

Successful Information and Communication Technology (ICT) Implementation in Readymade Garments factories in Bangladesh: Case Studies of SQUARE Fashions PLC and Nothern Toshirifa Group Limited, Bangladesh

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Abstract

Bangladesh's transformation into an agricultural nation has resulted in significant foreign exchange earnings from the export of ready-made garments (RMG) since the 1970s. Any RMG firm's main business operations are strongly associated with information and communication technology (ICT). The ready-made garment (RMG) sector in Bangladesh has been facing various challenges to secure a competitive position in the global market, including the improvement of industrial operational excellence. Among the various issues, implementation of ICT is felt to be a common and effective way to enhance operational excellence. A PhD thesis was made on the topic "Application of Information and Communication Technology in the Readymade Garments Industry: A Study on the Bangladesh Market" by the author. To validate the hypotheses and results of the thesis, two RMG firms are chosen to compare their gross sales and net profit before and after the implementation of ICT in their industry. The main objective of the case study is to increase information and communication technology (ICT) usage, resulting in improved operational excellence and increased profit.

Keywords: Ready Made Garments, ICT, ICT Application, Operational Excellence, and Bangladesh

1. Introduction

Bangladesh's accomplishments in RMG have inspired several countries to strive hard for this position. Bangladesh's RMG business might reach \$46.99 billion in export revenues in 2023 by utilizing innovative management strategies, human capital development, and state-of-the-art technology (Statista, 2024). Many analysts think that Bangladesh's labor-intensive RMG industry may leverage technology to boost productivity. Financial resources, infrastructure, and financing are essential for driving the sector's growth and achieving operational efficiency. Businesses need to invest more in technology because they employ more than 4.5 million people and account for up to 80% of the country's export earnings (Alam S., 2020). Acknowledging the importance of cutting-edge technology for the fashion industry, competing nations have implemented specific government assistance programs for their textile and apparel sectors, such as the Technology Upgradation Fund Scheme (TUFS). Bangladesh has progressed significantly in its digital transformation during the last 10 years, primarily due to the government's Digital Bangladesh plan. To fully benefit from digitization and integrate technology into business processes, the RMG industry still requires government support. As a result, export revenue rises for the nation. Entrepreneurs must also stay abreast of technological advancements and incorporate them into their businesses.

A modern educational system ought to exist in Bangladesh as well. The educational system and industrial activity are not in harmony. Determine the differences in talent supply and demand, particularly for roles in the sector to come, by identifying pertinent challenges. Collaboration between suppliers, customers, and specialists to identify existing and future capabilities needs would make it easier for high-level concerns to adopt rules related to capabilities needs. Child labor was outlawed in 1994, along with occupational safety, environmental health, and social compliance (Faruque, 2020). Global shoppers are taking notice of Bangladesh, which has emerged as the world's second-largest clothing manufacturer, following China. The cost of producing clothing

has increased in Bangladesh due to factors such as growing wages, the cost of raw materials, and the additional funding required to meet regulatory requirements. Technology is a valuable tool for cutting costs and maintaining competitiveness. Given that China is a major player in the region and has little experience with contemporary technologies, Bangladesh needs to be ready for the challenges that lie ahead. To close the gap, training is required (Murshedy A. S., 2019).

High-quality and efficient output would be ensured by automation. The RMG industry would experience favorable effects. Bangladesh has plenty of potential to grow and is still making progress in the global economy, thus automation in the ready-made garment (RMG) sector would not have a detrimental effect on it (Hoque, 2019). By adopting software such as cutting systems, which decrease the amount of waste fabric, RMG manufacturers can boost their production and efficiency. It takes less time and work to prepare the order, and it uses less fabric overall. It reduces the quantity of fabric utilized as well as the time and effort needed to prepare the order. Reduced fabric costs allow a business to increase profits by around 1%. Thread Sol's technology (cutting software) is now being used by twenty-five garment firms in Bangladesh, including Pacific Jeans, Dekko Group, Unifil Group, Beximco, Fakir Fashions, Epic Group, Urmi Group, Ananta Group, Kenpark, and Regency of Hirdaramani. Envoy Textile and other RMG manufacturers use Lectra, a pioneer in cutting-edge technology solutions for clothing, industrial textiles, and composite materials (Ganguli M. , 2020).

2. Problem Statement

RMGs must overcome obstacles to deployment and adoption that stem from technical and socioeconomic issues, which can arise from both internal and external sources (Lloyd, 2011). ICT use by business partners, trust in the security environment, firm understanding and access to infrastructure, and business process adaption are the primary categories of hurdles to ICT usage (Chitura, Mupemhi, Dube, & Bolongkikit., 2008). Additional problems with ICT applications include low-level current hardware infrastructure, investors' need for an immediate return on investment despite e-commerce and ICT being long-term investments, aversion to change, a preference for traditional systems like face-to-face communication or traditional telephone systems, a lack of IT knowledge and technological experience among staff members, time constraints, and partners' lack of understanding, lack of security issues and ICT acceptance (R.Vrazalic & MacGregor, 2002).

The main factor influencing Bangladesh's economic growth and development was industrialization. The RMG sector was vital to the industrialization of the clothing and apparel industry. Bangladeshi RMGs need ninety to one hundred and twenty days to finish the full process, from receiving the order to exporting the finished goods. According to Rahman and Anwar (2006), comparable operations take approximately 19–45 days in Sri Lanka, 40–50 days in China, and 50–70 days in India. In the textile industry, readymade clothes are primarily fashion items with a short lifespan. Reducing lead time is therefore essential in this sector (Haider, 2007).

A prime example of operational excellence might be minimizing lead time. An additional reason for lagging behind the competition is employees' reluctance to adopt ICT applications and their behavioral intentions when utilizing them. Optimizing operational excellence is the outcome of utilizing ICT applications. Profit will also rise as a result of faster internet-based interactions between employees, clients, and producers and shorter turnaround times.

3. Literature Review

Information and communication technology (ICT) refers to systems that provide access to information. Like information technology (IT), but more focused on networking applications. A few examples of communication tools include cell phones, satellite networks, and the internet. The cost of producing clothing has increased in Bangladesh due to factors such as growing wages, the cost of raw materials, and the additional funding required to meet regulatory requirements. Technology is a valuable tool for cutting costs and maintaining competitiveness. Given that China is a major player in the region and has little experience with contemporary technologies, Bangladesh needs to be ready for the challenges that lie ahead. Closing the gap requires training. It takes training to close the gap (Murshedy A. , 2019). In addition to the internet, satellite networks, cell phones, and other forms of communication, information and communication technology (ICT) encompasses a broad range of technological tools and services that are used to generate, distinguish, store, and process data for communication. On social networking sites like Facebook, Twitter, What's Up, and Instagram, voice over IP (VoIP), video conferencing, and instant messaging are frequently used connectivity methods (P.Christensson, 2018). It includes ICT systems, applications, commodities, embedded software, and all software and software-based operations. ICT includes all software and software-related services and solutions, including software commodities, ICT services, ICT applications, and embedded software (C.E.Tjia, 2005). ICT is an "electronic means of recording, encoding, preserving, and disseminating information (Cheng-Min, 2006). Now, most garment companies are

using hardware that is productive for the industry. Hardware, such as computers, Tracker balls, Printers, Plotter, Flat cutting plotter, Digital cameras, Automatic Gerber spreading machines, Automatic Inspection machines, Printing Routers, Punch Card Reader etc (E.M.Molla, 2018). New technologies have been used in many RMG industries. Some include JUKI Stitching Machines with computerized thread trimming and sucking devices, JUKI Automatic Hemming Machines, Programmed Non-dust Cloth Slit Cutting Machines with Edge Sealing, and MHM – Synchro 3000 Rotary Garment Printing Routers (Karim, 2018). IT industries and IT hi-tech parks are now quite common in Bangladesh. ICT in RMG is also developing by using various software. Office Software: MS2010,2016,2019, MS-Word, WordPad and Notepad, Oracle, MS Access, MS Excel, Microsoft PowerPoint, Adobe Photoshop, Adobe Illustrator, Paint Shop Pro, AppleWorks, MS Works, MS Paint Corel Draw, MS NetMeeting, AOL Instant Messenger, IRC, ICQ, MS NetMeeting, AOL Instant Messenger, IRC, ICQ, MS NetMeeting, AOL Instant Messenger, IRC, ICQ (I.T.Mason, 2015). Automatic drafting, categorizing, nesting, fully automatic patterns production model, and fully automatic marker making are examples of computer-aided manufacturing (CAM), such as SOPHEEA is a CAM program (J.Karim, 2018). Every task carried out by several firms is managed by an ERP system. ERP networks process all import purchases. In recent times, buyers have pushed suppliers to enhance their EPR operations so that buyers can monitor the progress of their orders every day while seated in the country office (Prasanta, 2017). The industry in which ICT is employed influences a number of classification options. In the logistics industry, Giannopoulos (2004) divided information and communication technology (ICT) into three groups: (1) network service and management; (2) knowledge and user guidance; and (3) freight transport system operation and management. The third industrial revolution—sparked by the digitalization of microelectronics manufacturing—encourages flexible production because Flexible production is encouraged by the third industrial revolution, which was brought about by the digitization of the manufacturing of microelectronics and robotics. On flexible, automated production lines, programmable robots or machines are used to make a variety of goods. According to M.Hridoy and K. Shabur (2021), a major barrier to implementing this new revolution and business integration to support automation in Bangladesh's manufacturing and production industries is the lack of understanding among employees, particularly at the management level and among key decision-makers (M.Hridoy & K.Shabur, 2021). There is a lot of information on Bangladesh's RMG from many angles, including supply chain, fire safety, MFA quota, and others, but it is extremely uncommon to locate related literature about ICT applications in the country's RMG sector. Imported raw materials play a major role in Bangladesh's RMG industry. Most textiles—over 90% for woven fabrics and 60% for knit fabrics—are imported in order to make apparel intended for export (M. Rumi, S. Bala, & A. Shah, 2021).

Many nations have been motivated to strive for this position by Bangladesh's accomplishments in the RMG sector. In order to reach the \$500 million export earnings target set for this industry by 2021, Bangladesh's RMG sector has room to grow further through the application of creative management techniques, human capital development, and state-of-the-art technology (Alam M. S., 2020). Many researchers believe that the labor-intensive RMG sector in Bangladesh might increase productivity with the use of technology. Since the sector employs over 4.5 million people and generates up to 80% of the nation's export revenue, businesses should increase their investments in technology (Shahriar, 2020). Reducing the price of cloth can boost a company's profitability by around 1%. Today, 25 Bangladeshi clothing factories—Pacific Jeans, Dekko Group, Unifil Group, Beximco, Fakir Fashions, Epic Group, Urmi Group, Ananta Group, and Kenpark and Regency of Hirdaramani—use Thread Sol's technology (cutting software). Lectra is a pioneer in sophisticated technology solutions for composite materials, industrial textiles, and apparel, and is utilized by RMG manufacturers such as Envoy Textile (Ganguli M., 2020). Automation would guarantee efficient and high-quality output. Positive effects would be seen in the RMG industry. Bangladesh will not be negatively impacted by automation in the ready-made garment (RMG) sector because it is still making progress in the global economy and has a lot of room to grow (HoQue, 2019).

4. Research Gap

Research gap The researcher has determined two significant study gaps based on the results of the prior literature review.

1. No research has been done to look at ICT use and its effects in Bangladesh's RMG industry. Many RMG studies on production, worker protection and safety, supply chain, and free quota systems have been conducted in Bangladesh. There is hardly much research in this field. Moreover, not enough thorough research has been done on ICT in Bangladesh's RMG sector or how effective ICT applications might improve organizational excellence and boost productivity.

2. No significant model has been developed so far to empirically investigate applying information and communication technology in the garment industry to see the effect on operational excellence as well as net profit,

These gaps present a significant opportunity to critically assess the advancement of knowledge in this field. According to the current study, the topic's significance in theory, practice, and contribution to this field will fill these research gaps.

5. Critical Success Factors of RMGS in Bangladesh

Numerous articles have revealed that RMG has a high success rate in achieving huge GDPs. These reasons are explained in the section below. These could be regarded as the prerequisites for success in RMG sectors. The following list includes most of these well-liked topics (Sun, Chitto, & Sukon, 2016) (Zafar, 2011).

- **Huge labor force:** Bangladesh's massive labor force is its greatest competitive advantage in RMG. The textile and apparel sectors can quickly hire them, providing an opportunity for advancement.
- **Skilled labor:** Professionals from both local and foreign markets are now employed by RMG companies in Bangladesh. They organize and manage suitable worker training. By giving employees enough training, they ensure superior quality when producing goods.
- **Technological developments:** The market for technical apparel is expanding, and new IT products have been bought.
- **Special Economic Zones and Export Processing Zones:** The Bangladeshi government has created particular RMG Economic Zones and EPZs, mostly in the regions of Savar, Sonargoan, Chittagong, and Musnshiganj.
- **Supply Chain Management:** Effective supply chain management is a feature of the textile sector in Bangladesh. To guarantee eco-friendly products, the industry is employing a large number of specialists and experts: To guarantee that eco-friendly items are used, clothing firms have a dedicated section staffed by specialists. The production process for RMG goods is environmentally friendly.
- **LEED (Leadership in Energy and Environment Design):** Notable clothing firms such as Epyllion, Remi Holdings, and Ha-meem Group have LEED factories. For clothing companies, this provides an additional competitive edge. Bangladesh's RMG sector boasts the highest number of green buildings in the world with 120 in 2019 and more than 500 factories slated for green status (Humayunr, 2020).
- **Flexible regulations and incentives:** The Bangladeshi government has maintained lenient tax laws and other policies that are beneficial to the apparel sector. However, the government has additionally provided incentives for the export of RMG goods and products.
- **Fast return:** According to factory owners, RMG is the only industry in Bangladesh where an investor could get back their investment in three to five years. When compared to other businesses or industries, the return on investment ratio is exceptionally high. People are the focus of the RMG industry. As of right now, 4.4 million people work there (BGMEA, 2024).
- **Huge market opportunities:** Export data from recent years show that Bangladesh has a great opportunity to increase its RMG industry. Bangladesh's market share is 6.4%, compared to China's 36.4%, which is our primary competitor. RMG exports are increasing annually, and for the last three years, its market share increased by 5.1%, 5.9%, and 6.4% (BGMEA, 2024).
- **Geographical and demographic advantages:** Bangladesh's location puts it in a prime location, which is particularly advantageous for international trade. Access to international air routes, seaports, and other facilities is extremely convenient for our country. It has 25 land ports, Three international airports (Dhaka, Chittagong, and Sylhet), and 3 marine ports (Chittagong, Mongla, and Payra). In Bangladesh, two lac young people enter the labor force annually. Since 70% of Bangladesh's population is under 40, there is a large labor pool available. Most young people are primarily educated (BBS, 2022).

6. Challenges in RMGS

Critical Success Factors and Challenges can be stood up by interchangeably. Continuing that, Bangladesh's RMG has been the country's highest export earner since 2005, putting itself at the forefront of the global apparel industry. RMG companies are going to undertake many programs for the implementation of ICT. It is not easy for RMG companies because many challenges are rising daily.

- **Lack of infrastructure:** The majority of RMG businesses lack the facilities necessary to maintain and store ICT-related equipment and products. Conversely, the RMG sector lacks access to IT training facilities.
- **Security system:** In terms of ICT, the security system is underdeveloped. Loss of data and systems can occur at any time.
- **Lack of training:** The majority of employees and workers in the garment industry are untrained in using modern technology-based equipment, products, and systems. They occasionally might cause serious losses or mishaps at work.
- **Internet network:** Large RMG infrastructure located outside of Dhaka cannot be assisted by capital-based internet service, and broadband internet-based service in Bangladesh is still of low quality.
- **Natural disaster:** Natural disaster like cyclone and flood causes problems to the whole network system (network collapse, slow speed) as the network system is air based.
- **Training costs:** Apparel companies train their employees to use ICT applications, which is time-consuming and costly.
- **Time-consuming:** Reconfiguring an ICT device may take more time. Since it is hard to identify the exact cause of the problem, they look at the entire system. Delays in manufacturing and other operations are therefore possible.
- **Terms and conditions:** The nations of importers and overseas buyers may apply a number of terms and restrictions.
- **Hacking:** As more RMG companies utilize ICT, hacking is posing a serious threat. Numerous businesses have already implemented robust firewalls and security software to safeguard their systems from cyberattacks. Rapid information transmission or leakage might occur due to outside hackers and thefts.
- **Quality assurance:** In order to preserve the output's quality, the hardware and software quality must also be guaranteed. If not, it could result in issues with quality.
- **Copyright:** Today's RMG businesses typically develop their own software and ICT application systems internally. They place a high value on these products' copyright. However, Bangladesh's copyright laws and protections for ICT-based products are still in development.
- **Inflation Rate:** The global inflation rate was the maximum in 2022 with a rate of more than 9%. Starting from necessary commodities to utilities, everything experienced a price hike during the period (Md Shahidullah Azim, 2023).
- **Utility price increase:** Utility bills, i.e. gas, water and electricity cover a big portion of the costs in RMG factories. Plunged by the dire effects of Covid-19, factories were already struggling to retain competitiveness in the international market. Amidst that, the price of gas, electricity and fuel has increased. Due to the geopolitical circumstances, production cost has already significantly increased in the last few years. And this new price hike will challenge the sustainability of the industry (Md Shahidullah Azim, 2023).
- **Backward linkage:** Our backward linkage is very weak at this moment; this poses a serious problem after Bangladesh's LDC graduation. After LDC graduation, we will have to follow the double transformation rules of origin. We will also have to produce our own fabric before making the clothes. Due to this, joint venture or FDI is a must in this sector, so that along with financial and technical know-how, the necessary skills can be learned by our industry (Md Shahidullah Azim, 2023).
- **Automation:** Another crucial factor that is changing the apparel landscape is automation, going beyond the production floor, and streamlining packaging and logistics processes. While it offers promising benefits, including improved efficiency, cost reduction, and quality enhancement, the automation of routine and manual tasks raises concerns about potential job losses, especially for low-skilled workers. In its study on future skills, the a2i identified RMG to be the most affected sector by Industry 4.0-led automation (Rashid, December 2023).
- **Infrastructure:** Mega projects like the Padma Bridge, Power Plants, Metro Rail, and bringing the country under a railway network are making solid progress. Electricity generation capacity has reached

more than 25,227 megawatts (BBS, 2022). 100 Economic Zones (EZ) are being developed to encourage structured and balanced investments. However, the timely completion of mega projects is indeed crucial. We have set a target to export \$100 billion within 2030; to achieve this, a revolutionary change in infrastructure is a must (Md Shahidullah Azim, 2023).

Most of the buyers are primarily from the United States, the United Kingdom, Australia, Switzerland, Canada, Italy, France, and the entire European continent. The Bangladesh apparel industry is growing rapidly because of a lower cost of production as the labor costs remain low and the capacity to produce quality goods. Bangladesh is a developing country, and the RMG sector is also increasing. The number of garment factories specifies the trends of this industry.

Table 1. Number of garments factories in Bangladesh

Year	Number of garment factories
2010	5060
2011	5150
2012	5400
2013	5880
2014	4220
2015	4300
2016	4330
2017	4480
2018	4560
2019	4620
2024	3971 (BGMEA, 2024))

[Source: <https://www.statista.com>]

Over seventy-one percent of Bangladesh's exports are going to just ten countries. The market should be diversified, according to experts. Ten nations account for the majority of Bangladesh's exports, making the nation highly dependent on these markets without creating new ones.

Bangladesh has concluded the fiscal year 2022–2023 with \$46.99 billion in total exports (Statista, 2024). Leading among the nations was the United States of America, with a 25.07% export share in 2023 (Hossain, 2024).

The amount of goods exported by Bangladesh to the US in 2023 was \$7.29 billion, a 25.07 percent increase. US buyers accounted for 25.07% of Bangladesh's total export value, or \$7.29 billion, of the country's biggest export destination, particularly for apparel (Export Promotion Bureau, 2024). Bangladesh's primary export markets for home textiles include the US, Europe, Japan, Canada, and Australia. Export growth constantly hits a new high point, even while the quantity of clothing produced is decreasing (Table 01). Bangladesh's RMG business accounts for almost 80% of its total export revenue. The fiscal year 2022–2023 saw clothing exports of almost 47 billion USD. This particular data also leads you that conclusions that why Bangladesh is lucrative for RMG businesses-

1. Buyers in the USA and the EU are not interested in doing business with China because of the country's internal disputes with other industrialized nations and the challenges posed by COVID 19. (Hatem, 2022).
2. Bangladesh's labor costs remain lower than those of China, Vietnam, and India. The cost of production will be taken into account when placing an order. Getting so many orders from overseas can be attributed in large part to this. For those nations, manufacturing costs are a consideration (Islam M., 2021).
3. Bangladesh is the country with the greatest concentration of green manufacturers in the world; 500 businesses are currently converting to green status, and the country's top export ranking is further supported by its LEED certification. Meanwhile, the number of garment exporters is falling (Humayunr, 2020).
4. The success of Bangladesh's RMG industry over the past ten years has been attributed, in part, to export destination diversification. Still, 25.07% of Bangladesh's RMG exports are going to the US market and 62% of its exports are going to European nations. Bangladesh is becoming less dependent on the American market as a result, and exports to non-traditional markets are rising (Islam M., 2021).

7. Research Methodology

This study aims to assess the outcomes in terms of the ultimate gains from ICT use in RMG sectors with a particular operational excellence performance. It offers both material and psychological advantages. In this study,

the decision was made to evaluate both traits independently and at the lower or first level. This is due to the fact that it focuses on the requirement to gauge the operational quality of ICT-using businesses, which is a crucial variable in this context. This study is entirely qualitative and focuses on case studies using a well-established model that the author developed for her thesis and subsequent publications.

This study's qualitative analysis focuses on non-numerical and not quantifiable elements including words, sounds, impulses, and thoughts. It has been stated that knowledge that cannot be comprehended using quantitative approaches belongs in the qualitative category. According to Dudovskiy (2018), this trait may indicate that an event occurs infrequently enough to produce trustworthy evidence. However, the model utilized here was created by the author for her doctoral dissertation. This research examines the validity of that model, supported by two distinct case studies and how their net income changed as a result of using the internet and other communication technologies. Through a thorough data analysis of 347 samples, the conceptual model presented in the thesis article was put to the test. The study used regression and partial least squares structural equation modeling (PLS-SEM) to estimate the hierarchical model and look into the connections between the constructs. The research model's general quality, measurement, and organization were all supported by the study's outcomes, which also validated seven major hypotheses.

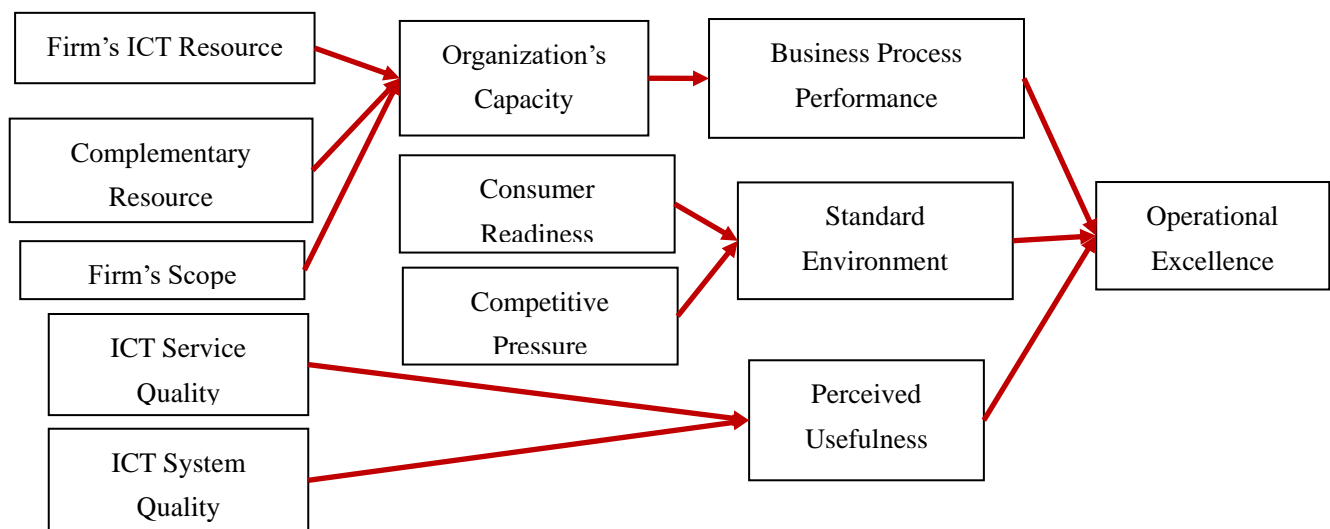


Figure 1. Conceptual Structural Equation Modelling (SEM)

Table 2. Operational definitions of the constructs

Constructs	Operational definitions of the constructs
Operational Excellence(OE)	Operational excellence involves making continuous improvements to achieve a competitive advantage.
Business Process Performance (BPP)	Business process efficiency ensures that strategic and organizational priorities are met while assisting decision-making for continuous process optimization.
Standard Environment (SE)	Environmental standards are regulatory or civil law guidelines governing environmental treatment and maintenance.
Perceived Usefulness(PU)	It is the degree to which a user assumes that using ICT can result in tangible results, such as assisting in completing a job, saving time, decreasing commitment, and reducing reliance on others.
Organization's capacity (OC)	Organizational capacity is the level of an organization's capability to deliver services and products.
ICT Service Quality (ISERV)	It refers to the degree to which ICT resources are reliable, relevant, detailed, current, understandable, and well-presented.
ICT System Quality (ISYST)	It is the extent to which ICT is accessible, user-friendly, consistent, fast, reliable, secure, and easy to use and navigate.
Firm's Scope (FS)	The firm's scope describes the essential processes and resources to complete a product.
Firm's IT Resources (FSE)	IT hardware, software, trainee, specialists.
Complimentary Resource (CMR)	Two or more resources that can substitute for one another.
Consumer Readiness(CR)	Customer readiness is when a customer is ready to try a new product for the first time.
Competitive Pressure (CP)	Competitive risk is measured by how it affects a company's incentives to develop new products and processes.

CASE STUDIES:

CASE-1: SQUARE TEXTILES PLC

Bangladesh is one of the leading knitting and spinning yarn producers. Through its cotton yarn processing plants, SQUARE joined the garment industry in 1997. This new SQUARE Company quickly soared to the top of the local textile industry by combining advanced technologies with a professional workforce in SQUARE's unique, inspiring setting. It now has one of the most advanced vertically engineered setups globally. SQUARE has over 12 years of yarn spinning experience. It now has one of the most advanced vertically integrated setups globally, producing 90,000 kg of yarn daily.

Square's valued customers recognize them for providing high-quality goods and dedicated support. The company's goal is the fulcrum of our strategy to maximize the output of high-quality, life-saving goods and services while minimizing societal costs and providing maximum value to customers, shareholders, and other stakeholders. Its conception of business arose from our vision, which sees it to the well-being of investors, stakeholders, employees, and members of the public by creating new wealth in the form of goods and services that satisfy the wants of all of them while not disrupting the mother earth's socio-economical balance.

To make every effort to maximize profit by conducting transparent market activities within the legal and social system, with no animosity against anybody and fairness for everyone, regardless of gender inequality, caste, faith, or country. The first objective of SQUARE is to create more jobs with minimum investments. That means proper utilization of resources. SQUARE uses ERP software for its resource management. SQUARE's second goal is to remain successful in domestic and global markets. SQUARE employs a variety of lean production techniques.

The garments industry has been increasingly reliant on information and communication technologies. Employee attendance (clocking in), shipment dispatching, ERP software installation Computer-Aided Design (CAD)/Computer-Aided Manufacture (CAM) method for pattern making or plotting computerized cutting machine, mailing solution, preparing of MIS papers, voice chatting, semiautomatic and fully automated sewing machines, and real-time contact with buyers through internet solutions like Skype—all these tasks are accomplished with the use of ICT.

- Computer Aided Designing (CAD)
- Computer Aided Design and Drafting (CADD)
- Computer Aided Manufacturing System (CAMS)
- Real time production progress reporting
- Automatic machines stop detection
- Event based or continuous data recording
- Recording of operator and shift productivity,
- PLC connection for online data collection
- Scanner and RFID support
- Machine monitoring and status supervision
- Shift/Operator summary report.
- Human Resource Information System (HRIS)
- Supply chain management (SCM)
- Enterprise Resource Planning (ERP)
- Electronic Data Interchange (EDI)
- Computer-Aided Textile Supervision (CATS)

Table 2. Annual Report FY 2016-17 to 2022-23 of SQUARE TEXTILES PLC

Year	Gross Sales (Million BDT)	Net Profit (Million BDT)
2016-17	7,758.88	413.74
2017-18	9,411.87	459.47
2018-19	8,896.24	346.46
2019-20	9,505.33	51.36
2020-21	13,293.57	671.86
2021-22	17,432.25	1,958.56
2022-23	14,967.96	1,071.42

[Source: Annual Report FY 2016-17 to 2022-23 of SQUARE TEXTILES PLC (SQUARE TEXTILES PLC, 2024)]

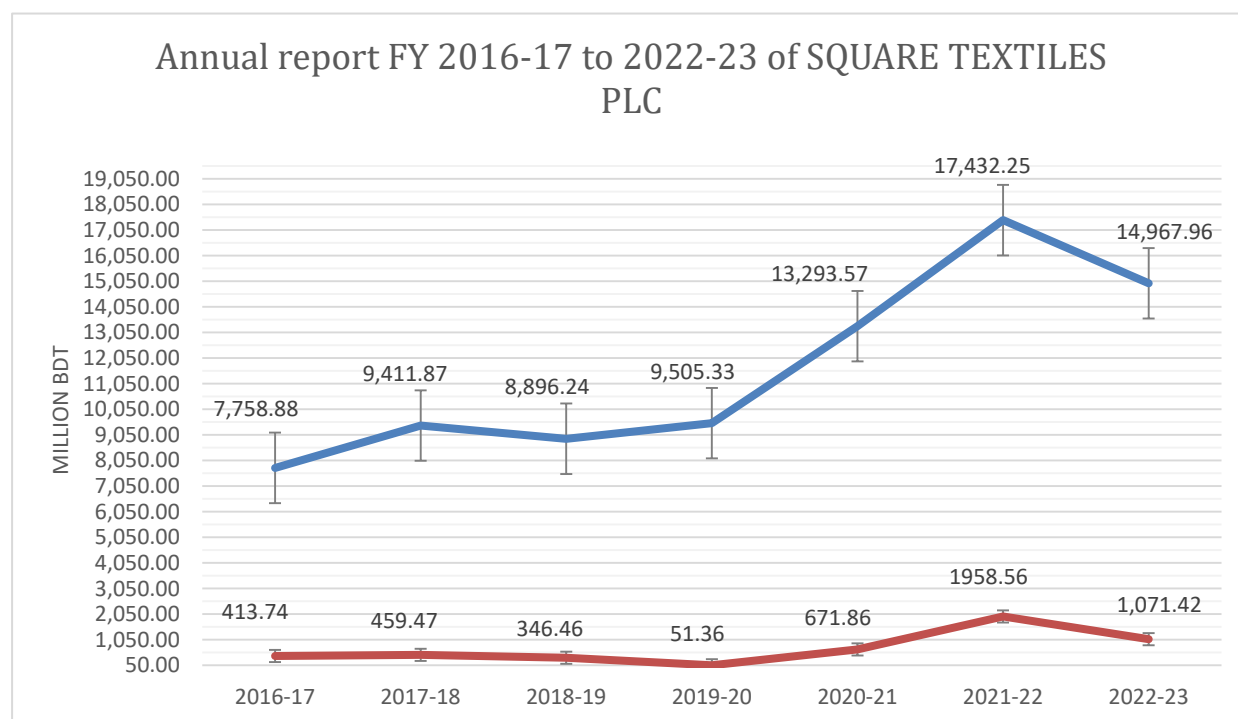


Figure 2. Annual Report FY 2016-17 to 2022-23 of SQUARE TEXTILES PLC

Owing to the inclusion of ICT related solutions, the merger of Square Yarns Ltd., the incline of the USD/Taka conversion rate, and the effect of product mix, turnover, gross profit, and net profit (after tax) rose by 39.72 percent, 41.67 percent, and 19.09 percent, respectively, in the year 2018-19 in contrast to the previous year, resulting in a rise in Earning Per Share (EPS) by the same level. Due to increased operational and financing costs in the year under review, the gross profit margin rose by 1.33 percent while the net profit margin fell by 14.88 percent. The cost of goods sold rose during the reporting year due to increased raw material, fuel/power, and plant overheads outside the management's control. Owing to increases in the cost of raw materials used, packaging cost, power cost, and extra cost in the reporting year compared to the previous year, the Cost of Goods Sold per unit has decreased by 5.56 percent in the current year. However, owing to a rise in foreign currency exchange rate (USD) as a fluctuation benefit, the Company received an additional 90.67 percent non-operating income (stated in Note No. 25 of standalone accounts) from 2022-2023 to the previous year.

CASE-2: TOSRIFA INDUSTRIES LIMITED

Being a member of an industry that employs nearly four million people in Bangladesh, Northern Toserifa Group (NTG) understands the duty and honor of the “Made in Bangladesh” name. NTG believes in the pledge through its social and environmental corporate practices. For the last three decades, major ready-made apparel retailers have entrusted NTG to be the premier supplier of high-quality merchandise. Northern Toserifa Group has not only been spinning endless wads of yarns since its inception, but it has also been sewing all those stories that lie underneath.

The workers affiliated with this organization are included in these accounts, as well as their determination to complete every mission, reminiscences of their accomplishments and even the tiniest bit of fulfillment they achieved while serving with NTG. It also includes the stories of all those stakeholders, vendors, clients, and, most significantly, consumers who have trusted NTG's unwavering efforts in their commitments over the past 52 years.

The Group has evolved from a small knitwear manufacturing unit to a center of 100 percent export-oriented businesses, ensuring consistency in quality and distribution at every step. ICT is essential for delivering high-quality solutions to our clients. Since NTG is a people-oriented organization, we hire professionals to ensure that all mechanical equipment runs smoothly. To remain one step ahead of the future, we keep up with the new technological advancements in our industry.

- Internet access
- Email
- Bulk SMS
- VOIP
- Organizational website
- Intranet
- Accounting packages
- Inventory packages
- Human resource packages
- Enterprise resource planning (ERP) systems
- Customer relationship management applications (CRM)
- Supply chain Management (SMC) System
- Software as a Service (SaaS)
- Cloud computing
- Content management system (CMS)
- Mobile CRM
- Mobile payment system
- System visualization.

Table 3. Annual Audited Report 2018 to 2023 of TOSRIFA Industries Limited

Year	Gross Sales (BDT)	Net Profit (BDT)
2018	1,251,310,829	241,250,142
2019	1,958,490,185	299,753,644
2020	1,956,716,491	141,508,807
2021	3,007,154,631	347,121,331
2022	4,905,730,424	477,155,496
2023	5,309,118,899	478,266,825

[Source: Annual Audited Report 2018 to 2023 of TOSRIFA Industries Limited (TOSRIFA Industries Limited, 2024)]

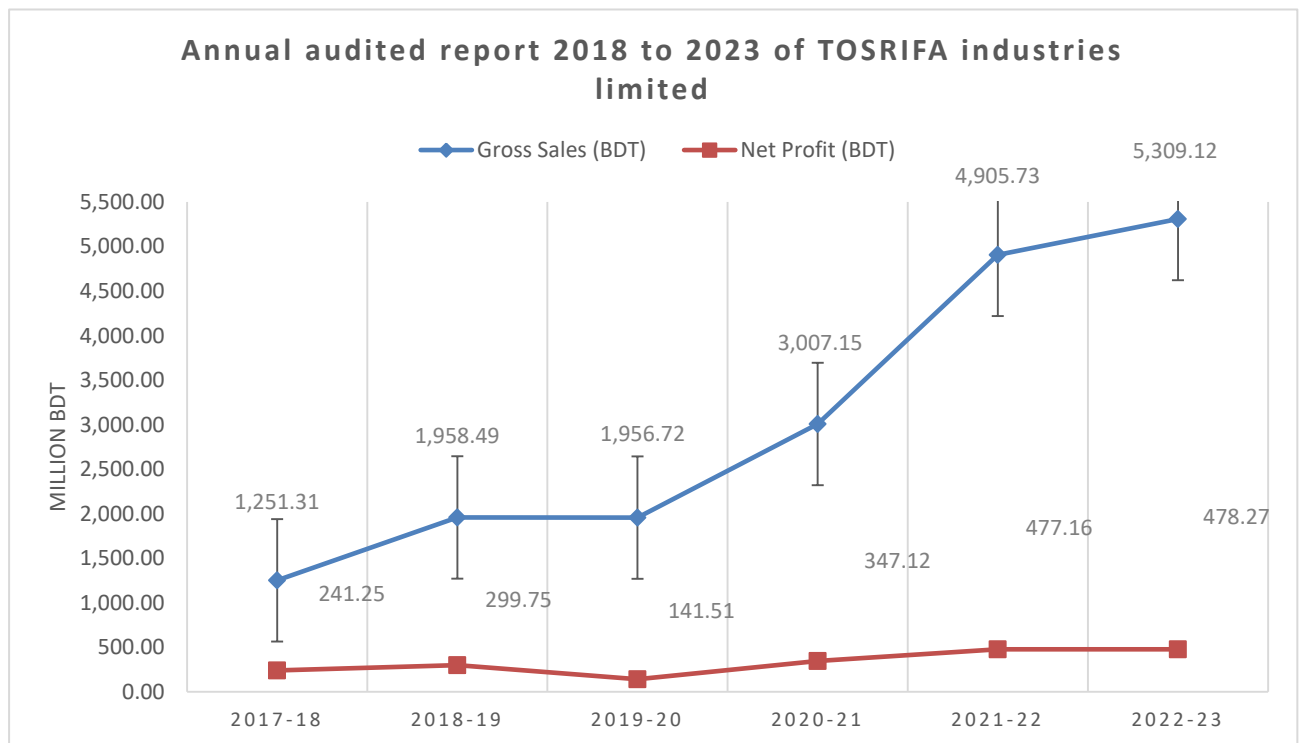


Figure 3. Annual audited report 2018 to 2023 of TOSRIFA industries limited

The company's overall financial performance is steady through direct export increase compared to the previous year. But, operational and financial costs significantly increase the net profit margin. It is noted that the widespread use of information communication technology makes the net profit margin high. It is noted that overall worker efficiency has been found moderate (on average around 45% against planned efficiency of 60%) due to frequent changes in style (small quantity order), timely feeding of raw materials, worker turnover etc. The sales volume has significantly increased compared to the previous year due to increased volume (in deemed export), which increased gross profit by 24.06%. However, the operating profit has risen slightly, but the net profit margin has been found to increase mainly due to a substantial increase in ICT.

PROBLEM ENCOUNTERED WHEN USING ICT (FOR BOTH COMPANIES)

The valuable respondents from those companies wrote some problems they faced in implementing Information Communication Technology are given below-

- Authorities' apathy to implement ICT in RMG
- Changing business environment
- The communication gap between the owners and the workers
- Lack of adaptability of the employees
- Backdated ICT applications used in RMG sectors
- The complexity of Software implementation and usage
- Employees' unwillingness to adopt new technology
- All end-user not accustomed to implemented ICT
- Financial problem
- High cost for installation
- Inadequate knowledge of analytic know-how
- Inadequate technical knowledge
- Lack of authentic software vendors
- Lack of awareness about implementing ICT applications in business

- Lack of ICT based management training
- Lack of research and development about ICT infrastructure
- Lack of trust in ICT
- Not sure about the benefits of the ICT
- Risk to data losses
- Security concerns regarding privacy

SUGGESTIONS TO OVERCOME THE PROBLEM TO IMPLEMENT ICT APPLICATIONS (FOR BOTH COMPANIES)

The valuable respondents gave some suggestions to overcome the problems they faced in implementing Information Communication Technology are given below-

- Proper training should be provided
- Customized ERP software should be built
- Government should initiate incentives to implement ICT
- User friendly ICT applications must be confirmed
- Software must be up to date
- Cost benefit analysis for ICT infrastructure implementation through the overall organization
- Proper and adequate market information about ICT
- Should develop the strong ICT management team
- Real time monitoring software
- Green ICT applications should be implemented
- Motivate owners to implement ICT in RMG
- Security of market data should be ensured
- IT infrastructure needs to develop to date
- Decision support systems should be initiated.

SWOT Analysis of ICT Implementation in the RMG Industry of Bangladesh Based on Square and Northern Toshirifa's Experiences

ICT implementation in Bangladesh's RMG Sector is a promising aspect of the modern apparel industry. There is fierce competition in exporting qualitative garments products around the world. It is necessary to adopt ICT related products and implement them properly. There are opportunities and threats in terms of this aspect. A SWOT analysis of ICT implementation in Bangladesh's RMG sector is based on the above results, problems, and suggestions from two independent RMG firms.

STRENGTHS:

- RMG companies have a significant capital for ICT implementation.
- Garments companies possess skilled and substantial human capital, which is available in Bangladesh.
- There are many growing IT firms around all cities of Bangladesh.
- The government of Bangladesh has taken many easy policies like tax rebates, industrial loans, and quick LC opening in terms of RMG and RMG related development.
- Garments Companies are investing more in ICT related research for new system development.
- BGMA has been undertaking much guidance, like formulating digital RMG wallets using digitized networks or improving lean production. Green RMG means environmentally sustainable production practices for ICT adaptation (BGMEA, 2021).
- Foreign experts are available for ICT implementation, mainly from Japan and China.
- Products (hardware, software) are available.
- Bangladesh has IT parks in each district, like Gazipur, Chittagong, and Jashore, which is a great strength.
- Trained employees are available in the RMG industry of Bangladesh.

WEAKNESS:

- Internet accessibility has not reached all employees and staff of the RMG industry.
- Infrastructural development in ICT implementation is not available in all areas of Bangladesh.
- Training centers and trainers are not sufficient.
- Guidelines and policies in ICT are not enough and are improper.
- Adoption of ICT and new technology cannot be quickly adopted by the labor staff in the RMG industry.
- Most of the staff are uneducated and lack general knowledge of ICT.
- Maintenance of ICT related products and new technologies is possible by many RMG companies.
- Lack of experience of employees in terms of ICT implementation.
- Employees have less interest in adopting and implementing new systems and technologies.
- Copyrights issues are on the rise, and weakening is rising ICT implementation.

OPPORTUNITIES:

- New projects have been undertaken in developing IT and software parks.
- The ICT Ministry of Bangladesh has established new ICT training centers.
- The ICT Ministry of Bangladesh generates flexible policies.
- Financing companies are coming to invest in terms of ICT implementation.
- The RMG industry can attract experts from foreign countries to adopt new technologies.
- Cheap labor and IT oriented staff can be hired in Bangladesh.
- Buyers have their requirements in producing products, and they are becoming a source for guidance in ICT implementation in the RMG industry of Bangladesh.

THREATS:

- Security in terms of IT-related products and systems is becoming vulnerable.
- Hacking rates are increasing.
- Many employees, staff, and laborers are losing their jobs due to adopting new ICT product implementation.
- System loss has been increasing.
- The maintenance cost of IT is increasing.
- Terms and conditions on importing IT products are becoming a significant threat.
- Confidentiality and integrity of data should be maintained.

Bangladesh is a developing country that has seen better improvement in its development recently. The apparel business is making impressive progress through the RMG sector. The economy is expanding and creating job possibilities, which will allow the apparel industry to diversify and expand the number of consumers and export destinations.

8. Conclusion and Future Direction

The organization's administration, operations, production, and sales all benefited greatly from the integration of ICT concepts by Square and Northern Tashrifa. In order for a successful implementation to propel the industry forward, the RMG sector's organizations ought to obey them. The expertise and tactics from these case studies that persuade the firms to employ ICT technologies will be closely observed. In certain ways, ICT has benefited them, but it has also made certain issues worse. Both these issues and opportunities for the sector can be brought about by effective administration. For upcoming research that could benefit Bangladesh's RMG business, these specialists can examine them. It may be useful for the relevant authorities to take the required action in light of these issues and recommendations. Therefore, the profitability and operational excellence of companies like Square and Northern Tashrifa were enhanced by the successful use of ICT applications. There are several disadvantages to be mindful of. First off, this research was restricted to the application of ICT in the RMG sector in a particular nation.

The study's findings have been revealed to have significantly contributed to the development of ICT applications for the garment industry in Bangladesh, as they have highlighted some previously unnoticed issues related to

better customer and user-oriented ICT applications for improving competitiveness and operational excellence. The most significant contribution of this research recognizes the necessity for ICT growth in Bangladesh's RMG business. For the first time, stakeholders can see what would make the sector more competitive and the support and help they need. As a result, various strategies may be devised and implemented to help Bangladesh's RMG industry compete globally. The three primary players - the government, suppliers, and buyers – may achieve the potential for development and solve Bangladesh's RMG growth formula by integrating the findings of this research. Most significantly, these parties must continue to collaborate to execute the numerous steps necessary to improve the image and competitiveness of Bangladesh as well as the global RMG business. Possible implications are given below:

- Scrutinizing the current technological environment and ICT infrastructure very carefully
- Determining the adaptability of the ICT applications according to the industry requirements
- Improving the IT skills of the employees by offering the training facilities
- Improving the security system of the ICT setup
- Making the ICT infrastructure more elastic and easier to use
- Introducing a common way of communication inside and outside of the organizations through modern ICT applications
- Improving the reliability and timeliness of the infrastructure
- Viewing the ICT infrastructure as essential to maintain the quality

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Authors' contributions

Dr. Nymatul Jannat Nipa is solely responsible for all the works associated with this article including study design, revising, data collection, drafting the manuscript and revising.

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Data sharing statement

No additional data are available.

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