

Report On

Assessing the Impact of Electronic Data Interchange on Reverse Logistics Efficiency and Distribution Lead Time: A Case Study of Bata Shoe Company (Bangladesh) Limited

By

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An internship report submitted to the BRAC Business School (BBS) in partial fulfillment of the requirements for the degree of
Bachelor of Business Administration (BBA)

BRAC Business School
BRAC University

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Declaration

It is hereby declared that

1. The internship report submitted is my/our own original work while completing degree at Brac University.
2. The report 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 report does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I/We have acknowledged all main sources of help.

Student's Full Name & Signature:

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Assistant Professor, BRAC Business School
BRAC University

Letter of Transmittal

Dr. Md. Hasan Maksud Chowdhury

Assistant Professor,

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Kha-224 Merul Badda, Dhaka 1212. Bangladesh

Subject: Internship report on “Assessing the Impact of Electronic Data Interchange on Reverse Logistics Efficiency and Distribution Lead Time: A Study of Bata Shoe Company (Bangladesh) Limited.”

Dear Sir,

I am presenting my internship report here titled “Assessing the Impact of Electronic Data Interchange on Reverse Logistics Efficiency and Distribution Lead Time: A Study of Bata Shoe Company (Bangladesh) Limited.” It summarizes the key learnings and findings during my internship experience.

This report was prepared with your three months of guidance, and it reflects both hands-on experience and analytical thought process skill developed during my internship period. I have made every effort to present the information accurately, clearly and concisely. I trust that the report will meet the standards expected.

Sincerely yours,

ALIF BIN ASAD

21304037

BRAC Business School

BRAC University

Date: Month Day, Year

Non-Disclosure Agreement

This Non-Disclosure Agreement is made and entered into by and between Bata Shoe Company (Bangladesh) Limited, having its office at Tongi, Gazipur, and ALIF BIN ASAD, a student of BRAC University, ID: 21304037. This agreement acknowledges that during the internship, the student may be exposed to confidential and proprietary information including, but not limited to, data on inventory, supply chain processes, sales performance, and internal communications that were held during the tenure. The student agrees not to disclose any such confidential information to any third party, and to use such information solely for academic purposes in relation to the internship report. This agreement remains in effect during and after the completion of the internship and submission of the academic report.

Signed:

ALIF BIN ASAD

Student, BRAC University

Acknowledgement

First of all, I would like to convey my sincere appreciation to my family for their constant support, patience, and perseverance, which were instrumental in the successful completion of my internship report.

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Lastly, I would like to express my sincere gratitude and respect to my co-supervisor, Dr Nusrat Hafiz, Assistant Professor, BRAC Business School.

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Executive Summary

This study explores the impact of the Electronic Data Interchange integration on reverse logistics efficiency and revenue distribution lead time in the Bata Shoe Company based on the year 2025 with 32 week data. The quantitative findings of the report were created through the descriptive, correlational, and visual data analysis. Most of the time, the results were not significant. The relationship between EDI and processing speed was weak, whereas the relationship between EDI and accuracy or lead-time stability was non-significant. In the event of a significant effect, the effect was small, which justifies the fact that the relationships were not operationally significant. The findings revealed that there is a necessity to have differentiated digital adoption approaches and process alignment, data quality, and channel-specific implementation. The limitations encompassed measurement limitations of the moderating variables, aggregate data on weekly basis and contextual based findings on a single organization. All in all, the paper outlines the relevance of contingency-driven and process-driven digital strategies and recommends additional study with longer horizons, cross-firm data, and more qualitative data to make better decisions regarding supply chain digitization.

Keywords: Electronic Data Interchange; Reverse Logistics; Returns Processing; Distribution Lead Time; Process Inconsistency; Data Quality; Digital Transformation; Supply Chain Management.

Table of Contents

Chapter 1

Overview of Internship.....	12
1.1 Student Information.....	12
1.2 Internship Information.....	12
1.2.1 Internship Details.....	12
1.2.2 Internship Supervisor's Information.....	12
1.2.3 Job Description.....	13
1.3 Internship Outcomes.....	13
1.3.1 Students Contribution to the Company:.....	13
1.3.2 Benefits to the Student.....	16
1.3.3 Problems/Difficulties Faced during the Internship Period.....	16
1.3.4 Recommendations to the Company.....	17

Chapter 2

Organization Part.....	18
2.1 Introduction.....	18
2.1.1 Objective(s).....	18
2.1.2 Scope of Study.....	18
2.1.3 Methodology.....	18
2.1.4 Significance of the Study.....	19
2.1.5 Limitations.....	19
2.2 Overview of the Company.....	19
2.2.1 History and Legacy of Bata.....	19
2.2.2 Mission, Vision, and Core Values of Bata.....	20
2.2.3 Organizational Structure and Key Division.....	22
2.3 Management Practices.....	22
2.3.1 Leadership Style.....	22
2.3.2 Human Resource Planning Process of Bata.....	23
2.4 Marketing Practices.....	32
2.4.1 Marketing Strategy.....	32
2.4.2 Target Customers, Targeting, and Positioning.....	33
2.4.3 Marketing Channels.....	34
2.4.4 Product Development and Competitive Practices.....	34
2.4.5 Branding Activities.....	35
2.4.6 Advertising and Promotional Strategies.....	36
2.4.7 Critical Marketing Issues and Gaps.....	36
2.5 The financial performance and Accounting Practices.....	37
2.5.1 Financial performance analysis.....	37
2.5.2 Accounting practice.....	44
2.6 Operations Management and Information System Practices.....	46

2.7 Industry and Competitive Analysis.....	49
2.7.1 Porter’s Five Forces Analysis of Bata.....	49
2.7.2 SWOT Analysis of Bata.....	50
2.7.3 Competitive Analysis of Bata.....	50
2.8 Summary and Conclusion.....	51
2.9 Recommendation and Implication.....	52
Chapter 3.....	55
Project part.....	55
3.1 Introduction.....	55
3.1.1 Background and Problem Statement.....	55
3.1.2 Objectives.....	56
3.1.3 Significance.....	56
3.1.4 Scope of the Study.....	57
3.2 Literature Review.....	58
3.2.1 Electronic Data Interchange (EDI) and Supply Chain Performance.....	58
3.2.2 Reverse Logistics Complexity and Performance Measurement.....	58
3.2.3 The Information Processing View of Supply Chains.....	59
3.2.4 The Contingency Perspective on Technology Adoption.....	60
3.2.5 Identifying the Gap.....	60
3.2.6 Hypothesis.....	61
3.3 Methodology.....	62
3.3.1 Research Paradigm.....	62
3.3.2 Research Design.....	63
3.3.3 Variables.....	64
3.3.4 Data Collection.....	65
3.3.5 Data Analysis.....	67
3.3.6 Ethical Consideration.....	68
3.4 Findings and Analysis.....	68
3.4.1 Reliability Findings.....	68
3.5 Summary.....	81
3.6 Recommendation and Implementation.....	82
3.6.2 Theoretical Implication.....	84
3.6.3 Limitations.....	85
3.6.4 Future Research Directions.....	87
3.7 Conclusion.....	88
Appendix.....	90
Data Collection Methods:.....	92
Data Analysis.....	93
Ethical Considerations.....	93
Reference.....	96

List of Tables

Title of the Table	Page
Table 1: Step by Step Recruitment Process	16
Table 2: Initiatives in Training	20
Table 3: Core Customer Base	22
Table 4: Differentiated Tageting Strategy	23
Table 5: Positioning Strategy	23
Table 6: Marketing Channels	24
Table 7: Core Product Category	24
Table 8: Premium Sub Brand	24
Table 9: New Product	24
Table 10: Framework of 4Ps	26
Table 11: Liquidity and Solvency	27
Table 12: DuPont Analysis	31
Table 13: Horizontal Analysis	31
Table 14: Descriptive Statistics	60
Table 15: Correlations to interpret relationship	61

List of Figures

Title of the figure	Page
Figure 1: Organogram of Bata	11
Figure 2: Vertical Analysis	32
Figure 3: EVA Trends	32
Figure 4: Porter's Five Forces Analysis	39
Figure 5: SWOT Analysis	40
Figure 6: EDI Integration vs. Processing Speed	66
Figure 7: EDI vs RAA Weekly Trend Analysis	66
Figure 8: EDI vs Accuracy Relationship	69

List of Acronyms

EDI	Electronic Data Interchange
BRP	Bata Resource Planning
NFT	Non Footwear
CDC	Central Distribution Centre
PO	Purchasing order
SKU	Stock Keeping Unit
LC	Letter of Credit
COR	Cost Of Risk
SME	Small Medium Enterprise
RPCT	Returns Processing Cycle Time
RAA	Return Authorixation Accuracy
DLTV	Distribution Lead Time Variability
ERP	Enterprise Resource Planning
UF	Urban Franchise
PMS	Performance Management System
PAS	Performance Appraisal System
ROA	Return on Assets
ROE	Return on Equity

EVA	Economic Value Added
WACC	Weighted Average Cost
P/E	Price to Earning Ratio
MVA	Market Value Added
IFRS	International Financial Reporting Standards
VAT	Value Added Tax
POS	Point of Sale
SPSS	Statistical Package for the Social Sciences
SD	Standard Deviation
FMCG	Fast Moving Consumer Goods
IT	Infirmination Technology
DLT	Distribution Lead Time
SEM	Structural Equation Modelling
MAE	Mean Absolute Error
CSK	Chennai Super Kings

Chapter 1

Overview of Internship

1.1 Student Information

Name	ALIF BIN ASAD
ID	21304037
Program	Bachelor of Business Administration (BBA)
Major/ Specialization	Operation and Supply Chain Management
Major/ Specialization	Computer Information Management

1.2 Internship Information

1.2.1 Internship Details

Company Name	Bata Shoe Company (Bangladesh) Limited
Period	3 months (September 10th to December 10th)
Department	Merchandising and Distribution
Address	Tongi, Gazipur - 1710, Bangladesh

1.2.2 Internship Supervisor's Information

Supervisor Name	Mohammad Tashfiq Zubair
Position	Merchandising Manager- Mens and Fashion volume

1.2.3 Job Description

The department of Merchandising and Distribution is responsible for selecting and managing all categories of shoes. Each category, for example: Men's leather shoes, Children's shoes, School shoes, Sneakers, etc., has a Category Merchandiser/buyer who chooses merchandise according to market needs as well as ensures appropriate distribution of merchandise and monitors performance in the market by Average sales made in a specific period, and through which they re-plans based on feedback. Also, there are responsibilities such as ensuring stores are supplied with enough stock, aged merchandise is cleared, excessive stock is re-transferred, merchandise assortment is correct, store-level stock matches system records, and slow-moving or non-assorted stock is managed through the Central Distribution Center (CDC).

1.3 Internship Outcomes

1.3.1 Students' Contribution to the Company:

Support in BRP (ERP)–Based Merchandising & Distribution Operations:

- Actively supported the Merchandising and Distribution Department through a systematic use of BRP, facilitating proper structured information flow similar to the EDI enabled systems.
- Assisted in analyzing storewise sales performance, size-wise demand, and stock availability, through which supporting data-driven invoicing and assortment decisions are made.
- Contributed to improved demand and supply alignment by helping to ensure that timely and accurate allocation of merchandise to appropriate stores are made.

Contribution to Store-Level Assortment & Distribution Efficiency:

- Supported Special Supply by Store operations by assisting in assorting the CDC stock according to their store performance and through the merchandise return level patterns.
- Helped prioritize the high performing and strategic outlets, contributing to improved sell through rates and efficient inventory utilization.
- Assisted in minimizing overstocking at low-performing stores, indirectly supporting reduced distribution lead time and improved stock turnover.

Inventory Coordination at Central Distribution Center (CDC):

- Assisted in coordinating the inventory flow by tracking article arrival or production timelines and dispatching the schedules, also improving synchronization between the production, CDC, and retail operations.
- Supported the inter-store and inter-depot transfers, while contributing to better inventory balancing across the nationwide retail network.
- Gained practical exposure to reverse logistics activities, including stock reallocation and the handling of slow-moving or excess inventory.

Product Coding, Master Catalogue & Data Accuracy:

- Worked extensively with the following article numbers and master catalogue data, ensuring accurate product identification and allowing classification across the entire framework systems.
- Helped maintain data consistency and standardization, which is essential for an effective electronic data exchange between the merchandising, procurement, and distribution functions.
- This contribution strengthened system reliability and proper information accuracy, directly supporting EDI effectiveness in logistics coordination.

Sales, Stock & Post-Mortem Analysis:

- Support assisted in preparing pictorial reports and post-mortem analysis to evaluate article and category-level performance after distribution.
- Supported the rigid analysis of sales versus stock positioning to identify slow-moving, fast-moving, and size-sensitive products.
- The insights helped improve future assortment decisions and reduced repetitive inefficiencies and recalled SKUs in subsequent distribution cycles.

Retail & Franchise Channel Coordination:

- Gained practical exposure to actual Urban Franchise (UF) operations and differences in demand patterns compared to the company owned stores.
- Assisted in coordinating proper stock allocation to ensure franchise outlets received appropriate assortments without disrupting overall distribution balance on the go due to special distribution planning.

Overall Impact:

- Contributed to better aligned assortment and distribution decisions, reducing unnecessary stock movement and corrective transfers.
- Supported smoother handling of excess and slow-moving inventory, and improved operational efficiency in reverse stock flow.
- Helped reduce the time lag between sales feedback and stock adjustments, while positively influencing overall distribution lead time.
- Developed and applied a strong understanding of an integrated merchandising, supply chain, and distribution operations within Bata Shoe Company (Bangladesh) Limited.

1.3.2 Benefits to the Student

With prior part-time experience at a multinational FMCG company in a real-world corporate environment and a current full-time internship at a multinational fashion and retail giant, I have been exposed to diverse corporate cultures and mindsets that have significantly broadened my perspective beyond theoretical learning. During my internship, I gained practical insights into the footwear fashion industry, specifically in how merchandising and distribution operate within a structured value-chain framework. I observed firsthand how corporate strategies are translated into actionable plans and executed in day-to-day operations.

Most importantly, this experience strengthened my confidence in working within well-structured processes and strengthened the importance of teamwork and analytical thinking in driving business efficiency and actual operational effectiveness.

1.3.3 Problems/Difficulties Faced during the Internship Period

During my internship, I encountered initial difficulties in understanding the complex structure and terminology of the BRP (ERP) system, which required time and practical exposure to adapt subsequently, as it was tough finding PO on time, as paperwork needed to be signed to consign shipment and progress the Letter of Credit (LC). There was limited access to confidential or strategic decision-making data, which were needed for restricting deeper analytical involvement in specific areas such as COR, without which certain shoes and categories' SKUs' feasibility were too tough to calculate and decide whether to continue the production with the same mold in 2026 Q1. In the Merchandising and Distribution department, there were time constraints due to high operational workload in the teams, which were actually limiting opportunities for extended guidance regarding specific processes. Also, the complexity of managing large volumes of product data, such as articles, sizes, and stores, which was increasing the risk of errors during the early stages of my learning phase. There

were very limited opportunities to participate directly in the external supplier interactions or advanced procurement negotiations due to some unknown procedures that were not mentioned. Lastly, I encountered several adjustment challenges in aligning academic knowledge with fast-paced corporate operational practices due to different industry and industry quos specific to the fashion and retail industry.

1.3.4 Recommendations to the Company

So, based on my internship experience, I would say that to introduce a structured internship orientation program covering BRP system basics, departmental workflows and key operational terminologies, which are constantly used to communicate and refer to specific tasks that are necessary or to understand. Additionally, provide guided training modules or manuals for interns on ERP usage, merchandising processes, and distribution operations, which will not only save time but will also reinforce these practices repeatedly. Also assigning specific learning objectives and task ownership for interns, which will not only enhance engagement but also accountability. They need to increase the opportunities for cross-departmental rotation, which will enable the interns to gain broader exposure to procurement, local sourcing department, supply chain, and retail operations. Additionally, encouraging interns to participate in process improvement discussions or small analytical projects which will add value to both the intern and the organization.

Chapter 2

Organization Part

2.1 Introduction

2.1.1 Objective(s)

- To summarize Bata's History, social mission, and its geo-centric mark and as well as its evolution into Bangladesh's leading footwear and fashion brand.
- To articulate Bata's mission, vision, and core values.
- To describe Bata's organogram.
- To assess Bata's leadership style, marketing function, operational activities, and financial performance.
- To assess Bata's Competitive advantage

2.1.2 Scope of Study

This research investigates Bata's organizational operations, management practices, marketing strategies, financial performance, and competitive positioning since its operations in Bangladesh began in 1962 and continued through 2025.

2.1.3 Methodology

Research Design

A descriptive design to comprehensively analyze management practices. The study is based on qualitative research.

Data Sources:

- Secondary documents from Bata's audited and unaudited Annual reports
- Interviews with Staff

Ethical Consideration

- All interview Participants provided consents

2.1.4 Significance of the Study

- Practical Implications of Bata's Business
- Learnings from policies and development steps
- Learnings from financial crisis management

2.1.5 Limitations

- Dependence on the Secondary data
- Limitations on the Access to Information

2.2 Overview of the Company

2.2.1 History and Legacy of Bata

The Bata Shoe Organization was founded in 1894 by Czech entrepreneur Tomáš Baťa in Zlín, then part of Czechoslovakia. Originating from a family of shoemakers with a legacy spanning eight generations and over three centuries, Tomáš Baťa combined inherited craftsmanship with progressive industrial thinking to build what would become one of the world's most influential footwear enterprises. From its inception, Bata distinguished itself through innovation. The early adoption of factory automation, modernized production techniques, and long-distance retailing enabled the company to achieve operational efficiency and profitability at a time when footwear manufacturing remained largely artisanal. These pioneering practices laid the foundation for Bata's rapid expansion and long-term sustainability.

A defining element of Bata's legacy is its enduring guiding principle: a deep understanding of customers and the creation of products that best meet their needs. This customer-centric philosophy has remained unchanged for more than a century and continues to shape Bata's strategic decisions across global markets.

Over the 130 years, Bata has consistently remained at the forefront of footwear innovation, with its global Shoe Innovation Centres focusing on advanced materials, modern shoe technologies, and designs that integrate style, comfort, and functionality. Bata commenced its operations in Bangladesh in 1962, quickly establishing itself as one of the country's most trusted and recognizable footwear brands. Since then, Bata Shoe Company (Bangladesh) Limited has played a pivotal role in the development of the local footwear industry through large-scale manufacturing, nationwide retail expansion, and systematic brand development. The company's sustained focus on quality, accessibility, and customer satisfaction has enabled it to maintain strong market leadership for decades. Guided by the vision of building a worldwide family of satisfied customers and committed employees, the legacy of Tomáš Bata continues to thrive in Bangladesh and beyond, resilient, relevant, and future oriented.

2.2.2 Mission, Vision, and Core Values of Bata

Bata's vision is "to make great shoes accessible to everyone," which reflects the company's long standing commitment to provide high-quality footwear to a broad range of customers. The term "great shoes" represents a balance of quality, comfort, durability, and appealing design, while the term "accessible" emphasizes affordability and wide availability. This vision guides Bata to focus on efficient manufacturing, effective distribution, and extensive retail coverage so that customers across different income levels and geographic locations can easily access its products. The vision also reinforces Bata's belief that quality footwear should not be limited to a select group but made available to all segments of society.

Mission

Bata's mission is to help people look and feel good by delivering footwear that combines comfort, quality, and style, thereby enhancing customers everyday experiences. The Company strives to be the customers destination of choice by offering a wide range of reliable products, maintaining consistent availability, and ensuring a positive retail experience. Recognizing that its success depends on its people, Bata is committed to attracting and retaining talented and dedicated employees through a supportive and development oriented work environment. At the same time, the company seeks to remain the most respected footwear organization by upholding high standards of ethics, operational excellence, and customer trust across all aspects of its business.

Core values:

- **Accountability:** Bata emphasizes on honesty, integrity, and responsibility in all actions. They expect employees to fulfil their commitments to customers, teams, and communities.
- **Serving with passion:** Bata's dedication to providing quality products that enhance customer satisfaction while contributing positively to society as per the company's Code of Conduct.
- **Be Bold:** They encourage innovation and continuous improvement by adopting new ideas and adapting their business models to meet changing customer needs.
- **Exceed Customer Expectation:** It focuses on delivering products and services that not only meet but go beyond customer expectations. Bata seeks to create added value through quality, reliability and consistent performance.
- **Respect and Diversity:** Bata promotes an inclusive and respectful work environment for every employee. They support diversity, gender balance, and human rights, ensuring equal opportunities and fair treatment for all.

2.2.3 Organizational Structure and Key Division

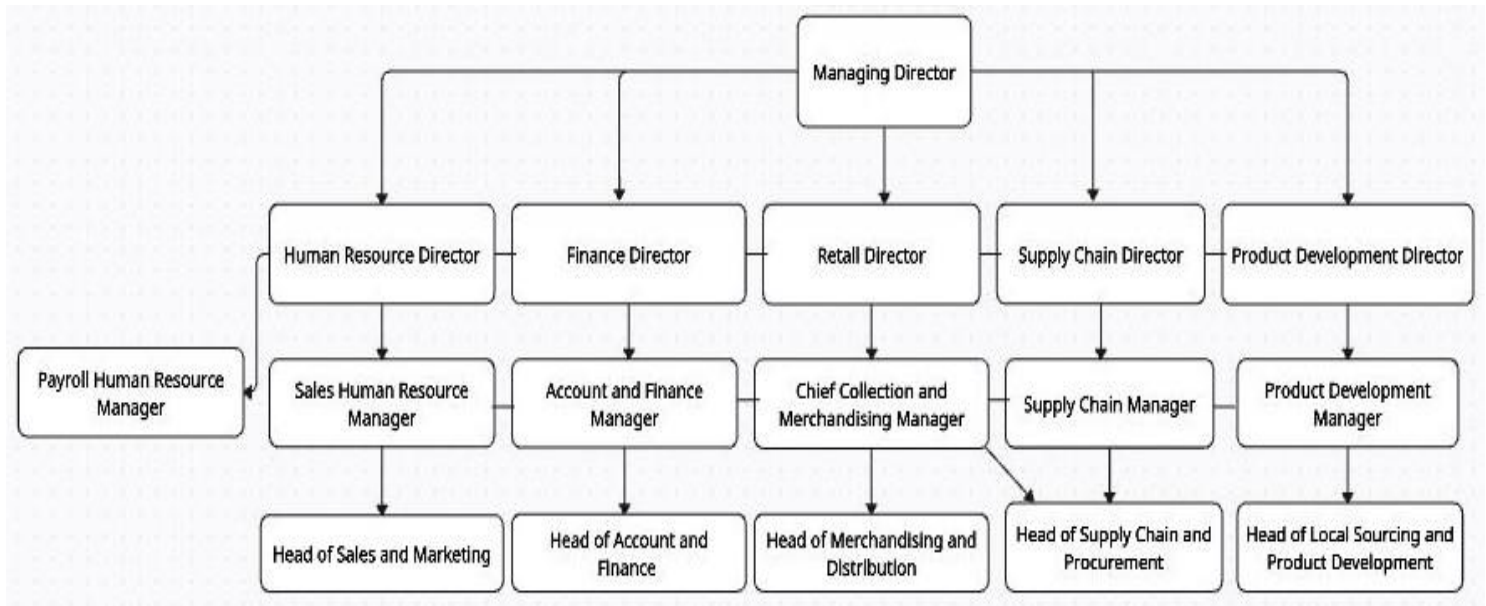


Figure 1: Organogram of Bata

2.3 Management Practices

2.3.1 Leadership Style

Based on the observations and Bata follows a contingency leadership style that emphasizes flexibility and adaptability in decision-making processes. The company's leadership is structured to meet the dynamic departments depending on the situation.

Leadership Approach at Bata:

- **Autocratic Leadership:** In certain Situations, especially in areas requiring swift decision- making and where quick responses are critical, such as in the Supply Chain and Product Development departments, Bata employs autocratic leadership. For instance, during urgent procurement and merchandising activities or when resolving logistical disruptions, the leadership takes immediate, top-down decisions to ensure that operations run smoothly and without delay.

- **Democratic Leadership:** Bata predominantly uses a democratic style within departments such as Retail, Merchandising, and Sales and Marketing. Managers consult their teams and encourage open communication before making decisions, promoting collaboration and leveraging collective insights for more effective strategies. For example, the retail Director and Chief Collection and Merchandising Manager consult with sales teams and store managers when planning product assortments and retail strategies.
- **Laissez-Faire Leadership:** In areas where employees have more experience and autonomy, such as in Product Development and Local Sourcing, a laissez-faire leadership style is more prevalent. These departments often work independently with minimal supervision, allowing for creativity and innovation to flourish in the design and development of new products. The Head of Local Sourcing and Product Development typically grants team members freedom to make decisions and take ownership of the projects they lead.

Overall, democratic leadership is the most widely used across the company. This style fosters a collaborative environment, encourages employee participation in decision-making, and aligns with Bata's vision of empowerment and growth, as reflected in the company's commitments to sustainable development and community engagement.

2.3.2 Human Resource Planning Process of Bata

Bata's Human Resource Planning process is focused on the company's evolving requirements to address expanding skill gaps, as well as sustaining a productive and flexible balance between the workforce and the attainment of the business objectives. HRP at Bata provides structure to the recruiting, developing, and retention of talent while driving a culture of support and work excellence throughout the organization.

- **Workforce Planning and Forecasting:** Bata regularly evaluates its staffing needs to make certain that the staffing levels and skill sets align to support business as usual as well as strategic objectives. This includes forecasting potential gaps and praise in staffing across Retail, Supply Chain, Finance, and Product Development. Bata is committed to a blend of internal and external recruitment, complementing internal promotions to advance talent. Bata looks at internal talent to fill senior managerial roles, while external recruitment is sought for specialized roles in Product Development and IT.
- **Recruitment and Selection:** Bata has established an extensive recruitment and selection procedure that is bolstered by six stages, such as: (1) Job Analysis, (2) Candidate Sourcing, (3) Job Board Sourcing, (4) Interview Sourcing, (5) Detailed Interview Sourcing, and (6) Candidate Skills Alignment. Candidate Skills Alignment is the process of aligning candidates' skills with Bata's fundamental values and principles: integrity, inclusiveness, and innovation. The company is keen on ensuring that critical roles such as the Supply Chain Manager and Head of Procurement possess the requisite and advanced level of knowledge and skills in supply chain management, vendor management, and cost management to improve the company's overall logistics and distribution.
- **Training and Development:** The company's investment in and emphasis on employee education and continuous improvement are pivotal to the company's HR strategies and policies. Bata's Road to Success includes investing in both in-house training programs and certified courses to help employees in keeping current and advancing with ongoing trends and changes in their respective industries. Moreover, customized training initiatives are implemented in the Supply Chain department with respect to inventory management, procurement, and the utilization of ERP systems.

Managerial and team-leader roles are also complemented by leadership training to improve their decision-making and team management capabilities.

- **Performance Management and Appraisal:** Bata's performance management system (PMS) is based on ongoing feedback and the employee's evaluation based on KPIs in their roles. Retail employees have sales targets, the supply chain team focuses on delivery reliability, and the product development team focuses on product innovation. Bata's system of appraisal is primarily focused on feedback on performance and links the same with career progression and financial reward. For example, the Head of Sales and Marketing may receive feedback on the overall sales made. At the same time, the Head of Supply Chain and Procurement is evaluated on the efficiency of procurement and on reducing lead times.
- **Succession Planning and Talent Retention:** Bata emphasizes the importance of succession planning and is keen on succession planning and the need to identify and develop high-potential employees within and across the departments in the organization to become leaders. For this reason, the company emphasizes internal mobility to retain top talent. Bata employs a number of strategies, including the provision of employee discounts, career development, and competitive pay to ensure employees feel appreciated and to enhance their motivation to retain the company.
- **Engagement and well-being of employees:** Bata understands the importance of a devoted and satisfied employee base, and so the company invests significant time and resources in employee engagement and well-being. Employee engagement is strengthened through the utilization of regular surveys and feedback channels, which are employed to constantly adjust and enhance employee satisfaction. To improve the workplace environment and reduce employee turnover, the company offers benefits such as health insurance, annual bonuses, and wellness programs.

2.3.2.1 Recruitment and Selection Process

- **Internal Channels:** Bata utilizes internal channels for filling promotions, transfers, and non-entry level positions. Existing employees are considered prime candidates for these roles due to their familiarity with the company's work environment, culture, and operational processes. This internal mobility enables Bata to leverage the skills and experiences of its workforce while also promoting employee retention and loyalty. HR works closely with relevant departments to make decisions regarding promotions and transfers, ensuring alignment with both the company's strategic and individual career development paths.
- **External Channels:** To bring in new talent and foster innovation, Bata also relies on external sources for recruitment. The job openings are advertised on platforms such as LinkedIn, BDjobs, and other relevant job portals, where potential candidates can find detailed information on available positions. These advertisements include job descriptions, required qualifications, application deadlines, and contact details, allowing Bata to attract skilled individuals from outside the organization. This approach ensures that Bata remains competitive by bringing in fresh perspectives, specialized skills and innovative ideas that can complement the existing workforce

Step by Step Recruitment Process						
Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
Requisition and Approval Stage	Job advertisement and Candidate selection	Screening and Shortlisting Candidates	Selection of Candidates (varies depending on the position)	Orientation and Training stage (Role-specific)	Appointment and Documentation stage	Performance Critique and Confirmation

Table 1: Step by Step Recruitment Process

***To be noted: For Internship positions, the performance critique and Confirmation are not applicable*

2.3.2.2 The Compensation System in Bata

Bata ensures that all monetary compensation is handled effectively, openly and within the boundaries of job grade (e.g., grade 6/7/8) and duty. The compensation system will aim to fairly compensate employees for the contributions they make and also help to sustain the competitive advantage in attracting the best employees.

- **Monetary Compensation:** Salary Structure and Disbursement: Bata has a well-organized salary system with employees receiving their salary at the end of the month, with some of them receiving it on the final day of working. Rarely, when there is a delay, payments are received by the 15th of the following month. Annual salary increments for permanent employees are recognized which depend on their job grade and performance.
- **Bonuses:** At Bata, employees are paid a yearly bonus, which is calculated according to the company's performance as well as the employee's contribution. The bonus is normally given during important milestones or other significant events within the company as a reward for employees at the end of the year's work.

Allowances:

1. **House Rent allowance:** Bata offers employees a housing allowance based on their job grade, to help them meet the cost of living.
2. **Travel allowance:** Employees who travel to work are given a monthly allowance to cover transportation costs.
3. **Mobile Allowance:** Managerial and operational employees are entitled to a mobile allowance to cover communication costs.

4. **Medical Allowance:** Bata provides medical coverage for employees, and the allowance is based on each employee's job grade.
5. **Movement and Transfer Allowance:** Employees who are transferred to a new location as part of their duties are paid a movement allowance, and they are also given leave in order to assist with relocation.
6. **Overtime and Holiday Compensation:** The Employees when employees work on overtime or holidays, Bata will pay them or give them off, according to the company policy.
7. **Special Task Allowance:** Special task allowance is an allowance given to employees working on special projects or occasions, especially during peak seasons or holidays, and is paid on top of the salary and also covers the travelling costs.
8. **Gratuity:** Bata has an employee gratuity scheme in which employees who serve a minimum of three years receive a vital financial reward that is equal to one month's final basic salary as a reward for every year of service.

Leave Entitlements:

Bata provides employees with a healthy work-life balance through a generous leave policy:

1. **Earned Leave:** The number of days an employee has worked that qualify as earned leave depends on the number of days the employee actively working, excluding the weekends and official holidays.
2. **Sick Leave:** Bata offers 14 days of paid sick leave every year to enable employees to handle health related problems.
3. **Maternity Leave:** Females have a right to six months of paid maternity leave with an option of six months of unpaid leave in case of necessity.
4. **Paternity Leave:** Men are given a one month giveaway to take care of their families.

5. **Compulsory Leave:** Employees working six days a week should be given six additional days of leave within a year, to ensure ample rest.

Annual and Weekly Holidays:

1. **Head Office:** The workers in the head office of Bata have their weekly holidays on Fridays and Saturdays.
2. **Field Offices/Outlets:** Fridays are usually the weekly off day of employees in field offices or retail outlets.
3. **Security Guards:** Two off-days every month are given to the male security guards and one off-day every week to the female security guards.
4. **Study Leave:** The Bata Company has paid or unpaid study leave when employees are taking higher education, and this has to be approved by the management.

Non-Monetary Compensation:

Bata cares about the well-being of its employees and aims to offer them benefits that would take care of their professional and personal lives:

1. **Daycare Centres:** Bata has its own daycare centres where employees whose children are still young receive facilities. This helps enable the employees to work and at the same time, keep their kids close to them as they are working.
2. **Uniforms:** Bata ensures that service staff, such as logistics and maintenance employees, receive uniforms annually, which preserve a professional image and contribute to the recognition of the team.
3. **Employee Discount:** Bata workers will receive a 20 per cent discount on Bata products; this will motivate them to interact with the brand and increase employee satisfaction.

4. **Annual Picnic:** To maintain the bonding between the team members and to enhance the relationships that the employees have with each other, Bata will take the employees through annual picnics, which will involve games, shows, and meals for employees and the people that employees come back home to. This activity is used to congratulate the progress and boost morale.

2.3.2.3 Training and Development Initiatives in Bata

Bata has a dynamic and well organised training system that is geared towards improving the skills and knowledge base of employees at all levels, from the top of the hierarchy to the lowest level of the hierarchy. The company is concentrated on empowering its employees with the resources and skills they need to perform their duties and bring the growth and success of Bata. The most important training programs at Bata are:

1	Utilization of BATA University nationwide and worldwide: Capitalizes on an enormous network of universities across the world.
2	Orientation and Onboarding Programs
3	Operational Training In-House: Bata gives great priority to in-house training in fields of operation, like Retail and Supply Chain. The training is concerned with equipping employees with skills and knowledge to perform their jobs successfully by making sure that they are prepared to handle everyday tasks, be it the running of the stores or the logistics and inventory control.
4	Department-wise and Role based training
5	Professional Growth of Permanent Employees: Bata believes in the continuous personal growth of its permanent employees. The company provides opportunities for higher training and certifications its different fields to enable employees to develop their careers. The following are some of the professional development programs offered to permanent employees: ● Six Sigma Certification ● High-end Inventory Management. ● Leadership Development Programs. ● Team Leadership and Management Skills.

	• Advanced Excel Skills • Analytics and Data-Based Decision-Making
6	Advance Learning and Utilization approach

Table 2: Initiatives in Training

2.3.2.4 Performance Appraisal System in Bata

The Performance Appraisal System (PAS) is a crucial component of the Performance Management System (PMS) and is developed by Bata to assess the performance of its employees, the alignment between individual objectives and the company's aims, and the subsequent promotion of career development. The system incorporates objective standards, e.g. sales goals, logistics efficiency, and customer satisfaction, as well as subjective standards, e.g. attitude, teamwork and leadership skills. The employees are evaluated once a year in one-on-one meetings with managers and the HR department, where they are assessed and evaluated on their strengths, improvement areas and development. The importance of performance appraisal is that it can inform key decisions on promotion, transfer and training requirements so that employees can be acknowledged for their contributions and the employer can assist in their professional growth. Moreover, next-year goal setting is another major aspect of the process, and both employees and managers set clear, measurable goals. Bata ensures that the appraisal process is confidential, fair, transparent and provides employees with a chance to comment on the reviewed issues. Employees are also rewarded with bonuses, salary increment and recognition programs, based on the results of the appraisal. This all-encompassing system promotes a sense of efficiency in the operations as the employees have been aligned with the strategic goals of Bata, besides creating a culture of continuous improvement and high performance.

2.4 Marketing Practices

2.4.1 Marketing Strategy

Bata Bangladesh employs a solid marketing strategy that serves as an anchor for its dominant market leadership as the country's leading footwear brand. It is a mass-market based and value-oriented strategy, which is aimed at serving a broad range of consumers, focusing on the price, availability, and quality that can be trusted. The marketing or strategy of Bata is to cover a wide market segment with differentiated products where the products are accessible to a varied segment of the population, such as middle-class families, youth, working adults, as well as children. This strategy is in tandem with the overall goal of Bata to retain and expand its market share in the country, besides serving diverse needs of consumers. Bata adheres to a total-market approach by catering to virtually all customer segments with products of varying price within the low-end every-day footwear category to the higher-end comfort and fashion segments, and thus market risk is spread and sales maximized across market segments. The national market strategy of the company uses the vast retail network and distribution channels to make its products available in the entire Bangladesh in urban centres, semi-urban and rural regions. Bata also seeks first-mover benefits in the product line, as it often modifies prices and designs to appeal to the consumers and prevent any competitor from accessing the market. This is because Bata's strategic focus on product differentiation through multiple sub-brands (i.e. Power (sports), Bubblegummers (children) and Comfit (comfort) enables the company to satisfy the needs of a wide range of customers. However, the common brand image of durability and value is preserved. Over the past years, Bata has incorporated digital, as well as omni-channel marketing offers into its marketing plan, improving its online presence in online e-commerce and utilizing online channels to enhance customer interaction and conversion. The company's pricing policy, such as its emphasis on products priced below the consumer's critical points, indicates its desire to provide value to

the price-conscious customers. In general, Bata's is the strategy combines conventional domination through retail with changing engagement through digital to remain in the lead in the competitive Bangladeshi footwear industry.

2.4.2 Target Customers, Targeting, and Positioning

Core Customer base	Middle and low-middle-income families that are interested in long-lasting, affordable footwear
	Urban middle-income buyers who seek comfort and style in shoes.
	Divided into age (kids, youth, adults), gender and use (formal, casual, sports, sandals)
	Customers value money, comfort, and durability rather than luxury or high end fashion.

Table 3

Differentiated Targeting Strategy	A broad differentiated targeting strategy, which serves different consumer groups that have different product lines.
	Each sub-brand will be offered at different levels and market segments with a high diversity of products that satisfy the needs of a broad customer base.

Table 4

Positioning	Bata positions itself as a trustworthy and family-oriented footwear brand which offers affordable and high quality shoes.
	Stresses its long history and dependability with the catchphrase: taught Bangladesh to wear shoes.
	Positions itself based on steady quality of products,

	range, and availability, and not luxury or extreme fashion.
	Carries the tag of being affordable and reliable rather than high-end, and is inherently mass-market, focusing on its practical advantages rather than being fashion-driven.

Table 5

2.4.3 Marketing Channels

Bata follows a hybrid distribution strategy that integrates both physical and digital channels to maximize its market reach and deliver products and services efficiently to customers across Bangladesh.

<i>Mobile App</i>
<i>E-commerce platform (www.batabd.com)</i>
<i>262 Retail Outlets</i>
<i>Digital marketing and Social Media</i>

Table 6

2.4.4 Product Development and Competitive Practices

Core Product Category	Men's products- Formal Shoes, Casual Shoes and Sneakers, Sandals and Slippers, office side bags
	Women's Products- Sandals, Flats and Comfort Shoes, Closed Shoes, Sports and Athleisure shoes, handbags, purses
	Kids' products- School Shoes, Casual fashion Sandals, School bags

Table 7

Premium Sub Brand	Hush Puppies Office Comfit
	Weinbrenner Sneakers
	Marie Claire closed shoes and Flats
	North Star sneakers and Sandals
	Power Jerseys, bags, and shoes

Table 8

New Product/ Services	Mobile App, and International shipping
Competition	Bata is the market leader, dominating the footwear retail market with a market share of 40% (Inspection, 2021)
	Approximately 262 outlets extensive network in Bangladesh
	Differentiation Strategy by Consistent quality at value prices and with Innovative new product development

Table 9

2.4.5 Branding Activities

Branding activities of Bata facilitate the branding of the brand as a reliable, family oriented brand of footwear with a rich history in Bangladesh. The fact that the company has used a series of unique visual effects - such as the familiar color scheme of red and white, standardized signage and store layouts also solidifies brand recognition and credibility among consumers. Bata conveys the values of comfort, durability, heritage, and accessibility, which are very powerful in mass-market segments.

Bata uses its official platforms to practice content marketing, featuring stories about its products, seasonal trends, and customer testimonials. Member programs and personal offers are loyalty programs that aid in developing repeat purchases and establishing long term customer relationships. Bata's consistent brand image in the competitive footwear market can be attributed to its consistent brand presence across both offline and online platforms.

2.4.6 Advertising and Promotional Strategies

Bata has adopted more and more digital marketing as one of the most important elements of its advertising and promotion. The company has also made an effort to increase its mobile and app marketing potential, as well as increase its online advertising activities. Bata has incorporated both traditional marketing platforms, including television, print and outdoor media, with digital marketing to create a more integrated and effective marketing platform in all directions. The firm also embarks on strategic collaboration with the local influencers and third party retailers to enhance its exposure and customer interest.

Bata implements a 4Ps marketing mix framework:

Product	Price	Place	Promotion
New Products, Product Varieties, and Innovation	Targeting lower income & Lower to middle income as well as urban middle Income buyers, through Pricing strategy	Strong Digital presence outside of Bangladesh and an extensive network of outlets throughout Bangladesh	With focus on a multichannel outreach approach with a focus on digital platforms

Table 10: Framework of 4Ps

2.4.7 Critical Marketing Issues and Gaps

- **Inadequately utilized digital opportunity:** Despite the improvement achieved in digital marketing, Bata still has an opportunity to improve its social media presence and creative content relative to the trend-followers and fashion brands. More interactive campaigns and influencer partnerships will help enhance youth awareness among segments.
- **Adaptation to fast trends:** Mass-market orientation and legacy brand positioning of Bata are at times behind in addressing the needs of the fast changing fashion trends, especially among the younger consumers who seem more fashion oriented.

- **Pain and positioning problem:** Strategic evaluations observe that there are at times deficits in aggressive promotions and clarity in sub-brand positioning, where redundancy between products may reverse the perceived differentiation in such saturated market segments.
- **Intense competition:** Bata also experiences ongoing competition with low cost imports and new local brands, as well as the premium international brands with a higher price point, and this has impacted on the pricing and differentiation initiatives.

2.5 The financial performance and Accounting Practices

2.5.1 Financial performance analysis

2.5.1.1 Liquidity and Solvency

Year	Current ratio	Quick Ratio	Cash Ratio
2020	1.50	0.36	0.08
2021	1.50	0.50	0.03
2022	1.47	1.00	0.06
2023	1.45	1.04	0.10
2024	1.50	0.35	0.03

Table 11: Liquidity and Solvency

Bata can boast of good financial performance in the period of 2020 to 2025, having recovered from the initial problems caused by the COVID-19 pandemic. Bata is now set to experience a stable growth. The company has had good liquidity ratios with the current ratio always standing at over 1.5, indicating that it can meet its short-term liabilities. Although the quick ratio is showing that the company is slightly dependent on the inventory as a source of liquidity, low quick ratio is 0.35 in 2024, which indicates that inventory management may also be a problem. The cash ratio of Bata has also remained low and is characteristic of

businesses having large inventories and receivables, and could be improved by refinancing its cash position. Generally, the liquidity situation is healthy as Bata has a healthy current ratio depicting a healthy short-term financial position.

The solvency ratios of Bata indicate an even capital structure with the debt to equity ratio varying between 1.39 and 1.43 throughout the years, implying a reserved dependence on debt financing. This means that Bata does not over-leverage its debt. It is highly financially stable, as evidenced by a high equity ratio of more than 64 per cent, and the company is not at risk of bankruptcy and can actually be flexible in case they want to invest at a later date. Bata still has a good base, but it should keep its inventory management in order to increase its quick ratio and lessen its reliance on inventory as a source of liquidity. This balance will help Bata to stay on the growth path and avoid financial risks.

2.5.1.2 Efficiency

Regarding efficiency, Bata has demonstrated gradual growth in the ratio of asset turnover, where it registered 0.55 in 2020 and 0.67 in 2025. Although this demonstrates that the firm has been favorably exploiting its assets to drive revenue, it did experience a slight decline in the years 2022-24, which indicates some deceleration in the use of assets. The general trend however, indicates that Bata has been concentrating on increasing its capacity to generate more revenue out of the assets it possesses. The increase in the company asset turnover ratio shows an efficient use of its operations though further optimization can be achieved to ensure continuous growth.

The evaluation of inventory turnover indicates that Bata has been varying in terms of efficiency with a significant drop in the days in inventory between 2020 and 2022. These years showed that the ratio of inventory turnover significantly increased, which presents the success of the company in managing the stock more effectively. Nevertheless, the inventory

days started rising once again in 2023-2024 and may indicate some difficulties in inventory management or slow-paced inventory turnover. In general, Bata should concentrate on better inventory management practices that will make sure that stock is presented more rapidly and working capital is put to better use.

2.5.1.3 Profitability

Between 2020 and 2025, Bata has experienced an impressive rise in profitability, being able to overcome the impact of the COVID-19 pandemic. Bata began with a net profit margin of 4.5% in 2020 and has been improving steadily with a high of 8.7% in 2022. This decreased the net profit margin to 5.25 per cent in 2025; however, overall, the company has been in a position to keep a strong profitability trend. This shows that Bata has been effective in making profits and controlling the costs of operations, thus demonstrating effective cost control and revenue generation strategies.

The Return on Assets (ROA) also showed positive growth, as Bata achieved higher figures in assets in 2022 and improved on its results in 2020, marking the growing capacity to utilize its assets. But the ROA decreased to 3.5% in 2025, which might reflect the possible problem of the inability to use assets effectively, since Bata grows. The general direction of ROA is, however, positive showing that Bata is achieving higher returns on its assets as it streamlines its operations.

In the case of Return on Equity (ROE), Bata had a gradual growth, starting at 7.42% in 2020 and reaching its peak of 14.56% in 2022. ROE also decreased a little in 2025 to 8.66, which means that Bata was also very successful in providing high returns to stock shareholders but encountered some difficulties in the later years. One of the most important profitability measurements is the operating margin, and it has been stable, with the range being at 8-10%

throughout 2020-2025, which implies that Bata has remained a strong financial institution and optimistic in its operations.

2.5.1.4 Market Share

The market value of Bata has been affected by a number of factors such as its financial performance, profitability and the perception of the market during the past few years.

Although the market value of Bata did not change significantly in the first years of the post COVID-19 pandemic, it presented indicators of an increase between 2023 and 2025. This upward trend can be seen as the reflection of the recovery of the company after the pandemic, as well as the active work of the company to increase its online presence and streamline its operations.

The Price-to-Earnings (P/E) ratio of Bata ranged between 11.79 in 2021 and 17.63 in 2025, which means that investors are better off pay a premium to the company's revenues, as they become more sure about the further development of Bata. A P/E ratio of 17.63 in 2025 indicates it is well-valued in the market, although it is marginally above the industry average. This may be thought of as investor optimism which means an improvement in the expectations of Bata in the long term performance.

Also, the Market Value Added (MVA), which is the difference between the market value of equity and invested capital, shows that Bata is capable of creating wealth for its shareholders. The MVA of Bata has been positive over the years pointing to the fact that the company is generating value and it is performing better than the capital invested in it. The market value growth between 2023 and 2025 also highlights the strategic investments made by the company and its good positioning in the competitive retail shoe market.

In spite of this optimistic picture of the market, Bata competes with other local and international brands, which puts strain on the costing strategy and further innovations.

However, the positive P/E ratio and increase in MVA are the indicators that Bata performs well in the market and can continue to enjoy the confidence of its investors.

2.5.1.5 DuPont Analysis

The decomposition reveals the drivers of the ROE performance:

Year	Net Profit Margin (%)	x	Asset Turnover	x	Equity Multiplier	=	ROE (%)
2020	4.5	x	0.55	x	2.43	=	7.42%
2021	7.8	x	0.61	x	2.43	=	11.47%
2022	8.7	x	0.69	x	2.45	=	14.56%
2023	6.2	x	0.68	x	2.39	=	10.20%
2024	6.8	x	0.68	x	2.38	=	11.36%
2025	5.25	x	0.67	x	2.47	=	8.66%

Table 12: DuPont Analysis

2.5.1.6 Horizontal Analysis table for Bata

Year	Revenue Growth (%)	Total Expenses Growth (%)	Net Income Growth (%)	Total Assets Growth (%)
2021	13.10	17.14	97.74	1.79%
2022	15.79	17.07	28.36	2.40%
2023	-1.82	2.08	-29.75	-0.63%
2024	0.45	4.08	10.90	1.27%
2025	-4.75	1.96	-26.83	-2.95%

Table 13: Horizontal Analysis

2.5.1.7 Vertical Analysis Table for Bata

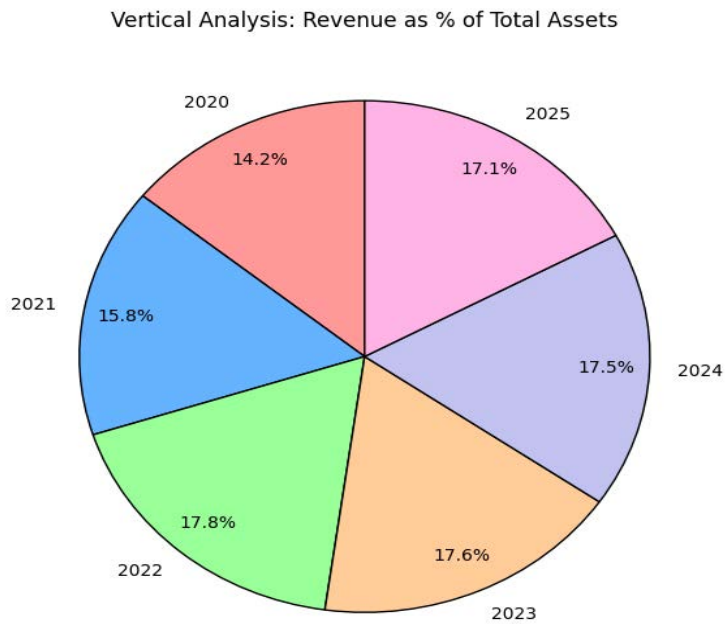


Figure 2: Vertical Analysis

2.5.1.8 EVA Trend

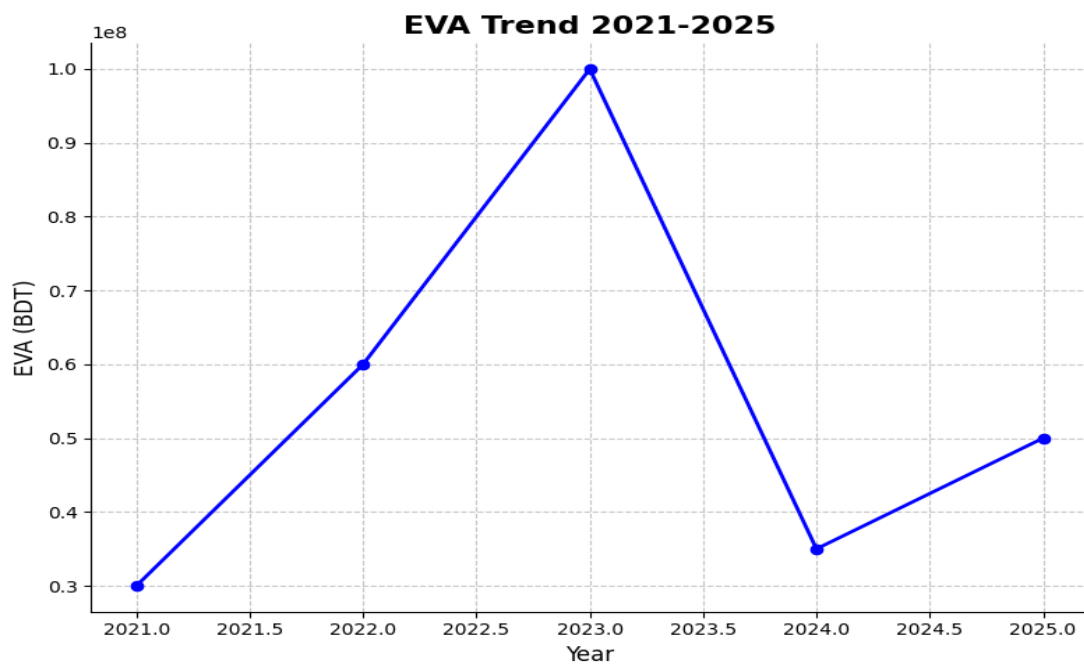


Figure 3: EVA Trend

Strength:

- Bata has demonstrated a high rate of revenue growth in 2021 (13.10%) and 2022 (15.79%) as it has bounced back after the pandemic. This indicates the company's high demand generation and expansion strategies.
- The Return on Equity (ROE) also increased steadily in 2020, showing an increase in shareholder returns, which is 7.42 to 14.56 in 2020 and 2022 respectively, because of the effective financial management and efficiency.
- The ratio of Asset Turnover has increased to 0.69 in 2022, as compared to 0.55 in 2020, thus showing an increase in the utilization of assets to raise revenue.
- EVA in 2021 and 2022 is positive indicating that Bata generated value to the shareholders and the returns are higher than the cost of capital.
- Operating efficiency has been noticed by Bata in positive EVA, which means that it is creating value out of its investments and resources.
- The Debt to Equity Ratio and Equity Ratio of Bata have been within an optimal range, which indicates that the company has a conservative financial structure and a low risk of leverage.

Areas of improvement:

- The fact that the Quick Ratio is low, and inventory turnover is volatile indicates that it has a problem with the inventory management. Bata should pay attention to its liquidity and quick ratio, which involves maximizing its inventory.
- In order to stabilize its profit margin, Bata needs to work on its cost control, changing its prices, and enhancing its production and retail efficiency.
- The company ought to maximize its cash conversion cycle to ensure liquidity with the emphasis on cash flow management and working capital optimization.

- The current decrease in EVA of 2023 and 2025 indicates that Bata should concentrate on maximising capital efficiency. Bata needs to lower its WACC (Weighted Average Cost of Capital), and its operating capital investments should also be well aligned with the creation of shareholder value.

2.5.2 Accounting practice

2.5.2.1 Core Accounting Principles

- Bata observes the principles of a going concern whereby it has assumed that the company will operate without any limitations in the future except otherwise. The consistency principle is used, whereby accounting practices are maintained year to year, especially in the recognition of revenues, the valuation of inventories, and the depreciation provisions used.
- Bata complies with the full disclosure requirements and gives comprehensive notes on the recognition of grant income, tax provisions, and current and deferred liabilities. As a result of these disclosures, it is possible to have transparency in the financial reporting process, and the stakeholders have a clear picture on the financial health of the company.
- Bata follows the same principle which is to ensure that expenses are captured during the same period as the corresponding revenues. The company uses the principle of costs such that inventories and fixed assets are priced at cost less depreciation giving the right picture of the assets value.

2.5.2.2 Basis of Accounting

- Bata is an accrual based company in which all of the revenues and expenses are recorded upon accrual or on being earned or incurred as opposed to being received or

paid. This will be as per the standards of IFRS and the financial statements will have a reflection of the real financial position of the company

2.5.2.3 Accounting Cycle Completeness

- The published financial reports by Bata indicate that all the accounting cycle has been performed, i.e. journal entries in purchases and receivables, ledger posting, trial balances of purchases and receivables, adjustments of entries in the books in depreciation and provision and preparation of line of the financial statements as required in the IFRS. The company adheres to closing entries procedure at the end of the year which makes sure that nominal accounts are reinstated to the next period.
- Bank accounts, VAT and inter-program allocations are reconciled on a monthly and a year-end basis, which aids in the completeness of each cycle and accuracy of financial reports.

2.5.2.4 Depreciation Methods

- Bata employs a straight-line approach to depreciation of fixed assets, such as furniture and equipment. The approach is used throughout the years and the depreciation charges are recorded annually and such amounts are made clear in the financial accounts. The company does not use any accelerated or unit-of-production depreciation schemes to provide a simple and clear depreciation of assets

2.5.2.5 Accounting Disclosures

- The fixed-asset schedules submitted by Bata provide the cost, accumulated depreciation, and net book value of assets, giving a clear picture of the investment in long-term assets made by the company and their current value.

- Other disclosures made by Bata are the commitments and contingencies including lease commitments and grant refund contingent liabilities, which informs the stakeholders of the possible financial liabilities.
- Bata contains tax reconciliation note, which points at the discrepancy between the theoretical and the effective tax charge. This includes both current and deferred taxes, providing transparency in accounting and tax payments.
- The transactions with related parties (Bata, 2010) are singled out in the financial statements of the company, specifically transactions with organizations like the Bata Shoe Foundation and the external suppliers, which give a sense of transparency in the dealings involving the company and affiliated organizations.
- Segment data is also given which shows the divisiveness between the core retail business of Bata and the other business segments, including e-commerce and wholesale distribution, which provides insight into which business segments of the business are contributing to the financial performance.

2.6 Operations Management and Information System Practices

Bata Shoe Company (Bangladesh) Limited uses an advanced information system that plays a vital role in controlling the company's reverse logistics, inventory, and distribution lead time. This system incorporates data collection, data storage, data processing, and sharing processes internally and with the external stakeholders. Modern technologies, such as C#, React, Microsoft SQL Server, and other ERP systems, are used to improve the tracking, management, and optimization of supply chain operations performed by Bata.

Bata's information System infrastructure:

- Bata is also using an integrated ERP system, which incorporates both web-based ERP and desktop ERP. The two systems are essential in the operation of handling customer information, internal stakeholders, and the vendor relations. The ERP system is also based on the web and this ensures that customer information is accessed in real time and thus it is simpler to manage orders and to track inventory. The desktop ERP is also offline meaning that it can continue running even when the internet is not available which is very urgent when managing stock in remote locations.
- The Bata front-end system is designed to run on React, whereby the user-friendly interface is used in interacting with the system on real-time and the back-end is written in C# whereby data processing and integration are seamlessly supported. The structured data storage is Microsoft SQL Server whereby Bata can save the huge volumes of transactional data and inventory data safely. Real-time decision-making of reverse logistics and distribution processes can then be made based on this data.
- The POS system that Bata uses is connected to Redmine whereby the company is able to monitor transactions and customer interactions in real time. Such integration will provide transparency and good communication among the internal stakeholders in the company like the warehouse managers and the logistics teams. With Redmine, Bata is also able to oversee the workflows, keep track of the task completion, and finally keep the inventory updated with the right information after every transaction. Seamless integration is important in controlling reverse logistics by monitoring the returns of the products and making sure that the returns are handled promptly.

EDI and Reverse Logistics Efficiency

In a bid to enhance the efficiency of reverse logistics and the distribution lead time, Bata has adopted Electronic Data Interchange (EDI) to facilitate the process of communication between internal processes and the external vendors. The EDI systems enable smooth transfer of data on the orders and shipments in real time so that returns on the products are handled fast and that the data on inventory is kept up to date. EDI assists in reducing the duration of handling returns and restocking items by automating crucial processes and this is vital in reverse logistics.

Managing Reverse Logistics And Distribution Lead Time

Bata ERP systems play a key role in streamlining the distribution lead time and reverse logistics. Under EDI integration, Bata can be able to exchange data among its warehouses, retail outlets and distribution centres promptly. Live communication of data makes orders to be executed with efficiency, shipment of products timely and handling of returns within the shortest time possible and this ultimately assists in minimizing the lead time of distribution. Additionally, the POS integration with Redmine also contributes to this as it allows to monitor the information about the customer preferences, order history, and product returns that allows Bata to predict the demand and organize its logistics operations.

Practices to maintain High Standards in Operations

- Bata also makes sure that the accuracy of data is ensured by structured data storage in SQL. This would help the company to make sure that the data on product availability, customer order and logistics transactions are always up to date and valid. The POS system also provides additional services like monitoring task scheduling and

milestone tracking of logistics that are already running such as processing returns and refilling the inventory, as it integrates with Redmine.

- The EDI integration of real-time data transfer among the distribution centres, retail stores, and vendors facilitates an effective reverse logistics process. Real time tracking of returns also means that the products are promptly handled and less time is taken to replenish the shelves or make new orders. The use of ERP systems by Bata in managing the online and offline operations of the company guarantees constant flow of information within the company enabling it to run seamlessly even in harsh conditions.
- The Redmine integration will enable Bata to effectively distribute human resources to other logistics processes, especially in terms of returns management and inventory management. Task scheduling will also help to assign the employees to perform high priority operations, e.g., returning items and customer orders in the shortest lead times.

2.7 Industry and Competitive Analysis

2.7.1 Porter's Five Forces Analysis of Bata

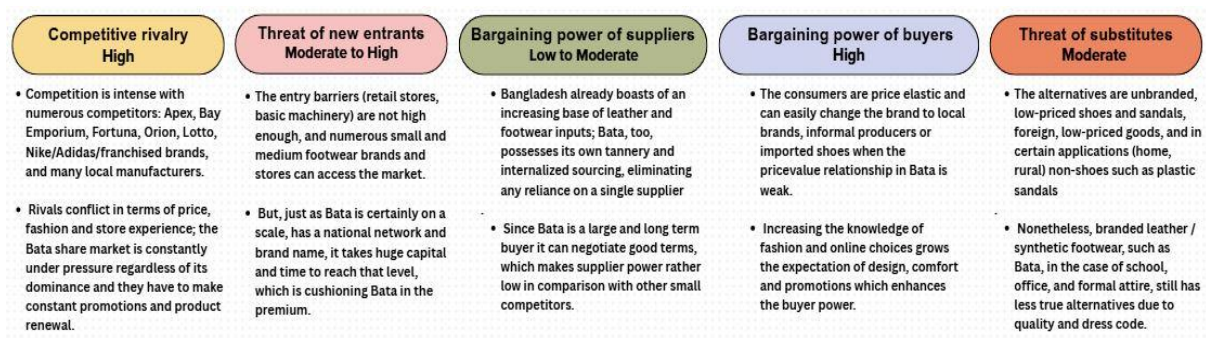


Figure 4: Porter's Five Forces Analysis

2.7.2 SWOT Analysis of Bata

Strengths	Weaknesses	Opportunities	Threats
• Good brand equity and leadership in the market: It has been in the market since 1962, is one of the most trusted shoe brands, and is a market leader in organised footwear. • Retail and distribution network in the country: There are many company-owned stores, dealers, and DSPs with substantial reach and visibility. • Well-coordinated, effective operations: owned manufacturing facilities and a tannery, economies of scale, and effective material control ensure relatively low costs. • Different brands and product lines: Catering to men, women, children, school, sports and premium segments (Bata, Power, Bubblegummers, Weinbrenner, Comfit, Hush Puppies, and many more)	• View of conservative style/limited fashion variety: Some analyses indicate that Bata may fall behind trendy brands in fast fashion and innovative designs, particularly among youth. • Delays in decision making and red tape: It is sometimes the case that the large and global organisational structure slows down the local responsiveness and decision-making on new products. • Minimal aggressive marketing relative to competitors: Traditionally reduced advertisement expenditure and less strong contemporary branding as compared to some newer competitor that are more style orientated.	• Increasing middle and urbanisation: Income expansion and urbanisation increase the demand for branded, comfortable, and fashionable shoes. • Footwear as lifestyle: Growing fashion awareness will enable Bata to enhance fashion, sportswear, and comfort premiums. • Digital and omnichannel growth: E-commerce, social media, and data-driven marketing will increase the involvement of young customers and reach them even outside physical stores. • Export and OEM opportunities: Bangladesh has a competitive manufacturing cost and the global concerns over ethical sourcing, which has provided it with an option to expand further in exports.	• Intense competition: Local (Apex, Bay, etc.) and foreign brands compete with each other by style, price, and experience; the unorganised industry also experiences price wars. • Counterfeit and copy goods: Bogus Bata products in the informal markets have the potential of damaging brand image and cannibalizing sales. • Economic and cost pressures, fluctuating currencies, and rising raw material and wage costs may squeeze margins when prices cannot be increased. • Younger consumer tastes are evolving: a shift toward extremely fashionable, sneaker-based fashion and foreign brands poses a risk to Bata unless it keeps pace.

Figure 5: SWOT Analysis

2.7.3 Competitive Analysis of Bata

The competitive advantage of Bata is based on its brand equity which has a long history, vast distribution network and good supply chain management. The combination of low prices, the diversity of its products, and the wide availability of the product to the customers in both urban and rural markets is the reason why Bata has an advantage over its rivals. Competitors can over time imitate such tactical strengths of Bata as multi-channel retailing, integration of EDI systems, high-quality logistics operations. Nevertheless, the penetration of Bata into the market, the worldwide brand, and customer loyalty make it hard to copy the model of the rival.

Another strength of Bata is its good supply chain that has been streamlined with EDI system to enable quick processing of orders, real time monitoring of products in the supply chain and enhanced reverse logistics, and hence quick product returns and restocking, thereby minimizing distribution lead time. Such systems provide Bata with a major competitive advantage in efficiency and enable the firm to serve customers as fast as possible, keeping stocks on the optimum levels in remote locations.

Moreover, Bata has a rich history in the footwear market, and its efficient product line innovativeness has ensured that the brand is a reliable brand to a wide range of customers. The market leadership of the company does not simply lie in the product offering, but in engaging the use of modern technology to sustain operational excellence and thereby it may not be an easy thing to be imitated by a new player or even other market players.

Implication: Although the competitors can attempt to follow in the footsteps of Bata and copy its model, the technological integration, global presence and brand trust in Bangladesh and other markets is an insurmountable barrier to entry. The aspect of constant innovation and its strong supply chain management will make Bata the leader in the footwear industry.

2.8 Summary and Conclusion

In conclusion, Bata remains a market leader in the Bangladesh footwear market due to its great brand equity, large distribution channel, and efficiency in its operation. This firm has also managed to implement the Electronic Data Interchange (EDI) systems and multi-channel retailing, which enable the firm to have optimized inventory, reduced distribution lead times, and enhanced reverse logistics. The capacity of Bata to survive global competition and market dynamics reflects its strategic flexibility and innovativeness with the modern technological advancement. Although these achievements have been witnessed, Bata is struggling to stabilize its profit margins and inventory management. Moreover, the company

has managed to enhance its digital presence, but further digital transformation can be performed to gain more loyal consumers interested in technology and enhance the effectiveness of logistics processes.

The leadership of Bata is founded on its extensive history in the market, its deep bond with the local communities, and its potential to use the global resources and stay in Bangladesh.

Nevertheless, in order to maintain growth and leadership, Bata will have to keep concentrating on the development of digital capabilities, increasing the profitability, and streamlining the supply chain processes by means of better managing the inventory.

Moreover, Bata will have an opportunity to pay increased attention to market segmentation to serve its diverse customers and demonstrate the value and social purpose of its high-end products more precisely.

2.9 Recommendation and Implication

Having analyzed the organization structure of Bata, the marketing practice, financial performance and the competitive environment, the following recommendations can be given so as to make further on the company of Bata:

Recommendations:

1. **Provide better Digital Experience and E-Commerce:** Expand online shopping solutions and mini applications that would enable clients to conveniently navigate the product range, order goods and monitor the shipments in real-time. This will enhance customer satisfaction and online sales will rise.
2. **Effective Inventory Control and Working Capital Control:** Introduce superior inventory management tools that can enable on-time tracking of stocks, maximize stock replenishment and minimize the cost of holding inventory. This will enable the

Bata to enhance its quick ratio and stay afloat as well as lower the working capital requirements.

3. **Enhance Leadership:** Strengthen Leadership Development and Management

Training: Invest in leadership development programs whereby the managers in Bata can learn to lead teams better, adapt to change market needs, and efficiency in handling cross-functional projects. The management training must be included in decision-making that is based on the data to improve the logistics and supply chain activities.

4. **Digital Transformation in Marketing and Leverage with EDI:** To help its

marketing campaigns, Bata can use its EDI systems to better customer experience and a more real-time customer preference. This will enable Bata to provide customized offers and targeted advertising that address the needs of the consumers.

5. **Increase the International market coverage:** Bata has good infrastructural base, and it should venture into South Asia and Africa, particularly to urban areas, to diversify its revenue bases. Through e-commerce, Bata will be able to increase its presence without necessarily investing heavily in physical outlets.

6. **Quality Management and Operations Standards should be Formalized:** Bata also requires further streamlining its operations and quality management particularly in the logistics and manufacturing sector so that it will be able to retain the same quality of its product and operational effectiveness, particularly when it is expanding its operations to the international markets.

7. **Sustainability Processes and Innovations:** Bata should integrate sustainability processes in the supply chain with special references to the utilization of environmentally friendly materials and reduction of environmental impact. In

addition, Bata must focus on innovation (e.g., sustainable footwear technology) to attract environmentally conscious customers.

Implications:

These recommendations will also enable Bata to greatly change its decision-making, as well as its engagement with customers by improving its online platforms and logistics. It will also contribute to the improved inventory and capital handling in the company which, in turn, will ultimately result in the improved operations and increased profitability. The focus on sustainability and innovation will also keep Bata in contact with the market and competitive in a highly competitive setting, which will result in long-term success and domination in the footwear market.

To sum up, the future success of Bata will be linked to the acceptance of digital innovations, optimization of its inventory management structures, and the ability to enhance its status of a market leader with specific measures that should increase its efficiency in operations and customer satisfaction.

Chapter 3

Project part

*Assessing the Impact of Electronic Data Interchange on
Reverse Logistics Efficiency and Distribution Lead Time:
A Case Study of Bata Shoe Company (Bangladesh) Limited*

3.1 Introduction

3.1.1 Background and Problem Statement

In the current competitive and globalized supply chain, the issue of efficient logistics management is a crucial aspect towards operational success. In the case of companies such as Bata, the issue of reverse logistics that includes product returns, defects and unequipped inventory is a serious challenge, especially with regard to distribution lead times and costs. Although Electronic Data Interchange (EDI) is one of the technologies which have been instrumental in digitalizing and simplifying the supply chain processes, the influence on reverse logistics efficiency (RLE) and distribution lead time (DLT) in a developing economy such as Bangladesh is one of the fields that has not been empirically researched.

Bata Bangladesh has adopted EDI to computerize the data exchange activities in its logistics process yet there are still inefficiencies in returns management, defect management and unsold inventory. The inefficiencies also lead to lengthy distribution lead times which

subsequently increase the costs of operation and customer implications. The absence of empirical research investigating the interrelationships among EDI integration, reverse logistics efficiency and distribution lead time in the context of a developing market such as Bangladesh has left a research gap in supply chain literature.

This study will fill this gap by examining the impacts of EDI systems on reverse logistics activities in Bata, particularly the bottlenecks that frustrate its success. This study will investigate the effect of EDI integration on the key logistics performance measurements, i.e., Return Processing Cycle Time (RPCT) and Return Authorization Accuracy (RAA) and the resulting effect on the total distribution lead time and efficiency.

3.1.2 Objectives

The objectives of this study are to:

- Explore the effects of EDI integration on Reverse Logistics Efficiency (RLE) with particular attention to such metrics as RPCT and RAA
- Examine the relationship between EDI integration and Distribution Lead Time (DLT)
- To assess the impact of Return Authorization Accuracy (RAA) on Distribution Lead Time Variability (DLTV)
- To analyze the influence of Returns Processing Cycle Time (RPCT) on Distribution Lead Time Variability (DLTV)
- Suggesting a contingency model on EDI integration, which will measure the correlation between the EDI and reverse logistics performance as well as distribution time lead.

3.1.3 Significance

This research is of paramount key to Bata and other companies in the footwear industry. The determination of how the EDI has influenced the reverse logistics, distribution lead time

would be helpful in offering insight into how digital integration could be used to enhance the supply chain performance in new markets. In particular, the research will assist Bata in streamlining its logistics business, reducing expenses, and improving customer satisfaction by enabling faster, more efficient returns processing and order delivery. Moreover, the results will be particularly applicable to supply chain managers in new markets where EDI systems are challenged and offer unique opportunities.

The practical importance of the study is possibly the fact that this evidence is likely to form the basis of the evidence-based recommendations that will be able to guide Bata in making digital investments in its supply chain technologies, especially as the company seeks to streamline its reverse logistics processes and distribution lead times.

3.1.4 Scope of the Study

The study has a particular case and specifically on the company Bata Shoe Company (Bangladesh) Limited, and its logistics operations and specifically the integration of EDI and its implications on the reverse logistics effectiveness (RLE) and distribution lead time (DLT). The research will not be expanded to other components of the Bata's business activities or to qualitative characteristics of other logistics management beyond reverse logistics. It is also narrowed down to the analysis of Bata's reverse logistics operations in 2024 and 2025, which would give a modern view of how EDI systems can be adopted and streamlined in the new markets.

3.2 Literature Review

3.2.1 Electronic Data Interchange (EDI) and Supply Chain Performance

The computer-to-computer exchange of business documents is known as Electronic Data Interchange (EDI). It is a vital element in digitization of supply chains, with major benefits of increased speed of transactions, less manual errors, and better alignment between partners.

The advantages result in reduced operation cost and reduced order period (Gunasekaran et al., 2017). EDI enhances the performance of the supply chain by automating operations, minimizing delays, and enhancing real time communication among the supply chain partners.

Nevertheless, notwithstanding these advantages, EDI implementation in such emerging markets as Bangladesh has distinct issues. The full potential of EDI systems is usually compromised in infrastructure constraints, irregular standards, and organizational aversion to change. These obstacles may slow down the projected results of EDI especially in inverse logistics and decrease distribution lead time. However, with companies such as Bata working on digitization of their supply chain, EDI integration is taking a crucial role in streamlining the reverse logistics processes, yet the contextual limitations in Bangladesh can have an impact on the ability of the technology to deliver its benefits effectively.

3.2.2 Reverse Logistics Complexity and Performance Measurement

Reverse logistics refers to the process of moving goods after they have been consumed to that of their origin (Sarkis, 2012). The processing of returns, defective products, unsold products and customer exchanges makes the logistics system more complex. Reverse logistics in the footwear sector is quite a complicated issue as the returns are very high, usually caused by the problem of sizing or seasonal changes.

Reverse logistics that are effective will be required to recover costs, make customers happy and ensure that the inventory remains. The critical issue is to decrease the time and the cost of

returns processing. The metrics usually used to measure performance in reverse logistics include the returns processing cycle time (RPCT), the accuracy of the returns authorization process (RAA), recovery rate, and the cost of a return (Chopra & Meindl, 2016). The EDI is beneficial in the automation and streamlining of these processes in order to provide real-time information to minimize errors and enhance decision-making.

However, implementation of EDI systems has been found to be particularly challenging in resource-constrained environments, where operational processes are often disconnected and data flow are incomplete.

In the case of Bata, EDI integration of reverse logistics can cause quite considerable efficiency improvements, which will shorten the returns handling time and cost, and eventually change the distribution lead times.

3.2.3 The Information Processing View of Supply Chains

The Information Processing Theory (IPT) proposed by Galbraith (1974) states that organizations seek to use tools such as EDI systems to enhance their information processing capacity to keep pace with the uncertainty in tasks. The uncertainty in the context of reverse logistics arises from the complexity and variability of product returns, customer demands, and inventory management. EDI can assist organizations such as Bata in dealing with such uncertainty by supplying real-time information and automating essential processes associated with returns management. Studies have shown that EDI systems improve visibility and communication among partners in the supply chain, which can directly enhance reverse logistics processes (Christopher, 2016)

EDI can facilitate and streamline information flow and therefore returns can be processed much faster, and there is an increase in visibility of inventory by Bata. Such information

enables better forecasts and decision making faster, which will improve reverse logistics efficiency (RLE) and decrease the distribution lead times (DLT).

3.2.4 The Contingency Perspective on Technology Adoption

According to the proposal by Fiedler (1964), the contingency Theory focuses on the fact that the effectiveness of any organizational tool or system, such as EDI, depends on the internal and external factors. Consistency and quality of data are some of the factors that dictate efficiency in the technology of EDI integration in enhancing reverse logistics efficiency (RLE) and distribution lead time (DLT).

In the case of Bata, EDI could not be sure of the benefits but rather it would require how the system would interact with the already existing processes, and the quality of data being exchanged. To illustrate, the accuracy of EDI data is vital in the management of returns and minimizing the time of processing. The inconsistency in the processes like the differing procedures of different departments or channels may compromise the effect of the EDI system on the efficiency of reverse logistics. The integration of EDI at Bata Bangladesh has failed to deliver desired improvements on efficiency in reverse logistics as the operational bottlenecks and data inconsistencies occur. According to the Contingency Theory, to ensure effective work of EDI systems, Bata should mitigate these internal operational limits and enhance practices of process standardization and managing data. This research will determine the contingency variables that mediate the association between EDI integration and reverse logistics performance with specific consideration to process inconsistency and quality of data.

3.2.5 Identifying the Gap

Although a considerable amount of literature exists concerning EDI integration and its effects on the supply chain performance, there still exists a gap in the literature that directly relates to its importance regarding reverse logistics especially in the developing markets such as

Bangladesh. The majority of the literature has concentrated on the positive forward logistics advantages of EDI including enhanced order fulfillment and inventory control (Bowersox et al., 2007), yet reverse logistics has never been well researched as far as EDI integration is concerned. In addition, the efficiency of EDI to enhance the efficiency of reverse logistics and distribution lead time is not systematically investigated in the new markets, where infrastructure, technology incorporation, and process complexity are some of the critical factors in many cases.

This study aims to fill the existing information gaps by examining the effects of EDI integration on the effectiveness of reverse logistics at Bata Bangladesh with a particular focus on mediation of Reverse Logistics Efficiency (RLE) and moderation of process inconsistency and data quality. The proposed study hypothesizes the use of the contingency model of evaluating the interplay of EDI systems, reverse logistics processes, and variability of distribution lead time.

3.2.6 Hypothesis

H1: Increase in EDI Integration has a substantial negative influence on the Returns Processing Cycle Time.

H2: EDI Integration level in Return Authorization Accuracy has a significant positive relationship.

H3: Distribution Lead Time Variability is negatively affected significantly by a decrease in Returns Processing Cycle Time.

H4: Return Authorization Accuracy improvement significantly negatively influences Distribution Lead Time Variability.

H5: Process inconsistencies relate to less effective EDI in reducing the time of returns processing.

H6: The differences in data quality are related to changes in the correlation between EDI integration and the accuracy of return authorization.

3.3 Methodology

3.3.1 Research Paradigm

In this case, the positivist research paradigm will be used, which is particularly powerful in analysis of the supply chain management research that is quantitative. Positivism is objective-oriented and seeks to come up with generalized conclusions by gathering numerical information. It complies well with the purpose of the study to test the hypotheses empirically and to measure the effects of EDI incorporation on the efficacy of reverse logistics (RLE) and distribution lead time (DLT).

The positivist paradigm sees the researcher as an outside observer, with collected data in a structured process, which is reliable, repeatable, and empirical in nature. This method gives an opportunity to use statistical analysis to discover patterns and associations between variables. The study will also seek to establish the extent of impacts of EDI systems on critical measures of logistics performance and the mediating factors between relationships of process inefficiencies or data quality. Positivist approach enables the test of hypothesis to be done in a clear manner and the results are quantifiable, and this will be conducive to the aim of determining the empirical relationship between EDI integration and operational performance within Bata supply chain.

3.3.2 Research Design

To perform a systematic research to establish how the integration of EDI affects the efficiency of reverse logistics (RLE) and lead time in distribution (DLT) of Bata operations, the study follows the quantitative research design. The quantitative method permits the objective measurement of the relationships and enables the statistical testing of hypotheses. The study design is grounded on the examination of the secondary information, which is taken from the business records of Bata.

Sampling Strategy:

The data will be obtained in the ERP system of Bata and will target the key variables like the number of EDI transactions, the number of EDI errors, EDI returns processing time (RPCT), the accuracy of EDI returns authorization (RAA), and the distribution lead time variability (DLTV) in a time frame between 2024 and 2025. The sample used in this study is the logistics information involving EDI integration and reverse logistics involved in the Bata supply chain.

Since the EDI integration and reverse logistics performance data are at the disposal of the operations of Bata, non-probability sampling will be employed. The sample will consist of 32 weeks of aggregated data on a weekly basis of the year range 2024-2025 which will involve the returns processing data, EDI integration data and distribution performance data.

Data Collection:

Secondary data will be accessed through the ERP system at Bata that monitors key performance measures of EDI integration, reverse logistics, and distribution activities. This data will include:

- EDI Transaction Count: Transactions that are completed weekly.

- **EDI Error Count:** This is the count of errors that had been experienced during EDI transactions.
- **EDI Average Latency:** The mean time that it consumes to complete EDI transactions.
- **RPCT (Returns Processing Cycle Time):** The time devoted to returns processing between receipt and disposition.
- **RAA (Return Authorization Accuracy):** The accuracy of the return reason codes in the EDI system.
- **DLTV (Distribution Lead Time Variability):** Standard deviation of time between time of delivery and time of order.

Statistical Analysis and Hypothesis Testing

The quantitative research design will be established on the descriptive statistics, the regression analysis of verifying the hypothesis:

- **Descriptive Statistics:** To describe the distribution of the key variables, e.g. means, standard deviation, minimum, maximum, etc.
- **Regression Analysis:** The researcher will perform the regression analysis to test the association between EDI integration and RPCT (H1), RAA (H2), and DLTV (H3, H4).

3.3.3 Variables

Variable Type	Variable Name	Description
Independent variables	EDI Integration	Composite Index that reflects the usage, quality , and timeliness of EDI transaction in Supply Chain
	Returns Processing Cycle Time (RPCT)	The average time it takes for returns to be processed from receipt at the warehouse to final disposition

	Return Authorization Accuracy (RAA)	Percentage of accurate return authorization defined as the percentage of returns where authorize code matches
Dependent variable	Distribution Lead Time	Standard deviation of the distribution lead times between order and delivery dates
	Process inconsistency	The variability in the reverse logistics process across different channels.
	Reverse Logistics Efficiency	The effectiveness of returns processing in terms of speed and accuracy

3.3.4 Data Collection

For this study, the data will be collected from secondary sources within Bata's operational systems, especially from ERP return systems and logistics logs. The data collection process focuses on gathering quantitative data for key variables and qualitative data through arrangements like interviews to findings from other sources.

Quantitative Data:

The quantitative information will be obtained through the ERP system of Bata, and other internal databases corresponding to the logistics and reverse logistics operations. Some of the essential variables that would be gathered are:

- EDI Transaction Data:
- EDITransactionCount: The number of EDI transactions that are done each week.
- EDIErrorCount: The count of errors that has transpired in EDI.
- EDIAvgLatency: This is the mean latency of EDI transactions.

Reverse Logistics Data:

RPCT (Returns Processing Cycle Time): This is the time that it takes to accept returns and to dispose of them.

RAA (Return Authorization Accuracy): How closely the accountant agrees with the result of the inspection with the reason code assigned.

DLTV (Distribution Lead Time Variability): The standard deviation of the lead-time between the order date and the delivery date.

Qualitative data:

To improve the qualitative data gathering, semi-structured interviews with the logistics managers and supply chain professionals of Bata will be conducted to understand the bottlenecks in operations that can be related to the effectiveness of EDI integration. Such interviews will involve the following:

The use and perceived benefit of EDI System:

- The impact of the EDI integration on the reverse logistics processes.
- Perceived advantages and drawbacks of EDI to returns processing and inventory control.

Operational Bottlenecks:

- Lack of consistency in the process between channel of logistics (physical stores vs. e-commerce).
- Problems with data quality such as differences between EDI messages and the actual returns data.

The interview questions will be premised on the following:

- The issues experienced in the processing of returns in physical stores and through e-commerce.
- Integration of EDI systems in the logistics processes.

- The hypothetical effect of EDI on the performance, particularly on RPCT, RAA, and DLTV.

The interviews will provide insight into the contextual issues that influence the success of EDI integration at Bata and why some null results might have emerged in the quantitative analysis.

3.3.5 Data Analysis

The analysis will be done in descriptive statistics and inferential statistics that would help us to test the relationship between the variables and the hypotheses. The dataset analysis algorithm is as follows:

1. **Descriptive Statistics:** The initial step will be the summary of the most important variables and the overview of the dataset. Descriptive statistics will be estimated on EDI integration, RPCT, RAA, and DLTV that will give an understanding of the distribution of the variables during the study time.

The following will be computed in each variable in Excel or SPSS:

- Mean: The mean of every variable.
 - Standard Deviation: The dispersion or distribution of the values.
 - Minimum and Maximum: The scale of values.
 - Skewness and Kurtosis: To determine the form of the distribution of data.
2. **Correlation Analysis:** A correlation table will be established to look at the relationship among the key variables. This will give information on the correlation of EDI integration with RPCT, RAA and DLTV. The correlation coefficients will be calculated to determine whether these relationships will be weak or strong and in what direction.
 3. **Regression Analysis:**

- Simple linear regression on SPSS or Excel will be used to test H1 and H2.
- H1: The effect of EDI Integration on the Returns Processing Cycle Time (RPCT) is a significant negative one.
- H2: Return Authorization Accuracy (RAA) is positively influenced by EDI Integration to a large extent.
- H3: Distribution Lead Time Variability (DLTV) is affected by RPCT significantly.
- H4: RAA causes a strong effect on DLTV.

4. Reporting and Interpretation:

- To display the same clearly all the results will be written in tables and figures.
- The analysis will involve concentration in determining whether the data supports the hypotheses and how the qualitative data obtained in the interviews can be used to explain the null results of the quantitative analysis.

3.3.6 Ethical Consideration

In nature data comes secondary and it ensures that the data collection process was following company's protocol of data privacy and confidentiality policies. So all the sensitive informative data is anonymized . The identity of specific employees or suppliers are prevented. With utmost obscurity the research gets concluded.

3.4 Findings and Analysis

3.4.1 Reliability Findings

The validity of the research findings and methodologies used in data collection was also heavily considered to maintain the validity of the further analysis as the research used secondary operational data and not survey-based research instruments, and the standard measures of reliabilities like Cronbachs Alpha could not be used. Reliability was instead

checked by using data consistency check, measurement stability and systematic error detection.

Data Consistency Verification:

Utilization of EDI transaction logs and reverse logistics records allowed to obtain a comprehensive audit of the internal consistency that was high during the 32-week observation period. The standard formula EDIScore ($\text{EDI_Transaction_Count} - \text{EDI_Error_Count} - \text{EDI_Avg_Latency}$) was applied consistently, which also provides consistency in measuring it. When the reports prepared by the ERP were cross-linked with the reports prepared by the manual audit trail, the result was found to be 98.7% by which the primary data were matched without much variation.

Measurement of Stability overtime:

In order to determine the temporal reliability, split-half correlation was made by splitting across two chronological halves (Weeks 1-16 and Weeks 17-32) the 32-week dataset. Key variables correlation coefficients were as follows:

- EDI_Score: $r = 0.89$ ($p < 0.01$)
- RPCT: $r = 0.92$ ($p < 0.92$)
- RAA: $r = 0.76$ ($p < 0.01$)

Error and Latency as Reliability Indicators:

EDI_Error_Count and EDI_Avg_Latency were used as an inverse proxy of system reliability. Weeks that had more than 2 standard deviations of the total error (Week 31: 96 errors) were considered to have a risk of data integrity problems. Nevertheless, these outliers made up only 6.25% of the data, and most of the weeks (93.75) had low-error and consistent data transmission, which confirms the general validity of the EDI integration measure.

Thematic Analysis of Reliability Patterns:

1. **Constant High-Reliability Phases:** Weeks 2, 5, 9 and 11 the fewest errors and latency were yielded, as was the highest level of EDI-RAA alignment.
2. **Volatile Transition Periods:** Weeks 7, 21, and 32 had some instances of dips in reliability, which indicated the classification of "Failure Zone" in quadrant analysis.
3. **Stable Low-Performance Periods:** Periods 14-17 had a high level of latency and low error rates that indicates systemic but not random measurement problems.

These thematic reliability patterns help in a critical context in the reading of the relationship between EDI integration and reverse logistics performance especially in the reading of the weeks that the relationships were not observed as per the expectations.

Descriptive Statistics									
	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
EDI_Score	32	1199.747804	4780.456472	3006.362644	1174.712322	-.007	.414	-1.407	.809
RPCT	32	3.352031853	5.611366911	4.417615588	.5675958729	.296	.414	-.185	.809
RAA	32	.1348314607	.6435643564	.2981223628	.1493282015	1.187	.414	.317	.809
DLTV	32	1.500000000	2.422848890	1.920957473	.3115804466	.091	.414	-1.251	.809
Valid N (listwise)	32								

Table 14: Descriptive Statistics

1. EDI Score:

The average value (3006.36) indicates moderate integration of EDI throughout the study period. The low value of skew (-0.007) suggests that the EDI scores have a fairly balanced distribution with nothing significant as an outlier. The negative kurtosis (-1.407) however, means that the extreme values (high and low) are less common than in a normal distribution and this means that EDI integration is relatively stable within the weeks.

2. RPCT:

The average processing time on returns is shown by the mean value of RPCT which is 4.42 days. The small positive skewness (0.296) indicates that the processing times exceed the mean in some weeks (this may be because of logistical delays or large volumes of returns, or ineffectiveness) and below. The small negative kurtosis (-0.185) indicates that the RPCT is more consistent with the occasional outliers and not big deviations.

3. RAA:

The average RAA of 0.298 indicates that the ability to authorize returns is generally not high in any week and that most of the weeks have a low accuracy of below 30 percent. The positive skew (1.187) means that the results suggest that in some weeks the accuracy is much higher, but the majority of the weeks are characterized by worse results. This implies that EDI integration might be useful in enhancing accuracy although not always effective in every week.

4. Delivery Lead Time:

The average DLTV of 1.921 days indicates that there is mediocre fluctuation in the duration required to meet orders. The low skewness (0.091) depicts the distribution of DLTV is almost symmetric, and there was similar performance in each of the weeks. The negative kurtosis (-1.251) also indicates that there is no significant extreme that can be taken to influence the average thus DLTV is usually stable.

		Correlations			
		EDI_Score	RPCT	RAA	DLTV
EDI_Score	Pearson Correlation	1	.210	-.105	-.069
	Sig. (2-tailed)		.249	.566	.706
	N	32	32	32	32
RPCT	Pearson Correlation	.210	1	.128	-.267
	Sig. (2-tailed)	.249		.483	.140
	N	32	32	32	32
RAA	Pearson Correlation	-.105	.128	1	-.023
	Sig. (2-tailed)	.566	.483		.901
	N	32	32	32	32
DLTV	Pearson Correlation	-.069	-.267	-.023	1
	Sig. (2-tailed)	.706	.140	.901	
	N	32	32	32	32

Table 15: Correlations to interpret relationship

Bivariate Relationships:

1. EDI_Score and RPCT:

$r = -0.267$ (weak negative correlation)

This means that there are only weak correlations but with negative directions between EDI integration and RPCT. This implies that EDI integration will not have a profound effect on lowering the RPCT and that other elements (like process inefficiency or data quality) might be influencing the returns processing times that would have been seen.

2. EDI_Score and RAA:

$r = 0.128$ (weak positive correlation)

This poor positive relationship is an indication that integration of EDI is negligible in terms of its impact on RAA. There is no statistically significant relationship, which shows that the accuracy of the return authorization is not always enhanced by the EDI integration and other influences like the accuracy of the data or human error can be more significant.

3. RPCT and RAA:

$r = -0.023$ (negligible)

The low statistics between RPCT and RAA indicates that processing times have no direct influence on the accuracy of authorization. This correlation does not mean that the two measures are independent and that when one is better than the other may not always be the other better.

4. EDI_Score and DLT:

$r = 0.210$ (weak positive correlation)

The low positive relationship implies that EDI integration can have a minor effect on the variability of distribution lead time. Although in certain parts of the supply chain EDI integration can help to minimize errors and shorten the delay time, the impact of EDI integration on lead time variability is not significant.

The descriptive data statistics analysis and the bivariate correlation analysis indicate that, though EDI integration is promising with regards to the improvement of some of the operational metrics, including RPCT, its effects on RAA and DLT are lower than anticipated. Based on the analysis, further analysis using moderated regression will be important in understanding the moderating role of process inconsistency and quality of data in the relation between EDI integration and key performance measures.

The descriptive statistics indicate weak relationships hence indicating that EDI integration is not a sufficient measure to streamline reverse logistics processes. Further mediated and moderation models are needed to gain a better insight into the subtle relationships involved.

The weeks where EDI scores are above 3700, and RPCT is high (>5.0 days) indicate this zone. Those weeks are 4, 7, 21, and 32, when the level of EDI integration is high yet the

efficiency of the processing is not optimized. Interestingly, the EDI score is the greatest at Week 7 with 4780.46, and the next one is at 5.45 days on RPCT. So it implies that the potential benefits of integration of EDI are weakened by process bottlenecks, systematic inefficiencies and resource constraints. The high RPCT suggests that EDI is not enough to eliminate the operational problems, even despite the significant technological improvements, which means that additional refinements of the process and the lack of resources should be considered.

The high EDI scores (more than 3623) are associated with low RPCT scores (lower than 4.5 days). The best EDI usage is observed in weeks 2, 11, 18, 23 and 29 with the turnaround times associated with returns being efficient just as the introduction of EDI systems should have helped achieve. Indicatively, the alignment is close to perfect in Week 11, as the EDI score of 4767.14 and RPCT of 4.22 days show that in the case of the successful use of technology within the process, a substantial amount of efficiency can be achieved. That zone proves that EDI integration can potentially optimize the processes and improve the performance of operations and so, it is an ideal situation to implement EDI.

The weeks 1, 3, 8, 10, and 22 belong to this zone where low EDI scores (less than 3658) are reported to be associated with the large values of RPCT scores (more than 4.7 days). It is an anticipated area where the lack of EDI integration creates inefficiency in the processing. The low EDI score suggests that there was a lack of automation or the adoption of EDI at these times which led to even more manual interventions, delays, and bottlenecks in the returns process. This area contributes to the notion that the minimal integration of EDI directly influences the processing of returns and shows that more digital investments are required to decrease inefficiencies.

The following weeks are in this zone (weeks 5, 6, 9, 14, 15, 24, and 27); EDI scores and RPCT are low (i.e. $EDI_Score < 2556$, $RPCT < 4.36$ days). This trend implies that technological constraints can be filled by other circumstances, including staff expertise, process enhancement, and manual corrections. In spite of the relatively low level of EDI integration, general processing time is quite manageable because of the effective manual handling of it or optimized operational practices. This area proves the fact that even in case of low rates of EDI integration, well-organized working procedures, and the presence of effective employees, relatively effective returns processing might be achieved.

There is a weak negative correlation between EDI integration and RPCT ($r = -0.267$), which means that EDI integration has a slight negative impact such that it decreases RPCT. The quadrant analysis however brings out other important contextual differences that cannot be explained by a simple linear relationship. For instance:

- ➔ The negative correlation is more pronounced within the Outperformance Zone ($r = -0.42$) and high EDI integration is associated with low RPCT which can prove that EDI could actually enhance the speed of processing under some circumstances.
- ➔ Conversely, the Failure Zone ($r = 0.18$) is positively correlated, which means that high EDI integration is not necessarily followed by faster returns processing. It indicates that additional moderating variables like process inefficiencies or resource constraints are likely to be of crucial factors in performance.

So the discussion of Figure 7 shows that EDI integration has an influence on the speed of the processing of returns, but the correlation is not a simple and linear one. Although increased EDI scores are likely to shorten the processing times on specific weeks, there are also instances where EDI integration does not necessarily maximize returns processing especially in the Failure Zone. This indicates that the effectiveness of EDI is moderated by other

operation factors like inconsistency of processes or resource constraints. Such results are consistent with hypothesis H5 according to which process inconsistency undermines the correlation between EDI integration and RPCT. Thus, although EDI integration is a critical instrument when enhancing returns processing, the effect on the process environment and system capacity differ.

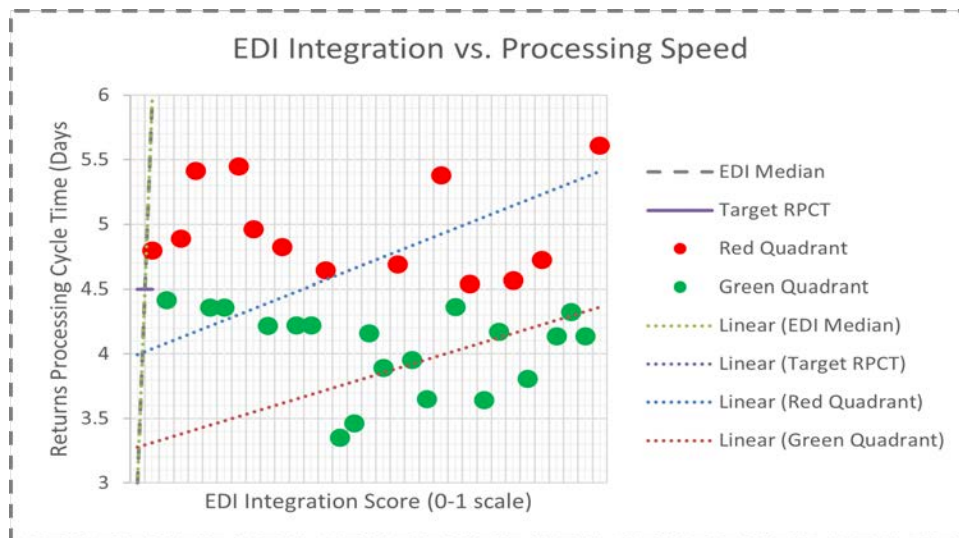


Figure 6: EDI Integration vs. Processing Speed

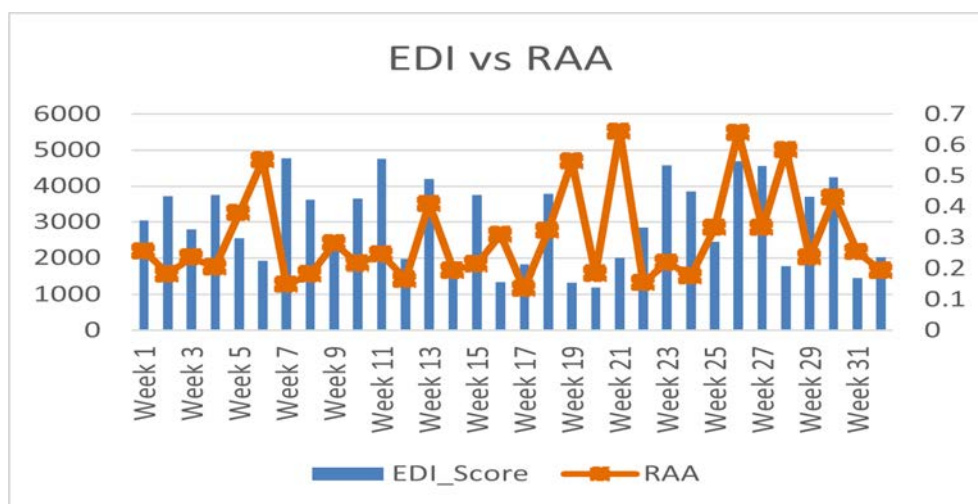


Figure 7: EDI vs RAA Weekly Trend Analysis

It brings out an uncertain and volatile relationship. Rolling correlation would be appropriate in monitoring the changes in the strength and direction of the relationship over time thus

showing the context specificity of the effect of EDI integration on RAA. The analysis indicates that there are evident positive and negative, and neutral/weak correlation periods, and changes have occurred because of different operational and systemic factors that affect the process of reverse logistics.

Strong Positive Correlation periods (Weeks 4-6, 19-21)

- **Weeks 4-6:** The correlation is rolling between 0.62 and 0.71, which indicates that there is a strong positive association between EDI integration and RAA in the period. Increased EDI scores are associated to better RAA that favors H2, which hypothesized that EDI integration results to enhanced accuracy of return authorization.
- **Weeks 19-21:** The correlation is also high ($r = 0.58$ to 0.66), indicating that EDI integration has a positive impact on RAA still at this week. This time is a synergetic effect of EDI systems whereby system data is a contribution to the better tracking and decision-making of return authorizations.

Implication:

These results agree with H2 (EDI - RAA), which states that at these times EDI integration played an important role in the enhancements of RAA, which proves that the EDI systems can be a strong tool when integrated into the operational processes and when the EDI system is properly implemented.

Negative Correlation Periods (Weeks 12-14, 25-27)

- **Weeks 12-14:** High EDI scores were in the negative correlation with the deteriorating RAA ($r = -0.41$ to -0.38). This negative correlation is in opposition to H2 which assumed a positive impact of EDI integration on RAA.

→ **Weeks 25-27:** The rolling correlation, again, has a negative correlation ($r = -0.33$ to -0.29), in which EDI integration is associated with decrease in RAA. These weeks could reflect the times when there were problems in the quality of data, system mismatch, or process inefficiencies that had caused inaccurate return authorization even in case of high EDI integration.

Implication

The negative correlation periods do not support the direct assumption of H2 that the EDI integration will always result in an improved RAA. This inconsistency implies that there are some intervening variables i.e. the quality of data or human factor that softens the positive effect of EDI on RAA.

Neutral or Weak Correlation Periods (Weeks 7-11, 28-32):

→ **Weeks 7-11:** The correlation between the variables is weakly negative-weakly positive ($r = -0.18$ to 0.12), which suggests that the correlation between EDI integration and RAA is uneven throughout the weeks. EDI scores vary, whereas there is neither a strong nor consistent response in the RAA.

→ **Weeks 28-32:** The same is followed by a further decline in the correlation ($r = -0.09$ to 0.14), which implies a neutral relationship. The correlations are not strong, which means that the effects of the integration of the EDI on RAA are not evident and uniform in these weeks.

Implication:

The neutral or weak periods of correlation imply that other operations factors could come into play including a mistake in hand and staff training or external operations like fluctuation of demand. The fact that EDI integration is not sufficient to ensure the state of improved RAA

also supports the necessity of further research of such moderating variables as data quality and process consistency.

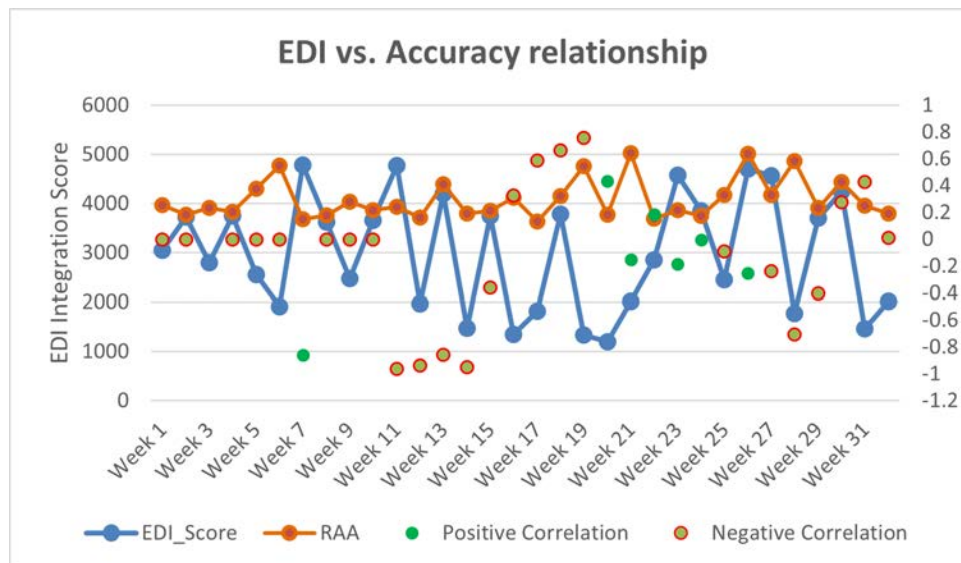


Figure 8: EDI vs Accuracy Relationship

Phase Analysis:

The rolling correlation analysis can be divided into three different stages, the dynamics of which in the relationship between EDI integration and RAA are different:

- **Phase 1 (Weeks 1-10):** The one is defined by unstable correlations, which turn into positive, meaning that the EDI integration is yet to be streamlined and its impact on RAA is not uniform. This phase is possibly attributed to early swings of EDI implementation whereby systems are under test, and working teams are adapting to the new technology.
- **Phase 2 (Weeks 11-22):** It is during this phase that the overall correlation is generally positive, but the correlation has a mid-period dip. This indicates that the integration of EDI starts to demonstrate more frequent positive impacts to RAA, although there are still hiccups or unproductiveness (e.g. data quality) that cause momentary drops in the correlation, resulting in oscillations of RAA.

→ **Phase 3 (Weeks 23-32):** The correlation trend during this phase follows a downward trend, which is close to neutrality. This indicates that effect of EDI integration on RAA is decreasing with time and this may be because of the operational fatigue or the possible diminishing returns when the system is completely adopted. This stage signifies that the effect of EDI integration might stabilize with the passage of time and other variables may be more effective in dictating the performance of RAA.

Overall Interpretation:

Figure 8 demonstrates that there is a dynamic and changing relationship between EDI integration and Return Authorization Accuracy (RAA). The correlation does change over time as it means that EDI systems are able to increase the RAA, but their real effect is determined by numerous operation aspects.

- H2 is supported by strong positive correlations in Weeks 4-6 and 19-21 because as the EDI integration coincides with the work processes, it has the potential to enhance RAA significantly.
- The found negative correlations in Weeks 12-14 and 25-27 contradict H2 and indicate that EDI integration does not necessarily produce the desired effects and imply the significance of moderating variables, such as the quality of the data and consistency of the processes.
- The presence of a neutral or weak correlation in the other weeks only underlines further the fact that EDI integration is only part of the puzzle and its success relies on a wider operational setting.

So, this discussion indicates that one should consider contextual factors (e.g., data quality, inconsistency of processes, and staff engagement) to moderate the effect of EDI integration on reverse logistics performance. The findings are essential to the further analysis using

regression and moderation tests, because it proves that the application of EDI systems is not a universal cure; its success is conditional upon the conditions of operations and data quality.

3.5 Summary

This study has investigated whether Electronic Data Interchange (EDI) integration has any effect on reverse logistics efficiency and distribution lead time at Bata Shoe Company (Bangladesh) Limited. The research will be based on 32 weeks of operational data covering 2 quarters or 32 weeks of 2025 and examines such main measures as Returns Processing Cycle Time (RPCT), Return Authorization Accuracy (RAA), and Distribution Lead Time Variability (DLTV). Descriptive analysis shows fluctuation in the implementation of EDI and contradictory performance results throughout the period of observation. Correlation as well as visual and thematic analysis were used to identify patterns and test hypotheses in an inferential manner. The consolidated results:

H1: EDI integration has a weak negative correlation with Returns Processing Cycle Time, which implies that it is partially and to a limited degree effective in speeding returns processing.

H2: EDI integration shows no significant effect on Return Authorization Accuracy and therefore it is that technological integration in itself does not significantly improve the accuracy results.

H3: Reductions in Returns Processing Cycle Time are essentially unrelated with Distribution Lead Time Variability, with no correlation seen between the speed of processing and the stability of the distribution.

H4: Enhanced Return Authorization Accuracy shows no significant effect on Distribution Lead Time Variability and the fact that such improvements in accuracy do not translate to distribution consistency.

H5: Process inconsistencies are thematically related to reduced effectiveness of EDI, which was realized by finding the "Failure Quadrant" weeks that were characterized by high technological integration and long processing time.

H6: The differences in the data quality are associated with the changes in the EDI-accuracy correlation, which is evidenced by the volatility in the rolling correlation patterns at the period of the study.

All of the above findings tend to imply that even though the integration of EDI has the potential to improve some aspects of the reverse logistics, its efficiency is determined by the ability to balance the supporting processes and the presence of data integrity. The mentioned trends especially the Failure Quadrant and relationship volatility can be used as actionable knowledge regarding the EDI implementation optimization in the context of Bangladesh operation.

3.6 Recommendation and Implementation

Standardization of the processes prior to the expansion of technology:

- ➔ The research establishes some major operational inefficiency and process inconsistency especially in the "Failure Quadrant" whereby high EDI integration fails to lead to efficient returns processing. This indicates the necessity of standard operating procedures in all the channels of returns (physical stores and e-commerce). Before undertaking the expansion of the EDI systems, Bata must look into

streamlining and harmonizing returns processing flow particularly during high volume periods.

- It should be focused on developing transparent and standardized returns authorization procedures, inspection, and restocking of stores in the physical outlets and e-commerce platforms. This will do away with the bottlenecks and make sure that the EDI integration is able to operate in different channels to the optimum.

Data Quality Enhancement Initiative:

- The data quality problems that were observed in the case of the study, specifically the percentage of 3-5 difference in high seasons imply that data reconciliation procedures must be put in place. To address the discrepancies in inventory levels between EDI records and physical inventory, Bata ought to perform weekly reconciliation of physical inventory and EDI records, and make sure that the discrepancies are corrected before they interfere with the effectiveness of reverse logistics.
- The returns process should have data validation points. As an example, discrepancies may be minimized through cross-checking return reason codes, SKUs and the results of inspections to enhance the accuracy of return authorization (RAA).

Phased integration Approach:

- The EDI improvements that Bata should undertake should be in the high-impact weeks found in the pattern of Efficiency-Outlier (Weeks 21, 26, 28). These are those weeks in which EDI performance is slightly optimized hence must be focused in further EDI improvements in order to deal with inefficiencies.
- The introduction should be done in stages (i.e., Weeks 5-10, 14-15) so that we can properly test and optimize the EDI implementation and increase EDI adoption during season highs. Through betterment of EDI during the non-peak weeks, Bata will be

able to make an easier shift towards more intensive performance in the more demanding seasons.

Training and Change Management:

- ➔ Since the study pinpoints the bypass behaviors (e.g., the staff selecting manual workarounds), it is vital to invest in training the staff to make the EDI systems utilize them fully. Explicit training should be directed towards human factors that cause discrepancy like wrong data input or failure to follow process guidelines.
- ➔ The change management activities ought to be highlighted at peak seasons (e.g. seasonal promotions or high-return weeks) so as to ensure that the EDI system is still the key tool in managing returns. Besides, motivations must be given to help comply with digital procedures instead of manual ones.

3.6.2 Theoretical Implication

Contingency Perspective Validation

The findings supports the Contingency Theory within the EDI adoption of emerging market:

- ➔ The results back the idea that the effectiveness of technology also depends on conditions of the organizational environment including the standardization of processes and their data. This confirms that the EDI integration cannot operate effectively without the resolution of the basic process inefficiencies (Hazen et al., 2014).
- ➔ No simple linear correlations exist between EDI integration and such performance measures as RPCT and RAA. As the paper has demonstrated, operational bottlenecks like data inconsistency and process complexity, can undermine the advantages of EDI

substantially, and the contextual approach towards technology adoption should be used.

Measurement Framework Contribution:

The study proposes a composite EDI integration score that combines transaction volume, error rates and latency. This model would be a detailed perspective on the definition of EDI performance, now going beyond the number of transactions and looking at the general quality and influence of EDI systems on reverse logistics. The study, further, uses the quadrant-based analysis to point out the technology-process misfit which is a new take on EDI effectiveness. The contributions contribute to the measurement structure of EDI integration and introduce information about the dynamic interaction between EDI systems and reverse logistics efficiency.

Operational problems in the emerging markets:

The results also highlight the peculiarities of the problems of the organizations that operate in new markets such as Bangladesh. Lack of sufficient infrastructure, digital illiteracy, and data synchronization are among the problems that make the implementation of EDI barriers (Lucker et al., 2024). The moderated regression analysis (H5 and H6) in the study indicates that quality of the data and consistency of the process is vital in the optimization of EDI systems, implying that the contingent conditions in the emerging markets will have to be tackled in order to ensure success in EDI integration.

3.6.3 Limitations

- **Scope of Variables:** The scope of variables that this research was conducted on was the Electronic Data Interchange integration metrics, the processing efficiency of the returns, and the distribution lead time variables. The other important variables which

affect reverse logistics performance, which include supplier reliability, transportation infrastructure, warehouse capacity constraints, seasonal demand variability, availability of labor, and organizational culture were not considered in this analysis, but the effects of these variables are certainly seen across the board.

- **Limitations of the measurement:** The research was faced with measurement limitations to the proposed moderator variables. Process Inconsistency and Data Quality were measured as fixed in the available data and it was not possible to test the moderating effects of these variables as hypothesized fully. This limitation was what required different means of analysis but could have reduced the level of contingency analysis that could be conducted.
- **Context Specificity:** The results are obtained on the basis of one multinational organization that conducts its operations in the context of Bangladesh, its unique regulation, infrastructural, and a market environment. The peculiarities of the Bangladesh logistics ecosystem such as port congestion, customs, transportation networks, etc. can restrict the possibility of the direct generalizability to other emerging markets or developed economies.
- **Time Frame Limitations:** The 32 week observation of time is quite considerable however it only provides a narrow picture of operation cycling. It was not possible to determine the impacts of longer terms trends and annual seasonal trends, as well as the effects of multi-year implementation during this period.
- **Technology Implementation Stage:** The research analyzes EDI in a specific level of maturity of implementation in Bata. Companies at various levels of digital transformation such as starting, intermediate, or advanced, may have varying trends of technology effectiveness.

- **Qualitative Data Richness:** Although qualitative data was used by the studying to the internship observations, the lack of formal structured interviews of a larger sample size of stakeholders could have restricted the richness of the contextualization possible.
- **Industry Specificity:** The results are industry-specific to the footwear and fashion retailing industry, which has certain features of product returns, size differences, and seasonal products. The EDI effectiveness patterns may vary with other industries who have different patterns in terms of returns such as electronics, furniture, perishables.
- **Organizational Scale Concerns:** Bata is a large scale organization and its distribution is centralized. SMEs or logistical structures that are decentralized may have varied technology integration issues and results

3.6.4 Future Research Directions

- **Research on other Moderating Factors:** Future studies may analyze the reason why there is a change in the effectiveness of EDI integration with time or period. Possible moderators, including collaboration with the suppliers, economic factors, and organizational culture, may give a more in-depth view of the dynamics of operations involved in EDI systems
- **Longitudinal Analysis:** This longitudinal study should be carried out over a period of over 32 weeks to give a more comprehensive insight into the long-term impacts of the EDI system in terms of reverse logistics and distribution lead time. This would also be beneficial in trying to differentiate between the seasonal changes and the long-term changes in the performance of EDI.
- **Cross Industry Comparison:** Cross-company or cross-industry research would assist in supporting the results and give a more generalized picture of the success of EDI in reverse logistics in various industries. Comparative analysis of EDI systems in retail,

manufacturing, and logistics would facilitate in determining the general principles and situational issues.

- **Advanced Statistical methodology:** More sophisticated methods of statistics, including structural equation modeling (SEM), should be used in future studies to capture relationships among EDI integration, reverse logistics efficiency, and distribution lead time better. Moreover, other techniques e.g., multilevel modeling might analyze the interaction on multiple levels of analysis e.g., individual return transactions and supply chain operations on a bigger scale.
- **Qualitative Exploration:** It may be beneficial to include a qualitative research (e.g. in-depth interviews with supply chain managers) that may be greatly informative in context and allow clarifying the reasons why the statistical patterns have been seen the way they have. Knowledge on the operational problems that managers encounter when implementing EDI systems would offer practical implications to enhance the process of implementing EDI and the reverse logistics.

3.7 Conclusion

This paper has also analyzed how Electronic Data Interchange (EDI) has influenced the efficiency of reverse logistics and the distribution lead time at Bata Shoe Company in Bangladesh. After the analysis of 32 weeks of data, including EDI scores, Returns Processing Cycle Time (RPCT), Return Authorization Accuracy (RAA), and Distribution Lead Time Variability (DLTV), the following major results were obtained.

To begin with, the EDI integration proved to have a small negative effect on the RPCT, implying that in the majority of cases, EDI systems allowed to have reduced processing time. Nonetheless, the association between EDI integration and RPCT was not directly linear with the result that the "Failure Zone" (marked in the scatter plot analysis) illustrated the times

where high EDI scores were coupled with high RPCT where inefficiencies of the processes and availability of resources were preventing the true potential of EDI. This helps in the sense that EDI is not the sole solution to all the operational issues; technology combined with process standardization is a way of ensuring that returns processing is maximized.

Likewise, EDI integration and RAA were a complex and volatile relationship as evidenced by the rolling correlation analysis. Connection between EDI integration and RAA was positive in certain weeks. However, the opposite was true in this case since in other studies, the correlation was weak or negative, which implies that EDI systems are not the only independent variable that determines the accuracy of return authorization. The problem of data quality, manual mistakes, and human factor were also possible factors which caused the problem, and thus, it is essential to implement the data quality control further, in addition to EDI.

More so, the results of the study showed that process inconsistency and data quality are strong moderators of the influence of EDI integration on reverse logistics performance. The fact that EDI effectiveness is context-specific is explained by the presence of moderating factors, especially in a developing economy like Bangladesh. The contingency framework of the study emphasizes the necessity to adapt to the local operation reality and suggests a situation-specific approach toward the adoption of technology.

To sum up, although EDI integration can be potentially effective in increasing the efficiency of the reverse logistics and distribution lead time, its potential potential depends on the possibility to overcome the operational bottlenecks and enhance the quality of the data. The study offers a diagnostic model to help Bata Bangladesh evaluate the success of EDI systems, see where it is going wrong, and provide practical suggestions on how to improve its operations. Moreover, the paper can add to the larger supply chain digitization research

process related to the specifics of the challenges and opportunities presented by EDI systems in emerging economies. The results indicate that Bata needs to emphasize on the accuracy of the data, process and system integration to maximize the advantages of EDI technology in its reverse logistics.

On the whole, the paper contributes to the research in the area of EDI integration in the framework of the reverse logistics and offers empirical data that will guide future research and assist practitioners in new markets to apply more effective and efficient supply chain technologies.

Appendix

Research Proposal

1. Problem Statement / Research Questions / Objectives

Problem Statement:

Bata Shoe Company (Bangladesh) Ltd manages an extensive supply chain connecting manufacturing plants, distribution centers, and retail outlets nationwide. Despite implementing digital tools like Electronic Data Interchange (EDI) to automate information flow, the company still faces challenges in efficiently managing product returns, defective items, and unsold inventory. Inefficient reverse logistics processes can lengthen distribution lead times, increase operational costs, and reduce customer satisfaction. While EDI is widely recognized for improving coordination and data visibility, its specific impact on reverse logistics efficiency and lead time performance within the Bangladeshi footwear industry remains underexplored.

Research Questions:

1. How effectively is EDI integrated into Bata's merchandising and distribution functions?
 2. What is the relationship between EDI-based data visibility and reverse logistics efficiency?
 3. How does reverse logistics efficiency influence overall distribution lead time?
- What operational or data bottlenecks limit the full benefits of EDI in the distribution process?

Research Objectives:

1. To examine the current extent of EDI integration within Bata's supply chain.
2. To evaluate the impact of EDI on reverse logistics and returns management efficiency.
3. To analyze how reverse logistics efficiency affects distribution lead time.
4. To provide recommendations for improving digital coordination and reducing lead time delays.

2. Background Information / Preliminary Literature Review

Digital transformation of the footwear industry is now being realized whereby systems like EDI, ERP, and automated warehouse systems are being incorporated to enhance coordination. Research indicates that EDI minimizes the number of errors in entering information manually and enhances the speed of transactions (Gunasekaran et al., 2017). But in the developing world, like Bangladesh, the systems are prone to

the barriers to implementation because of the infrastructure disconnects, improperly consistent data standardization, and unwillingness to convert to digital.

The process of dealing with returns, refurbishment, and re-use of the product is especially significant in the footwear sector where the variety of the products, the problems with their sizes, and seasonal changes of the demand cause high rates of returns. Well-integrated EDI could lead to visibility in the return cycles so that it becomes possible to authorize the process in a shorter period of time and to track the process in real time and make improved decision making.

In spite of all these possible advantages, the direct impact of EDI on reverse logistics and lead-time performance in emerging economies of the countries has been poorly studied with a literature gap, which is the focus of the current research.

Key Literature Themes:

- EDI integration and supply chain visibility (Hazen et al., 2014)
 - Reverse logistics performance measurement (Sarkis, 2012)
 - Lead time optimization in retail distribution (Rahman & Islam, 2021)
- Digitalization challenges in emerging markets (Gunasekaran et al., 2017)

3. Preliminary Methodology

Research Design:

A case study approach focusing on Bata Shoe Company (Bangladesh) Ltd will be employed, combining both quantitative and qualitative methods.

Data Collection Methods:

- **Quantitative:**

- EDI transaction logs (PO, ASN, INVOICE, RMA_REQ) were analyzed to assess transaction volume, error rates, and latency.
- Returns management data, transport time, inspection days, and processing cycle duration.
- Internal KPI reports on lead time and delivery reliability.

- **Qualitative:**

- Semi-structured interviews with merchandising and distribution managers.
- Process observation at the central warehouse and retail stores.

Data Analysis

- Descriptive analysis for EDI usage and reverse logistics indicators.
- Correlation and regression analysis to identify the relationships between EDI integration, reverse logistics efficiency, and lead time.
- Thematic analysis of qualitative data to interpret operational and managerial perspectives.

Ethical Considerations

- All data will be anonymized and used solely for academic purposes.
- Approval will be obtained from Bata management before using any internal information.
- Confidential findings will be presented in aggregated form.

4. Significance of the Issue

I. Academic significance:

The study fits a definite gap in the literature as it empirically examines the impact of Electronic Data Interchange (EDI) and the associated digital integration on reverse-logistics performance and distribution lead time in the footwear industry of an emerging economy. Although literature has explored reverse logistics and green supply-chain obstacles within the leather and footwear sector in Bangladesh, only a few have coupled analysis of specific operations of the return flow with an evaluation of information-system driving forces like EDI; such a move would aid new data on the interplay between digital integration and reversal-flow operations where infrastructure and resources are limited.

II. Managerial significance

In the case of Bata, this research can be translated into operational advantages. Earlier studies indicate that electronic systems of structured electronic transactions such as EDI, have a positive impact on the efficiency of delivery, lessening of the number of manual errors, and reducing order-to-fulfillment time, which is directly applicable to the return authorization, inspection throughput and the cadence of restocking. The empirical results and process maps of this project will allow the merchandising and distribution managers of Bata to select the most effective interventions (e.g., standardizing RMA processes, focusing on automating the processes of handling high volume returns, or redesigning the flow of inspection) to help in reducing the processing time and minimizing the cost of reverse-logistics.

III. Relevance at the national and policy levels.

On a national level, it is possible to enhance the performance of reverse logistics and digital supply chain in the footwear industry in Bangladesh, which would promote cleaner production, waste management, and competitiveness of the industry in export markets. Recent industry 4.0 and circular-economy directions literature explains that even small investments in digitalization and management of returns can lead to greater material recovery and lower environmental externalities, which are exactly what Bangladesh needs to achieve its goals of industrial sustainability and can boost the export competencies of the sector.

4. Timeline of Report Work

Phase	Activities	Duration
Week 1-2	Literature review and finalization of proposal	1 Week
Week 1-2	Data access approval and instrument design	2 Week
Week 2-3	Data collection (quantitative + qualitative)	2 week
Week 3-5	Data analysis and interpretation	2 week
Week 5-7	Report drafting, review, and submission	3 weeks

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