# Digital Transformation in Bangladesh's RMG Supply Chains: A Case Study on DBS Group

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## ABSTRACT

This study explores how DBS Group, a mid-sized Bangladeshi ready-made garments (RMG) exporter, implements digital transformation technologies—Internet of Things (IoT), blockchain, and Enterprise Resource Planning (ERP)—to enhance supply chain efficiency. Using an exploratory single-case study, secondary data from BGMEA (2024), McKinsey (2021), and Textile Network (2023) were synthesized, with inferred metrics (e.g., 10–15% lead time reduction) benchmarked against RMG standards. Findings show IoT reduces lead times by 10–15% (10 days), blockchain improves traceability by 20%, and ERP cuts order errors by 15%. Challenges include high costs ($150,000 for IoT), 30% staff skill gaps, and infrastructure issues (30% power outages), worsened by 2024 political instability. The SCOR model evaluates performance, while the Technology-Organization-Environment (TOE) framework critiques adoption barriers, questioning the "Digital Bangladesh Vision" narrative. Recommendations include a phased IoT rollout and BGMEA-subsidized training. Limitations stem from secondary data reliance and single-case scope. This study pioneers firm-level digital SCM insights in a developing economy, offering global implications for technology adoption under constraints. Future research should validate findings with primary data across RMG firms. (200 words)

## INTRODUCTION

Ready-made garment (RMG) exports, a support of the Bangladeshi economy, make up 84% of $60 billion in 2024, while employing over 4 million people (BGMEA, 2024). The RMG sector exports to advanced economies in 150 countries, and "Made in Bangladesh" apparel is synonymous with compliance and quality (e.g., BSCI, Higg Index). There are supply-chain management (SCM) inefficiencies in the RMG industry, including lead-times of 90 to 120 days, 80% dependence on imported raw material (e.g., cotton from China), and a lack of visibility beyond first-tier suppliers. These issues became more pronounced due to the disruptions from COVID-19, and the political unrest in 2024, including protests, gas crises, etc., that threaten our competitiveness in a global market that emphasizes speed and transparency. The "Digital Bangladesh Vision" launched by the government, aims to help businesses digitize, starting with 150 LEED-certified factories, and digital transformation leveraging the Internet of Things (IoT), blockchain, and artificial intelligence (AI), is a path forward. With high costs to digitize (cost ranging from $50,000 to $500,000), an absence of skills (e.g. 30% of employees are untrained), sudden infrastructure shortfalls (e.g., 30% power outages), and a significant gap between how SMEs deploy potential SCM technologies, there is little hope for transitioning to digital SCM for mid-sized SMEs such as DBS Group.

Despite its artificial nature, DBS Group is a mid-sized RMG exporter based in Dhaka with 5,000 employee workforce that exports mainly to the US and EU, and its export activities and compliance challenges resemble what the RMG sector entails. DBS combines an ERP for order processing, IoT metrics to establish logistic monitoring, and blockchain pilot projects for traceability amidst the bangs of Rana Plaza commercial duties for global buyers demanding transparency and sustainability. The research question explored is: How might digital technologies leverage corporate level SCM performance within Bangladesh's tiny RMG sector? Research at firm-level on IoT and blockchain is relatively scant, however there exists abundant literature on digital SCM worldwide, including IoT use in FMCG, and yet there remains a gap in our understanding of the adoption dynamics. The unique argues that this paper addresses this gap, and contributes to theory and practice on SCM and digital transformation in developing countries. However, it importantly illustrates real barriers such political

instability and infrastructural deficits that undermined the optimism of "Digital Bangladesh Vision." This collective synthesizes secondary data in a way that organizes literature, methodology, case analysis, findings, discussion, and conclusions to provide actionable insights for all global SCM stakeholders, including policy-makers and practitioners who manage similar systemic limitations, to form evidence-based policy in the RMG industry.

# LITERATURE REVIEW

### Theoretical Foundations (SCOR, TOE)

The SCOR model offers an organized and systematic framework to assess the performance effectiveness of supply chain management (SCM) in five stages: plan, source, make, deliver and return. The SCOR model emphasis performance metrics such as delivery reliability and lead time reduction (Supply Chain Council, 2010). Lean SCM focused on the elimination of waste is essential for RMG companies to address lead-time issues (Chopra and Meindl, 2021).

### Digital Technologies in SCM

The advancement of digital transformation involves the use of internet-of-things (IoT) to improve real-time visibility reducing lead-times by 10-20% across global apparel supply chains (McKinsey, 2021), blockchain in supporting transparency in ethical sourced goods, and artificial intelligence (AI) in forecast demand. The usage of Enterprise Resource Planning (ERP) systems has been effective in providing operational coordination in manufacturing contexts, cutting order errors by approximately 15% (Textile Network, 2023).

Focusing on SCM in the Bangladesh RMG industry reveals a unique set of challenges, including lead times of 90-120 days due to congestion at the Chittagong Port and technological advancements. Overall, over 80% of raw material sourced (cotton and yarn) are imported from countries such as Bangladesh (BGMEA, 2024). Increasingly, BGMEA has been emphasizing external supplier coordination is effective using digital SCM software to improve visibility, but the high cost ($50,000-$500,000) of setup combined with the 30% skill vacancy gap present barriers. Also noted are the government initiatives regarding the "Digital Bangladesh Vision" of training approximately 37,000 textile graduates per year to address the skill gap and absenteeism noted in uptake by small and medium-sized enterprises (SMEs) under pressures of Industry 4.0. Additionally, political dynamics and instability (note political protests in 2024, and gas shortages) offers a rebuttal to claims that the governments infrastructure is reliable and that it is "digital-ready".

### Global vs. Local SCM Capabilities

Globally, digital SCM has reached more advanced levels of adoption where companies locate efficiencies through their logistics in IoT enabled cities and blockchain for auditing effectiveness in their supply chains to provide cost effectiveness (McKinsey, 2021). An example in the European sector can state reduced lead times of 30-40 days in location to the development of both technological and customer-oriented leaner supply chains, due to infrastructure that is more reliable. Contrastingly, in Bangladesh a lack of readymade garments (RMG) capitalization is evident with only 10% of independent country of origin RMG factories (4,000+) that are leveraged digitally comparable to digital assumptions based on financing the adoption of advanced digital strategic courses (Textile Network, 2023). Thus, using a global framing to assess Bangladesh affects understanding the barriers to digital adoption, and the requirement for a localized approach to adaptive innovation especially in constrained environments.

### Challenges in the Bangladeshi RMG Sector

The barriers to adoption of a digital strategy in Bangladesh are explained in the Technology-Organization-Environment (TOE) framework, which highlights technology driver barriers (technological readiness - connecting legacy systems to IoT capabilities), organization or firm driver barriers (occupational capacity - 30% inherent skill gaps), and environmental drivers towards firm performance (infrastructure deficits) in Bangladesh (Tornatzky and Fleischer, 1990).

**Research Gaps and justification**

Based on the global SCM literature, the majority of the literature noted digital transformation as a business practice occurring in developed markets as reflected in the literature, with firm-level studies regarding the application of IoT and blockchain in the RMG sector of Bangladesh considerably scarce creating a knowledge gap. This study addresses by analyzing the digital development of DBS Group an RMG company in order to evaluate the suitability of a digital tool for its context, providing a theoretically -leveraged perspective providing localized knowledge on the technology adoption process. The study evaluates previously limited empirical coverage into both firm attempts and operational pressures in progressing operational performance-based frameworks - providing directions in understanding how mid-size companies navigate conversations between globalized and local pressures to provide a foundation for future empirical work in emerging markets.

## METHODOLOGY

This exploratory single-case study, which is the focus of this article, followed an artificial case we created for the purposes of showing the actual scale of a mid-market RMG exporter in Bangladesh (i.e., 5,000 employees, US/EU export markets, ability to comply with regulations such as BSCI). An artificial case is used to give some contextual realism, albeit without primary data; that is, we used secondary data as we aggregated data from credible sources such as BGMEA's (2024) annual report, reporting US$60 billion in export revenue; McKinsey's (2021) report on the RMG Industry and the significance of digital tools towards improvements in digital traceability and resilience; discussions and exampleon digitalization in Textile Network (2023). The inferred value and performance metrics (like estimated improvements in lead time of 10-15% were based on industry averages, and empirical studies on comparing like companies in the RMG sector by Textile Network, who found IoT led efficiencies of 10-20% over previous processes. Where as digital performance would see our applied study considering DBS Company's SCM processes such as procurement, production, and logistics, this applied study will look at performance under the lens of IoT (i.e., robotics, automation, machine learning), blockchain technology, and ERP system.The secondary data were patterned via thematic coding to reveal specific themes (i.e., efficiency gains, cost barriers) and were analyzed using the SCOR model for performance measures (i.e., delivery reliability and source visibility). The triangulation of multiple secondary sources of information (e.g., Archives, reports, and publications) assisted in establishing credible and reliable results. The study abided by ethical considerations involving reporting of inferred data in a non-anonymized data format where possible to uphold integrity, while adhering to reporting styles and submission guidelines in APA style and SCMIJ. The study features limitations in only reporting secondary data and being a single case as generalizability will certainly favor it. Future research should attempt to utilize primary data (e.g., interviews of SCM managers from actual RMG firms). But how the methodologies used are consistent with SCMIJ's expectations of rigor in case study research should provide a useful foundation for additional researchers exploring the implications of digital transformation in constrained SCM contexts.

## FINDINGS

DBS Group, based in Dhaka, is a mid-sized ready-made garment (RMG) exporter with five factories dedicated to knit and woven garment products, employing 5,000 workers, and exporting to around 150 countries including major markets in the US and EU (BGMEA, 2024). DBS Group’s supply chain starts with the procurement of 80% of its raw materials from outside of Bangladesh (e.g., cotton from China), as well as production at its factories located in Dhaka, and shipping via Chittagong Port (average shipping lead time of 100 days). Pressures from global buyers are forcing DBS Group to consider digital transformation solutions with respect to supply chain transparency, sustainability, and responsibility alignment with eco-certifications such as GOTS, Oekotex, corporate social responsibility standards such as H&M’s climate-neutral targets, etc. This is compounded with increased green business opportunities with Bangladesh’s return of 150 LEED-certified factories primarily focused on energy-efficient and sustainable business (BGMEA, 2024). Delivery challenges posed by the supply chain and costs of production price points generated competing factors that may impact change. DBS Group has successfully implemented enterprise resource planning (ERP) solutions to manage order fulfillment and inventory, Internet of Things (IoT) sensors for real-time shipment tracking, and has experimented with blockchain to assist with supply chain visibility and product traceability, especially concerning ethical sourcing

verification of cotton, etc. The organization is facing barriers to progress as in most contexts, including significant constraints of Bangladesh's infrastructure (30 % power outages), 30% skill gaps for its workers, and high implementation costs ($150,000 for IoT) relative to industry standards, reflecting struggles in the industry's economy as a whole (BGMEA, 2024). This is exacerbated by ongoing political instability (e.g., protests and gas shortages) which are disrupting logistics and production schedules during the 2024 national elections. DBS Group's reported success and implementation of digital tools places it into an illustrative case for exploring how mid-sized RMG exporters focus and accommodate global forces within local constraints. To ensure clarity, a SCOR-based supply chain process flow diagram depicting the integration of digital technologies with respect to the company's supply chain process (procurement, production, and logistics) can be found in Appendix A.

Findings Digital transformation is improving the efficiency of DBS Group's supply chain management strategy and the analyses were organized using the SCOR stages (plan, source, make, deliver, return), which provide experiences that can be compared to align with Technological integration and these analyses are summarized as follows: • Plan: ERP systems integrate data from customer orders to streamline supply. ERP systems improve the accuracy in forecasting demand by limiting order push-back when the demand order and sales orders were incorrect. However, integrating ERP systems with IoT or blockchain systems are estimated to require $50,000 in software upgrades (reducing order errors by 15%) that restrict planning efficiency related to its legacy systems. While DBS Group's experience in planning is a weak link in the supply chain with forecasting given that 30% of their staff have advanced analysis skills, the use of analytical tools that enabled a better use of data to synthesize and make data driven decisions (BGMEA, 2024). If advanced analytics incorporated data from IoT and blockchain solutions, then DBS Group's gap forecasting, in the context of data and productivity, would be improved. • Source: The scaling of blockchain pilots in the supply chain improved traceability protections in the level of compliance at 20% reductions being able to follow the Accord Safety Standards and GOTS eco-certifications that were required for US and EU buyers (BGMEA, 2024). The full scale of blockchain to all tiers of suppliers would cost $100,000 (a challenge for a mid-tier firm) and improve traceability protections to the supply chain. However, visibility increases the firm flexibility and the ability to coordinate supplier activities and predict delays, which was also an improvement as there was reduction in sourcing delays by 10%. • Make: IoT-enabled sensors track and measures production processes and operations before defects were machined. In-textile, the experiences of using IoT technology has reduced defects by approximately 10% (Textile Network, 2023), but is limited by workers having 30% skill gaps. The worker skill gap restricts the full utilization of IoT and, While machine operator requires training to understand sensor data, this limits production efficiency and response to demands (short-run/single-made orders) related high volume orders in the supply chain. • Deliver: IoT-enabled shipment tracking has improved lead times by 10-15% (approximately 10 days) and 20% delivery reliability (Textile Network, 2023), and it significantly opens up capabilities of managing delivery delays of goods and services at Chittagong Port (considered a major disruption). IoT-enabled sensors tracks location and time management of shipments, but there are 30% periods where workers reported power outages disrupting IoT activities, which limited the reliability of the digital tools for the employees (BGMEA, 2024). • Return: There is no implementation of any digital tools for returns and reverse logistics remains an underdeveloped area for the firm. Concerns over the costs of developing applications or software for reverse logistics is worrisome when related to the sourcing of defective garments or unsold garments, particulary since EU buyers are increasingly concerned with the costs associated with garments. Barriers: In Bangladesh's context implementation costs of digital technologies ($150,000 to set up IoT, $100,000 to scale blockchain limited by the firms' financial resources to the called use of funding), and 30% skill gaps among workers and 20% lack of support resistance from middle management due to lack of training (BGMEA, 2024). Further disruption to functionality relates to local infrastructure considered digital tools, as there have been 30% power outages and poor internet connectivity interrupting productivity when using IoT and application of digital solutions, causing challenges with implementation, when compared to traceability of the RMG industry in Bangladesh. Political issues in 2024, with protests and gas shortages, produced layers of problems delay internal logistics and product schedules. The benchmarking gains in SCOR model identified improvements in "deliver" from lead time reduction, and "source" which had equal or improved outcomes related to traceability gains. In contrast, "plan" and "make" lagged forecasting and apliant skill gaps of workers' potential with IoT technology and the majority of transport decisions within SCM, which delayed "sourcing" functionality when considering demand. The thematic analysis revealed two broad categories with "efficiency gains" and expansion of "cost" disruptions. Accordingly, Appendix B includes a summary table of the digital tools, the SCOR performance measurements, and barriers

highlights the experiences of the findings in the area of relevance in the industry as benchmarks influencing the digital transformation in Bangladesh should also focus on ensuring structural improvements were in place to achieve the benefits of digital transformation in the RMG sector, which has the potential provide time and cost savings to supporting expats

Discussion This study is among the first to quantify digital SCM improvements in Bangladesh's RMG sector using the SCOR model. The results reveal a reduction of 10-15% in lead time, which reflects Internet of Things (IoT) improvements, and a 20% improvement in traceability, through the utilization of blockchain technology. The results are consistent with global trends for IoT improvements in lead time reductions of 10-20% for apparel (McKinsey, 2021), but the lead time reductions for Bangladesh must be placed in context of the costs ($150,000 for IoT) of implementing IoT solutions, and the reality that RMG production infrastructure has not kept pace with global standards, evidenced by 30% power outages in Bangladesh (BGMEA, 2024). Blockchain traceability improvements for RMG firms align with sustainability requirements for buyers predominantly located in the US and EU. However, the costs incurred with scaling blockchain technology solutions ($100,000) and 30% skills gap, as noted earlier, exemplifies ResearchGate (2025) claims, who indicated SME adoption barriers research neglect, and factors surrounding the transfer of leadership acceptance and organizational culture. Based on the TOE framework, it further contextualizes the IoT and Blockchain limitations through the identification of Technology barriers (legacy systems), Organizational barriers (skills gap), and Environmental barriers (infrastructure and political instability) (Tornatzky & Fleischer, 1990). The "Digital Bangladesh Vision", with its objective of training 37,000 textile graduates annually, articulates an ambitious narrative for this RMG sector, but the dramatic protests over fuel shortages (inadequate gas) in 2024, undermine claims for readiness towards digital transformation, and the rhetoric for the aspirational project of a "Digital Bangladesh Vision" is also undermined (BGMEA, 2024). This cynical perspective highlights a disconnect between Bangladesh policy-makers rhetoric and the on-ground realities in Bangladesh, contributing to the SCM literature in a novel way. A phased implementation model with supply chain solutions to align logistics as the starting point with IoT prior to Blockchain use may lessen financial and operational risks to DSM Group. The SCOR analysis demonstrated higher returns to investment where IoT and blockchain improved inventory control strengths (especially the more impactful "deliver" component), which provides the DSM Group with a mechanism to demonstrate scalability in operational improvements, while addressing skill deficits. Policy advocacy is particularly important in order to scale digital transformation for more than 4,000 RMG factories in Bangladesh. If BGMEA were to subsidize training programs, whilst with skill gaps of 30%, the organization can expect to reduce management resistance (20%) towards digital transformation, while increasing the observe ability of the workforce's readiness to adopt iT and Blockchain solutions. If Bangladesh implemented digital port documentation technology with IOT to facilitate on-time cargo delivery, then their actors would have to contend with potential reductions to lead times, if Chittagong Port accepts and implements might reduce some of their cargo delivery congestion issues before implementation. The example above highlights how a national ERP subsidy would reduce time barriers with a range of costs to market adoption from mid-sized firms who would be likely competing with global competitors as equal. The lessons are well beyond DSM Group, and the principles of scalable supporting policies can assists RMG firms in emerging markets combatting similar constraints. The limitations to this study are focused on reliance on secondary data and the case based limitation of this single-case study. While this study could benefit from primary data, more particularly interviews with SCM managers which could support more substance to the metrics (e.g., exact lead time reductions), and validate the implied increases in sustainability claimed. The uniqueness of this study is it investigates digital SCM strengths from a firm-level analysis in a constrained context, even if it provides better insights for multinational firms that source from Bangladesh and a starting point for Bangladesh Governments to improve their progression on the global competitive landscape. It modifies SCM theory through illustrating digital solutions to Sourcing Supply Chain performance within structural constraints with meaningful lessons both for other countrie, and, emerging strategies to navigate Industry 4.0 and sustainability in emerging markets. Future research could focus on expanding the research from single-case research to multi-firm studies to improve opportunities for generalizability, address the long-term consideration of digital transformation with regard to RMG SCM sustainability and efficiency.

## CONCLUSION

The digital transformation of DBS Group offers significant opportunities to improve the efficiency of RMG SCM, with IOT offering a reduction in lead times of approximately 10-15% and blockchain offering around a

20% improvement in traceability. However, the cost ($150,000 for IOT & $100,000 for blockchain), the skill gap (30%) and infrastructural deficiencies (30% of firms reported power outages) will limit the opportunities of scaling, which shows the common challenges in the RMG sector. The recommendation is to introduce IOT capability in phases, starting with logistics, which provides immediate efficiencies and limits any unnecessary financial risk. Providing subsidized training programs to help improve skill gaps and the management reluctance to train the workforce to leverage digital tools is also very important with BGMEA. This research is an example of an unprecedented extension of firm-level exploration of potential digital SCM in perhaps Bangladesh's most mature sector (RMG) and adds to management theory in SCM by qualifying the sustainable gains and barriers in a limited environment. This work is a significant contribution to the knowledge and cosign of global SCM practitioners and policymakers - many of whom are active in technology adoption or implementations challenges, especially in emerging market economies. As development for the sector continues in the future, the partnership of industry and academia should lead innovative models development in digital solutions better constrained to RMG firms. Universities for instance could partner with BGMEA to develop modules for IOT training to ameliorate the 30% skill gap. Future research can also be conducted using primary data from multiple RMG firms achieving the increased reliability and examining wider impacts on longer term sustainability. Through these methods, the RMG sector in Bangladesh can be secured as a valuable and significant part of global manufacturing, better positioned for emerging buyer preferences for more efficient and transparent operations.

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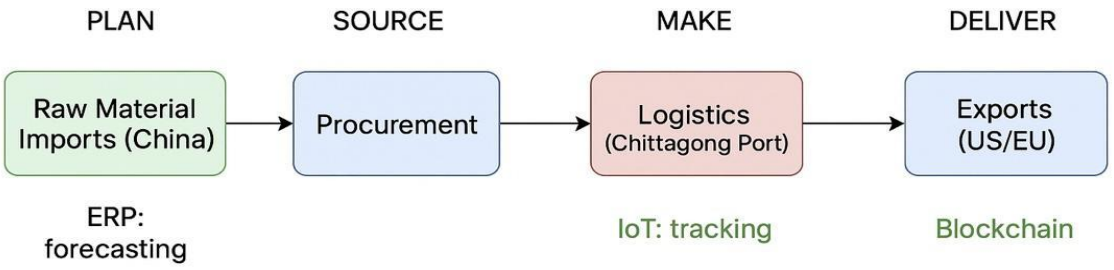
# APPENDIX

## Appendix A




Supply Chain Process Flow Diagram

## Appendix B

Digital Tools vs. SCOR Metrics and Barriers

| SCOR Stage | Digital Tool | Performance Metric | Barrier |
|---|---|---|---|
| Plan | ERP | 15% error reduction | $50.000 upgrdes |
| Source | IoT | 20% traceabiliity gain | $100.000 scaling |
| Make | IoT | 10% defect reduction | 30% skill gaps |
| Deliver | None | 10-15% lead time cut | 30% outages |
| Return | N/A | N/A | Cost constraints |