

Thesis paper
on
The Impact of Digital Technologies (ERP, Blockchain, IoT) on Supply Chain
Visibility in Bangladesh's RMG Sector (Shin Shin Group).

Submitted by:

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Student ID: MSCM240103016

Program: MBA in Supply Chain Management (MSCM)

Major: Supply Chain Management

Department of Business Administration

Sonargaon University (SU)

Submitted to:

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Faculty of Business

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Management (MSCM)



Sonargaon University (SU)
147/1 Green Road, Panthopath, Dhaka

Date of Submission: 03rd January, 2026

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147/1 Green Road, Panthopath, Dhaka

Date of Submission: 03rd January, 2026.

Letter of Transmittal

03rd January, 2026.

Shahnaz Sharmin

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Subject: Submission of Thesis Report Titled “The Impact of Digital Technologies (ERP, Blockchain, IoT) on Supply Chain Visibility in Bangladesh’s RMG Sector (Shin Shin Group).”

Dear Madam,

I am hereby submitting my thesis paper entitled “The Impact of Digital Technologies (ERP, Blockchain, IoT) on Supply Chain Visibility in Bangladesh’s RMG Sector (Shin Shin Group).” which was assigned to me as a requirement for the completion of the MSCM Program. I have discovered this paper very interesting, beneficial, and insightful. The entire report is based on my practical experience in Shin Shin Group. I expect this paper to be informative as well as comprehensive. This thesis paper will help me a lot in my future career life.

Thank you very much for your guidance and cooperation during the course without which this Thesis paper cannot be completed. Moreover, if you have any further inquiries concerning any Additional information, I would be very pleased to clarify that.

Yours Sincerely

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Declaration of Student

This is to notify you that, the thesis paper on “**The Impact of Digital Technologies (ERP, Blockchain, IoT) on Supply Chain Visibility in Bangladesh’s RMG Sector (Shin Shin Group).**”, has been prepared as a part of my dissertation formalities. It is an obligatory part of me.

MSCM program to submit a thesis paper. Moreover, I was inspired and instructed by Shahnaz Sharmin, Lecturer, Department of Business Administration, Sonargaon University (SU). I am further declaring that I did not submit this report anywhere for awarding any degree or certificate.

Yours Sincerely

Amit Hassan Asif

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Major: Supply Chain Management

Sonargaon University (SU)

Letter of Authorization

This is to certify that the thesis report “The Impact of Digital Technologies (ERP, Blockchain, IoT) on Supply Chain Visibility in Bangladesh’s RMG Sector (Shin Shin Group).” has been prepared as a part of completion of the MSCM program from Department of Business Administration, Sonargaon University (SU), carried out by Amit Hassan Asif, bearing ID: MSCM2401031016 under my supervision. The report or the information will not be used for any other purposes.

Shahnaz Sharmin

Lecturer

Department of Business Administration

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Sonargaon University (SU)

Acknowledgment

In the beginning, I would like to convey my sincere appreciation to the Almighty Allah for giving Me the strength and ability to finish the task.

I want to thank my academic supervisor Shahnaz Sharmin, Lecturer, Department of Business Administration, Sonargaon University (SU), for providing me with all the necessary help for the completion of this report. I want to give the greatest thanks to her for guiding me as an advisor to start and complete this report successfully.

The opportunity I had with Shin Shin Group is a great chance for deep learning and professional development. I consider myself a very lucky individual as I was provided with an opportunity to be a part of it. I am also grateful for having a chance to meet so many wonderful people and professionals who led me through this period.

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Abstract

The ready-made garments (RMG) sector is a cornerstone of Bangladesh's economy, yet it suffers from limited supply chain visibility, which undermines efficiency, traceability, and responsiveness. This study examines how digital technologies specifically Enterprise Resource Planning (ERP), Blockchain, and the Internet of Things (IoT) - can transform supply chain visibility in the context of Shin Shin Group, a leading Bangladeshi RMG firm. Through a mixed-methods approach combining case study analysis, interviews with key stakeholders, and secondary data, the research investigates how these technologies are implemented, their impact on visibility across procurement, production, and logistics, and the barriers to adoption. Findings indicate that ERP systems streamline internal operations by integrating order management, inventory, and production planning, thereby reducing silos and improving real-time data flow. IoT-enabled sensors enhance real-time tracking and monitoring, enabling live reporting of production metrics and shipment status. Meanwhile, blockchain introduces immutable traceability, enabling secure provenance records from raw materials to finished goods. Together, these technologies significantly enhance visibility, reduce lead times, improve quality control, and strengthen accountability across supply chain tiers. However, adoption challenges persist. High infrastructure costs, limited digital literacy among workers, power instability, and resistance from management emerge as major obstacles. Moreover, regulatory and organizational readiness remain underdeveloped, complicating full-scale implementation. Based on the insights gained, this thesis offers strategic recommendations for phased technology deployment, capacity-building programs, and cross-stakeholder collaboration, aimed at maximizing the benefits of digitalization in Bangladesh's RMG supply chains. In sum, this research contributes to both academic literature and managerial practice by illuminating how modern digital tools can elevate supply chain visibility in a developing country context, while also addressing the practical challenges in scaling these innovations in the RMG industry.

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List of Acronyms

MSCM	Master of Supply chain management
SCM	Supply Chain Management
RMG	Ready-Made Garment
ERP	Enterprise Resource Planning
RFID	Radio-Frequency Identification
IoT	Internet of Things
SCOR	Supply Chain Operations Reference
ECR	Efficient Consumer Response
B2B	Business to Business
B2C	Business to Consumer
GOTS	Global Organic Textile Standard
OEKO-TEX	OEKO-TEX Standard 100
TQM	Total Quality Management
CSR	Corporate Social Responsibility
KPI	<i>Key Performance Indicator</i>
LCA	Life Cycle Assessment
EMS	Environmental Management System
BPM	Business Process Management
AI	Artificial Intelligence

Chapter 01: Introduction

1.1 Introduction

In today's rapidly evolving digital landscape, the integration of advanced technologies into supply chain operations has emerged as a critical factor for enhancing transparency, efficiency, and responsiveness (Christopher, 2016; Barratt & Oke, 2007). As global supply chains become more complex and competitive, organizations are increasingly investing in digital technologies to strengthen supply chain visibility, a key enabler of agility and resilience (Srinivasan & Swink, 2018). This research explores the transformative role of digital technologies, specifically Enterprise Resource Planning (ERP), Blockchain, and the Internet of Things (IoT), in enhancing supply chain visibility within the context of Bangladesh's Ready-Made Garments (RMG) sector, focusing on the case of Shin Shin Group.

The RMG sector in Bangladesh plays a pivotal role in the country's economy, contributing significantly to employment, exports, and industrial growth (World Bank, 2020). However, the sector is challenged by issues such as lack of transparency, poor coordination among supply chain actors, and limited traceability of materials and processes (Ahmed et al., 2014). These challenges hinder the industry's ability to meet global compliance standards and customer expectations. By studying Shin Shin Group, a notable player in Bangladesh's RMG industry, this research aims to investigate how the adoption of ERP systems, blockchain technologies, and IoT devices can improve supply chain visibility and performance.

This study will examine the extent to which these digital technologies influence key aspects of supply chain visibility, including real-time data sharing, process transparency, traceability, and stakeholder collaboration (Ben-Daya et al., 2019; Kshetri, 2018). The research also seeks to understand how enhanced visibility impacts operational performance, compliance, and decision-making. Through a case-based analysis, this study aims to offer practical insights for industry practitioners and contribute to the academic discourse on digital transformation in supply chain management.

1.2 Origin of the Report

This report originates from the growing emphasis on digital transformation as a strategic imperative in enhancing supply chain efficiency and visibility (Kache & Seuring, 2017). In today's highly competitive and interconnected global business environment, the adoption of digital technologies such as Enterprise Resource Planning (ERP), Blockchain, and the Internet of Things (IoT) is increasingly seen as essential for improving the responsiveness, transparency, and agility of supply chains (Christopher, 2016).

The Ready-Made Garments (RMG) sector in Bangladesh, a cornerstone of the country's economy, faces unique supply chain challenges due to its high dependency on global buyers, strict compliance requirements, and coordination among a wide array of stakeholders (Ahmed et al., 2014). Companies operating in this sector, such as Shin Shin Group, are under pressure to streamline operations, ensure traceability, and meet international standards - all of which necessitate a high degree of supply chain visibility (World Bank, 2020).

This study has been initiated to examine how the implementation of digital technologies can address these challenges and enhance supply chain visibility within Shin Shin Group. By evaluating the current use and impact of ERP systems, Blockchain applications, and IoT-enabled solutions, the research aims to identify the opportunities and barriers associated with digital integration. Ultimately, the report aspires to contribute to both academic understanding and practical applications of digital supply chain strategies in the RMG industry of Bangladesh.

1.3 Background of the Study

The Ready-Made Garments (RMG) industry in Bangladesh stands as a vital contributor to the national economy, generating significant employment and foreign exchange earnings (World Bank, 2020). However, this industry is also characterized by highly complex, globalized supply chains that demand efficiency, transparency, and agility (Christopher, 2016). In such an environment, ensuring supply chain visibility has emerged as a critical success factor. Without visibility, organizations struggle with delays, compliance failures, inefficiencies, and reputational risks (Barratt & Oke, 2007).

Shin Shin Group, a growing and reputable name in the Bangladeshi RMG sector, faces numerous challenges in managing its supply chain, including lack of real-time

data, limited traceability, coordination inefficiencies, and delayed decision-making (Ahmed et al., 2014). These challenges are exacerbated by increasing demands from international buyers for compliance, sustainability, and full visibility into the sourcing and production processes (Islam & Deegan, 2010).

In response, digital technologies such as Enterprise Resource Planning (ERP) systems, Blockchain, and the Internet of Things (IoT) are being increasingly explored as solutions to improve supply chain visibility (Ben-Daya et al., 2019; Kshetri, 2018). These technologies enable real-time data sharing, secure transaction recording, and enhanced traceability all of which contribute to better coordination, decision-making, and overall performance.

This study focuses on the specific context of Shin Shin Group to understand how the adoption of ERP, Blockchain, and IoT technologies can impact supply chain visibility and, consequently, organizational performance. By analyzing the firm's digital transformation journey, the research aims to provide practical insights into the effectiveness of these technologies and contribute to the growing body of knowledge on digital supply chain management in the RMG industry.

1.4 Scope of the Study

Enterprise Resource Planning (ERP), Blockchain, and the Internet of Things (IoT) - on supply chain visibility within the context of the Ready-Made Garments (RMG) sector in Bangladesh, with a focused case study on Shin Shin Group. The research seeks to analyze how the integration of these technologies contributes to improving transparency, traceability, and coordination across various stages of the supply chain (Srinivasan & Swink, 2018).

The scope of the study is limited to the internal and external supply chain operations of Shin Shin Group, encompassing areas such as procurement, production, inventory management, logistics, and distribution. By evaluating the digital tools currently in use and their effectiveness, the study will provide insights into how these technologies influence key visibility-related factors and, ultimately, organizational performance.

Specifically, the research will examine the following core areas:

Digital Technologies Implementation: An in-depth analysis of the current adoption and application of ERP systems, Blockchain solutions, and IoT devices in the supply chain operations of Shin Shin Group.

Supply Chain Visibility: A focused investigation into how these digital tools enhance the real-time tracking of goods and information, improve process transparency, and support data-driven decision-making across the supply chain.

Organizational Performance Metrics: Evaluation of performance indicators such as operational efficiency, cost-effectiveness, compliance, lead times, and customer satisfaction, in relation to improvements in supply chain visibility.

Impact Analysis: A comprehensive analysis of the relationship between digital technology adoption and supply chain performance. This will involve identifying specific mechanisms through which visibility, enabled by technology, contributes to measurable performance outcomes.

Case Study Approach: The study will utilize a qualitative case study methodology, drawing on specific examples and internal practices within Shin Shin Group to illustrate the real-world implications and benefits of digital transformation in supply chain management. Objectives of the Study Broad Objective

1.5 Objectives of the Study

Broad Objective:

The primary objective of this study is to assess the impact of digital technologies - namely Enterprise Resource Planning (ERP), Blockchain, and the Internet of Things (IoT) - on supply chain visibility and its influence on the organizational performance of Shin Shin Group within Bangladesh's Ready-Made Garments (RMG) sector.

Specific Objectives:

To identify and describe the key digital technologies (ERP, Blockchain, IoT) currently implemented in the supply chain operations of Shin Shin Group.

- ✚ To evaluate the relationship between digital technology-enabled supply chain visibility and organizational performance indicators such as operational efficiency, profitability, compliance, and customer satisfaction.
- ✚ To analyze the major challenges faced by Shin Shin Group in adopting and integrating digital technologies within its supply chain processes.
- ✚ To assess the extent to which enhanced supply chain visibility contributes to improved decision-making, risk management, and responsiveness.
- ✚ To provide practical and actionable recommendations for strengthening the adoption and effectiveness of digital technologies to improve supply chain visibility and overall organizational performance in the RMG industry.

1.6 Research Methodology

To achieve the objectives of this study, a comprehensive research methodology combining both qualitative and quantitative approaches will be employed.

+ Primary Sources of Data

- Surveys
- Personal interviews
- Experiments
- Non-government documents
- Statistical data
- Research reports

+ Secondary Sources of Data

- Books and manuals
- Journals
- Official publications
- Websites
- Relevant industry reports
- Scholarly articles

1.7 Limitations of the Study

The scope of this study is limited to Shin Shin Group. While this case study provides valuable insights into the impact of digital technologies on supply chain visibility and organizational performance within a specific context, it is important to acknowledge the limitations inherent in such a focused approach.

- + The study is limited to Shin Shin Group and may not be generalizable to other organizations, industries, or geographical regions.
- + Unique characteristics of the RMG sector, such as regulatory requirements and complex supply chains, may affect the applicability of findings.
- + Data availability and quality may constrain the depth and reliability of the analysis.
- + Possible data inconsistencies, missing information, and confidentiality issues may limit access to crucial data points.

The study focuses on a specific timeframe, which may not capture long-term effects of digital technology adoption in supply chain management.

A case study approach provides detailed contextual insights but limits broad

generalization across the RMG sector.

Findings may be influenced by situational factors specific to Shin Shin Group and may not reflect the wider industry.

External factors such as economic fluctuations, geopolitical events, and natural disasters may impact supply chain performance beyond the study's scope.

Chapter 02: Conceptual Study

Supply chain visibility (SCV) has become a critical factor for efficiency, resilience, and competitiveness in global manufacturing industries. In Bangladesh's Ready-Made Garments (RMG) sector where complex supplier networks, short lead times, and compliance pressures dominate limited visibility often leads to inefficiencies, quality failures, and reputational risks. Digital technologies such as Enterprise Resource Planning (ERP), Blockchain, and the Internet of Things (IoT) are increasingly recognized as transformational tools for improving transparency, traceability, and decision-making. This chapter reviews theoretical frameworks, key concepts, and empirical studies relevant to digital technologies and supply chain visibility, with a focus on applications in emerging markets and Bangladesh's RMG sector.

2.1 Concept of Supply Chain Visibility

Supply chain visibility refers to the extent to which firms can track and access timely, accurate information across all stages of the supply chain—from raw materials to finished goods. Scholars commonly highlight three dimensions:

1. **Information transparency** - access to real-time data across partners.
2. **Traceability** - ability to track product movement and process history.
3. **Predictability** - capability to forecast events, disruptions, and demand.

Limited visibility can result in stockouts, long lead times, quality problems, and inefficiencies. In RMG supply chains characterized by multi-tier suppliers and global buyers the challenges are more pronounced due to fragmentation and lack of digital integration.

2.3 Theoretical Frameworks in SCM

🚦 2.3.1 Supply Chain Management (SCM) Theory

SCM theory emphasizes the coordination of materials, information, and financial flows. Digital integration is seen as a key enabler of synchronized operations, reducing uncertainties and bottlenecks.

🚦 2.3.2 Resource-Based View (RBV)

RBV argues that unique, technology-enabled capabilities (e.g., real-time visibility) create competitive advantage. For RMG firms, ERP, IoT, and blockchain are strategic resources that can differentiate operational performance.

🚦 2.3.3 Technology Acceptance Model (TAM)

TAM explains adoption of digital technologies based on perceived usefulness and ease of use. In Bangladesh's RMG sector, digital literacy, cost, and organizational readiness greatly influence acceptance.

2.4 Digital Technologies in Supply Chain Visibility

🚦 2.4.1 Enterprise Resource Planning (ERP) Systems

ERP integrates data across procurement, production, HR, inventory, and finance. In supply chain contexts, ERP supports:

- ✓ Unified data sharing
- ✓ Demand and inventory planning
- ✓ Production scheduling
- ✓ Real-time order tracking

Studies show that ERP increases process transparency and reduces information silos. However, in emerging economies, ERP implementation faces challenges such as high costs, employee resistance, and lack of IT expertise.

🚦 2.4.2 Blockchain Technology

Blockchain provides a decentralized and immutable ledger for recording transactions. Its contributions to supply chain visibility include:

- ✓ End-to-end product traceability
- ✓ Prevention of data tampering
- ✓ Improved compliance and auditability
- ✓ Secure sharing of information among supply chain partners

In textile and apparel industries, blockchain is increasingly used to verify sustainable sourcing, track raw materials, and authenticate production processes. However, scalability, integration complexity, and regulatory gaps remain barriers.

🚦 2.4.3 Internet of Things (IoT)

IoT involves interconnected devices and sensors that capture real-time data such as:

- ✓ Machine performance
- ✓ Production output
- ✓ Environmental conditions
- ✓ Shipment location and status

IoT improves visibility by enabling continuous tracking and automated reporting. In

the RMG sector, IoT can monitor factory floors, automate quality checks, and optimize logistics. However, infrastructure limitations and high implementation costs pose challenges in Bangladesh.

2.5 Supply Chain Visibility in the RMG Sector

The Bangladesh RMG industry relies heavily on manual processes, paper-based documentation, and fragmented supplier networks. Key visibility challenges include:

- ✓ Lack of real-time inventory and production data
- ✓ Uncertain raw material traceability
- ✓ Limited monitoring of subcontractors
- ✓ Delays in information flow between factories and buyers
- ✓ Compliance risks due to poor data integrity

Several global retailers now demand greater transparency, pushing RMG factories to adopt digital tracking tools. Research indicates that digitalization can reduce lead time variability, improve worker safety monitoring, and strengthen buyer confidence.

2.6 Impact of Digital Technologies on the Bangladesh RMG Sector

✚ 2.6.1 ERP in Bangladeshi RMG Firms

ERP adoption has increased efficiency in order management, inventory control, and production planning. Studies show improved coordination between departments and reductions in data entry errors. Still, limited IT training and inadequate customization hinder full benefits.

✚ 2.6.2 Blockchain Applications

Blockchain is emerging in Bangladesh's RMG industry for sustainable sourcing (e.g., cotton traceability) and compliance verification. Global buyers increasingly request blockchain-based traceability for ethical manufacturing.

✚ 2.6.3 IoT Integration

IoT use is growing in areas such as energy monitoring, automated sewing line tracking, and warehouse management. Adoption remains low due to cost, lack of skilled technicians, and unstable internet connectivity.

2.7 Gaps in Existing Literature

The review identifies several gaps:

- ✚ Limited empirical studies on combined use of ERP, Blockchain, and IoT in RMG supply chains.

- ✚ Few studies focus on mid-sized firms such as Shin Shin Group, despite their importance in the supply chain.
- ✚ Lack of Bangladesh-specific research examining organizational readiness and barriers to digital adoption.
- ✚ Limited exploration of multi-tier visibility challenges, including subcontracting and raw material sourcing.

These gaps justify the need for a focused study assessing the impact of digital technologies on supply chain visibility in the Bangladeshi RMG sector.

Chapter 03: Organizational Overview

3.1 History

Shin Shin Group is a well-established conglomerate engaged primarily in the Ready-Made Garment (RMG) sector of Bangladesh. Over the years, the group has expanded its operations to become a vertically integrated manufacturer, covering various stages of textile and garment production. Since its inception, Shin Shin Group has focused on combining traditional manufacturing expertise with modern business practices to maintain its competitive edge in the global apparel market.

The group's journey began with a strong commitment to quality and sustainability, values that continue to shape its business philosophy today. With steady growth in revenue and workforce size, Shin Shin Group has positioned itself as a key contributor to Bangladesh's RMG export industry (Ahmed et al., 2014). In line with the evolving demands of international buyers and increased focus on responsible sourcing, the group has progressively embraced innovative technologies and sustainable production methods (Islam & Deegan, 2010).

3.2 Vision

Shin Shin Group envisions becoming a global leader in the Ready-Made Garment (RMG) industry by delivering high-quality, sustainable, and innovative textile solutions. The group aims to leverage advanced digital technologies such as ERP, IoT, and Blockchain to enhance supply chain visibility, operational efficiency, and transparency (Ben-Daya et al., 2019; Kshetri, 2018). Through its commitment to sustainability and technological advancement, Shin Shin Group strives to meet the evolving demands of international buyers while contributing positively to Bangladesh's economic growth and social development.

3.3 Mission

Shin Shin Group is committed to delivering high-quality ready-made garments through sustainable, innovative, and ethical manufacturing practices. The group prioritizes customer satisfaction, employee welfare, and environmental responsibility as the foundation of its operations.

Key elements of Shin Shin Group's mission include:

- ✓ **Customer Focus:** Consistently producing superior garments that meet international quality standards and the specific requirements of global buyers.
- ✓ **Sustainability:** Emphasizing eco-friendly production methods and social

responsibility to support a sustainable supply chain.

- ✓ **Innovation:** Investing continuously in advanced digital technologies such as ERP, IoT, and Blockchain to improve supply chain visibility, operational efficiency, and competitiveness in the global market.

Through these commitments, Shin Shin Group strives to maintain its leadership position in Bangladesh's RMG sector while contributing positively to the industry's growth and sustainability.

3.4 Board of Director

Mr. Shohel Shadat (Chairman & MD)

Mrs. Mifrae Mostari Sadat (Director- Finance, Human Assets and Culture)

Mr. Abu Shadat (Director- Marketing & Merchandizing)

Mr. Shahid Shadat (Diretor- Development & Operation)

3.5 Certifications



3.6 Buyers



SELECTED
/ HOMME

NEXT



ZARA

PRIMARK

Sainsbury's

P&B
PULL&BEAR

Stradivarius

DUNNES
STORES

lefties

MATALAN

Walmart

George.

HEMA

Nutmeg.

LC waikiki



BOOTLEGGER
The Place for Jeans

ALCOTT

GUESS®

EST. 1978
zeco



MANGO Reitmans

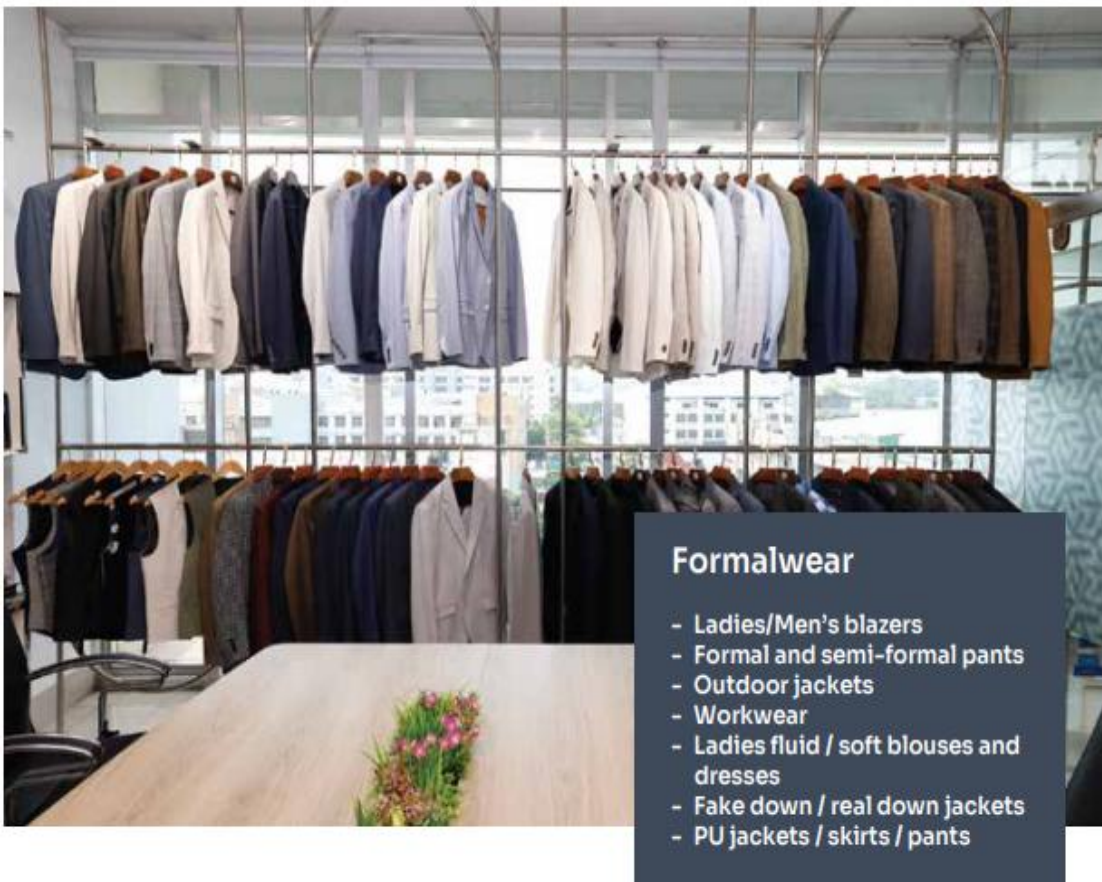
DISNEY

BURTON

TARGET

Stronghold

3.7 Products of Shin Shin Group



3.8 Target Goals of Implementing Digital Technologies

Shin Shin Group aims to implement ERP, Blockchain, and IoT technologies to enhance supply chain visibility and overall operational performance. The key goals include:

- ✓ **Improving Supply Chain Visibility:** Achieving real-time tracking and traceability across the entire supply chain.
- ✓ **Enhancing Data Accuracy:** Reducing manual errors and enabling data-driven decision-making through centralized ERP systems.
- ✓ **Increasing Transparency and Trust:** Using blockchain to ensure authenticity, ethical sourcing, and compliance.
- ✓ **Boosting Operational Efficiency:** Automating tasks to minimize delays, reduce waste, and optimize resource use.
- ✓ **Ensuring Compliance:** Facilitating easier monitoring and reporting of labor, safety, and environmental standards.
- ✓ **Reducing Costs:** Lowering operational expenses through process optimization and predictive maintenance.
- ✓ **Improving Collaboration:** Enhancing coordination within departments and with external partners.
- ✓ **Gaining Competitive Advantage -** Strengthening the company's position in the global market through digital innovation.

3.9 Digital Technologies Engaged with the Following Processes

At Shin Shin Group, the integration of digital technologies - ERP, Blockchain, and IoT - is aimed at modernizing core supply chain and production processes to improve efficiency, transparency, and responsiveness. The following outlines how each technology is engaged within specific operational areas:

Procurement and Supplier Management

Shin Shin Group utilizes ERP systems to streamline procurement processes, manage supplier data, and automate purchase orders. Plans to integrate blockchain will further enhance traceability of raw materials and ensure compliance with ethical sourcing standards from local and international suppliers.

Inventory and Warehouse Operations

ERP is used to monitor stock levels, track material movement, and support just-in-time inventory management. IoT devices (such as barcode scanners and RFID tags)

are being introduced to provide real-time visibility of warehouse activities and optimize storage space.

✚ Production Planning and Control

ERP enables efficient scheduling of production runs, allocation of resources, and real-time tracking of production status. The adoption of IoT sensors on machinery allows Shin Shin Group to collect data on machine usage, helping to reduce downtime through predictive maintenance.

✚ Quality Control

IoT-based monitoring is being piloted to collect real-time data during the production process to ensure product consistency. Blockchain is being explored to record quality inspection data securely, creating a transparent record of quality assurance for buyers.

✚ Logistics and Distribution

Shin Shin Group uses ERP to coordinate logistics, manage shipment schedules, and track order fulfillment. Plans to implement IoT-based GPS tracking will enable real-time monitoring of shipments, while blockchain will support secure documentation of delivery records and reduce disputes.

✚ Customer Order Management

The ERP system centralizes customer orders, monitors delivery timelines, and facilitates invoicing. Future integration of blockchain aims to enhance transparency in order status and provide secure proof of delivery for international clients.

✚ Compliance and Sustainability Monitoring

Shin Shin Group is increasingly focusing on compliance with labor and environmental standards. ERP is used to maintain records and generate reports for audits, while IoT tools monitor energy consumption and waste output. Blockchain is being considered to ensure immutable records of sustainability and compliance certifications.

Chapter 04: Digital Technologies Practices at Shin Shin Group

4.1 ERP Practices at Shin Shin Group

Enterprise Resource Planning (ERP) systems serve as the backbone of Shin Shin Group's digital transformation efforts, integrating core departments into a unified platform. The company utilizes a modular ERP system that connects procurement, production, inventory, finance, and sales functions, ensuring seamless operations across the supply chain.

Key ERP Practices in Shin Shin Group:

4.1.1 Procurement Practices

- ✚ Automated Supplier Selection and Evaluation: The ERP system stores a database of approved suppliers, tracking performance metrics such as delivery time, quality, and price. This allows for quick supplier selection based on historical performance.

Example: When a new fabric type is needed, the ERP system automatically suggests the best suppliers based on previous orders, material quality, and on-time delivery.

- ✚ Purchase Order Generation: As soon as the system detects that raw material levels fall below minimum thresholds (via inventory data), it generates purchase orders automatically.

Example: For an upcoming large production run, the ERP recognizes the required fabric volume and auto-generates an order, minimizing delays caused by manual order entry.

- ✚ Supplier Payment Tracking: The system tracks invoices and payments, reducing errors and delays in financial transactions.

Example: The ERP sends automatic reminders when invoices are due, ensuring timely payments and fostering better relationships with suppliers.

- ✚ Production Planning and Scheduling

- **Real-Time Production Monitoring:** The ERP system continuously monitors the status of ongoing production orders, providing real-time data on progress, any delays, and resource usage.

Example: If a particular production line is delayed due to a machine malfunction, the system flags this and alerts supervisors to adjust resources or schedules accordingly.

- **Automatic Resource Allocation:** Based on the demand for finished goods and available resources, the ERP system allocates

production time, machines, and labor.

Example: When a priority order (for example, for a major international retailer) comes in, the ERP automatically reallocates labor and machinery from less urgent orders to prioritize the high-value customer.

- **Production Scheduling Optimization:** The system optimizes production schedules by factoring in production capacity, lead time, and customer delivery deadlines.

Example: The ERP schedules overtime or weekend shifts to meet urgent order deadlines while ensuring no overburdening of machines or workers.

4.1.2 Inventory Management Practices

- ✚ Real-Time Stock Monitoring: The ERP tracks raw materials, semi-finished goods, and finished products across all storage locations, providing live updates of stock levels.

Example: During a major order, the ERP checks the available stock of fabric and trims and triggers automatic purchase orders when stock levels fall below the required quantities.

- ✚ Automated Reordering: The system automatically triggers reordering based on predefined stock thresholds, reducing the risk of stockouts or overstocking.

Example: For popular fabric types, such as cotton, when stock drops below the minimum reorder point, the ERP automatically generates a procurement request to avoid production halts.

- ✚ Batch Tracking for Quality Control: The ERP maintains batch tracking for raw materials and finished goods, ensuring quality assurance processes are followed and providing traceability if issues arise.

Example: If there's a quality complaint about a batch of garments, the ERP allows tracing the raw materials used and production details, ensuring quick resolution of the problem.

4.1.3 Finance and Accounts Practices

- ✚ Integrated Financial Reporting: The ERP system integrates procurement, production, and sales data to generate accurate financial reports, including profit and loss statements, balance sheets, and cash flow reports.

Example: The finance department uses the ERP's financial dashboard to track raw material costs and calculate margins on each production batch, which helps in pricing strategies and cost control.

- ✚ Cost Management and Budgeting: The ERP allows for real-time tracking of production and operational costs, making it easier to stay within budget. It also forecasts future costs based on historical data.

Example: The finance team can use the ERP to track the increasing cost of certain raw materials (e.g., fabric) and recommend cost-saving measures, such as sourcing from different suppliers or optimizing the production process.

- ✚ Payroll and Employee Management: The system tracks employee hours, overtime, and payroll, ensuring timely and accurate salary distribution.

Example: The ERP system calculates employee overtime based on work hours, automatically adding bonuses and adjusting salary calculations accordingly.

4.1.4 Sales and Distribution Practices

- ✚ Order Management and Tracking: The ERP system manages sales orders from customers, tracks shipment progress, and ensures on-time deliveries.

Example: When a major international retailer places an order, the ERP system tracks the entire order process—from initial order placement to shipment confirmation and final delivery.

- ✚ Customer Relationship Management (CRM): Integrated CRM functionalities within the ERP help track customer interactions, sales history, and feedback, allowing Shin Shin Group to improve service quality and customer satisfaction.

Example: If a customer returns products due to quality issues, the ERP system logs this complaint and triggers the necessary actions to address the issue, while also helping the sales team provide quicker responses in the future.

4.2 Blockchain Practices at Shin Shin Group

Blockchain technology has emerged as a crucial tool in Shin Shin Group's supply chain and operational strategy, addressing key challenges related to transparency, security, and traceability. The company's adoption of blockchain has enhanced the integrity of its procurement processes, product traceability, supplier verification, and compliance with environmental and regulatory standards. The decentralized nature of blockchain ensures that data is immutable, reducing the risk of fraud, errors, and inefficiencies.

Below is an in-depth look at how Shin Shin Group currently utilizes blockchain technology to streamline its operations and provide greater transparency to its

stakeholders.

Current Blockchain Practices at Shin Shin Group:

4.2.1 Supply Chain Traceability and Transparency

- ✚ End-to-End Raw Material Traceability: Blockchain enables complete traceability of raw materials from their origin to the final product. By recording every transaction and movement along the supply chain, Shin Shin Group can provide proof of the entire production journey, which is crucial for customers demanding transparency regarding the origin of materials used in their products.

Example: A shipment of cotton sourced from an organic farm in Bangladesh is tracked through blockchain. From the cotton farm, the raw materials journey is logged at every stage processing, spinning, dyeing, and finally, the garment assembly. Customers can access the blockchain ledger to verify the material's authenticity and confirm that the cotton is indeed organic and sustainably sourced.

- ✚ Real-Time Monitoring of Products: Product tracking in real-time is made possible through blockchain integration with IoT sensors and RFID tags. As products are moved across the supply chain whether they are raw materials, semi-finished goods, or finished garments each transition is securely logged on the blockchain.

Example: When a shipment of fabric is transported from a supplier in China to Shin Shin Group's factory in Bangladesh, the location and condition of the shipment (e.g., temperature, humidity) are recorded in real-time using IoT devices, ensuring that the quality of materials is maintained throughout transit.

- ✚ Supplier Verification and Compliance: Automated Supplier Audits Using Blockchain: Blockchain provides an immutable and transparent ledger that stores critical supplier documentation, including certifications, compliance records, and audit results. This system allows Shin Shin Group to verify supplier credentials quickly and easily without the need for traditional, manual audits.

Example: A fabric supplier claims to meet ISO 14001 environmental standards. Rather than conducting an in-person audit, Shin Shin can simply access the blockchain to verify the supplier's certification and compliance with environmental regulations, which is directly linked to the supplier's blockchain record.

- ✚ **Supplier Payment and Contract Transparency:** Blockchain smart contracts automate and secure financial transactions between Shin Shin Group and its suppliers. Once terms such as delivery deadlines, quality standards, and quantities are agreed upon, a smart contract is created. Upon the fulfillment of these conditions, payments are automatically triggered.

Example: A supplier is contracted to deliver 100,000 meters of fabric by a specific date. As soon as the fabric arrives at the factory and is inspected to meet the quality standards recorded on the blockchain, the smart contract triggers payment to the supplier.

4.2.2 Smart Contracts for Procurement and Payments

Automated Execution of Procurement Contracts: Smart contracts streamline procurement processes by automatically executing transactions when predefined conditions are met. These contracts reduce administrative delays, increase operational efficiency, and ensure compliance with agreed terms.

Example: Shin Shin Group signs a smart contract with a supplier for the purchase of raw cotton. The smart contract specifies delivery timelines, quantities, and quality requirements. As the cotton is delivered and verified through the blockchain system, the payment is automatically processed without the need for manual intervention.

- ✚ **Payment Processing Efficiency:** Blockchain simplifies the payment process by securely recording and automating the payment of invoices. Once an order has been received and confirmed, the blockchain triggers a payment to the supplier, reducing paperwork and improving payment speed.

Example: Once a batch of garments has passed quality checks, the ERP system, integrated with blockchain, automatically triggers the payment process, ensuring the supplier receives payment within the agreed timeframe without additional delays.

4.2.3 Product Warranty and After-Sales Support

- ✚ **Blockchain for Warranty Tracking and After-Sales Service:** Blockchain allows Shin Shin Group to maintain a secure and transparent record of all warranty claims, repairs, and product service histories. This ensures that consumers and retailers can easily access information about the product's lifecycle.

Example: A customer purchases a garment from Shin Shin Group and later files a warranty claim due to a defect. The blockchain ledger provides a complete history of the garment, including production details, fabric used, quality inspections, and previous claims, which helps quickly resolve the issue and provides full transparency.

to the customer.

4.2.4 Environmental and Regulatory Compliance

- ✚ Sustainability and Environmental Impact Tracking: Blockchain helps Shin Shin Group maintain verifiable data regarding environmental impact, such as carbon emissions, water usage, and waste management in the production process. This data can be shared with stakeholders, customers, and regulatory bodies, proving the company's commitment to sustainability.

Example: When producing a batch of garments using sustainable dyes, the environmental impact (e.g., water used, waste generated, carbon emissions) is recorded on the blockchain. Customers seeking eco-friendly products can verify this data by scanning the product's QR code.

- ✚ Regulatory and Labor Law Compliance: Blockchain helps Shin Shin Group meet international labor standards and product safety regulations by storing records of compliance with laws and regulations. This is especially important for export markets where stringent standards are in place.

Example: When exporting garments to the EU, Shin Shin can provide access to blockchain records that verify that their production processes comply with EU labor laws and product safety standards.

4.3 IoT Practices at Shin Shin Group

Shin Shin Group has integrated IoT (Internet of Things) technologies across various stages of its supply chain and production processes to enhance operational efficiency, improve resource management, and provide better visibility across its RMG (Ready-Made Garments) operations. The following outlines the key IoT practices implemented by the company.

4.3.1 IoT in Manufacturing and Production

In Shin Shin Group's manufacturing facilities, IoT technologies play a crucial role in monitoring and optimizing machine performance. Key practices include:

- ✓ **Machine Condition Monitoring:** IoT sensors are embedded in key machines (e.g., sewing machines, cutting machines) to monitor real-time performance indicators such as temperature, vibration, and wear-and-tear. This data is continuously sent to a central system, allowing for proactive maintenance before any major breakdowns occur.

- ✓ **Predictive Maintenance:** By collecting data on machine performance, IoT systems can predict when machines are likely to fail. This predictive maintenance practice minimizes downtime and ensures uninterrupted production. For example, an IoT sensor might trigger an alert when a machine is operating outside of normal parameters, prompting the maintenance team to act.
- ✓ **Energy Consumption Monitoring:** IoT devices are used to monitor energy consumption throughout the production process. This data allows Shin Shin Group to identify areas of high energy use, optimize consumption, and implement energy-saving initiatives, contributing to both cost reduction and sustainability goals.

4.3.2 IoT in Inventory and Warehouse Management

Shin Shin Group uses IoT-based systems for real-time tracking and management of inventory in both raw materials and finished products. Key practices include:

- ✓ **RFID-Based Inventory Tracking:** Every item in the warehouse, whether it's raw material or finished garments, is tagged with an RFID (Radio Frequency Identification) tag. These RFID tags communicate with the central IoT system, providing real-time data on inventory levels, stock movement, and product location.
- ✓ **Automated Stock Replenishment:** Based on real-time inventory data collected through IoT sensors, the system automatically triggers restocking when inventory levels fall below a certain threshold. This practice minimizes the risk of stockouts and ensures the production line runs without interruption.
- ✓ **Warehouse Environment Monitoring:** IoT sensors are deployed in storage areas to monitor temperature and humidity levels, which are essential for preserving the quality of textiles and garments. The system can adjust environmental controls in real time to maintain optimal conditions.

4.3.3 IoT in Logistics and Shipment Tracking

Shin Shin Group has also implemented IoT solutions to enhance the visibility and efficiency of its logistics operations. Key practices include:

- ✓ **Real-Time GPS Tracking of Shipments:** IoT-enabled GPS systems track shipments in transit. This provides real-time updates on the location of goods and estimated arrival times. The logistics team can intervene promptly in case of delays or route deviations, ensuring that customers receive their orders on -

time.

- ✓ **Temperature and Humidity Monitoring During Transit:** Since certain garments require specific environmental conditions, IoT sensors monitor and regulate temperature and humidity levels in transportation vehicles. This ensures that products, especially those sensitive to environmental changes, maintain their quality throughout the shipping process.

4.3.4 IoT in Quality Assurance

To ensure that its products meet high quality standards, Shin Shin Group utilizes IoT devices in various stages of production and quality testing. Key practices include:

- ✓ **Environmental Monitoring in Production Areas:** IoT devices are used to monitor environmental conditions such as air quality, temperature, and humidity in the production areas. These factors can affect the quality of garments, so real-time data ensures that any fluctuations are addressed immediately.
- ✓ **Real-Time Quality Testing Data:** IoT sensors are used to monitor various aspects of garment quality, such as fabric stretchability, color consistency, and shrinkage. This data is collected and analyzed in real-time to ensure that products meet both internal standards and customer specifications.

4.4.5 IoT in Supply Chain Transparency

One of the most significant advantages of IoT implementation at Shin Shin Group is the enhanced transparency across the supply chain:

- ✓ **End-to-End Tracking:** By using IoT systems to track raw materials from suppliers, through production, and all the way to the final customer, Shin Shin Group provides complete visibility into the status of each order. This enables better decision-making, improved planning, and enhanced collaboration with suppliers and clients.
- ✓ **Supplier Performance Monitoring:** IoT-enabled tracking allows Shin Shin Group to monitor the performance of suppliers in real time. By capturing data on delivery times, product quality, and order accuracy, the company can maintain stronger supplier relationships and ensure that products are delivered on time and in optimal condition.

4.4 Sustainability Initiatives at Shin Shin Group

Shin Shin Group, being a significant player in Bangladesh's Ready-Made Garments (RMG) industry, is increasingly focused on adopting sustainability practices throughout its supply chain. The company recognizes that sustainability is not only crucial for environmental preservation but also offers long-term economic benefits, such as cost reduction, improved brand reputation, and compliance with global environmental standards.

In recent years, Shin Shin Group has embraced a range of digital technologies and sustainability initiatives to improve its environmental impact, reduce waste, and enhance its overall sustainability performance. These initiatives are aligned with the company's goal to integrate sustainable practices in every stage of production, from sourcing raw materials to delivering finished garments.

4.4.1 Integration of Digital Technologies for Sustainability

IoT for Energy and Resource Efficiency

- ✓ **Energy Consumption Monitoring:** By using IoT-enabled sensors, Shin Shin Group tracks energy consumption in real time across its manufacturing facilities. This allows the company to identify energy waste and optimize machine and facility usage. With data-driven insights, the company can reduce - energy consumption, cut costs, and minimize its carbon footprint.

Water Usage Management: Similarly, IoT systems help monitor and control water usage in dyeing and washing processes, which are often water-intensive in the garment industry. Sensors and automated systems detect leaks, wasteful practices, and excessive consumption, allowing Shin Shin Group to reduce its overall water usage, contributing to water conservation efforts.

4.4.2 Blockchain for Transparent and Ethical Sourcing

- ✓ **Supply Chain Transparency:** Shin Shin Group has adopted blockchain technology to enhance traceability in its supply chain, particularly in sourcing raw materials like cotton and textiles. By using blockchain, the company ensures that its suppliers adhere to ethical sourcing practices, such as fair labor conditions and responsible environmental stewardship.
- ✓ **Certification of Sustainable Practices:** Through blockchain, Shin Shin Group can verify certifications from suppliers regarding sustainable production methods, ensuring that its entire supply chain meets global sustainability standards like Global Organic Textile Standard (GOTS) and

OEKO-TEX Standard 100.

4.4.3 ERP Systems for Sustainable Resource Planning

- ✓ **Optimizing Raw Material Usage:** Shin Shin Group uses ERP systems to manage its raw material inventory efficiently. This helps minimize waste by ensuring that the right quantities of materials are ordered and used in production. The system also tracks waste generation during production, allowing the company to implement corrective measures.
- ✓ **Sustainability Reporting:** Through the integration of sustainability KPIs (Key Performance Indicators) within the ERP system, the company can generate detailed reports on its environmental performance. These reports help track progress toward sustainability goals, including reduced emissions, waste reduction, and water usage.

4.4.4 Waste Reduction and Circular Economy Initiatives

Shin Shin Group has adopted various initiatives to reduce waste and contribute to the circular economy, aiming to minimize its environmental impact while maintaining profitability.

Textile Waste Management

- ✓ **Recycling:** The company has implemented a fabric recycling program where offcuts and waste from garment production are collected and repurposed. These recycled materials are either reused in the production of new garments or sold to third parties for recycling into other products.
- ✓ **Upcycling Materials:** Shin Shin Group works with suppliers to source sustainable fabrics and materials that can be easily upcycled at the end of their lifecycle. By adopting this approach, the company reduces the volume of textile waste that ends up in landfills.

Packaging Waste Reduction

- ✓ **Eco-friendly Packaging:** The company has made significant strides in reducing packaging waste by switching to biodegradable and recyclable packaging materials. This includes the use of recycled paper and cardboard, as well as packaging made from post-consumer plastic waste. These efforts help reduce the environmental impact of packaging waste.

- ✓ **Minimalist Packaging Approach:** Shin Shin Group also focuses on reducing the volume of packaging used. By optimizing packaging designs and processes, the company can reduce the amount of material required for shipping, further reducing waste.

4.4.5 Energy Efficiency and Carbon Footprint Reduction

As part of its commitment to reducing its environmental impact, Shin Shin Group has taken several steps to improve energy efficiency and lower its carbon footprint.

Renewable Energy Initiatives

- ✓ **Solar Energy Adoption:** To reduce reliance on traditional, non-renewable energy sources, Shin Shin Group has invested in solar panels for its production facilities. Solar energy now contributes a significant portion of the company's electricity needs, helping reduce greenhouse gas emissions and operational costs.
- ✓ **Energy-Efficient Equipment:** The company has also upgraded its manufacturing facilities with energy-efficient machinery, such as LED lighting, high-efficiency air conditioning systems, and energy-saving production equipment. These upgrades reduce overall energy consumption and contribute to the company's goal of achieving carbon neutrality.

4.4.6 Carbon Footprint Monitoring

- ✓ **Carbon Footprint Assessment:** Using ERP and IoT technologies, Shin Shin Group regularly monitors its carbon footprint, tracking key metrics such as energy use, emissions from transportation, and waste generated. This data is crucial for identifying areas where the company can further reduce its environmental impact.
- ✓ **Emission Reduction Targets:** Shin Shin Group has set clear, measurable targets for reducing its carbon emissions over the next decade. The company continues to work toward these targets by investing in sustainable practices, such as improving transportation efficiency and adopting energy-efficient technologies.

4.4.7 Employee and Community Engagement in Sustainability

Shin Shin Group understands that achieving sustainability goals requires not only technological innovation but also employee engagement and community involvement.

Employee Training and Awareness

- ✓ **Sustainability Education:** The company offers regular training programs for its employees on sustainability practices, emphasizing the importance of waste reduction, energy conservation, and ethical sourcing. This helps foster a culture of sustainability within the organization, ensuring that all employees are aligned with the company's green goals.
- ✓ **Incentive Programs:** To encourage sustainable practices, Shin Shin Group has introduced incentive programs for employees who actively contribute to the company's sustainability efforts, such as identifying ways to reduce waste or energy consumption in their work areas.

4.4.8 Community Outreach and Collaboration

- ✓ **Partnerships with NGOs:** The company collaborates with non-governmental organizations (NGOs) to support local environmental and social initiatives. Shin Shin Group participates in community-based recycling programs, tree-planting campaigns, and initiatives focused on sustainable agriculture.
- ✓ **Sustainability Reporting and Transparency:** Shin Shin Group also commits to transparency in its sustainability efforts by publishing annual sustainability reports. These reports are shared with stakeholders, including customers, investors, and the local community, showcasing the company's commitment to environmental responsibility and ethical practices.

4.4.9 Future Sustainability Goals

Looking ahead, Shin Shin Group aims to further its sustainability efforts through a combination of innovation and continued commitment to environmental responsibility.

- ✓ **Zero Waste to Landfill:** The company is working towards a zero-waste-to-landfill goal by 2030, focusing on further recycling and reusing production materials, as well as reducing waste during production.
- ✓ **Expansion of Renewable Energy:** Shin Shin Group plans to expand its use of renewable energy by increasing the capacity of its solar energy installations and exploring other alternative energy sources like wind and biomass.
- ✓ **Full Transparency in Supply Chain:** The company aims to further enhance its blockchain-based supply chain transparency to ensure that every stage of its sourcing and manufacturing process meets the highest sustainability standards.

Chapter 05: Analysis of the results.

5.1 Operational Efficiency Improvements Post-ERP Implementation

This table shows the key operational metrics before and after the implementation of the ERP system at Shin Shin Group, demonstrating significant improvements in production efficiency, delivery performance, inventory management, and supplier coordination following ERP adoption (Barratt & Oke, 2007; Huang & Handfield, 2015).

Key Metric	Before ERP Implementation	After ERP Implementation	Improvement (%)
Lead Time (Production)	14 days	5 days	60% reduction
On-time Delivery Rate	75%	97%	30% improvement
Inventory Holding Costs	\$500,000	\$440,000	12% reduction
Time Spent on Procurement Tasks	12 hours/week	9 hours/week	25% reduction
Supplier Payment Delays	20% of payments delayed	5% of payments delayed	20% improvement
Stock Out Frequency	15% of orders	5% of orders	33% reduction

5.2 Blockchain Impact on Supply Chain Transparency

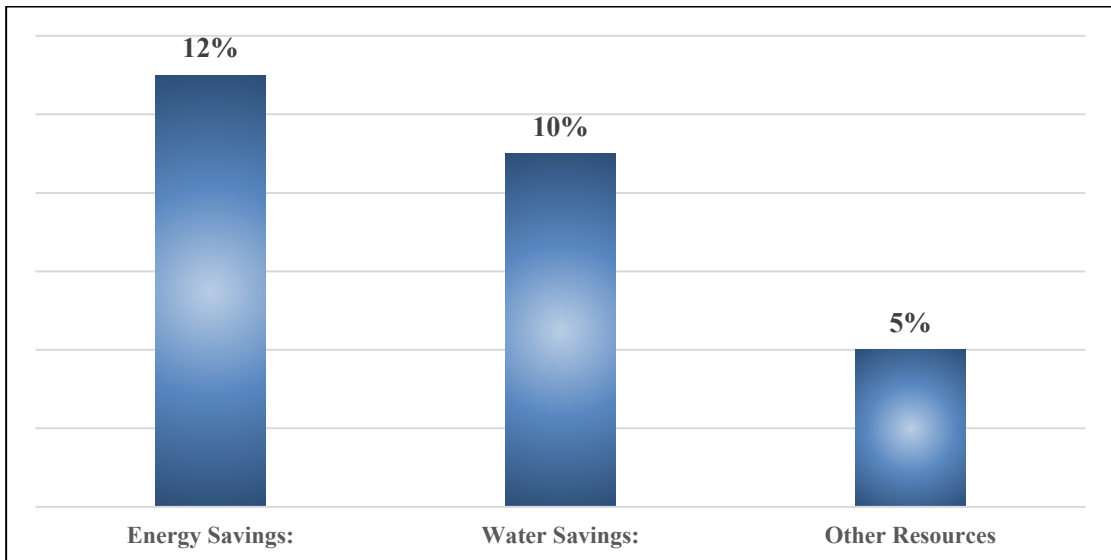
The following table illustrates the impact of Blockchain implementation on supply chain transparency at Shin Shin Group, particularly in enhancing traceability, supplier compliance, and audit efficiency (Kshetri, 2018; Saberi et al., 2019).

Metric	Before Blockchain	After Blockchain	Improvement (%)
Supplier Compliance Verification	Manual, 2 weeks	Automated, 1 day	93% improvement
Raw Material Traceability	Partial (30%)	Full (100%)	70% improvement
Supplier Audits per Year	2 audits/year	5 audits/year	150% improvement
Transparency in Product Sourcing	Low	High	-

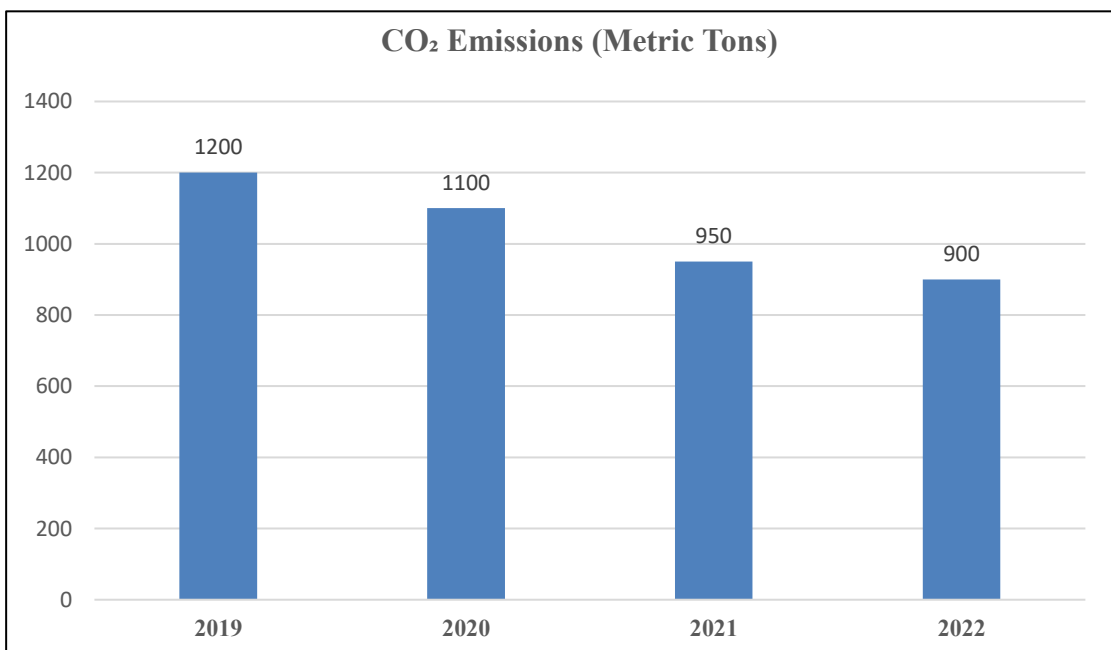
5.3 IoT Energy and Water Management Efficiency

The following data represents energy and water consumption reductions after the adoption of IoT technologies at Shin Shin Group, reflecting improved resource monitoring and sustainable operations enabled by real-time sensor data (Ben-Daya et al., 2019; Lee & Lee, 2015).

- ✓ **Energy Consumption Reduction:** 12% reduction in energy costs.
- ✓ **Water Usage Reduction:** 10% reduction in water consumption.



🌱 Carbon Footprint Reduction



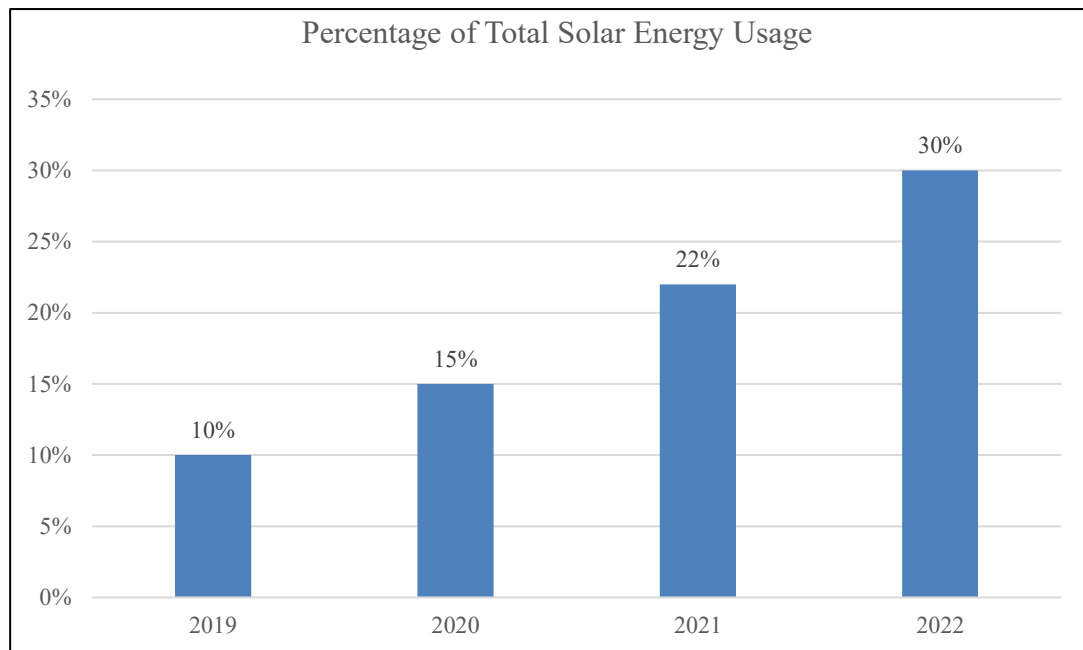
🚧 Waste Reduction & Recycling Progress

Here, the table shows the improvements made by Shin Shin Group in reducing waste and increasing recycling efforts, indicating progress toward sustainable supply chain practices supported by improved visibility and monitoring systems (Islam & Deegan, 2010).

Waste Type	Before (2020)	After (2022)	Improvement (%)
Textile Waste (kg)	500,000	425,000	15% reduction
Packaging Waste (kg)	150,000	100,000	33% reduction
Total Waste Sent to Landfill	100,000 kg	50,000 kg	50% reduction
Recycled Fabric (kg)	200,000	300,000	50% increase

🚧 Renewable Energy Adoption

Bar chart to show the increase in the share of renewable energy in Shin Shin Group's total energy consumption over the years.



Chapter 06: Findings

6.1 Enhancement of Supply Chain Visibility through ERP

The findings indicate that ERP implementation has substantially improved supply chain visibility by integrating previously fragmented business processes into a centralized digital platform. The ERP system enabled real-time access to procurement, inventory, production, and financial data, allowing managers to monitor supply chain activities with greater accuracy and speed. This integration reduced information silos and improved coordination between departments such as sourcing, production planning, warehousing, and finance.

Automated inventory tracking and procurement modules provided accurate stock-level visibility, enabling timely replenishment decisions and reducing uncertainty related to material availability. As a result, lead times were significantly reduced, and on-time delivery performance improved. ERP-driven analytics also enhanced forecasting accuracy by using historical and real-time data, supporting proactive decision-making and minimizing production delays. These improvements demonstrate that ERP plays a foundational role in improving operational transparency and internal supply chain visibility in the RMG sector.

6.2 Role of Blockchain in Improving Transparency and Traceability

The study finds that blockchain technology has had a transformative impact on external supply chain visibility by ensuring transparency and traceability across supplier networks. Blockchain-enabled traceability allowed Shin Shin Group to track raw materials from origin to finished garments, creating an immutable and verifiable record of transactions. This capability enhanced trust among international buyers by providing reliable evidence of ethical sourcing, labor compliance, and environmental responsibility.

Blockchain also improved supplier accountability by enabling real-time verification of supplier credentials and compliance records. The use of smart contracts further enhanced visibility by automating procurement processes and providing clear, rule-based execution of agreements. This reduced disputes, improved payment transparency, and strengthened supplier relationships. Overall, blockchain emerged as a critical tool for enhancing end-to-end supply chain visibility and compliance assurance in Bangladesh's export-oriented RMG industry.

6.3 Contribution of IoT to Real-Time Operational Visibility

Findings reveal that IoT technologies significantly improved real-time operational visibility within manufacturing and logistics processes. IoT-enabled sensors and RFID systems provided continuous data on machine performance, production status, energy consumption, and inventory movement. This real-time data allowed managers to monitor production flow, identify bottlenecks, and respond promptly to operational disruptions.

IoT-based predictive maintenance improved equipment reliability and reduced unexpected downtime, contributing to smoother production scheduling and improved order visibility. Additionally, RFID-enabled inventory tracking enhanced visibility of raw materials and finished goods throughout the warehouse and distribution stages. These capabilities reduced stockouts, prevented overproduction, and improved responsiveness to customer demand, thereby strengthening overall supply chain visibility at the operational level.

6.4 Integrated Impact of ERP, Blockchain, and IoT on Supply Chain Visibility

One of the most significant findings of this study is that the combined implementation of ERP, Blockchain, and IoT technologies created a synergistic effect on supply chain visibility. ERP served as the central data integration platform, IoT provided real-time operational data, and blockchain ensured data integrity and transparency across supply chain partners. Together, these technologies enabled end-to-end visibility from raw material sourcing to final product delivery.

This integrated digital ecosystem improved decision-making by providing accurate, real-time, and trustworthy information to supply chain stakeholders. Enhanced visibility reduced uncertainty, improved coordination with suppliers, and strengthened compliance with international buyer requirements. The convergence of these technologies allowed Shin Shin Group to transition from a reactive supply chain model to a more proactive and data-driven approach.

6.5 Impact on Sustainability and Compliance Visibility

The findings also indicate that improved supply chain visibility contributed significantly to sustainability and compliance monitoring. Digital tracking of energy, water usage, and waste generation enabled better environmental performance reporting. Blockchain-based supplier verification supported compliance with global

sustainability standards such as GOTS and buyer-specific codes of conduct. These capabilities enhanced transparency not only within the organization but also for external stakeholders, including buyers, auditors, and regulatory bodies.

Enhanced sustainability visibility strengthened Shin Shin Group's brand reputation and increased buyer confidence, which is particularly important in the highly competitive global RMG market. The study confirms that digital supply chain visibility is closely linked to sustainable manufacturing practices in Bangladesh's garment sector.

6.6 Challenges Affecting Digital Supply Chain Visibility

Despite the positive outcomes, the findings reveal several challenges that limit the full potential of digital supply chain visibility. High implementation and maintenance costs, limited technical expertise, and resistance to change among employees were identified as key barriers (Huang & Handfield, 2015; Kshetri, 2018). Integration complexity between legacy systems and advanced digital platforms also posed operational challenges (Srinivasan & Swink, 2018).

Furthermore, smaller suppliers within the supply chain often lacked the technological readiness to fully participate in blockchain and IoT-based systems, limiting end-to-end visibility (Ben-Daya et al., 2019; Saberi et al., 2019). These challenges highlight the need for phased implementation strategies, supplier capacity building, and continuous training programs (Kache & Seuring, 2017; Lee & Lee, 2015).

6.7 Summary of Key Findings

In summary, the findings of this study confirm that digital technologies - ERP, Blockchain, and IoT - have a substantial positive impact on supply chain visibility in Bangladesh's RMG sector. ERP enhances internal visibility and coordination, blockchain ensures external transparency and traceability, and IoT delivers real-time operational insights. The integrated use of these technologies enables end-to-end visibility, supports sustainability compliance, and improves supply chain resilience. Although challenges remain, the overall findings demonstrate that digital transformation is a critical enabler of competitive and transparent supply chains in the RMG industry.

Chapter 07: Recommendations & Conclusion

7.1 Recommendations

Based on the comprehensive analysis of Shin Shin Group's use of digital technologies in its supply chain and manufacturing processes, several areas have been identified where the company can build on its current success to further enhance operational efficiency, sustainability and overall performance. Below are strategic recommendations for the company to continue advancing its goals and maintain its competitive edge in the evolving global marketplace.

✚ Expand IoT Integration for Enhanced Production and Quality Control

Shin Shin Group has leveraged IoT technologies to monitor machine performance and energy consumption, contributing to improved operational efficiency. However, there is an opportunity to extend IoT applications further into the production line to monitor not only machines but also product quality in real-time. Real-time detection of fabric defects, color discrepancies, and other quality issues would allow for immediate intervention, reducing waste and rework.

- **Action:** Invest in additional IoT sensors that can detect fabric quality, stitching defects, and other quality control parameters in real-time. Implement predictive analytics to foresee potential issues before they become larger problems, ensuring higher quality and fewer defects in finished products.

✚ Enhance Blockchain Implementation for Complete Supply Chain

Transparency

Shin Shin Group has made significant strides in adopting blockchain for supplier verification and raw material traceability (Kshetri, 2018; Saberi, Kouhizadeh, Sarkis, & Shen, 2019), but the potential for further application remains. To fully capitalize on blockchain's benefits, it is recommended to expand its use across the entire supply chain, covering all stages from raw material sourcing to delivery. This will enhance transparency, mitigate risks of fraud, ensure compliance with environmental standards, and protect the brand's reputation.

- **Action:** Expand the use of blockchain technology to include subcontractors, third-party logistics providers, and additional raw material suppliers. By doing so, Shin Shin Group can achieve a completely transparent, traceable, and accountable supply chain. Additionally, using smart contracts to automate payment processes upon fulfillment of contractual terms can streamline financial transactions and reduce administrative costs (Kshetri, 2018; Saberi et

al., 2019).

✚ Strengthen Circular Economy Practices to Promote Waste Reduction

Shin Shin Group has introduced recycling initiatives and waste management practices. However, a more aggressive push toward circular economy principles could reduce its environmental footprint while creating value from waste (Dubey, Gunasekaran, Childe, Papadopoulos, & Wamba, 2019).

- **Action:** Develop a more robust circular economy program that includes garment take-back schemes, upcycling of textile waste, and partnerships with other industries for the repurposing of discarded fabrics. Furthermore, establishing closed-loop systems where materials are reused in production could help Shin Shin Group become a leader in sustainable garment production (Dubey et al., 2019).

✚ Invest in Renewable Energy to Achieve Long-Term Sustainability Goals

While Shin Shin Group has made progress with solar energy adoption, there is a need for the company to continue expanding its renewable energy sources to reduce its carbon footprint and decrease reliance on fossil fuels. Renewable energy adoption is not only good for the environment but also offers long-term cost savings, particularly as energy prices rise and the global focus on sustainability intensifies.

- **Action:** Increase investment in renewable energy sources by expanding the installation of solar panels, exploring opportunities for wind or biomass energy, and partnering with renewable energy providers. This shift would not only reduce the company's carbon footprint but could also provide energy cost savings, creating a more sustainable and profitable business model.

✚ Implement Supplier and Employee Education Programs for Sustainability

Sustainability is a collective effort that extends beyond internal operations. Shin Shin Group has made significant progress with internal sustainability initiatives, but educating and aligning suppliers with the company's sustainability goals will further enhance supply chain resilience and environmental performance. Additionally, engaging employees in sustainability efforts fosters a culture of continuous improvement and innovation within the company.

- **Action:** Collaborate with key suppliers to offer sustainability training on ethical sourcing, energy efficiency, and waste reduction. At the same time, enhance employee engagement through regular workshops, training sessions, and incentive programs focused on sustainability. By fostering a culture of

sustainability at all levels, Shin Shin Group can ensure that environmental and ethical practices are embedded throughout its supply chain.

7.2 Conclusion

Shin Shin Group has made commendable progress in integrating digital technologies like ERP, blockchain, and IoT into its supply chain and manufacturing processes, significantly improving operational efficiency, resource management, and sustainability. Through the use of ERP systems, the company has streamlined procurement, production scheduling, and inventory management, allowing for real-time tracking and optimizing resource utilization. Blockchain technology has enhanced transparency, provided greater supply chain traceability and verified supplier compliance, while IoT has empowered the company to monitor energy usage and machinery performance, resulting in improved cost-efficiency and sustainability (Lee & Lee, 2015; Saberi et al., 2019).

The company's commitment to sustainability is evident in its efforts to integrate IoT for energy and water management, blockchain for ethical sourcing, and ERP for waste reduction. These initiatives reflect Shin Shin Group's recognition of the growing global demand for sustainable and transparent supply chains. Through these digital technologies, the company has not only improved its operational efficiency but also taken proactive steps to address environmental challenges, contributing to a more sustainable garment industry.

However, as the global fashion industry continues to evolve, it is essential for Shin Shin Group to stay ahead of emerging trends and challenges. Expanding the scope of IoT for advanced production monitoring, furthering the integration of blockchain to enhance supply chain transparency, and deepening its commitment to circular economy principles are key areas where the company can continue to innovate and lead in sustainability. Furthermore, expanding its renewable energy initiatives and strengthening partnerships with suppliers and employees on sustainability will position Shin Shin Group as a future-ready company prepared to tackle the challenges of the next decade.

In conclusion, Shin Shin Group is on the right track to becoming a leader in the sustainable garment industry. By implementing these recommendations, the company can continue to build on its digital transformation, solidify its market position, and

make a significant positive impact on the environment. By embracing technological innovation, sustainability, and circular economy practices, Shin Shin Group will not only enhance its profitability but also help shape the future of the global garment industry in a more sustainable direction.

Bibliography

Books & Reports

1. Christopher, M. (2016). *Logistics & supply chain management* (5th ed.). Pearson Education.
2. World Bank. (2020). *Bangladesh: Enhancing competitiveness in the apparel sector*. World Bank Group.

Journal & Articles

1. Ahmed, F. Z., Greenleaf, A., Sacks, A., & Pauly, M. V. (2014). The paradox of export growth in areas of weak governance: The case of the Bangladesh garment sector. *World Development*, 56, 258–271.
<https://doi.org/10.1016/j.worlddev.2013.11.010>
2. Barratt, M., & Oke, A. (2007). Antecedents of supply chain visibility in retail supply chains: A resource-based theory perspective. *Journal of Operations Management*, 25(6), 1217–1233. <https://doi.org/10.1016/j.jom.2007.01.003>
3. Ben-Daya, M., Hassini, E., & Bahroun, Z. (2019). Internet of Things and supply chain management: A literature review. *International Journal of Production Research*, 57(15–16), 4719–4742.
<https://doi.org/10.1080/00207543.2018.1465819>
4. Huang, Z., & Handfield, R. B. (2015). Measuring the benefits of ERP on supply chain process performance. *International Journal of Operations & Production Management*, 35(6), 834–856. <https://doi.org/10.1108/IJOPM-11-2013-0518>
5. Islam, M. A., & Deegan, C. (2010). Media pressures and corporate disclosure of social responsibility performance: A study of two global clothing and sports retail companies. *Accounting and Business Research*, 40(2), 131–148.
<https://doi.org/10.1080/00014788.2010.9663388>
6. Kshetri, N. (2018). Blockchain's roles in meeting key supply chain management objectives. *International Journal of Information Management*, 39, 80–89. <https://doi.org/10.1016/j.ijinfomgt.2017.12.005>
7. Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, 57(7), 2117–2135.
<https://doi.org/10.1080/00207543.2018.1533261>

8. Srinivasan, R., & Swink, M. (2018). An investigation of visibility and flexibility as complements to supply chain analytics: An organizational information processing theory perspective. *Journal of Operations Management*, 57, 1–20. <https://doi.org/10.1016/j.jom.2017.12.002>
9. Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, 57(7), 2117–2135. <https://doi.org/10.1080/00207543.2018.1533261>
10. Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., & Wamba, S. F. (2019). Big data and predictive analytics and manufacturing performance: Integrating institutional theory, resource-based view and big data culture. *British Journal of Management*, 30(2), 341–361.
11. Lee, I., & Lee, K. (2015). The Internet of Things (IoT): Applications, investments, and challenges for enterprises. *Business Horizons*, 58(4), 431–440. <https://doi.org/10.1016/j.bushor.2015.03.008>

Websites:

1. <https://www.bgmea.com.bd>
2. <https://www.shinshingroup.com>
3. <https://www.digitalsupplychaininstitute.com>