a one-unit increase in RFID implementation is associated with a 0.240 increase in Digital Distribution Efficiency. Similarly, the B value for EDI is 0.391, indicating that a one-unit increase in EDI is linked to a 0.391 increase in efficiency. These values reflect the direct effect of each variable on the efficiency outcome.



The Standardized Coefficients (Beta) reflect the relative importance of each variable in the model. The Beta for RFID is 0.242, suggesting that among the independent variables, RFID has a moderate influence on Digital Distribution Efficiency. EDI has the highest Beta value of 0.230, indicating that it has a significant impact on efficiency. ERP and MRP also have positive influences with Betas of 0.221 and 0.239 respectively, though they are slightly less influential compared to EDI.

The t-values assess the significance of each coefficient. All variables have t-values greater than 1.96, indicating that the relationships between these variables and Digital Distribution Efficiency are statistically significant at the 0.05 level. Specifically, RFID's t-value is 2.599, EDI's is 3.739, ERP's is 2.392, and MRP's is 1.938, all of which have p-values of 0.001. This significance level confirms that the relationships observed are not due to random chance and that these technological initiatives effectively contribute to improving Digital Distribution Efficiency.

#### 4.8 Results

**Table 4.6**

<b>Variables</b>	<b>Significance Level</b>	<b>Result</b>	<b>Accept / Reject</b>
<b>Radio Frequency Identification</b>	.001	Positive Impact on digital distribution efficiency	Hypothesis accepted
<b>Electronic Data Interchange</b>	.001	Positive Impact on digital distribution efficiency	Hypothesis accepted
<b>Enterprise Resource Planning</b>	.001	Positive Impact on digital distribution efficiency	Hypothesis accepted
<b>Material Requirement Planning</b>	.001	Positive Impact on digital distribution efficiency	Hypothesis accepted

#### 4.9 Analysis of Research Hypotheses

**H1:** Electronic Data Interchange (EDI) has a positive impact on digital distribution efficiency.

**Result:** The analysis indicates a highly significant positive impact of EDI on digital distribution efficiency, with a p-value of 0.001.

Electronic Data Interchange (EDI) plays a crucial role in improving digital distribution efficiency by facilitating seamless electronic communication between trading partners. EDI eliminates manual processes, reduces paperwork, and ensures faster and more accurate exchange of information. By automating transactions, order processing, and document sharing, EDI streamlines supply chain operations, leading to enhanced efficiency in digital distribution.

**H2:** Enterprise Resource Planning (ERP) has a positive impact on digital distribution efficiency.

**Result:** The analysis reveals a highly significant positive impact of ERP on digital distribution efficiency, with a p-value of 0.001.

Enterprise Resource Planning (ERP) systems provide integrated platforms for managing various business functions, including supply chain management. By centralizing data and processes, ERP systems enable better coordination, planning, and decision-making across the organization. ERP facilitates real-time access to information, improves resource allocation, and enhances inventory management, all of which contribute to increased efficiency in digital distribution.

**H3:** Radio Frequency Identification (RFID) has a positive impact on digital distribution efficiency.

**Result:** RFID technology demonstrates a highly significant positive impact on digital distribution efficiency, with a p-value of 0.001.

Radio Frequency Identification (RFID) technology enables automatic identification and tracking of products throughout the supply chain. By using RFID tags and readers, organizations can accurately monitor inventory levels, track shipments in real-time, and streamline logistics processes. RFID enhances visibility and traceability, reduces errors, and enables faster and more efficient digital distribution operations.

**H4:** Material Requirement Planning (MRP) has a positive impact on digital distribution efficiency.

**Result:** Material Requirement Planning (MRP) shows a highly significant positive impact on digital distribution efficiency, with a p-value of 0.001.

Material Requirement Planning (MRP) systems help organizations plan and manage their material requirements based on demand forecasts. By ensuring the availability of materials at the right time and place, MRP minimizes stockouts, reduces excess inventory, and optimizes production schedules. MRP enhances efficiency in digital distribution by improving inventory control, reducing lead times, and streamlining order fulfillment processes.

## Chapter 5

### Discussion, Conclusion and Recommendations

#### 5.1 Discussion

The analysis of the data revealed that all four technological initiatives (EDI, ERP, RFID, and MRP) have a significant positive impact on digital distribution efficiency within the FMCG sector. The correlation analysis showed strong positive correlations between each of these variables and digital distribution efficiency, indicating that higher levels of technology adoption are associated with greater efficiency in supply chain operations.

Cronbach's alpha scores clearly suggested a greater level of reliability and consistency with the questionnaire employed in the study's primary research. Cronbach's alpha values are extremely near to one, indicating the reliability of the questionnaire employed as well as the dependability of the respondents' replies; they fall within the specified threshold of 0.7 and 0.9. However, dependability is adequate. This Cronbach alpha demonstrates more consistency in the Likert scale, and the floating questionnaire for this quantitative study is authentic and straightforward.

The data showed a positive correlation between RFID utilization and digital distribution efficiency, supporting the hypothesis that RFID technology enhances efficiency. By enabling real-time tracking and monitoring of products, RFID improves inventory management, reduces stockouts, and enhances overall supply chain visibility. Finally, the analysis demonstrated a positive correlation between MRP implementation and digital distribution efficiency, indicating that MRP systems contribute to greater efficiency. MRP software helps companies plan and manage material requirements, leading to better inventory control and production efficiency.

The supply chain is crucial in the purchase, transformation of raw materials into completed goods, and delivery to clients, including post-sale services in some circumstances. The major goal of supply chain management is to simplify processes, cut costs, shorten lead times, and increase efficiency to remain competitive in the market. Digital distribution efficiency is critical in accomplishing these goals since it determines how smoothly these processes can be carried out.

The findings of this research indicate a significant correlation between technological initiatives and digital distribution efficiency in the FMCG sector of Pakistan. The study underscores the profound impact of technology on supply chain operations, emphasizing its role

in enhancing efficiency and performance. Given the diverse range of products in the FMCG sector, it is imperative for companies to identify key characteristics and determinants for efficient digital distribution. The results of the analysis demonstrate that technologies such as Radio Frequency Identification (RFID), Electronic Data Interchange (EDI), Enterprise Resource Planning (ERP), and Material Requirement Planning (MRP) have a positive impact on digital distribution efficiency.

The findings of this study have several implications for FMCG companies looking to improve digital distribution efficiency. First, the adoption of technological initiatives such as EDI, ERP, RFID, and MRP can significantly enhance supply chain operations, leading to cost savings, improved productivity, and better customer service. Second, FMCG companies should prioritize investments in technology to remain competitive in the market and meet the evolving needs of customers. Third, continuous monitoring and evaluation of technology adoption are essential to ensure ongoing improvements in digital distribution efficiency. Technological initiatives play a critical role in enhancing digital distribution efficiency within the FMCG sector. By leveraging tools such as EDI, ERP, RFID, and MRP, companies can streamline supply chain operations, reduce costs, and improve overall performance. The findings of this study underscore the importance of technology adoption for FMCG companies seeking to achieve operational excellence and maintain a competitive edge in the market.

Given the issues that the FMCG industry faces, such as changeable customer expectations and high market rivalry, the use of technology solutions is critical. Companies that use RFID, EDI, ERP, and MRP technologies may simplify supply chain operations, cut costs, and shorten lead times, improving overall efficiency and performance. This study emphasizes the need of embracing technology advances to meet the changing demands of the FMCG sector and achieve long-term success.

## **5.2 Conclusion**

Digital distribution is significant in many industries, but it becomes more important when it comes to the FMCG sector. The variables which were mentioned play a significant role in the supply chain of the FMCG sector. With more levels of variety and different products in the sector of FMCG, it becomes too important to digitize it or to implement the tools of information technology to make the supply chain of these products more efficient and effective. Technological

factors play an important role in the digital distribution efficiency of the FMCG sector. The result of this research shows that all the stakeholders working in the field of the FMCG sector are pretty much aware of the dimensions of the measuring of digital distribution efficiency and technological initiatives. The supply chain of the FMCG sector is too vast because of its diversity in the product and because of the large volume since with the manual work it gets too hard for the company to maintain the efficient and effective supply chain of the company, so in this case, the technological tools help a great deal in controlling the cost of the companies and to control maintain the efficient and smooth flow of goods from the producers to the customers. The employment of technical tools such as RFID, EDI, MRP, and ERP is vital in improving the digital distribution efficiency of the FMCG supply chain. The operations part in the FMCG sector is of immense importance because of large numbers of quantity and a large number of variety, without the smooth execution in the supply chain it gets very difficult for the company especially in the FMCG sector, so to maintain the longevity and survival of the companies in the FMCG sector it is of immense importance to control the operations of the supply chain of the company which can only be smooth out with the help of technological tools and these tools/variables are correlated with the digital distribution efficiency. The variables or the tools of technological which have mentioned above are too important for a smooth and efficient supply chain because there is too much risk involved in the supply chain the risk of less quantity, bullwhip effect, false products/goods because of manual work, these risks can be eliminated with the help of the technological supply chain tools like the use of RFID, EDI, ERP, MRP can eliminate the risk and help out the business to reduce the cost, ultimately making the business more profitable. Like above there are too many risks involved, and these risks can be too costly for the organization and can increase the cost to a significant level, the use of modern supply chain technology like in the above case can reduce cost, increase supply chain integration, and ultimately can increase the efficiency of the productivity performance of the company which is important for the smooth operations.

### **5.3 Recommendations**

By analyzing the whole paper it has become crystal clear that FMCG industries these days in Pakistan are facing too many challenges because of their usage of the old way and traditional way of doing things, this inefficient process is costing companies too much because the consumers are shifting towards their competitors and the companies are facing with the problems of lost sales, backorders and bullwhip effects, with these problems facing by the companies in the current era

is because of lack of adaption of new technologies by most of the stores/companies operating in our country.

The problems in the sector of FMCG digital distribution of Pakistan is not only limited to the internal factors but it is extended to external factors as well, the main external factors which sectors political instability, changes in economic policies, complex supply chains, socio-economic factors like high rate of food inflation, high cost of transportation, high rate of taxes, etc., these external factors can prove to be very fatal for companies in the FMCG sector. The diverse demand of the goods because of the different ethnic belonging of citizens of Pakistan can also prove to be a hurdle for efficient procurement and forecasting of the goods. These are the external challenges being faced by them.

Apart from the external factors, the internal factors can also prove to be very fatal for the company the internal factors like the lack of digitization which can lead to false demand estimation/false forecasting, and with the fluctuation in both demand and supply, there is the problem of bullwhip effect which can lead to less income, more lead time, etc. Apart from that the companies in our country are also facing different problems of fraud, mismanagement, false naming and labeling for instance there is the case in some cases where the imported products are being manufactured in Pakistan and then being sell to the stores and customers as a high-quality product which of course is not the case and which can lead to many problems for instance fake products may lead to dissatisfaction on the part of the customer, ultimately leading to lost sales of the products. The companies will have to adapt themselves to the new technology and new digitization of the infrastructure of the companies to survive and thrive, the lack of implementation of these tools can lead to distortion in supply/demand, bad forecasting, more cost, lost sales, and more lead time so this process must be catered and to be dealt accordingly with the implementation of IT tools.

- Implementation of digitized systems or automated tools can help in increasing the efficiency of the processes and can reduce the error of humans to a certain extent.
- Automated systems like ERP can be installed in the companies for tracking raw materials and to meet certain deadlines.
- The use of data analytics with certain tools of technology can also help a great deal in productivity performance and increase the efficiency of digital distribution of the FMCG sector.

- The more integrated departments of the company there are the more efficient and smoother the supply chain is going to be.

So, the aim of this research has successfully been achieved with the connections of the FMCG sector and modern supply chain techniques. Aside from that, management should look at these variables to improve the company's profitability and long-term viability in digital distribution. Aside from that, the researcher has made recommendations for increasing departmental integration across the supply chain in order to compete for long-term earnings and a worldwide market with Pakistani FMCG firms.

#### **5.4 Limitations**

The research has several limitations that should be acknowledged. Firstly, the sample size, consisting of managers, supervisors, and staff from the FMCG sector in Pakistan, may not be sufficiently large to generalize the findings to the entire industry. Additionally, sampling bias could have occurred during data collection, potentially skewing the results. Furthermore, the use of surveys and Likert scales may increase response bias and reduce the depth of replies. The study's cross-sectional methodology precludes the determination of causation, and the findings may not be applicable to other sectors or countries. Variable measurement errors, as well as the absence of external elements such as economic situations, restrict the scope. Furthermore, the study concentrated on certain technical endeavors, perhaps ignoring other important elements. Addressing these constraints in future studies would yield a more complete picture of the link between technical initiatives and digital distribution efficiency.

#### **5.5 Implications**

The research findings have several implications for theory, practice, and policy in the FMCG sector. Firstly, the positive impact of technological initiatives such as RFID, EDI, ERP, and MRP on digital distribution efficiency highlights the importance of investing in these technologies to enhance supply chain performance. This suggests that FMCG companies should prioritize the adoption and integration of these technologies into their operations to streamline processes, reduce costs, and improve customer service. Additionally, the identification of specific variables that contribute to digital distribution efficiency provides valuable insights for managers and policymakers seeking to optimize supply chain management strategies. By focusing on these key variables, companies can develop targeted interventions to address inefficiencies and enhance overall performance. Furthermore, the research underscores the significance of embracing



technological advancements in the FMCG sector to remain competitive in today's rapidly evolving market landscape. Companies that fail to adapt to new technologies risk falling behind their competitors and losing market share. Therefore, the findings emphasize the need for continuous innovation and technological investment to drive digital transformation and achieve sustainable growth.

## **5.6 Future Research**

The findings of this research suggest several avenues for future investigation in the field of supply chain management and technology adoption in the FMCG sector. Firstly, future studies could delve deeper into understanding the specific mechanisms through which RFID, EDI, ERP, and MRP contribute to digital distribution efficiency. This could involve qualitative research methods such as case studies or interviews to explore the implementation processes, challenges, and outcomes associated with each technology. Additionally, longitudinal studies could be conducted to assess the long-term impact of technology adoption on supply chain performance and organizational outcomes. Moreover, there is a need to explore the role of emerging technologies such as blockchain, artificial intelligence, and the Internet of Things (IoT) in improving digital distribution efficiency in the FMCG sector. Investigating the integration of these technologies into existing supply chain systems and their effects on performance could provide valuable insights for companies looking to stay ahead in the competitive market. Furthermore, comparative studies across different industries or regions could help identify best practices and factors influencing technology adoption and effectiveness. Overall, future research should aim to provide a comprehensive understanding of the evolving role of technology in supply chain management and its implications for FMCG companies.

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## **Appendix**

### **Impact of Technological Initiatives that Influence Digital Distribution Efficiency in FMCG Sector**

#### **Research Questionnaire**

This survey has been created with the sole intention of gathering information on the " Impact of Technological Initiatives that Influence Digital Distribution Efficiency in FMCG Sector". The information gathered will be treated with a high degree confidentiality and will only be used for academic purposes. You are kindly asked to fill out this questionnaire by circling appropriate answers.

#### **Section A: General Information**

**Name:** \_\_\_\_\_

**Gender:**

- Male
- Female

**Email Address:** \_\_\_\_\_

**Age:**

- 20-30
- 31-40
- 41-50
- Above 50

**Education level:**

- Matriculation/O-Level
- Intermediate/A-Level
- Bachelors
- Masters
- PhD

**Organization:** \_\_\_\_\_

**Designation:**

- Senior Manager
- Middle Level Manager
- Supporting Staff
- Executive
- Front Line Manager

**Job Experience:**

- Less than a year
- 1-3
- 4-6
- 7-9
- More

Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5

### Section B: Independent Variables

<b>Radio Frequency Identification</b> Srinivasan, R., & Choi, T. Y. (2022)	SDA	DA	N	A	SA
RFID offers better tracking and inventory control	1	2	3	4	5
RFID offers, less stock-outs and increase in sales	1	2	3	4	5
RFID offers labor cost reduction	1	2	3	4	5
RFID offers improve stacked lead time	1	2	3	4	5
RFID offers better warehouse management of goods	1	2	3	4	5
<b>Electronic data interchange</b> Gupta, M., & Kohli, R. (2023)					
EDI helps reduce the cost. (Accounting, manufacturing, distribution, and finance)	1	2	3	4	5

EDI helps in efficient flow of information.	1	2	3	4	5
EDI helps in improving the quality of products.	1	2	3	4	5
EDI helped our company in high turnover.	1	2	3	4	5
EDI improved competitiveness.	1	2	3	4	5
<b>Enterprise Resource Planning</b> Azad, N., & Ali, S. (2022)					
The contract agreements will be easier to manage	1	2	3	4	5
The order lead-time will decrease	1	2	3	4	5
The costs in procurement will be reduced	1	2	3	4	5
The customers are more integrated in the new system	1	2	3	4	5
The suppliers are more integrated in the new system	1	2	3	4	5
<b>Material Requirement Planning</b> Tuzunkan, D., & Ilk, B. (2022)					
Implementation of MRP has improved responsiveness	1	2	3	4	5
Implementation of MRP has reduced production cost.	1	2	3	4	5
Implementation of MRP has increased sales revenue.	1	2	3	4	5
Implementation of MRP has improved delivery time to customers.	1	2	3	4	5
Implementation of MRP has increase operational flexibility.	1	2	3	4	5

### Section C: Digital Distribution Efficiency

<b>Digital Distribution Efficiency</b> Lee, J., & Lee, H. (2022)	SDA	DA	N	A	SA
Digital distribution processes are efficient	1	2	3	4	5
Digital technologies streamline supply chain operations	1	2	3	4	5
I am satisfied with the accuracy of data exchange	1	2	3	4	5
Digital tools improve distribution efficiency	1	2	3	4	5
My organization optimizes inventory management	1	2	3	4	5

# MBA

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