Understanding and Digitalizing the Supply Chain in Bangladesh's RMG Sector: Current Practices, Challenges, and Opportunities

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A Dissertation submitted to the Brac Institute of Governance and Development in partial fulfillment of the requirements for the degree of
Masters in Procurement and Supply Management

BRAC Institute of Governance and Development
BRAC University
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Letter of transmittal

22 April 2025

Syed Mahbubur Rahman, PhD
Professor
Brac Business School, Brac University
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Subject: Submission of Thesis Paper titled "Understanding and Digitalizing the Supply Chain in Bangladesh's RMG Sector: Current Practices, Challenges, and Opportunities"

Dear Sir,

In correlation with the requirement of partial fulfillment for my degree of Masters in Procurement and Supply Management, I am submitting my dissertation for your kind perusal.

This paper analyzes the present state of the supply chain management in RMG sector, digitalizing of it along with challenges and opportunities.

I hope you find this report satisfactory as per the requirements stipulated by Brac University.

Sincerely yours
Raihan Hossain
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Declaration

It is hereby declared that

1. The thesis submitted is my own original work while completing degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

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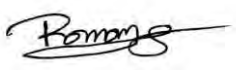

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Approval

The thesis/project titled "**Understanding and Digitalizing the Supply Chain in Bangladesh's RMG Sector: Current Practices, Challenges, and Opportunities**" submitted by Raihan Hossain (ID 22282011) of Fall, 2022 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Masters in Procurement and Supply Management.

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Abstract/ Executive Summary

This dissertation explores the current practices, challenges, and opportunities in the supply chain of Bangladesh's Ready-Made Garments (RMG) sector, with a focus on digitalization. As the largest contributor to the nation's export earnings, the RMG industry faces significant supply chain inefficiencies due to limited adoption of advanced digital tools such as Enterprise Resource Planning (ERP) systems. The study analyzes data collected from key industry stakeholders, highlighting critical issues such as dependency on imports, quality control challenges, and inadequate logistics infrastructure. Additionally, barriers to digital transformation, including cost constraints, lack of expertise, and resistance to change, are identified. Despite these challenges, the research underscores opportunities for improvement through digital technologies, such as IoT, blockchain, and predictive analytics, which can enhance transparency, efficiency, and sustainability. Recommendations are provided to foster innovation and competitiveness in the sector, emphasizing the importance of ERP adoption, skill development, and strategic investment in supply chain digitalization.

Keywords: RMG sector, supply chain, digitalization, iOT, e-GP tender, ERP, Bangladesh, challenges, opportunities, sustainability.

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List of Acronyms

GDP	Gross Domestic Product
RMG	Ready Made Garments
ERP	Enterprise Resource Planning
SCM	Supply Chain Management
JIT	Just In Time
R&D	Research & Development
H&M	Hennes & Mauritz
C&A	Clemens & August
PO	Purchase Order
T&A	Time & Action
BOM	Bill of Material
CS	Comparative Statement
CRM	Customer Relationship Management
HRM	Human Resource Management
MRP	Material Resource Planning
ICT	Information and Communication Technology
RFID	Radio Frequency Identification
GOTS	Global Organic Textile Standard
IoT	Internet of Things
AI	Artificial Intelligence
EGP	e- Government Procurement

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Chapter 1

Introduction

1.1 Background

Bangladesh economical pillar is the readymade garments industry. The “Made in Bangladesh” tag labels have provided us significant appreciation and honor and turned into global brand. Once written off by skeptics as a "hopeless case," Bangladesh has transformed into a "basket of possibilities," achieving an impressive 6% annual GDP growth on average. Despite having limited resources, the country has made remarkable progress in social and human development (Bangladesh Development Update Recovery and Resilience Amid Global Uncertainty, 2022).

After gaining independence in 1971, Bangladesh faced the tough challenge of rebuilding its war-torn economy with very little industrial infrastructure. During its time as East Pakistan, unfair policies held back industrial growth (*02-Bangladesh-Development_27052020-Edited-Rev*, n.d.). In this situation, the rise of the ready-made garment (RMG) sector has been truly game-changing. Today, the RMG industry is the country's biggest export earner, contributing around 83% of total export income (LDC GRADUATION Turning Challenges into Opportunity, n.d.). However, this success depends on a strong and efficient supply chain, covering raw material sourcing, machinery, equipment, and logistics.

The supply chain in the RMG sector is an intricate system that connects both global and local suppliers, playing a crucial role in sustaining the industry's competitiveness on the world stage (Roy & Hossain, 2016). Proper management of this supply chain is essential to ensure that high-quality raw materials are available on time, production deadlines are met, and the strict quality requirements of international markets are satisfied. The use of advanced machinery and equipment, procured from both international and domestic sources, is vital for boosting production efficiency and driving innovation (Tareque et al., 2020).

In modern times technological advancement and digitalization have become the game changer for supply chain management. Technologies such as block chain, IoT, AI and cloud-based ERP systems have brought more traceability and efficiency in the RMG supply Chain (Three Game-Changing Supply-Chain Technologies, n.d.). However, the adoption of these technologies in Bangladesh's RMG sector remains limited, presenting both challenges and opportunities for growth (Salman et al., 2024)

This research seeks to explore the current practices, challenges, and opportunities in the supply chain of Bangladesh's RMG sector, with a particular focus on the potential of digitalization to drive transformative change. By understanding the existing gaps and proposing actionable solutions, this study aims to contribute to the sector's sustainable growth and resilience in an increasingly competitive global market. The findings will provide valuable insights for stakeholders, including manufacturers, policymakers, and technology providers, to make informed decisions and foster innovation in the RMG supply chain.

Technologies such as Enterprise Resource Planning (ERP), Artificial Intelligence (AI), and the Internet of Things (IoT) are revolutionizing how businesses forecast demand, manage inventory, collaborate with suppliers, and track goods across the value chain. However, while global brands increasingly invest in smart supply chains, many Bangladeshi RMG manufacturers still operate with fragmented, paper-based, or semi-automated systems. This lack of integration leads to inefficiencies, poor visibility, quality concerns, and cost escalations.

At the same time, the public procurement sector in Bangladesh has seen a remarkable shift through the e-Government Procurement (e-GP) system an electronic platform that has brought transparency, accountability, and efficiency to state procurement processes. Inspired by this, there is a growing opportunity to implement a digital tendering model within the private garment sector for sourcing raw materials, which could significantly reduce procurement lead time, mitigate corruption or collusion risks, and ensure better price discovery.

Hence, this dissertation investigates how the digitalization of supply chains in the garment sector, particularly through the adoption of ERP, AI, and IoT, can be leveraged for improved performance and introduces a new implementation model: private-sector e-tendering for raw materials, inspired by the government’s e-GP system.

1.2 Rationale of the Study

The traditional RMG supply chain is often reactive, relying on manual coordination among departments and suppliers. Lead times are lengthy, material wastage is high, and disruptions like political unrest, port congestion, or global crises can cripple operations. In contrast, ERP systems can centralize operations, enabling better planning and control. AI can support predictive analytics, supplier risk analysis, and demand forecasting. And IoT devices—like RFID and sensors—can bring real-time visibility into production and logistics.

(Pal & Yasar, 2020) highlight how the integration of IoT and blockchain in the apparel supply chain can solve the prevalent issue of data silos by enabling secure, transparent, and real-time data exchange among stakeholders. Their model introduces RFID and sensor-based tracking systems that can improve inventory management, warehouse operations, and even sustainability compliance in textile manufacturing.

Meanwhile, the tendering process for material sourcing remains outdated in most garment factories. Negotiations are often informal, supplier selection lacks transparency, and price fluctuations are not always market-reflective. Drawing from public sector experience, (Rahman et al., n.d.) examined the procurement framework of Bangladesh's Directorate of Primary Education and emphasized the importance of lead time reduction and digital process adoption. Their insights can be adapted for private supply chains, where a similar e-tendering system can bring structure, transparency, and traceability to purchasing decisions.

This study therefore explores a hybrid solution: Digitalizing the supply chain via ERP/AI/IoT while introducing a structured e-tendering process for raw material sourcing potentially transforming both internal operations and supplier collaboration in the RMG sector.

Electronic procurement (e-procurement) has revolutionized public sector supply chains by automating bidding processes, enhancing transparency, and reducing corruption (Rahman et al., n.d.). The e-GP system in Bangladesh demonstrates how digital platforms can streamline supplier selection, ensure competitive pricing, and improve accountability in procurement (*EGP_Guidelines*, n.d.). However, while e-procurement is well-established in government sectors, its adoption in private supply chains particularly in RMG raw material sourcing remains limited. By integrating an ERP-supported e-tendering mechanism, garment

manufacturers can automate supplier bidding, real-time price comparison, and contract management, thereby optimizing procurement cycles and reducing lead times.

This research explores the feasibility of implementing an e-tendering system in the RMG supply chain, leveraging technologies such as ERP, AI, and blockchain to enhance decision-making and traceability.

1.3 Research problem

There are some challenges in supply chain management regarding RMG sectors. Despite its rapid growth, the sector faces considerable supply chain challenges that impede its efficiency and global competitiveness. Poor transportation and logistics infrastructure, including roads, ports, and warehousing facilities, cause delays and increase costs. Despite the advantages of Enterprise Resource Planning (ERP) systems in streamlining operations, many companies in Bangladesh's RMG sector have not adopted ERP. This lack of ERP usage contributes to inefficiencies, poor data management, and difficulties in maintaining supply chain transparency.

Under this report researcher has worked on the " Understanding and Digitalizing the Supply Chain in Bangladesh's RMG Sector: Current Practices, Challenges, and Opportunities". The researcher tried to illustrate the present supply chain pracices, challenges and opportunities by collecting data from his and present work place **"Dekko Legacy Group"** previous workplace **"Fakir Apparels Limited".**

1.4 Research Objectives and Research Questions.

The purpose of this study is to examine the current supply chain landscape of Bangladesh's RMG sector and explore strategies for its digital transformation.

However, the study objectives are:

This research aims at assessing the status of digital supply chain management in the readymade garments industry in Bangladesh. It explores the current practices, obstacles digitization of supply chain faces, and the opportunities, taking the cases of Dekko Legacy Group and Fakir Apparels Limited, two of the renowned RMG producers in Bangladesh

To achieve the research objective, the following research questions need to be answered:

a) What are the existing supply chain management (SCM) practices in Bangladesh's RMG sector, and how do they impact operational efficiency?
b) To what extent are ERP systems and digital tools (e.g., IoT, AI) currently adopted, and what gaps persist in their integration?
c) What role can industry collaborations, government support, and tender systems (e.g., eGP-type auctions) play in reducing costs and improving transparency?

Chapter 2

Literature Review

2.1 Garments History of Bangladesh

As a driving force behind expansion and change, the ready-made garment (RMG) sector has been essential to Bangladesh's economic prosperity. The "Made in Bangladesh" label has elevated the nation to a respectable position in the global apparel market and given it international prominence. Cynics formerly called Bangladesh a "bottomless basket," but now they see it as a "basket full of wonders," with a remarkable average GDP growth rate of 6% annually and notable advancements in social and human development (LDC GRADUATION Turning Challenges into Opportunity, n.d.)

After gaining independence in 1971, Bangladesh was one of the poorest countries in the world, with inadequate industrial infrastructure. The area experienced discriminatory regulations that hindered economic progress while it was East Pakistan (*02-Bangladesh-Development_27052020-Edited-Rev*, n.d.). With little resources, rebuilding the war-torn nation was an enormous task. But the 1980s saw the rise of the RMG sector, which signaled a sea change in Bangladesh's economic development. With 83% of overall export revenue, the RMG industry is currently the nation's top export earner (LDC GRADUATION Turning Challenges into Opportunity, n.d.).

Figure 2.1 : Garments worker working in friendly environment

When Bangladesh's jute industry, once the primary export earner, began to decline, the RMG sector stepped in to fill the void and eventually surpassed it. The apparel industry started its journey in the 1980s and has since grown into a global powerhouse. The late Nurool Quader Khan is widely regarded as the pioneer of the RMG industry in Bangladesh. In 1978, he sent 130 trainees to South Korea to learn garment production techniques, laying the foundation for the industry's growth (Hossain et al., 2021). Upon their return, these trainees helped establish the first RMG factory, Desh Garments, which marked the beginning of Bangladesh's export-

oriented garment industry.

Figure 1.2: Desh garments (the first ever garments industry in Bangladesh)

Following this groundbreaking initiative, other visionary entrepreneurs, such as the late Akhter Mohammad Musa of Bond Garments, Mohammad Reazuddin of Reaz Garments, and Engineer Mohammad Fazlul Azim of Azim Group, established some of the earliest garment factories in the country (BGMEA, 2023). Their efforts inspired a wave of industrial growth, and the RMG sector quickly became a cornerstone of Bangladesh's economy. Despite numerous challenges, including labor issues and global market fluctuations, the industry has demonstrated remarkable resilience and continues to thrive.

One of the most significant milestones in the industry's history was the elimination of child labor in 1995, following international scrutiny in 1994 (York, 1995). This achievement not only improved the sector's global reputation but also underscored its commitment to ethical practices.

Overview of Supply Chain Management

2.2. Supply Chain Management:

The broad objectives of supply chain management are to create value, build a competitive infrastructure, leverage worldwide logistics, synchronise supply with demand and measure performance. The following points should also be considered:

- SCM is about the efficient and effective management of all activities from primary suppliers right through to the point of sale.
- In some sectors, SCM is a key activity, whilst in others it is less important. Procurement and supply professionals should become increasingly involved in SCM, ideally playing a leading role in its development wherever possible.
- For best results, SCM requires a senior sponsor appropriate to the sector.
- SCM has a pivotal role to play within the organisation, involving responsibility for predicting and satisfying end customers' demand back through to the suppliers.

2.3 Importance of supply Chain Management :

Effective supply chain management (SCM) is a cornerstone of organizational success, directly contributing to financial performance by aligning operations with corporate strategy and delivering value to stakeholders. By optimizing procurement, operations, and logistics, SCM reduces operational costs across the entire supply chain, thereby enhancing profitability. For large organizations, the scale of financial success is often closely tied to the efficiency of their supply chain processes (SUPPLY CHAINS: A FINANCE PROFESSIONAL'S PERSPECTIVE, 2022).

Beyond its financial impact, SCM plays a vital role in ensuring customer satisfaction. The timely delivery of high-quality products and services is a direct result of well-managed supply chains, which help organizations meet customer expectations and build long-term loyalty. Moreover, SCM has a broader societal impact that is often overlooked. It ensures the steady flow of essential goods such as food, clothing, energy, medicine, and infrastructure, which are critical to modern life and human well-being(SUPPLY CHAINS: A FINANCE PROFESSIONAL'S PERSPECTIVE, 2022).

However, a significant challenge lies in effectively communicating the value of SCM to stakeholders. Without clear articulation of its contributions and demonstrated success, it can be difficult to gain the recognition and support necessary for continued investment and improvement in supply chain practices(SUPPLY CHAINS: A FINANCE PROFESSIONAL'S PERSPECTIVE, 2022).

Components of Supply Chain Management

2.4 Planning

Planning is the foundational stage of supply chain management (SCM) and involves forecasting demand, allocating resources, and developing strategies to align supply with customer needs. In the context of the Ready-Made Garment (RMG) sector, planning is crucial for managing the entire production lifecycle, from demand forecasting to production scheduling and resource allocation. Given the global nature of the apparel industry, Bangladeshi manufacturers must align their production processes with international trends and seasonal demands, requiring meticulous planning to meet the strict deadlines and orders of global buyers (Chopra & Meindl, 2016).

However, the RMG sector in Bangladesh faces significant challenges in planning due to frequent fluctuations in demand from international brands and a lack of access to advanced forecasting tools. These issues often result in inefficiencies such as excess inventory or stockouts, which can disrupt production and lead to financial losses. To address these challenges, the adoption of advanced digital tools, such as Enterprise Resource Planning (ERP) systems, can significantly enhance the accuracy and efficiency of demand forecasting and planning processes (Chopra & Meindl, 2016).

Despite the potential benefits of digital tools, many garment manufacturers in Bangladesh continue to rely on manual planning systems. This reliance on outdated methods often leads to delays, inefficiencies, and an inability to respond swiftly to changing market demands. Transitioning to automated and data-driven planning systems is essential for improving the competitiveness and resilience of the RMG sector in the global market (Chopra & Meindl, 2016).

2.5 Sourcing

Sourcing is a critical component of supply chain management (SCM) that involves selecting suppliers, procuring raw materials, and managing supplier relationships to ensure the quality and timeliness of materials. In the Ready-Made Garment (RMG) sector, sourcing encompasses the procurement of essential inputs such as fabrics, accessories, dyes, and trims required for garment production. Bangladeshi manufacturers often source these materials both locally and internationally, with a significant reliance on countries like China and India for fabrics. Effective supplier relationship management is vital to maintaining consistent material quality and ensuring on-time deliveries(Monczka et al., 2016).

However, the heavy dependency on foreign sources for raw materials, particularly fabrics, poses significant challenges. Geopolitical tensions, shipping delays, and price fluctuations can create bottlenecks, disrupting production schedules and increasing costs. To mitigate these risks, developing a robust local backward linkage industry such as domestic fabric and accessories production could reduce reliance on imports and shorten lead times. For instance, companies like Fakir Apparels Ltd. have adopted vertical integration by producing fabrics in-house alongside garment manufacturing. This strategy has allowed them to reduce dependency on imported fabrics and gain greater control over their supply chain (Monczka et al., 2016).

Investing in local sourcing capabilities not only enhances supply chain resilience but also supports the growth of domestic industries, creating a more sustainable and self-reliant ecosystem for the RMG sector in Bangladesh.

2.6 Manufacturing/Production

Manufacturing involves the production or assembly of goods. Proper management of production processes ensures that products are made in the right quantities and delivered on time to meet customer demand. In the Ready-Made Garment (RMG) sector, this includes steps like cutting, sewing, and finishing garments. Bangladesh's RMG industry relies heavily on labor, with workers skilled in large-scale garment production. Efficient production management is crucial to keep up with the fast-paced demands of global brands like Zara, H&M, and Walmart.

2.7 Logistics (Transportation & Warehousing)

Logistics is all about moving, storing, and delivering goods efficiently. It ensures that products reach their destination on time and are stored properly. For the Ready-Made Garment (RMG) industry, logistics is especially important because it helps move raw materials to factories and finished products to global markets. In Bangladesh, most garment exports are shipped through ports like Chittagong, using both air and sea transport. However, problems like slow port operations, traffic jams in cities like Dhaka, and a lack of good storage facilities can cause delays in the supply chain. To fix these issues, improving port facilities, building more warehouses, and using digital tools to track shipments in real-time can help. In the past, delays at Chittagong port have caused problems, such as missed deadlines and fines from buyers (Christopher, n.d.).

2.8 Inventory Management

Inventory management is about keeping the right amount of stock to meet customer demand without having too much or too little. It involves tasks like storing goods, controlling stock levels, and managing materials. In the garment industry, good inventory management ensures that raw materials like fabric, thread, and accessories are available when needed, helping factories meet production deadlines without delays.

However, many Ready-Made Garment (RMG) companies still rely on manual systems for managing inventory. This often leads to mistakes, poor stock control, and problems like running out of materials or having too much stock. These issues can disrupt production and increase costs. To solve these problems, companies can use automated systems like barcode scanning or RFID technology.IoT can be used vastly here for digitilization. These tools improve accuracy and efficiency by providing real-time updates on stock levels. For example, companies like Dekko Legacy Group could use real-time tracking systems to monitor materials and avoid production delays (Nahmias & Demmy, 1981).

2.9 Information Flow/Technology

Information flow within the supply chain ensures coordination between suppliers, manufacturers, and distributors. Technologies like ERP (Enterprise Resource Planning) systems and digitalization efforts enable real-time data sharing and decision-making.

The efficient flow of information within the supply chain—from suppliers to manufacturers to distributors is critical in the RMG sector. This includes sharing design specs, production schedules, order updates, and delivery timelines with all stakeholders.

Many RMG companies in Bangladesh lack integrated information systems, leading to poor communication, delays, and errors. Manual systems dominate, making real-time data sharing difficult.

Digitalizing the supply chain through ERP systems or cloud-based platforms could provide real-time updates on inventory, production status, and order fulfillment.

Companies that have adopted ERP systems, like Fakir Apparels Ltd., can manage information flow more efficiently, which results in better coordination between production and customer order management(Laudon & Laudon, 2022).

2.10 Returns/Reverse Logistics

The process of returning defective or surplus products and managing the reverse flow efficiently to minimize losses.

Returns management involves handling defective or excess goods, as well as managing customer returns. In the garment sector, returns can occur due to defects or non-compliance with buyer specifications, requiring effective reverse logistics to minimize costs and maintain customer satisfaction.

Due to long lead times and high transportation costs, managing returns can be complex and costly, especially in the case of export orders.

Strengthening quality control and ensuring better communication between factories and buyers could reduce the incidence of returns. Setting up local warehouses for returned products could also improve reverse logistics.

Larger brands may demand replacements for faulty garments, which the RMG companies have to manage efficiently to avoid penalties (Going Backwards: Reverse Logistics Trends and Practices, n.d.).

Chapter 3

Methodology

3.1 Research Design

This study adopts a qualitative research design to explore the current practices, challenges, and opportunities in digitalizing the supply chain of Bangladesh's Ready-Made Garment (RMG) sector. Qualitative methods are chosen to capture in-depth insights, contextual nuances, and stakeholder perspectives that quantitative data alone cannot provide. The research is exploratory and descriptive, aiming to understand the "how" and "why" behind the limited adoption of digital tools (e.g., ERP, IoT) and the potential for transformative change.

3.2 Data Collection Methods

Primary Data Collection

1. **In-Depth Interviews**: Semi-structured interviews were conducted with 15–20 key stakeholders, including:
    - Supply chain managers and procurement officers from **Dekko Legacy Group** and **Fakir Apparels Limited**.
    - Industry experts (e.g., BGMEA representatives, technology providers).
    - Government officials involved in e-procurement (e-GP) initiatives. Interviews focused on:
    - Current SCM practices and pain points.
    - Barriers to digitalization (cost, expertise, resistance).
    - Perceptions of ERP, IoT, and e-tendering systems.
2. **Focus Group Discussions (FGDs)**: Two FGDs were held with mid-level managers (production, merchandising, logistics) to identify operational challenges and collaborative solutions.
3. **Case Studies**: Detailed analysis of **Dekko Legacy Group** and **Fakir Apparels Limited** was conducted to examine:
    - Existing digital tools (e.g., ERP adoption).
    - Successes/failures in implementing e-tendering or traceability systems.

Secondary Data Collection

Secondary sources included:

- **Academic literature**: Peer-reviewed journals on SCM, digitalization, and RMG sector dynamics.
- **Industry reports**: BGMEA, McKinsey, and World Bank publications on Bangladesh's RMG supply chain.
    - **Company documents**: Internal reports, procurement policies.

3.3 Data Analysis Techniques

Qualitative data was analyzed using **thematic analysis**:

1. **Coding**: Interview transcripts and FGD notes were coded to identify recurring themes (e.g., "ERP resistance," "import dependency").
2. **Pattern Recognition**: Themes were grouped into categories:
    - **Challenges**: Lack of digital infrastructure, supplier opacity.
    - **Opportunities**: ERP benefits, e-tendering potential.
3. **Triangulation**: Findings were cross-verified with secondary data (e.g., BGMEA reports) to ensure validity.

3.4 Ethical Considerations

- Participants provided **informed consent**; anonymity was maintained (e.g., "Manager A, Fakir Apparels").
- Company-specific data was anonymized to protect confidentiality.

3.5 Limitations of the Study

1. **Sample Bias**: Findings may not generalize to all RMG firms (limited to two case studies).
2. **Subjectivity**: Qualitative interpretations may reflect researcher bias, mitigated by triangulation.
3. **Time Constraints**: Depth of interviews was limited by participants' availability.

Chapter 4

4.1 Current Supply Chain Scenario in RMG sector

The garment supply chain in Bangladesh typically operates as a **pull supply chain** at the manufacturing and export levels. Here's why:

Demand-Driven Production: Most Bangladeshi garment manufacturers operate based on orders placed by international buyers (such as large retail brands). These orders are often customized to the buyers' specifications, with quantities, colors, sizes, and delivery schedules tailored to their needs. This means production is "pulled" based on actual demand rather than on anticipated or forecasted demand, which is characteristic of a pull system.

Just-in-Time (JIT) Approach: Many manufacturers adopt JIT practices to reduce inventory costs, as holding large volumes of stock can be expensive. Materials and components are ordered based on immediate production requirements to fulfill customer orders, reinforcing the pull model(SUPPLY CHAINS: A FINANCE PROFESSIONAL'S PERSPECTIVE, 2022).

Reactive Production Cycles: Unlike in a push supply chain, where products are manufactured based on forecasts, the Bangladeshi RMG sector generally waits for purchase orders to start production. This is especially true for custom, high-volume orders from major brands that update collections seasonally or as fashion trends change.

However, some push elements exist in the **upstream parts of the supply chain**, such as raw material production. For instance:

Fabric and Yarn Sourcing: Suppliers may produce or stock certain raw materials based on anticipated demand to meet shorter lead times, particularly for fast fashion retailers.

Inventory Buffers: Some manufacturers keep buffer stocks of basic raw materials (e.g., fabric or trims) to meet urgent demand and avoid delays.

Overall, the RMG sector in Bangladesh is largely **demand-driven** and operates predominantly on a pull-based model, particularly for end-product manufacturing and export.

4.2 **Total Procedure**

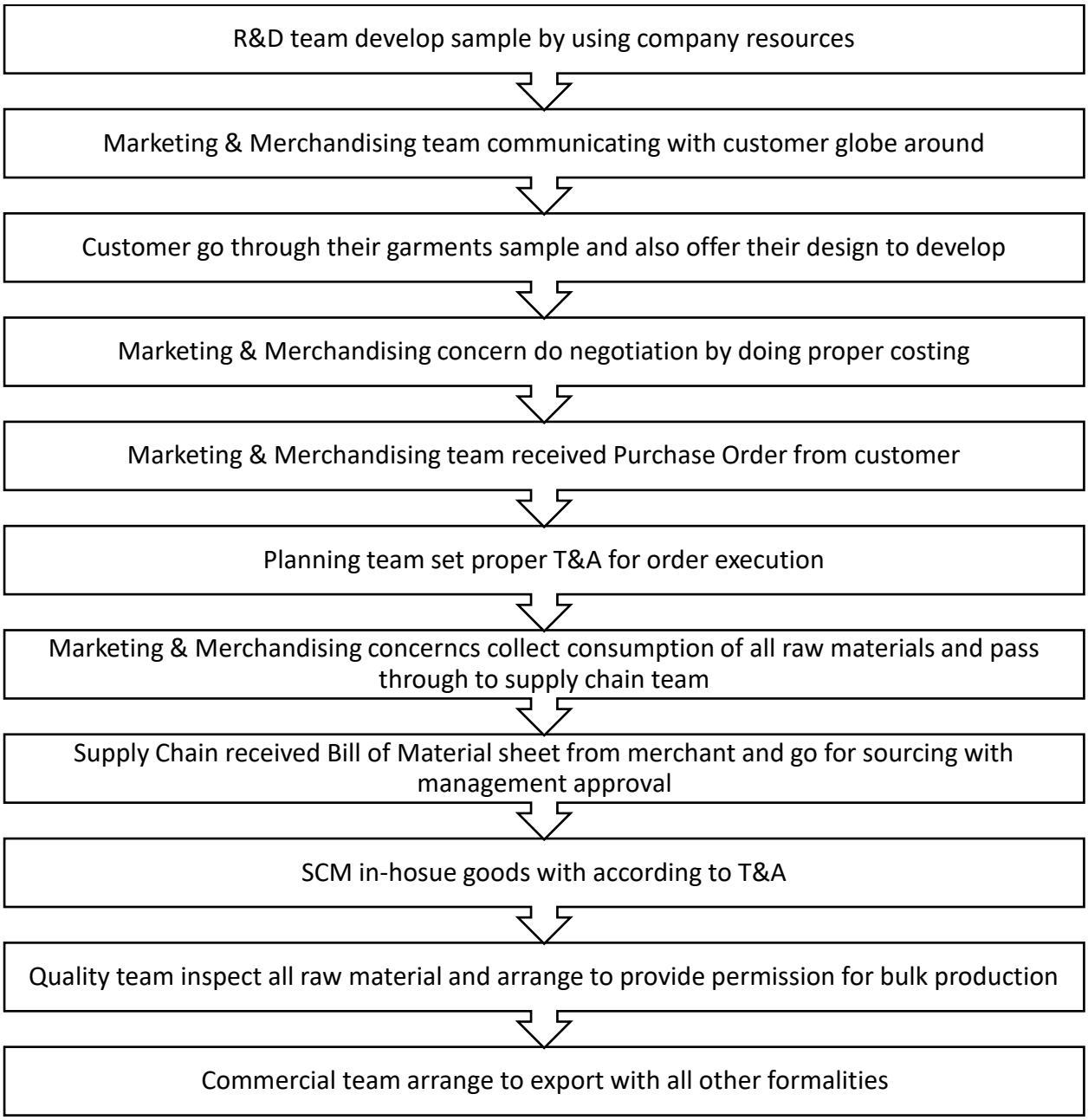

Table 4.1 : Total process flow chart of Ready Made Garments Supply Chain

4.3 R&D team develop sample by using company resources

The Research and Development (R&D) department is where skilled designers work, utilizing their expertise and exposure to the latest global design trends. They are equipped with advanced computerized tools and software to excel in their tasks. The R&D team is responsible for developing initial garment samples by leveraging available resources such as fabrics, machinery, and skilled labor. This stage is vital in the product development process, as it allows the team to evaluate designs, assess quality, and ensure functionality.

4.4 Marketing & Merchandising team communicating with customer globe around

The Marketing and Merchandising teams reach out to customers worldwide to understand their needs, present new designs, and discuss potential orders. This interaction helps tailor the products to specific customer preferences and market trends. They communicate with customer with their best design and product to attract customer.

Some customers list in below (Region wise) :

1. North America

United States: Major US retailers and brands like Walmart, Target, Gap Inc., Levi Strauss & Co., Nike, VF Corporation (owner of brands like The North Face and Timberland), and Calvin Klein source heavily from Bangladesh due to competitive pricing and quality.

Canada: Companies like Hudson's Bay, Lululemon, Joe Fresh, and Reitmans frequently source from Bangladeshi suppliers.

2. Europe

United Kingdom: Retailers such as Primark, Marks & Spencer, Next, and Tesco are known for sourcing a significant amount of their garments from Bangladesh.

Germany: German brands and retailers, including H&M, C&A, Lidl, and Aldi, rely heavily on Bangladeshi garment factories.

Sweden: H&M is one of the largest buyers from Bangladesh and has long-standing relationships with Bangladeshi suppliers.

France: Companies like Carrefour, Decathlon, and Auchan source garments from Bangladesh.

Spain: Zara (Inditex Group) and Mango are notable Spanish brands that work with Bangladeshi manufacturers.

Netherlands: Dutch retailers like C&A (which operates in multiple European countries) and HEMA source from Bangladesh.

3. Asia

Japan: Uniqlo (Fast Retailing) has a strong presence in Bangladesh's RMG sector, along with other Japanese companies focusing on quality textiles.

China: While China is a major global manufacturer, some Chinese brands source garments from Bangladesh to meet the demand for lower-cost production.

India: Indian retailers and brands, including Reliance Retail, Flipkart, and Shoppers Stop, occasionally source products from Bangladesh.

South Korea: Companies like E-Land are known to have partnerships with Bangladeshi garment suppliers.

4. Australia

Brands like Cotton On, Kmart, Target Australia, and Woolworths source from Bangladesh, largely due to cost-effectiveness and competitive quality.

5. Middle East

Retailers like Landmark Group (with brands like Max Fashion) and Lulu Group International source from Bangladesh, catering to the demand for affordable fashion in the Middle Eastern markets (Prothom Alo, 2024).

4.5 Customer Reviews Samples and Offers New Designs

Customers examine the samples provided by the company. They may approve these designs or request customizations to align with their brand standards, style requirements, or seasonal trends.

4.6 Negotiation and Costing by Marketing & Merchandising

The Marketing and Merchandising team performs cost analysis and negotiates terms with the customer, considering factors like material, labor, and production overhead. This step ensures the pricing is competitive and profitable.

4.6 Marketing & Merchandising team received Purchase Order from Customer

Once the negotiation is successful, the customer places a formal Purchase Order (PO) specifying the quantities, designs, and delivery timelines. This order becomes the basis for further production planning. In PO all order description are mentioned like payment terms, order qty, shipment mode etc.

4.7 Planning Team Sets Time and Action (T&A) for Order Execution

The Planning team creates a timeline (Time and Action calendar) for the order's production, allocating resources, scheduling tasks, and setting deadlines. This helps coordinate activities across departments to meet the customer's delivery date.

4.8 Collection of Raw Material Consumption by Marketing & Merchandising

The Marketing and Merchandising team calculates the required raw materials for the order and forwards this consumption data to the Supply Chain team. This ensures the correct quantities are procured to avoid delays or excess inventory.

Supply Chain Receives Bill of Material (BOM) and Sources Materials

The Supply Chain team receives the Bill of Material (BOM) from Merchandising, detailing the raw materials needed. With management approval, the team sources these materials from suppliers, considering quality, cost, and lead times.

4.9 SCM In-Houses Goods According to T&A

The Supply Chain Management (SCM) team ensures that all necessary materials arrive at the factory on schedule, following the T&A plan. This is crucial for maintaining the production timeline and avoiding delays.

4.10 Quality Team Inspects Raw Materials and Approves Bulk Production

The Quality Assurance team inspects the raw materials for consistency, durability, and compliance with standards. Upon approval, the materials are released for mass production, ensuring quality in the final product.

4.11 Commercial Team Prepares for Export with Formalities

Once production is complete, the Commercial team manages the export logistics, including documentation, packaging, customs clearance, and shipping. This final step ensures a smooth transition from production to delivery.

4.12 Supplier Development

Supplier development in the Ready-Made Garments (RMG) Supply Chain Management (SCM) is a crucial aspect for ensuring consistent quality, timely deliveries, and cost-effective production. Supplier development in this context focuses on building and maintaining reliable relationships with suppliers to improve overall performance. For raw material procurement like Fabric, Trims & Accessories, supplier devlopment is mandatory. Additionally we have seen there are some nominated suppliers regarding customer wise. So there is some bindings regarding supplier selection.

Here some supplier list itemwise :

Fabric :

- Ha-meem denim limited
- Zaber and zubair fabrics ltd
- King base pte.ltd.
- NZ denim ltd
- Argon denims ltd
- Pioneer denim ltd.
- Hangzhou sanjin textiles
- Jamuna denim
- Sanjana fabrics ltd.

Trims & Accessories :

- YKK bangladesh pte Ltd.
- SAB weixing co. Ltd.
- COATS Bangladesh
- Dekko Accessories Ltd.
- Paxar bangladesh Ltd.
- Mcdry desiccant limited
- Mainetti Bangladesh Ltd
- Atex international co. Ltd.
- R-pac Bangladesh
- Uniglory packaging industries
- Nine united Bangladesh ltd.
- OTL-Doublegull
- Check point
- Suzhou laisheng
- Rotex bangladesh ltd.
- Esquire accessroies ltd
- American & Efird, BD
- Shanghai topping textile
- Montrims Ltd.
- Naturub accessories

4.13 Negotiation

Negotiation in the garments supply chain is crucial due to the industry's competitive nature, tight margins, and the need for cost efficiency. Buyers in the garments industry aim to achieve the lowest possible price without compromising quality. Fluctuations in raw material costs, labor expenses, and other supply chain variables can impact final pricing. Buyers often use volume leverage, long-term contracts, or multi-sourcing strategies to negotiate favorable pricing with suppliers. SCM negotiate with suppliers with price , payment terms, incoterms, quality and delivery terms.

4.14 Comparative Statement (CS) Approval

A Comparative Statement (CS) in the garment supply chain is prepared before placing bookings to evaluate supplier quotes and select the best option based on cost, quality, and delivery terms. This document outlines each supplier's details, item specifications, quantity, unit prices, total costs, delivery timelines, and payment terms, allowing the procurement team to assess value for money. Often formatted as a table, the CS enables easy comparison and may include weighted criteria to rank suppliers. This structured approach ensures an objective selection, balancing quality and budget while justifying the final choice before approval.

4.15 Booking Placement and Inhouse goods according to T&A

In the garment supply chain, Booking Placement and In-House Goods Tracking are managed according to the Time and Action (T&A) plan to ensure timely production. Bookings for materials, such as fabrics and trims, are aligned with the T&A schedule, allowing lead times to be managed effectively and ensuring materials arrive when needed for each production stage. Coordinating with suppliers and tracking shipments closely ensures that materials are in-house on time, preventing production delays. This structured approach enables smooth workflow from raw material acquisition to final garment completion, optimizing efficiency and meeting delivery deadlines. Bookings are made through ERP software.

4.16 Solve quality issues if have any

In the garment supply chain, several practical measures are taken to address and prevent quality issues. First, pre-production meetings and production teams ensure everyone understands quality expectations, material specifications, and design details. During production, inline quality inspections are conducted at key stages (such as after cutting, sewing, and finishing) to catch defects early. Additionally, random sample testing helps verify that the product meets standards before full-scale production continues. In some cases, external lab testing is used for fabric durability, colorfastness, and shrinkage to ensure materials meet compliance standards. Post-production, a final inspection is done on a batch basis to identify any remaining quality issues before shipment. Training and continuous feedback loops for workers also reinforce quality standards and provide data for improving processes over time. These practices together create a robust quality management system that minimizes defects and enhances product consistency.

Chapter 5

Current Supply Chain Challenges, and Opportunities in RMG sector

Current Challenges

- Lack of Digitalization and ERP Systems
- Dependency on Imports for Raw Materials
- Quality Control Issues
- Logistics and Infrastructure Constraints
- Limited Supplier Transparency and Traceability
- Environmental and Sustainability Concerns

Above challenges are taken from Dekko Legacy Group.

5.1 Lack of Digitalization and ERP Systems

ERP refers to Enterprise Resource Planning software. In general, ERP is an industry term for the broad set of activities supported by the multi-module application software that help our manufacturer including order receive, booking, sourcing, production planning, purchasing, maintaining inventories, interacting with suppliers, providing customer service, and tracking orders.

Typically, an ERP system is integrated with a relational database system. It attempts to integrate all departments and functions across a company onto a single computer system that can serve all those departments' particular needs. The integration streamlines internal business processes and improves the productivity of a company.

In Bangladesh, many RMG (Ready-Made Garments) factories are still continue to operate without ERP (Enterprise Resource Planning) systems, which has led to significant challenges and missed opportunities for growth and efficiency. Without ERP, factories struggle with disorganized data management and a lack of real-time visibility into operations, from procurement to production and distribution. This lack of integration makes it difficult to streamline processes, forecast demand accurately, and respond to dynamic market needs, leading to inefficiencies that increase operational costs and delay deliveries. Additionally, without ERP, tracking inventory and managing supply chain logistics becomes cumbersome, often resulting in wastage or stockouts, which can directly impact profitability. The absence of ERP also means a missed opportunity to gather and analyze critical data for strategic decision-making, thereby limiting these factories from realizing their full potential in a

competitive global market. Embracing ERP could drive transformative changes in efficiency, cost savings, and customer satisfaction, yet the barriers of implementation cost, lack of digital skills, and resistance to change keep many factories from adopting this crucial technology. In Fakir Apparels Ltd. ERP is more organised, but not hav IoT yet

5.2 To be concise, ERP software offers the following benefits:

The ERP system is an integrated transaction processing and reporting system. The different software applications and forms of ERP support the reengineering of business processes. Expressed in simpler terms, erp systems provide the means for tracking organizational resources, including people, processes, and technology. The system serves as the
backbone to the organization in terms of providing the information and support required for making decisions.

ERP systems add a process logic to an organizational information system and create a fundamental discipline in business processes. Whereas in the past managers and staff were free to make decisions independent of other functional areas, ERP systems effectively force people to interact together in a single system, even if they would prefer not to.

ERP systems also create a process logic among the closely related areas of customer order management, manufacturing planning and execution, purchasing processes,
and financial management and accounting.

In effect, ERP systems enable employees in these very different parts of the business to communicate with one another. In an ideal case of moving information across the supply chain, sales representatives enter customer orders directly into their company's ERP via a laptop computer desktop computer or mobile device. The sales reps can access the sales order planning and master production schedule. Once the orders are input in the system, the sales reps can provide an available-to-promise report and can inform customers when they can expect order delivery. The master production schedule drives the material requirements system, which automatically generates purchase orders. This ensures that suppliers will deliver parts, components, and services in time to meet the customer's order request. The material requirements planning (MRP) module converts material requirements

into purchase requisitions that purchasing places with selected suppliers. When the supplier delivers the components, this information is passed through to the scheduling system, which ensures that the components are linked to the specific production order on the shop floor. Once production begins, the salesperson in the field also knows that the order will soon be delivered to the customer. Once delivered, customer billing and payment are also automatically generated by the ERP system (Monczka et al., 2016).

ERP integrates all aspects of the business processes including manufacturing, design, customer services, financial, sales and distribution. By integrating business processes and people anywhere in a company which can enjoy more efficient workflow and improved productivity.

Nowadays, retailers and consumers push for lower prices, better quality and quicker lead time. ERP implementation shows your determination to head in that direction. The confidence of the business partners and consumers will be increased.

ERP provides the right information to the right people at the right time anywhere in the world, enabling you to improve productivity, enhance decision making and promote communication between coworkers, customers, and vendors.

For better ERP software, it helps to reduce or eliminate duplicate work and automates operational tasks, and provides easy access to information. ERP, therefore, can deliver significant time savings. **For example in Fakir Apparels Ltd has inventory receiving number for all raw materials item, but in Dekko which has not run 100% yet.**

5.3 Digital marketing tools

Digital marketing tools enable manufacturers to identify new buyers, explore new markets, determine target prices, assess desired quality levels, and establish specific lead times. These tools address communication and presentation challenges, helping companies achieve their growth objectives by reaching more consumers and persuading them to make purchases. To maximize effectiveness, businesses must leverage the most valuable marketing resources and technologies, making digital marketing essential for all industries. Key benefits of digital marketing include cost-effectiveness, remote accessibility, customer flexibility, expanded market opportunities, multimedia product presentations, interactive product displays, customer tracking, enhanced brand authority, influencer engagement, and improved print marketing (Akhi Akter, 2021).

Figure 4.1: Digital marketing tool helps manufacturers to identify new buyers, new market, target price, desire quality, specific lead time. Courtesy: Collected

A digital marketing tool helps manufacturers to identify new buyers, new market, target price, desire quality, specific lead time. It'll solve the communication and presentation problem. Each company has different specific goals, but most are trying to achieve growth by reaching more consumers and convincing them to purchase.

To do this effectively, have to take advantage of all the most valuable marketing resources and technologies. This makes every business in need of digital marketing.

We must understand the benefits of digital marketing for businesses, which included affordability marketing cost, remotely accessibility, customer flexibility, more expansion opportunity, multimedia presentation of the products, interactivity product presentation, customer tracking, authority, influencer engagement & print enhancement.

CRM

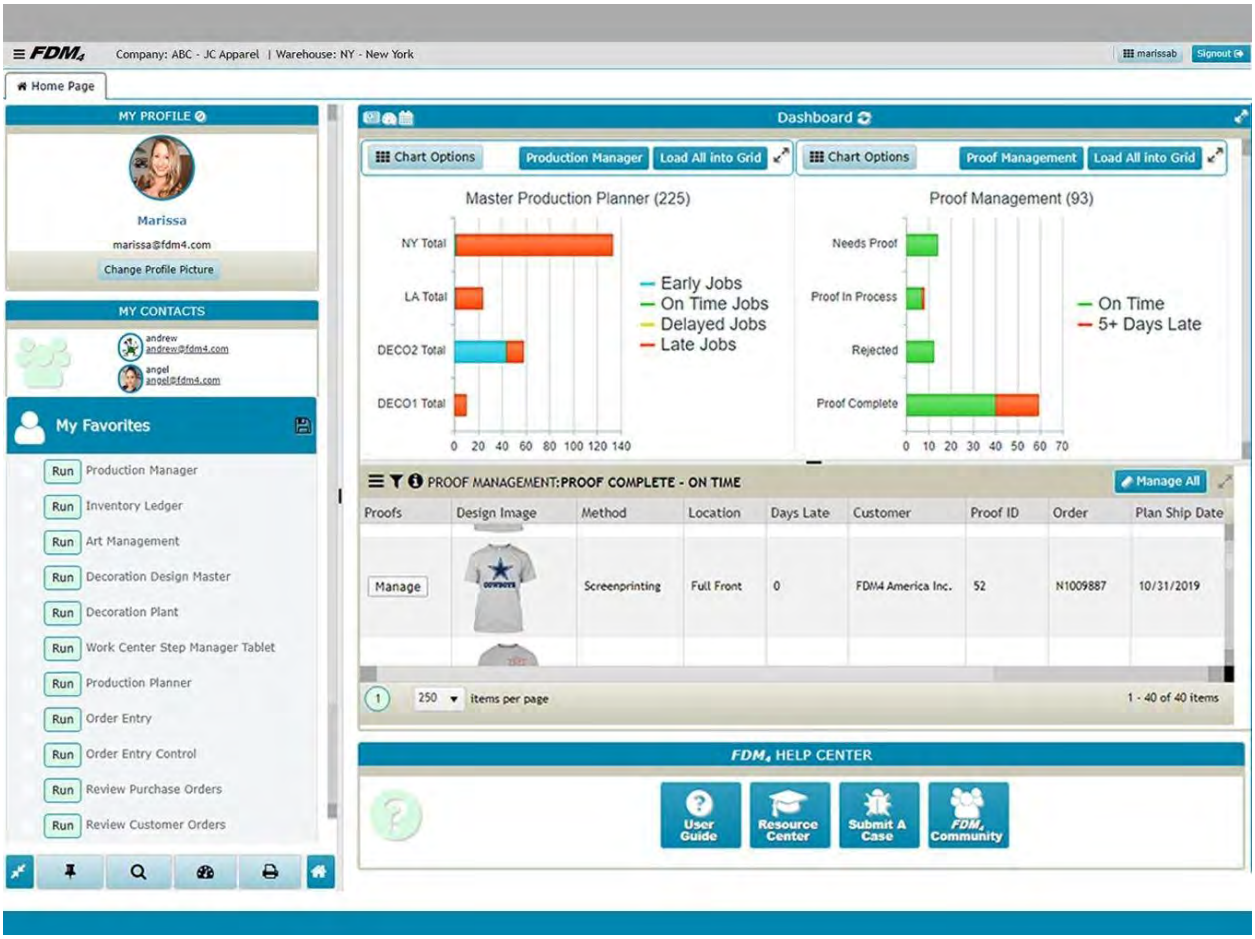

Figure 4.2: CRM software allows manufacturers to organize customer data within a single tool. Courtesy: Collected

The factory knows that making a great product alone is not enough. They must also have processes in place for managing customer relationships and improving product sales.

Manufacturers recognize that producing high-quality products alone is insufficient; effective customer relationship management is equally critical. CRM software tailored for the manufacturing industry helps organize customer data in a centralized platform, enabling sales teams to better understand buyer requirements, expedite deal closures, and identify upselling or retargeting opportunities. However, selecting the right CRM tool can be challenging, as manufacturers must evaluate core features, deployment options, and suitability for their business size. Common CRM features include contact management, interaction tracking, lead and sales pipeline management, task and workflow automation, document management, reporting and analytics, inventory tracking, product repositories, and sales forecasting. These features make CRM an invaluable tool for marketing teams facing significant challenges (Akhi Akter, 2021).

HRM:

Human Resource Management (HRM) involves planning, implementing, and evaluating programs that align with an organization's strategies and values. HRM encompasses activities such as staffing (recruitment, selection, promotion, termination), rewards (compensation, incentives, performance management), and employee development (training). HRM decisions significantly impact organizational outcomes, including employee performance, satisfaction, retention, attendance, and product or service quality. Recognized as a source of sustained competitive advantage, HRM systems are categorized into HRIS (Human Resource Information Systems), HCM (Human Capital Management), and HRMS (Human Resource Management Systems), each offering distinct capabilities tailored to organizational needs (Akhi Akter, 2021)

Figure 4.3: HRM decisions and activities have been linked to many outcomes for the organization. Courtesy: Collected

HRM decisions and activities have been linked to many outcomes for the organization, including employee performance, satisfaction, retention, attendance, and product/service quality.

HRM has recently been recognized as an important source of sustained competitive advantage for a factory, buying house and liaison office. The three main acronyms used to describe human resources management systems are HRIS, HCM, and HRMS. Each type of system has explicit capabilities and characteristics that may be best for different organizational needs.

In both Fakir and Dekko group have HRM software, but it has only payroll and attenedance management rather than other skill development tools.

MRP

Material Resource Planning (MRP) software facilitates production planning and inventory management, providing a structured framework for controlling production processes. This system is particularly beneficial for the apparel industry, as it allows for detailed definitions of bills of materials (BOM) based on color and quality for each finished product. The MRP module enhances control over fabric and trim purchasing, reduces excess stock, and frees up capital by providing accurate forecasting and inventory data. By minimizing cash tied up in raw materials, MRP systems improve operational efficiency and reduce costs associated with stock management (Akhi Akter, 2021).

Both Dekko & Fakir have MRP in ERP, which can create transparency in raw material budget.

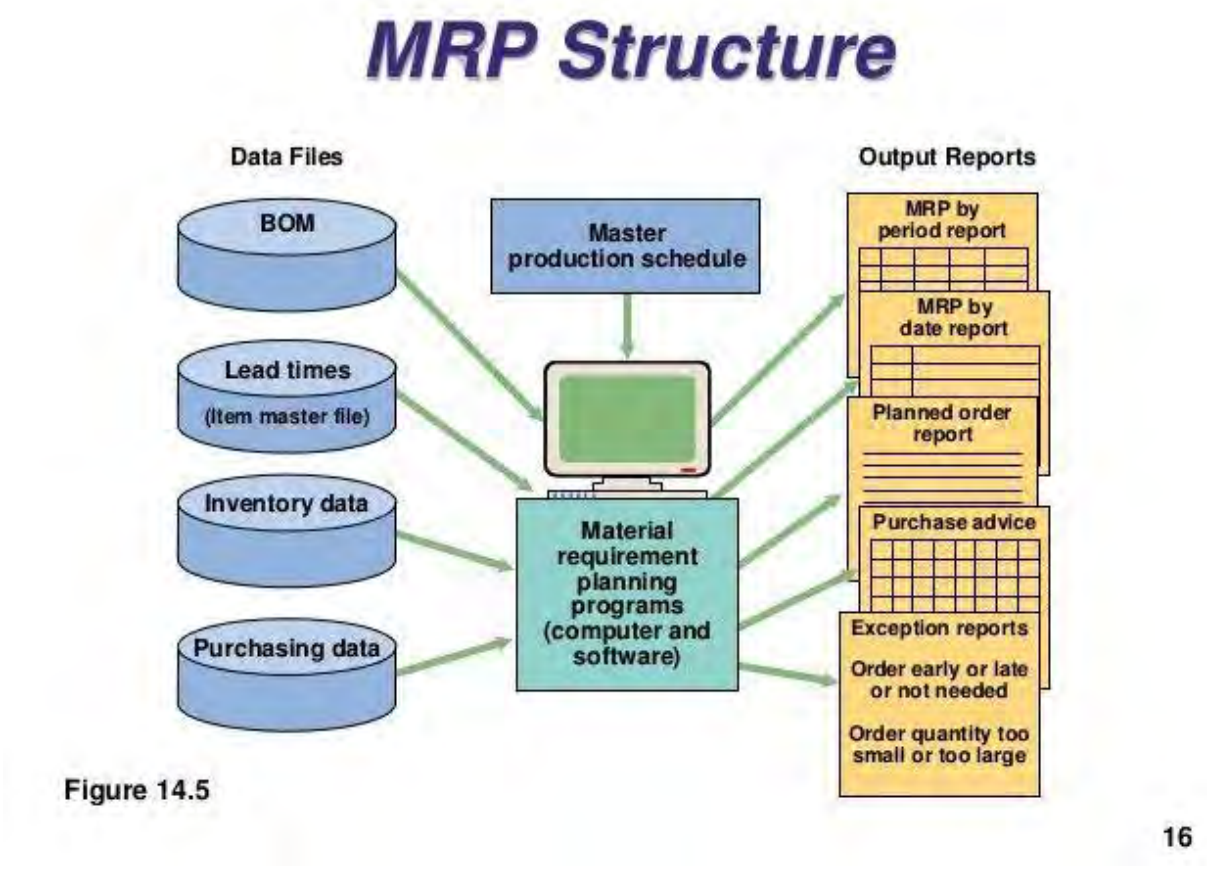

Figure 4.4: The overall production planning control concept and the process can be defined through the MRP software. Courtesy: Collected

Lean management

Lean manufacturing improves efficiency, reduces waste, and increases productivity. The benefits, therefore, are manifold: Increased product quality: Improved efficiency frees up employees and resources for innovation and quality control that would have previously been wasted.

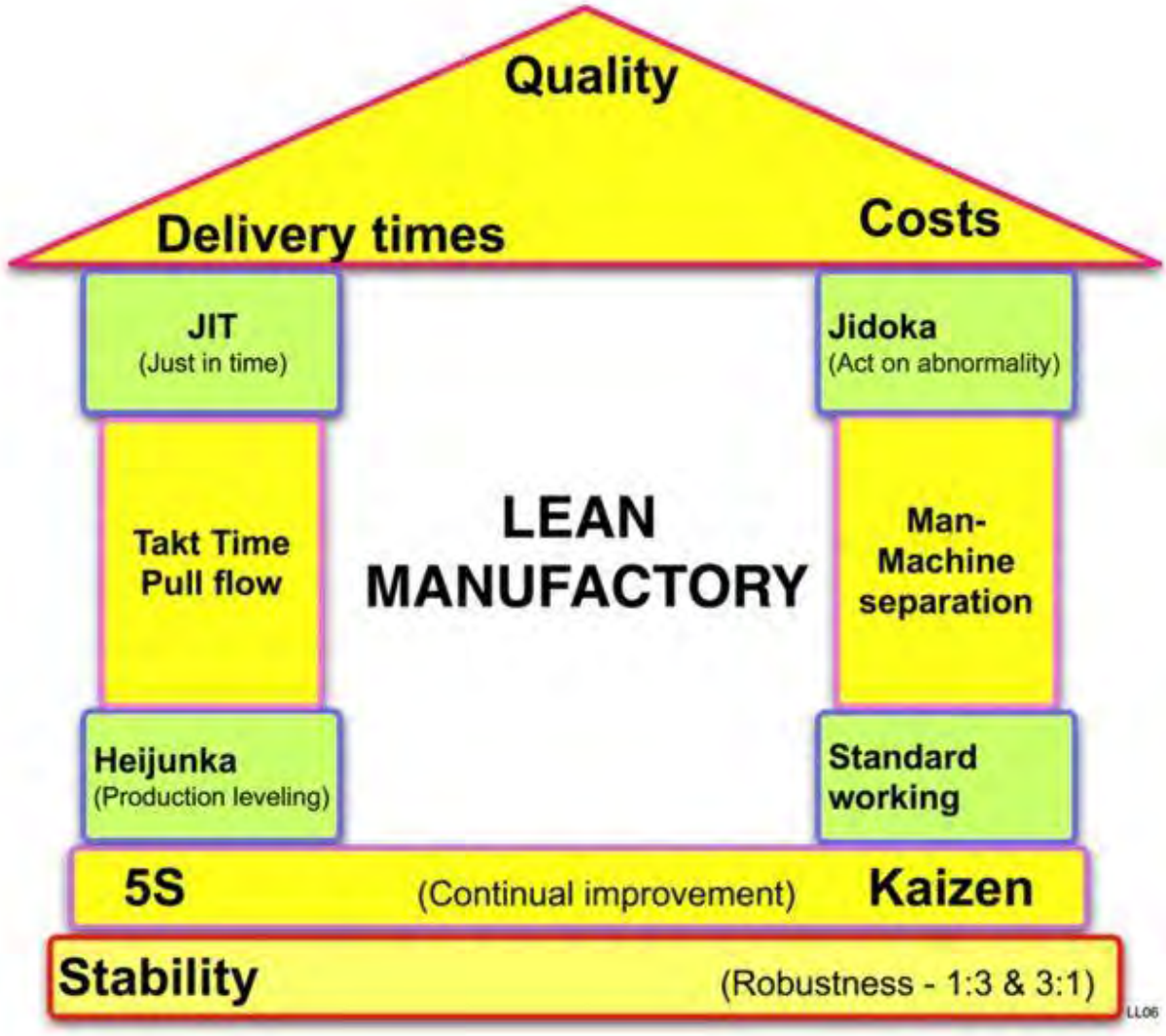

Figure 4.5: Lean manufacturing improves efficiency, reduces waste, and increases productivity. Courtesy: Collected

According to the Lean Enterprise Institute, the core idea behind “lean” is: “To maximize customer value while minimizing waste.” The business benefits of “lean” are achieved because there's less process waste, reduced lead time, less rework, reduced inventories, increased process understanding, improved knowledge of the products. **For an example in garments industry Beximco and DBL group adopted various lean and sigma practices.**

Based on the research of high-performance companies at the Center for Strategy, Execution and Valuation in the Driehaus College of Business at DePaul University (Center for SEV), there are at least three major unrecognized advantages of instituting lean principles.

1. It provides a clear framework for aligning a company’s purpose and decision-making with stakeholder needs.

2. It fosters a highly engaged employee culture.

3. It equips manufacturers to navigate competitive challenges effectively (Akhi Akter, 2021).

5.4 Dependency on Imports for Raw Materials

The Ready-Made Garment (RMG) industry in Bangladesh heavily depends on imported raw materials, including yarn, fabrics, chemicals, and dyes, which exposes it to several supply chain vulnerabilities. A significant portion of these materials is sourced from countries such as China, India, and Pakistan, making the industry susceptible to fluctuations in global supply chains, exchange rates, and geopolitical tensions. This reliance on imports limits local control over lead times, pricing, and material quality, often resulting in production delays and increased costs, particularly during global disruptions like the COVID-19 pandemic. Additionally, the lack of robust local infrastructure and capacity to meet high demand further weakens the industry's supply chain resilience. To mitigate these risks, investing in local production capabilities and supporting indigenous suppliers could enhance self-sufficiency and long-term sustainability in the RMG sector. **For example in Dekko Legacy group they outsource all raw materials including fabric, trims & accessories, but in Fakir they have vertically integrated knit composite factroy, so in here cost is reduced.**

5.5 Quality Control Issues

In recent years, the Ready-Made Garment (RMG) industry in Bangladesh has faced numerous quality-related challenges, primarily due to the use of substandard raw materials. This issue often surfaces during garment inspections, leading to frequent penalties such as discounts imposed by customers. The root causes include a lack of traceability in raw materials and cost-cutting measures that compromise quality.

Quality control remains a persistent issue in Bangladesh's RMG sector, negatively impacting profitability and brand reputation. Inconsistent standards, outdated quality control practices, and insufficient worker training contribute to the difficulty in maintaining consistent product quality. Many factories still rely on manual inspection methods, which are prone to human error, and the absence of standardized processes across production lines further exacerbates the problem. These shortcomings often result in higher defect rates, costly reworks, and even order rejections, damaging relationships with international buyers. Additionally, the reliance on low-cost raw materials and inadequate investment in advanced machinery makes it challenging for factories to meet stringent global quality standards, leading to the production of inferior goods.

Addressing these issues requires not only technological upgrades, such as the adoption of automated quality monitoring systems, but also a cultural shift that prioritizes quality at every stage of production. Investing in workforce training for quality assurance and fostering collaboration between quality control and production teams are critical steps toward improving standards and strengthening Bangladesh's position as a dependable RMG supplier (Posh Garments, 2023)

5.6 Logistics and Infrastructure Constraints

Logistics and infrastructure constraints in Bangladesh's RMG supply chain pose significant challenges to efficiency and competitiveness. These include:

- **Port Congestion**: Chattogram Port, the primary gateway for imports and exports, often faces congestion, resulting in delays and higher lead times.
- **Inadequate Transport Network**: Poor road conditions, traffic congestion, and limited rail connectivity hinder the swift movement of goods across the country.

- **Lack of Warehousing Facilities**: Many RMG firms lack modern warehousing solutions, causing inefficiencies in inventory management and distribution.
- **Power Supply Issues**: Frequent power outages disrupt manufacturing processes and increase operational costs.
- **ICT Limitations**: The limited adoption of digital tools for logistics management reduces supply chain visibility and operational efficiency.

Addressing these constraints is crucial to boosting Bangladesh's RMG sector's global competitiveness.

5.7 Limited Supplier Transparency and Traceability

Traceability plays a crucial role in ensuring the sustainability of industries. It refers to the ability to monitor and track the movement of products, ingredients, and materials throughout the supply chain, from their origin to the end consumer. This capability allows businesses to identify the root causes of issues such as quality defects, safety concerns, or environmental impacts and take appropriate corrective actions.

Figure 4.6: Traceability is an important factor for industry sustainability.

According to the Codex Alimentarius Commission, traceability, or product tracing, is defined as the ability to follow the movement of a product through specific stages of production, processing, and distribution. Within product quality control systems, traceability serves as a tool to combat counterfeit products, provide accurate product information, and ensure product authenticity (Textiletoday, 2023).

Customer like Zara, H&M, they always trace Tier-1, Tier-2 and other supplier to understand the quality, sustaiability of the products, but in garments factory in Bangladesh yet not started the tracability.

Traceability in the textile industry :

Traceability in the textile industry refers to the ability to monitor and document the journey of textiles and garments from raw materials to the final product. This process ensures responsible sourcing of materials, adherence to fair labor practices, and the implementation of sustainable production methods. Traceability can be achieved through technologies such as blockchain, Radio Frequency Identification (RFID) tagging, and advanced supply chain management systems that track the movement of goods and materials at every stage of production. The primary objective of traceability is to enhance transparency and accountability, promote ethical manufacturing practices, and build consumer trust in the products they buy (Glogar et al., 2025).

Importance of traceability in the textile industry

Traceability and transparency in the textile supply chain are crucial for achieving sustainability in the textile and fashion industry. To make credible claims about a product's lifecycle impact such as its social impact, production history, raw material details, and logistics data it is essential to have traceability systems in place. These systems connect different stakeholders in the supply chain and enable the sharing of accurate product-related information, ensuring accountability and sustainability throughout the process.

Figure 4.7: Traceability and transparency in the textile supply chain are very much essential for achieving sustainability in the textile and fashion industry.

Today's customers are more mindful and focused on spending according to their basic needs rather than making impulsive purchases. This shift in consumer behavior has significantly impacted the fashion, apparel, and textile industry. The rapid growth of fast fashion has slowed down as more sustainable business practices gain traction.

Modern consumers want to know who made their products, who benefits from them, and the origin, materials, and history behind them. This demand for transparency has made traceability a critical focus for the industry.

The textile industry is highly fragmented, involving numerous suppliers, manufacturers, and stakeholders. Achieving sustainability requires collective efforts rather than isolated actions from individual players. Traceability plays a key role in uniting the industry by providing a flow of information across the supply chain.

However, the textile supply chain is not fully integrated. Retailers, often acting as supply chain leaders, only partially control the chain. No single entity has the power to implement traceability strategies across the entire supply chain, making collaboration essential for success. (Textiletoday, 2023).

Concept of traceability

Enhancing transparency and traceability has become a top priority for the textile and clothing industry to better manage its value chains. The apparel supply chain consists of six key stages: **fiber production, spinning, fabric manufacturing, dyeing/finishing, apparel production, and retail.** Traceability promotes a more transparent and efficient supply chain by ensuring visibility at each step (inspectorio, 2023).

Dispersed textile supply chain

The conversion of raw textile material to finished product takes a number of steps as shown below:

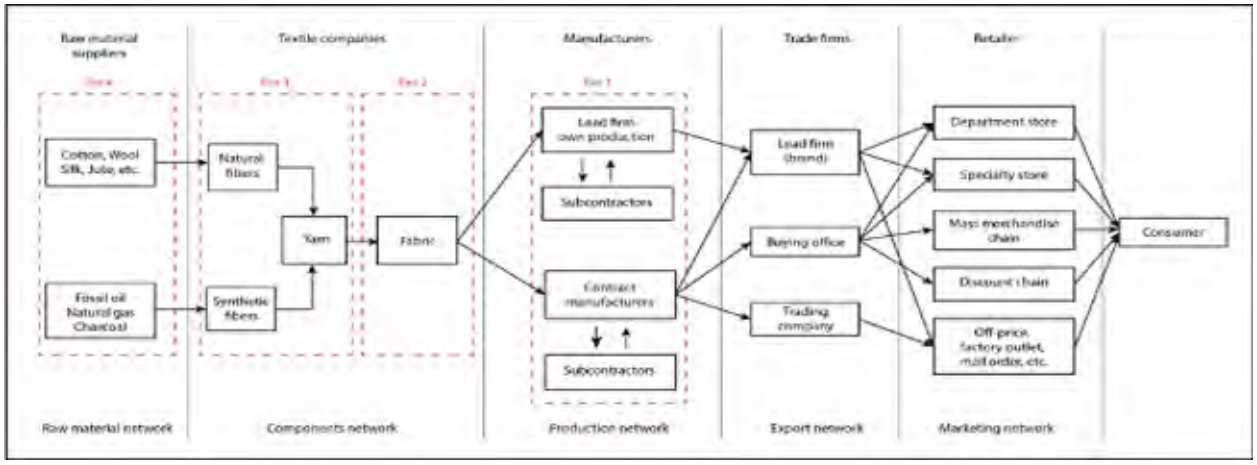

Table 5.1 : Conversion of raw materials to finish products flow chart

Raw material production and product manufacturing are generally located in developing countries due to the availability of low-paid workers. On the other hand, most of the retailers and customers are in developed countries. All these complexities make supply chain integration extremely difficult and result in an unclear network with limited information exchange between partners. (Md.Akhteruzzaman, 2023).

Figure 2.8: Raw material production and product manufacturing are generally located in developing countries due to the availability of low-paid workers.

Traceability in the social issue

Traceability in social issues means being able to follow a product's journey from where it starts to where it ends up, making sure it's made in a fair and ethical way. This involves checking that workers are treated well, paid fairly, and work in safe, healthy conditions. It also means making sure products don't harm local communities or contribute to problems like inequality or human rights abuses.

For example, traceability can help ensure that no child labor or forced labor is used in making a product, and that workers earn a decent wage. It can also confirm that products don't contain "conflict minerals," which are mined in war zones and used to fund violence.

Traceability matters because it makes supply chains more transparent and holds companies accountable. It encourages businesses to act responsibly and helps improve workers' lives, support economic growth, and reduce poverty.

Marketing: Traceability can also act as a marketing tool that can increase consumer confidence in the brand and assist in making informed purchasing decisions.

Figure 4.9: Traceability can also act as a marketing tool that can increase consumer confidence in the brand and assist in making informed purchasing decisions. Courtesy: Collected

Logistics management: Traceability, using real-time tracking tags, helps manage logistics more effectively. It ensures products are delivered on time and in the right amounts, while also improving inventory control. Additionally, with details about raw materials and product data, traceability can address challenges in circular supply chains and support reverse logistics, like recycling and reusing products.

Supply chain circularity: Traceability is a valuable tool for tackling circular supply chain challenges. It can automate tasks like collecting and sorting materials and help with recycling by providing accurate information about raw material composition.

While traceability improves control and transparency in supply chains, not everyone sees full transparency as a good thing. For example, some companies may not want to share all their supplier details, as this could help competitors and affect their business strategies.

Sustainability requires everyone involved from production to consumption and disposal to work together. A traceability system that connects all these stages will be essential. To make this work, a common framework and standardized terms will be needed.

Way forward for industry traceability

The textile industry is facing increasing pressure to improve traceability and ensure the sustainability of its products. To move forward, the following steps can be taken:

Adoption of digital technologies: The industry can use tools like blockchain, RFID, and cloud computing to boost traceability and transparency in supply chains.

Industry collaboration: Companies can work with suppliers, customers, and governments to create and follow traceability standards and practices.

Consumer engagement: Consumers can drive change by demanding transparency and sustainability from textile brands and products.

Government support: Governments can help by supporting the development and implementation of traceability systems and sustainability standards.

Implementation of sustainability standards: : Adopting standards like the Global Organic Textile Standard (GOTS) can ensure products are made in environmentally and socially responsible ways.

Investment in research and development: The industry can invest in R&D to improve traceability and sustainability, such as creating eco-friendly materials and production methods. (Textiletoday, 2023).

Bangladesh's Ready-Made Garment (RMG) industry faces significant challenges in managing quality, compliance, and sustainability due to limited supplier transparency and traceability. These challenges include:

- **Complex Supplier Networks**: Many RMG companies depend on multi-layered supplier networks, making it hard to fully track the supply chain, especially when it comes to sourcing raw materials.
- **Inconsistent Record-Keeping**: Suppliers often lack digital systems, leading to incomplete or inconsistent documentation, which makes tracing materials and processes difficult.
- **Limited Compliance Monitoring**: Low transparency makes it tough to monitor suppliers for social and environmental compliance, such as labor standards and sustainable practices, increasing risks to brand reputation.
- **Quality and Cost Variability**: Without transparency, manufacturers find it hard to evaluate the quality or cost breakdowns from suppliers, affecting their ability to maintain consistent product quality and fair pricing.
- **Difficulty in Risk Management**: Limited traceability makes it harder to manage risks during disruptions, as identifying vulnerabilities in complex supplier networks becomes challenging.

  Improving transparency and traceability would help ensure compliance, build buyer trust, and enable better risk management in Bangladesh's RMG industry.Improving transparency and traceability would support compliance, strengthen buyer confidence, and enable better risk management for Bangladesh's RMG industry.

For fiber tracability Dekko and Fakir takes TC (Transaction Certificate) from supplier for tracability and sustaiability but only for fabrics.

5.8 Environmental and Sustainability Concerns

Bangladesh's Ready-Made Garment (RMG) industry faces major environmental and sustainability challenges due to its high resource use and waste generation. Key issues include:

Water Usage and Pollution: The dyeing and washing processes consume large amounts of water, putting pressure on local water resources. Untreated wastewater is often released into rivers, causing pollution.

Energy Consumption and Emissions: Energy-intensive manufacturing, mostly powered by fossil fuels, increases carbon emissions, contributing to climate change.

Textile Waste: Improper disposal of textile waste harms the environment, leading to further degradation.

Compliance Challenges: Many factories, especially smaller ones, struggle to meet international environmental standards and buyer sustainability requirements due to limited resources.

To address these issues, the industry needs to adopt cleaner production technologies, improve waste management, and encourage collaboration among stakeholders to promote sustainable practices. Many factories have already taken steps, such as installing Effluent Treatment Plants (ETPs) to treat polluted water.

In Fakir and Dekko has ETP plant for water treatment.

5.9 Raw material procurement must be purchase by Supply Chain Department:

In the Bangladeshi RMG sector, it is still common for marketing and merchandising teams to be directly involved in the procurement of raw materials. While this approach might have been effective in earlier stages of the industry's growth, it now hinders operational efficiency and distracts these teams from their core functions. Marketing and merchandising teams should focus on building customer relationships, acquiring new business, and managing orders, while the procurement of raw materials should be delegated to the supply chain department.

The supply chain department is equipped with the expertise to handle procurement efficiently, ensuring cost optimization, quality assurance, and timely delivery. By centralizing procurement responsibilities within the supply chain, companies can eliminate redundancies, reduce lead times, and foster better collaboration with suppliers. This strategic shift would allow marketing and merchandising teams to dedicate their full attention to enhancing brand visibility and customer engagement, which are critical for maintaining competitiveness in the global market.

5.10 Digitalization and Automation:

Digitalization and automation are revolutionizing supply chains worldwide by introducing advanced technologies that enhance efficiency, transparency, and decision-making. For Bangladesh's RMG sector, these innovations present immense opportunities to address existing inefficiencies and improve global competitiveness.

Digitalization in the supply chain involves the integration of technologies such as ERP systems, IoT (Internet of Things), blockchain, and data analytics into business operations. ERP systems streamline data flow across procurement, production, and logistics, ensuring a unified platform for decision-making. IoT-enabled devices allow real-time tracking of shipments and monitoring of factory environments, while blockchain technology enhances transparency by creating immutable records that can trace products from raw material to delivery. Furthermore, predictive analytics aids in demand forecasting, inventory management, and risk mitigation, allowing businesses to operate more proactively. These digital tools collectively enhance visibility, foster seamless collaboration between stakeholders, and optimize resource allocation, resulting in significant cost efficiency.

Automation, on the other hand, focuses on minimizing human intervention in repetitive or labor-intensive processes. In supply chain operations, automation is applied in several ways. Automated warehousing systems use robotics for sorting, packing, and inventory management, while automated production tools, such as cutting and sewing machines, ensure precision and speed in manufacturing. Logistics processes also benefit from automation, with self-driving vehicles, automated loading systems, and drones transforming how goods are transported and delivered. Artificial intelligence (AI) plays a crucial role by automating decision-making processes, such as supplier selection and quality inspections. Automation not only boosts productivity and reduces lead times but also ensures consistency and scalability, enabling companies to expand operations efficiently.

For Bangladesh's RMG sector, digitalization and automation have a transformative potential. However, many companies in this sector continue to rely on manual processes, leading to inefficiencies and challenges in meeting international standards. Early adopters of digital tools, such as ERP systems, have reported improvements in coordination, cost reduction, and

operational transparency. Technologies like IoT could help monitor energy consumption and reduce waste, while predictive analytics could enable more accurate demand forecasting. Additionally, blockchain technology can enhance traceability, which is increasingly valued by global buyers emphasizing ethical sourcing.

Despite these opportunities, the path to digital transformation is not without challenges. The high cost of implementing advanced technologies, a lack of technical expertise among workers, and resistance to change are significant barriers. Furthermore, many companies in the RMG sector are accustomed to traditional methods, making the shift to digital processes daunting.

In conclusion, while digitalization and automation are critical to sustaining global competitiveness in the RMG sector, their adoption requires careful planning, investment, and workforce training. Overcoming these challenges will enable companies in Bangladesh to unlock greater efficiency, comply with international standards, and secure their position in an increasingly digitalized global supply chain (Pal & Yasar, 2020).

5.11 Implementing an EGP-Type Auction System for Raw Material Procurement

The introduction of an **e-Government Procurement (eGP)-type auction system** for raw material procurement in Bangladesh's RMG sector could significantly enhance transparency, cost efficiency, and supplier management. This digital platform would allow companies to invite competitive bids from pre-qualified suppliers in a structured, transparent, and automated manner.

Such a system ensures that procurement decisions are data-driven, free from biases, and optimized for both cost and quality. Suppliers can compete fairly, leading to better pricing and improved material standards. Moreover, the system's transparency reduces the risks of fraud or favoritism, fostering trust among stakeholders.

By adopting an eGP-inspired model tailored to the needs of the RMG sector, companies can streamline procurement processes, achieve better supplier performance, and align with global best practices in digital procurement. This initiative can be a cornerstone for integrating digitalization into supply chain management, setting a benchmark for efficiency and accountability in the industry.

Chapter 6

Data Analysis and Results

6.1 Introduction

This chapter presents the analysis and interpretation of the data collected through surveys conducted to understand the current practices, challenges, and opportunities in the digitalization of the supply chain in Bangladesh's RMG sector. The findings are systematically analyzed and discussed to draw meaningful conclusions relevant to the study.

6.2 General Information about survey data

The survey included responses from professionals working in various roles in the RMG sector, including supply chain managers, merchadisers and other personnel.

Question	Response Categories	Percentages
Do you have Supply Chain Management Dept. in your company?	Yes	90%
	No	10%
	Management are taking initiative to open SCM dept	0%
Right now, which department are responsible for sourcing and developments?	Merchandiser/ Marketing	10%
	SCM	40%
	Both	50%
Which department are responsible for bulk booking?	Merchandiser/ Marketing	20%
	SCM	30%
	Both	50%
What processes are currently used for managing inventory and purchase orders?	Through ERP	60%
	Manually by excel	30%
	Other	10%
Do you have full integrated ERP system in your company?	Yes	40%
	No	60%

For raw material sourcing do you think tender system can be introduced like EGP procurement for competitiveness?	Agree	50%
	Disagree	0%
	Neutral	50%
Do you agree real time material trackability by ERP can decrease wastages and material missing chances	Strongly Disagree	20%
	Disagree	20%
	Neutral	0%
	Agree	30%
	Strongly agree	30%
What are the major barriers to digitalizing your supply chain?	Cost	-
	Expertise	10%
	Resistance	-
	Manpower	10%
	All	80%
Do you think Digitalization and Integrated ERP system can interrupt bulk production?	Yes	70%
	No	30%

Table 6.1 : Survey data

6.3 Survey Response Overview and Summery

To complement the survey data, semi-structured interviews were conducted with Several private & RMG organizations concern like Fakir Apparels Ltd. Dekko Legacy group, Volume zero key stakeholders in Bangladesh's RMG sector, including supply chain managers, procurement officers, ERP department. Participants were selected through purposive sampling method to ensure representation across company size and roles. Each interview lasted approximately 20 minutes and was conducted in person or virtually between January 2024 to March 2025. Open-ended questions focused on SCM pain points, ERP implementation challenges, and perceived benefits of digital tools. These qualitative insights provide depth to the survey findings, triangulating data for robust conclusions.

6.4 Existing SCM Practices & Operational Efficiency'

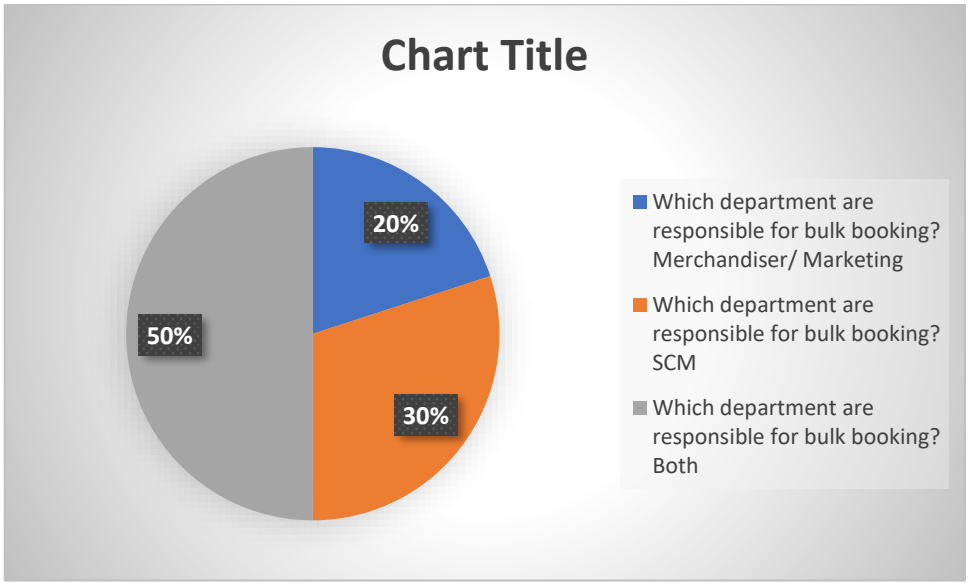

Figure 6.1 shows that half of the bulk booking is done through both merchandising and SCM. If we look at the individual role for bulk booking, we see SCM is giving more bulk booking than merchandiser.

- **Bulk Booking Responsibility**: After interviewing Figure 6.11 (Department Chart) shows that 20% of respondents attribute bulk booking to Merchandiser/Marketing, 30% by SCM and 50% is indicating a centralized approach. This may streamline procurement but risks bottlenecks.

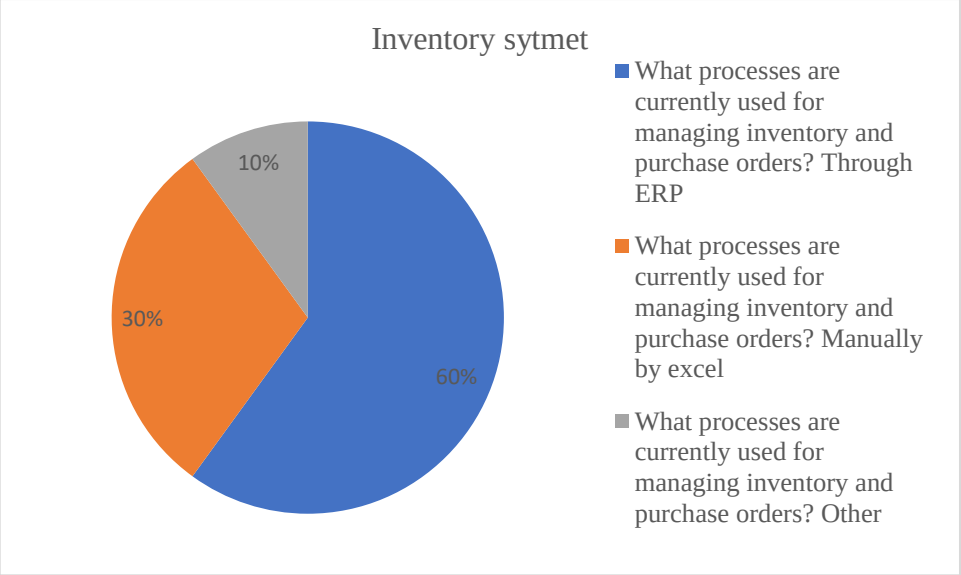

Figure 6.2 shows that more than half of inventories are managed through by ERP, but still excel practices and manual goods receiving practices have showed

- **Inventory/PO Processes**: Figure 6.2 reveals 30% rely on manual methods (e.g., spreadsheets), while only 60% use automated tools, leading to delays and errors.

6.5 ERP & Digital Tool Adoption Gaps

Key Findings from Survey:

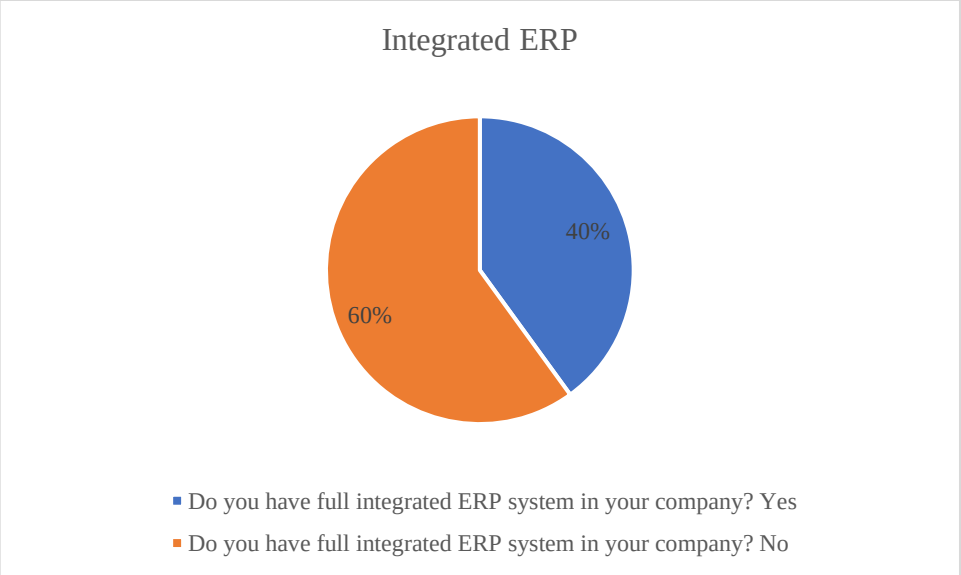

Figure 6.3 show maximum number of companies have integrated ERP system

- **ERP Integration**: Figure 3 shows only 60% of firms use a full ERP system, while 40% lack integration.

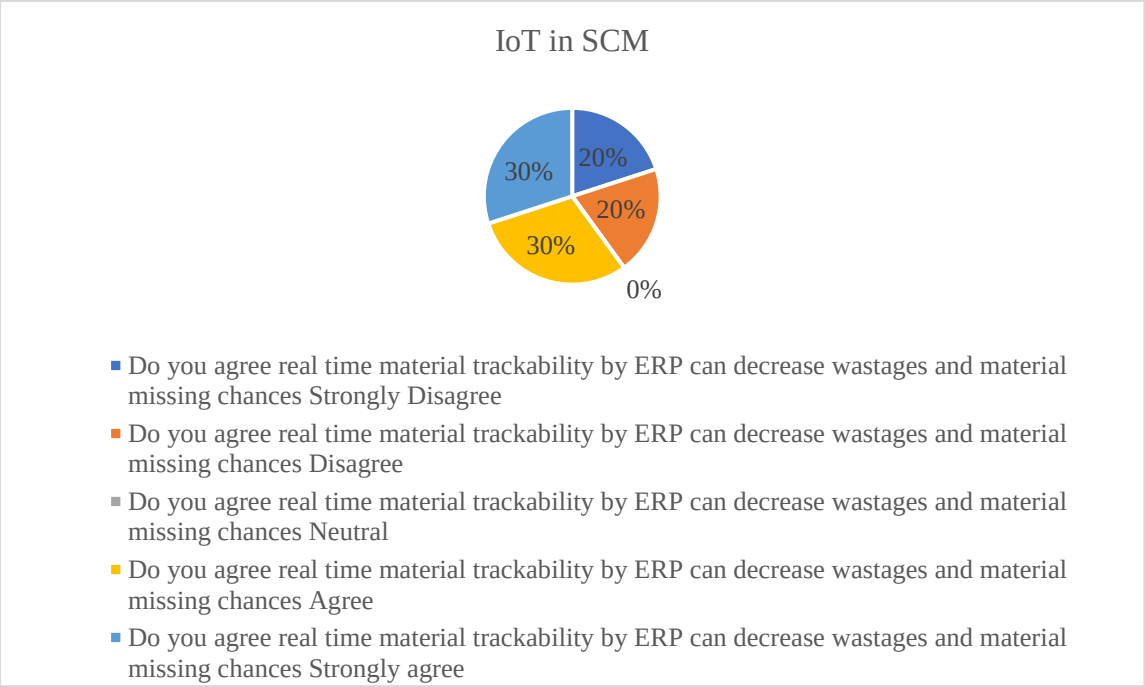

Figure 6.4 shows in real time material tracking concept is received mixed opinion

- **Real-Time Tracking**: Figure 6.4 notes 80% agree ERP reduces waste, yet adoption remains low.

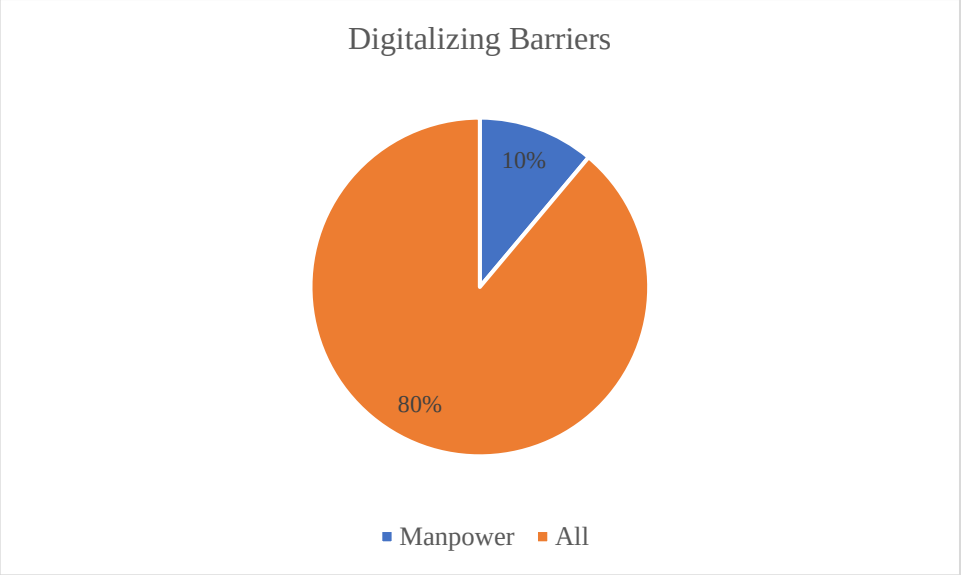

Figure 6.5 shows that ERP barriers are expertise, cost and manpower. Although cost and expertise are the main factors considered.

- **Digitalization Barriers**: Figure 6.5 highlights top obstacles: cost, training, and manpower. 80% people thinks for all four attributes creating barriers in SCM.

6.6 Industry Collaboration & Policy Interventions

Key Findings from Survey:

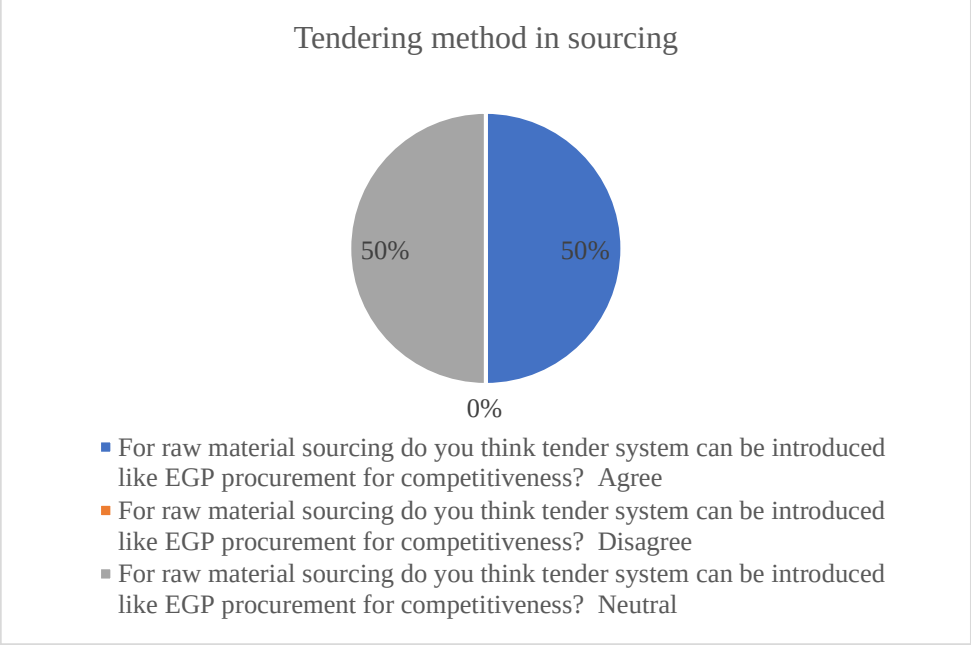

Figure 6.6 shows new procurement system in RMG sector e-tendering adopted by half of people and half of people are neutral

- **Tender Systems**: Figure 6.6 shows 50% support eGP-like auctions for sourcing, while 50% fear vendor risks and was neutral.

Discussion:

- **Tender systems** could cut costs but require:
    - **Transparency safeguards**
    - **Vendor training** to mitigate resistance.
- **Policy Recommendations**:
    - **Public-private partnerships** to fund ERP adoption.
    - **Pilot programs** for eGP auctions in RMG sourcing.

Chapter 7

Conclusion & Recommendations

7.1 Conclusion

The survey data highlights that while the supply chain functions in Bangladesh's RMG sector are gradually evolving with some adoption of ERP systems, significant gaps persist in terms of full integration and streamlining of processes. The reliance on manual tools, combined with shared responsibilities across departments, creates inefficiencies and limits the sector's ability to fully leverage digital solutions. Barriers such as cost, manpower shortages, and expertise gaps remain major obstacles to digitalization, despite the potential benefits, such as improved material tracking and reduced wastage. Moreover, concerns regarding disruptions to bulk production suggest a need for careful change management in digital transformation initiatives.

7.2 Recommendations

To overcome the barriers identified, RMG companies should prioritize the establishment of dedicated SCM departments and fully integrated ERP systems. Addressing cost constraints through industry collaborations and government support can ease the transition to digitalization. Furthermore, training programs and effective change management strategies are crucial to overcoming resistance and building digital expertise. Finally, adopting tender systems and implementing digital solutions incrementally can ensure competitiveness and minimize disruptions during the transformation process. And additionally according to surveryers use IoT-Enabled Machinery, AI-Driven Design Tools can also be included here for better performance.

SCM Practices	Manual processes reduce efficiency.	Automate inventory tracking via low-cost ERP modules.
ERP Adoption Gaps	Cost/training block adoption.	Advocate for government subsidies & workforce upskilling.
Collaboration	Tender systems face trust issues.	Launch pilot eGP auctions with audit controls.

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Appendix

Questionnaire :

1. Name *

_____

2. In which company are you working currently?

_____

3. Do you have Supply Chain Management Dept. in your company? *

Check all that apply.

- ☐ Yes
- ☐ No

Management are taking initiative to open SCM dept

4. Right now which department are responsible for sourcing and developments? *

Check all that apply.

- ☐ Merchandiser/ Marketing
- ☐ SCM
- ☐ Both

5. Which department are responsible for bulk booking? *

Check all that apply.

- ☐ Merchandiser / Marketing
- ☐ SCM
- ☐ Both

6. What processes are currently used for managing inventory and purchase orders ?
   Check all that apply.

- [ ] Through ERP
- [ ] Manually by Excel
- [ ] Other

7. Do you have full integrated ERP system in your company? *

Check all that apply.

- [ ] Yes
- [ ] No

8. For raw material sourcing do you think tender system can be introduced like EGP procurement for competitiveness?

Mark only one oval.

- ◯ Agree
- ◯ Disagree
- ◯ Neutral

9. Do you agree real time material trackability by ERP can decrease wastages and material missing chances
   Mark only one oval.

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

10. What are the major barriers to digitalizing your supply chain?

Mark only one oval.

- Cost
- Expertise
- Resistance
- Manpower
- All

11. What kind of digitalization may be included in garments supply chain?

_____

12. Do you think Digitalization and Integrated ERP system can interrupt bulk production?

Mark only one oval.

- Yes
- No