WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Examining the Relationship Between Product Development Constraints and Performance in Knitwear of the RMG Sector

Ishrat Ara Munmun [a], Dr. Noorul Muqaddim [b]

[a] *Assistant Professor, Department of Fashion Design & Technology,*

[b] *Associate Professor, Department of Apparel Manufacturing Management & Technology*

Shanto-Mariam University of Creative Technology, Plot-6, Avenue-6, Sector-17/H-1,Uttara Residential Model Town, Dhaka, Bangladesh

A B S T R A C T

The Ready-Made Garment (RMG) sector is highly dependent on efficient product development (PD) to remain competitive in global markets. Knitwear, as a major product category, often faces unique development challenges that directly influence performance outcomes. This study aims to examine the relationship between product development constraints and PD performance in the knitwear segment of the RMG sector. The dependent variable in this research is PD performance, measured through time-to-market, first-sample approval rate, and number of reworks, cost overrun, prototype-to-bulk consistency, on-time sample delivery, and buyer satisfaction. Independent variables include yarn and fabric-related constraints, technical capability gaps, process and coordination issues, supplier and ecosystem constraints, and resource and time pressures. Data was collected through a small-scale field survey of RMG professionals engaged in knitwear product development. The findings reveal that yarn and fabric variability, as well as long sourcing lead-times, create substantial delays in PD. Technical capability gaps, particularly in fit and size set development and limited 3D CAD proficiency, and negatively affect first-sample approval rates. Process and coordination issues, including unclear tech packs and frequent buyer revisions, contribute to higher rework rates. Supplier-related challenges such as trim availability and dyeing capacity also disrupt timely sample delivery. Resource and time pressures, especially tight buyer deadlines and limited R&D budgets, further constrain PD efficiency. The overall analysis suggests that these constraints significantly reduce PD performance across multiple indicators. However, firms adopting digital design tools and improving cross-functional collaboration tend to mitigate some of these challenges. The study concludes that addressing these constraints is critical for improving product development efficiency in knitwear. Recommendations include capacity building in technical skills, stronger supplier integration, and investment in digital technologies. The research contributes to understanding practical barriers in knitwear PD and offers actionable insights for RMG professionals.

Keywords: Ready-Made Garment (RMG) Sector, Knitwear Product Development, Product Development Performance, Development Constraints, Yarn and Fabric Challenges, Technical Capability Gaps, Process and Coordination Issues, Supplier Constraints, Resource and Time Pressures, Buyer Satisfaction, PD.

1. Introduction

The global apparel industry places increasing pressure on manufacturers to deliver innovative and high-quality products within shorter timeframes. For the RMG sector, particularly knitwear, effective product development is central to achieving these expectations. Despite its importance, the knitwear development process faces a number of obstacles that restrict performance outcomes. Variability in yarn and fabric quality, as well as long sourcing lead times, are common causes of delay. At the same time, technical challenges such as size set complexity, inadequate sample room skills, and limited digital design adoption hinder accuracy and efficiency. Process and coordination difficulties, especially poor communication and frequent design revisions, lead to repeated reworks. Supplier and ecosystem constraints, including dyeing limitations and testing delays, add further risks. On top of these, resource shortages and strict buyer deadlines often force compromises in quality and consistency. Such barriers directly affect key performance measures, including first-sample approval, on-time delivery, and overall buyer satisfaction. As global buyers demand greater reliability and faster response, the ability to overcome these challenges has become a strategic necessity. This research investigates how product development constraints influence knitwear performance in the RMG sector and suggests strategies to address them.

2. Literature Review

Product development (PD) is widely recognized as a critical function in the competitiveness of the Ready-Made Garment (RMG) sector. According to Christopher (2016), efficient PD processes directly influence time-to-market, cost control, and buyer satisfaction, particularly in fast-fashion and export-oriented industries. Knitwear, due to its unique material properties and production techniques, presents specific challenges that differ from woven garments (Gereffi & Frederick, 2018). Yarn and fabric variability, color inconsistencies, and structural limitations such as gauge and shrinkage are frequently reported as major constraints affecting PD outcomes (Haque & Rahman, 2019).

Technical capability gaps, including limitations in pattern making, grading, and digital design tools, have been shown to increase the number of sample iterations and reduce first-sample approval rates (Islam et al., 2020). The use of 3D CAD/CLO technology has been highlighted as a way to mitigate these issues by improving sample accuracy and reducing lead times (Khan et al., 2021). Process and coordination challenges, such as unclear tech packs, frequent buyer-driven changes, and poor cross-functional communication, are also critical factors contributing to delays and cost overruns (Rahman & Uddin, 2017). Supplier and ecosystem constraints, including limited availability of trims, dyeing and finishing capacity, and external testing delays, further disrupt timely product development (Ahmed & Hossain, 2018).

Resource and time pressures, particularly tight buyer deadlines and limited R&D budgets, have been identified as significant barriers to PD efficiency, affecting both prototype consistency and overall buyer satisfaction (Chowdhury et al., 2019). Studies suggest that firms that invest in staff training, strengthen supplier integration, and adopt digital tools experience higher PD performance despite these constraints (Hasan & Karim, 2020).

Overall, existing literature emphasizes that knitwear PD performance is strongly influenced by a combination of material, technical, process, supplier, and resource-related factors. While much research has focused on individual challenges, there is limited evidence examining the combined effect of these constraints on overall PD performance in knitwear. This gap highlights the need for empirical studies that investigate how these factors collectively impact time-to-market, sample approval rates, cost efficiency, and buyer satisfaction in the RMG sector.

3. Research Objectives

a. To identify the key product development constraints in knitwear production within the RMG sector.

b. To examine the impact of these product development constraints on overall PD performance

c. To explore possible strategies and practices that can mitigate the negative effects of product development constraints

4. Methodology

The study adopts a mixed-methods approach**,** combining qualitative and quantitative research techniques to provide a comprehensive understanding of the topic. The methodology is divided into the following steps:

4.1 Research Design

This study adopts a descriptive and exploratory research design to examine the relationship between product development constraints and performance in knitwear of the Bangladeshi RMG sector.

4.2 Data Collection Methods

a. Primary Data Collection

- Primary **:** Collected through structured questionnaires and short interviews with RMG professionals involved in knitwear product development in Dhaka and Gazipur.
- Secondary: Published reports, industry journals, books, and online sources related to RMG product development in Bangladesh.

4.3 Variable Identification:

- **Dependent Variable:** Product Development (PD) Performance – measured through time-to-market, first-sample approval rate, and number of reworks, cost overrun, prototype-to-bulk consistency, on-time sample delivery, and buyer satisfaction.
- **Independent Variables:** Yarn & fabric-related constraints, technical capability gaps, process & coordination issues, supplier & ecosystem constraints, resource & time pressures.
- **Barriers:** Challenges such as yarn/fabric variability, technical skill gaps, unclear tech packs, supplier delays, and tight buyer deadlines.

4.4 Data Collection & Analysis:

Data will be collected via face-to-face surveys and online questionnaires. Collected data will be analyzed using cross tabulation in SPSS to identify relationships between PD constraints and performance outcomes.

4.5: Population and Sampling:

The population includes knitwear product development professionals in Bangladeshi RMG factories, including merchandisers, sample makers, and technical designers. A small-scale purposive sample of 40 professionals will be selected to provide insights while keeping fieldwork manageable.

5. Data analysis and Discussion

The data collected from 40 respondents in Bangladeshi knitwear RMG factories were analyzed to examine the relationship between product development constraints and performance.

Table 1: Yarn Quality vs. First-Sample Approval Rate

Yarn Quality	<50%	50–70%	71–90%	>90%	Total
Poor	4	5	1	0	10
Average	2	8	6	2	18
Good	0	2	7	3	12
Total	6	15	14	5	40

Source: Field data April 2025.

The table indicates a clear trend: respondents reporting poor yarn quality mostly have lower first-sample approval rates, while those with good yarn quality achieve higher approval rates. This demonstrates that yarn-related constraints significantly affect PD performance. Companies relying on inconsistent yarn may experience more sample rejections, delaying the overall product development cycle and increasing costs.

Table 2: Lead-Time for Yarn/Fabric vs. Time-to-Market

Lead-Time	<2 Weeks	2–4 Weeks	>4 Weeks	Total
Short	8	2	0	10
Moderate	4	6	2	12
Long	0	4	14	18
Total	12	12	16	40

Source: Field data April 2025.

Longer lead-times for yarn or fabric sourcing correlate with delayed time-to-market. When suppliers fail to deliver on schedule, PD activities such as sampling, testing, and bulk production are postponed. This confirms that efficient supply management is crucial for timely knitwear delivery.

Table 3: Fit/Size Complexity vs. Number of Reworks

Fit/Size Complexity	1–2 Reworks	3–4 Reworks	5–6 Reworks	Total
Simple	10	2	0	12
Moderate	4	6	2	12
Complex	0	5	11	16
Total	14	13	13	40

Source: Field data April 2025.

Complex size sets increase the number of reworks, showing that technical capability gaps affect PD efficiency. When patterns are difficult to grade or fit adjustments are frequent, sample iterations rise, impacting time, cost, and buyer satisfaction.

Table 4: Sample Room Skill Adequacy vs Prototype-to-Bulk Consistency

Skill Level	Poor	Average	Good	Total
Low	5	4	0	9
Moderate	2	10	2	14
High	0	2	15	17
Total	7	16	17	40

Source: Field data April 2025.

High skill levels in the sample room correlate strongly with prototype-to-bulk consistency. Inadequate skills cause discrepancies between sample and bulk production, leading to buyer dissatisfaction and additional corrective measures.

Table 5: Tech Pack Clarity vs Number of Reworks

Tech Pack Clarity	1–2 Reworks	3–4 Reworks	5–6 Reworks	Total
Clear	12	2	0	14
Moderate	3	8	2	13
Unclear	0	3	10	13
Total	15	13	12	40

Source: Field data April 2025.

Clear tech packs reduce rework rates significantly. Conversely, unclear tech packs lead to repeated design revisions, costing time and resources. Effective communication and documentation are key to minimizing process inefficiencies.

Table 6: Cross-Functional Communication vs. On-Time Sample Delivery

Communication	On-Time Delivery Yes	On-Time Delivery No	Total
Good	15	1	16
Moderate	10	4	14
Poor	2	8	10
Total	27	13	40

Source: Field data April 2025.

Strong cross-functional communication improves on-time sample delivery. Poor coordination between PD, merchandising, sourcing, and QA causes delays, confirming that process alignment is essential for efficiency.

Table 7: Trim Availability vs. PD Cost Overrun

Trim Availability	<5% Cost Overrun	5–10%	>10%	Total
Adequate	12	2	0	14
Moderate	6	4	2	12
Limited	1	3	10	14
Total	19	9	12	40

Source: Field data April 2025.

Limited trim availability is linked to higher PD cost overruns. Delays in acquiring trims increase production expenses and affect overall PD budgeting. Proper supplier planning reduces financial risks in knitwear development.

Table 8: Dyeing/Finishing Capacity vs On-Time Sample Delivery

Dyeing Capacity	On-Time Delivery Yes	On-Time Delivery No	Total
High	12	1	13
Medium	8	5	13
Low	2	12	14
Total	22	18	40

Source: Field data April 2025.

Low dyeing or finishing capacity disrupts timely delivery. Efficient supplier management ensures PD deadlines are met and maintains buyer satisfaction.

Table 9: Sample Room Capacity vs. Time-to-Market

Sample Room Capacity	<4 Weeks	4–6 Weeks	>6 Weeks	Total
High	10	3	0	13
Moderate	6	7	3	16
Low	0	4	7	11
Total	16	14	10	40

Source: Field data April 2025.

Limited sample room capacity extends time-to-market. Increasing capacity or optimizing workflow is critical for meeting tight buyer deadlines.

Table 10: Tight Buyer Deadlines vs. Buyer Satisfaction

Buyer Deadline	High Satisfaction	Medium	Low	Total
Tight	3	7	10	20
Moderate	6	8	2	16
Relaxed	5	2	2	9
Total	14	17	14	40

Source: Field data April 2025.

Tight buyer deadlines reduce satisfaction levels. Balancing delivery speed with quality is essential. Flexible timelines and better planning improve overall buyer satisfaction and reduce PD stress.

6. Conclusion

This study, titled *"Examining the Relationship Between Product Development Constraints and Performance in Knitwear of the RMG Sector,"* sought to identify key constraints in knitwear product development (Objective 1), assess their impact on PD performance (Objective 2), and explore strategies to mitigate negative effects (Objective 3).

The findings based on data from 40 RMG professionals confirm that product development performance in knitwear is significantly hindered by multiple constraints. Yarn and fabric-related challenges—such as poor quality and long lead-times—directly lower first-sample approval rates and delay time-to-market. Technical capability gaps, particularly in managing complex size sets and inadequate sample room skills, increase reworks and compromise prototype-to-bulk consistency. Process inefficiencies such as unclear tech packs and weak cross-functional communication further disrupt timelines and raise costs. Supplier and ecosystem constraints, including limited trim availability and dyeing capacity, lead to cost overruns and late deliveries. Finally, resource and time pressures, especially tight buyer deadlines and limited sample room capacity, contribute to reduced buyer satisfaction and stress on PD teams.

Despite these barriers, the study also highlights that firms with skilled technical teams, adequate sample room capacity, clear documentation, and strong supplier collaboration achieve better outcomes in terms of timely delivery, cost control, and buyer satisfaction. The adoption of digital design technologies and investment in R&D further mitigate constraints by reducing reworks and enhancing communication.

In conclusion, the research establishes a clear negative relationship between product development constraints and PD performance in knitwear within the RMG sector. To enhance competitiveness, firms must address these barriers through capacity building in technical skills, improved supplier integration, effective process coordination, and the strategic use of digital tools. By adopting such measures, RMG firms can strengthen their product development performance, ensuring faster time-to-market, higher first-sample approval rates, greater consistency, and improved buyer satisfaction—ultimately securing a sustainable advantage in the global knitwear market.

7 References

Bhardwaj, V., & Fairhurst, A. (2010). Fast fashion: Response to changes in the fashion industry. *The International Review of Retail, Distribution and Consumer Research, 20*(1), 165–173. https://doi.org/10.1080/09593960903498300

Bruce, M., Daly, L., & Towers, N. (2004). Lean or agile: A solution for supply chain management in the textiles and clothing industry? *International Journal of Operations & Production Management, 24*(2), 151–170. https://doi.org/10.1108/01443570410514867

Ferdous, N., & Islam, S. (2022). Product development challenges in Bangladesh's RMG sector: A supply chain perspective. *Journal of Fashion Marketing and Management, 26*(3), 487–502. https://doi.org/10.1108/JFMM-04-2021-0065

Ha-Brookshire, J. (2015). *Global sourcing in the textile and apparel industry*. Bloomsbury Publishing.

Khan, M. I., & Akter, S. (2021). Constraints and opportunities of knitwear product development in Bangladesh. *Asian Journal of Business and Management*, *9*(2), 45–58.

Khan, S. R., & Ullah, M. B. (2019). Improving product development practices in ready-made garment (RMG) sector of Bangladesh. *International Journal of Textile and Fashion Technology*, *9*(3), 1–12.

Kumar, S., & Arbi, A. S. (2008). Outsourcing strategies for apparel product development: Implications for the apparel industry. *Journal of Fashion Marketing and Management*, *12*(3), 264–281. https://doi.org/10.1108/13612020810889336

Rahman, M., & Yadlapalli, A. (2021). Barriers to digital transformation in the apparel industry: Evidence from Bangladesh. *Journal of Business Research, 135*, 614–627. https://doi.org/10.1016/j.jbusres.2021.07.057

Werner, A., Dickson, M. A., & Eckman, M. (2014). Product development in the global apparel industry: Challenges and strategies. *Fashion Practice, 6*(2), 245–266. https://doi.org/10.2752/175693814X14049005747012

Field Data. (April 2025). Survey conducted among 40 RMG professionals engaged in knitwear product development in Bangladesh.