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Nymatul Jannat Nipa
Associate Professor
Department of Management Information Systems
Faculty of Business Studies
University of Dhaka
Email: nipa.mis@du.ac.bd

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Model of achieving operational excellence by using information and communication technology in readymade garments: A Study on Bangladesh Market

Abstract

Bangladesh's transformation from an agricultural to industrial nation has resulted in significant foreign exchange earnings from the export of ready-made garments . Any RMG firm's main business operations are strongly associated with information and communication technology. But owners and managers are not quite ready to adapt all their activities from manual to automatic rather they found it costly. That's why this paper makes an effort to examine, from a Bangladeshi viewpoint, the potential and importance of ICT applications in RMG, how they will impact operational excellence, and how operational excellence will drive RMG towards greater sustainability. A comprehensive data analysis of 347 samples was used to test the conceptual model followed by a literature and a set of hypotheses. Partial least squares structural equation modeling (PLS-SEM) has been utilized in the study to estimate the hierarchical model and investigate the relationships between the constructs. ICT is seen in the RMG industry as a vital sustainability tool rather than a way to obtain a competitive edge, according to data retrieved from study. In accordance to the results, implementing ICT in the RMG industry will be the best way for achieving operational excellence in almost all of RMG companies in Bangladesh.

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1. Introduction

Bangladesh's Ready Made Garments industry is globally recognized for its robust production techniques, which are bolstered by the accessibility of inexpensive labor. A vast array of knitwear and woven textile goods, such as shirts, slacks, T-shirts, jeans, jackets, sweaters, and other items, are produced by around 4,000 garment factories. In Bangladesh, this business is more well-known than others due to its export revenue, foreign exchange profits, job creation, efforts to reduce poverty, and support for women (Nipa, 2023). The RMG sector has grown to be one of Bangladesh's economic lifelines, contributing significantly to the nation's export revenue. Bangladesh's economy has grown at the most rapid pace in the world due to the power of RMGs, and the nation has promoted itself internationally by using the phrase "Made in Bangladesh." (Islam and Adnan, 2016). Its journey began in the later part of the 1970s. The

acceptance and deployment of RMGs are beset by technical and socioeconomic issues that might arise from either internal or external influences (Lloyd, 2011). ICT, comprising the internet, intranets, extranets, enterprise resource planning (ERP), and other related technologies ranging from simple networking tools that increase an organization's facilities and operations, has had a significant impact on organizational functioning (Selvaraju et al, 2008). Internet technologies have an impact on businesses, consumers, dealers, manufacturers, and potential new market entrants (Porter, 2001). A company can obtain a competitive advantage by implementing and utilizing internet technology (Odedra and Starub, 2003). Lower unit costs and the globalization of the labor, knowledge, and product markets are the outcomes of the internet's availability. The internet can give businesses in wealthy countries quick access to international markets, efficient operations, and fair competition (Licker, 2005). Bangladesh has always been a late adopter of emerging technologies in the manufacturing field due to its status as a developing country.

Despite of that, Bangladesh is the third-largest exporter of clothing in the world. Today's business environment is very dynamic, and failing to embrace technological advances would make it challenging to stay competitive and profitable in the coming years. Modern industry is dominated by technology, which offers a variety of automation and creativity patterns. It applies to all sectors, not just the garment industry (Israt, 2020). Low liquor dyeing machine with automation, Ozone washing machines with automation, SAP (Systems Applications and Products), IOT (internet of things) in supply chain management, 3-D printing innovations, Technology Upgrade Fund Scheme, Online FIT approval, Mailing solution, MIS reports, Voice chatting with prospective buyers or consumers, Payroll system, ERP for inventory tracking in the production management, Real time communication with buyers through online solutions like Skype, Viber , Computerized cutting machine, Semi-automatic and fully automatic sewing machines., RFID tag related machines and software, Central database, Forecasting software, Software for production planning and quality control, Simulation software, CCTV cameras. Mobile phone application for tracking necessary RMG activities like order management and production planning are the common ICT applications used in different RMG firms frequently (BGMEA, 2017).

The main categories of barriers to ICT usage contain the firm understanding and access to infrastructure, trust in the security environment, ICT use by business partners, and business process adaptation (Chitura et al, 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 experience among staff members, time constraints, partners' ignorance of the business opportunities presented by ICT, a lack of security concerns, and ICT (Vrazalic and and MacGregor, 2002). One of the main examples of operational excellence is minimizing lead time. Employee reluctance to adopt ICT applications and their behavioral intents

when utilizing them are additional reasons why they lag behind the competition (Haider, 2007). Enhancing operational excellence will be the outcome of using ICT applications. Profit will also rise as a result of time savings and improved productivity in online exchanges between producers, consumers, and employees (Rahman and Anwar, 2006).

The purpose of this study is to investigate the ways in which the RMG sector in Bangladesh benefits from modern ICT applications in terms of operational excellence and to look at the relationship between ICT applications and businesses' operational excellence. The textile industries in Bangladesh use advanced technologies such as CAD, CAM, robotic cutting machines, and laser technology to clean denim. The vast investment behind these technical advances will need to be increased to meet global buyer demand for smart wear and tech-driven goods. Using these technological resources will boost the sustainability of the RMG sector. There is some new dimension in terms of technological and ICT related adoption and gradation in the RMG industry of Bangladesh. Fabrics with value-adding properties such as solar protection, waterproofing, odor reduction, and bend and stretch are the product of innovative technology. Retailers and merchandisers depend on technology for trend forecasting, outfit design, quick fashion, e-commerce, and product exposure in the global market. Economic modeling choices, textile digital printing, embroidery, traditional weaving, embellishment attachment, heat transfer, and laser decoration are examples of changes in Bangladesh's fashion industry (Israt, 2020). Some well-known Garments Companies (Ha-meem Group, Epyllion Group, Fakir Group) have always become pioneer in adapting new technologies (Israt, 2020). Sensors for body functions and environmental control (temperature, humidity), LEED (Leadership in Energy and Environment Design) status, wireless networking instruments along with networks, personal localization (GPS) devices, geographic information systems (GIS) are all being adopted by renowned garment companies of Bangladesh. Cooling and heating elements, an emergency stop, smart textiles, cellular system monitoring and detection, physical security information management, and virtual reality have also been demonstrated in this sector.

2. Literature Review

Telecommunications-based systems that provide access to information are referred to as ICT. Like information technology (IT) but with a stronger emphasis on networking applications. Examples include the internet, satellite networks, cell phones, and other kinds of communication. There is no denying the advantages of technology in the apparel sector. Bangladesh captures the interest of international consumers by becoming the world's second-largest garment producer, after China. The cost of producing clothing has increased in Bangladesh as a result of increases in wages, raw material prices, and new investments required for compliance. Using technology can be a great method to maintain competitiveness and cut costs. Bangladesh needs to be ready to face the challenges because China is the dominant country in this region and it lacks experience with current technologies. To bridge the gap, training is necessary (Murshedy, 2019). ICT also refers to a wide range of technological instruments and services used to create, differentiate, preserve, and process

data for communication including the internet, satellite networks, cell phones, and other kinds of communication. Instant messaging, voice over IP (VoIP), and video conferencing are common connectivity tools on social networking sites like Facebook, Twitter, What's Up and Instagram (Christensson, 2018). It encompasses all software and software-based operations, including ICT systems, applications, commodities, and embedded software. ICT consists of all software and software-related processes and solutions, such as ICT services, ICT applications, software commodities, and embedded software (Tjia, 2005).

ICT is an "electronic means of recording, encoding, preserving, and disseminating information (Cheng, 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 (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: MS 2010, 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 (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 (Karim, 2018).

An ERP system manages all the tasks completed by different organizations. ERP networks make all imported purchases, and many buyers have lately forced suppliers to upgrade operations on their EPR so that buyers can check the status of their orders daily while sitting in the country office (Prasanta, 2017). Regarding categorizing ICT, several choices depend on the sector in which the technology is used. One of Giannopoulos's classifications applies to the logistics sector and splits ICT into three categories: (1) network service and management; (2) knowledge and advice to users; and (3) freight transport system operation and management (Giannopoulos, 2004). The digitization of manufacturing microelectronics and robotics ushered in the third industrial revolution, which promotes flexible production. Various items are made on flexible and automated production lines using programmable machines or robots. The dearth of employees' understanding, particularly at the management level and among key decision-makers, has been cited as a major obstacle to implementing this new revolution and business integration to assist automation in Bangladesh's manufacturing and production industries (Hridoy et al., 2021). The International Trade Center proposes three main zones of data exchange between vendors and

suppliers for which ICT is essential: (1) Data exchange, which includes any information that affects the operation and execution of various parts of the inventory network, including reports on sales, inventory management, production schedules, and shipping details. (2) Synchronized arranging concur on managing the traded data. This will make procedures for item presentation, gauging and recharging. (3) Workflow coordination misuses cooperative energies between the distinctive inventory network members. This study's theoretical framework works on dependent variables like operational excellence and independent variables like behavioral intentions, work environment, perceived usefulness, and standard environment (Amoroso, 2017), (Wenga, 2017), (Bae, 2018). User's intention to continue using the applied Information Communication Technology can be described as continuance intention or behavioral intention in the sense of this research. Perceived utility and confidence are essential determinants of users' desire to return (Susanto, 2016). TAM (technology acceptance model) defines perceived utility as "the degree to which an individual feel that using a specific device will improve their job efficiency" (Davis, 2013).

A substantial number of experiments have shown that perceived utility significantly impacts consumers' decision to continue using or engaging in such behaviors (Wenga, 2017). In this analysis, perceived usefulness is characterized as the perception that the information and services the implemented ICT offers can meet users' needs (Roger and Mayer, 1995). In general, it is problematic for consumers to determine whether service benefactors have kept their promises and whether they adequately secure customer privacy information (Pavlou, 2014). To create long-term relationships, trust decreases the volatility of online retailers' activities and strengthens the assumed power of unpredictable purchases (Pavlou, 2014). Clients also question whether the ICT application has a useful function or can afford high-quality data and administration as promised (Dahlberg, 2008). Moreover, in ICT studies, confidence has often been emphasized as a crucial factor in improving persistence or behavioral intentions (Shahriar and Akter, 2011).

The variables of service quality and information quality have been chosen (Yang, 2015). In the form of an ICT, program service corresponds to a specific ICT service. Communication and expertise are two factors that can be used to assess the consistency of ICT services (Laugesen, 2015). Users' expectations of the ICT service provider's expertise and communication skills are critical aspects of ICT service efficiency (Laugesen, 2015). ICT's administration quality may be a focal signal since clients must invest energy in encountering ICT administration and evaluating its quality which impact of administration quality relevance, precision, adequacy, and timeliness are all indicators of information quality (Zhou, 2012). Over 60% of their members' businesses focus exclusively on the Bangladeshi industry. Wide range use of computer programs in Bangladesh have been launched in banking, telecom, pharmaceutics, garments, and textiles, the domestic demand for software and IT (Ahamed, 2014). Manufacturing industries such as garment, apparel, and pharmaceuticals have generated long-term demand for IT technologies such as ERP,

HRIS, and development and financial management applications, which is great news for us (Ahamed, 2014). It is very rare to find the corresponding literature about ICT applications in the RMG sector in Bangladesh, but there is a lot about Bangladesh's RMG from different perspectives like supply chain, fire safety, MFA quota and others. Bangladesh's RMG sector is heavily reliant on imported raw materials. To create clothing for export, over 90% of woven textiles and 60% of knit textiles are imported (Rumi et al., 2021). Bangladesh's achievements in the RMG sector inspire many countries worldwide, and they have been striving to achieve this status. Bangladesh's RMG sector has room to expand further by employing innovative management strategies, human capital growth, and cutting-edge technology, all of which are essential to meet the $500 million export earnings goal set for this sector by 2021" (Alam, 2020). According to many analysts, technology would be a crucial enabler in helping Bangladesh's labor-intensive RMG sector improve productivity. Technology investments in companies should be expanded because the industry accounts for up to 80 percent of the country's total export income and employs over 4.5 million workers (Shahriar, 2020). A company's profitability can be increased by around 1% by cutting cloth prices. Thread sol's tech (cutting software) is currently used by 25 garment factories in Bangladesh, including Pacific Jeans, Dekko Group, Unifil Group, Beximco, Fakir Fashions, Epic Group, Urmi Group, Ananta Group, and Hirdaramani's Kenpark and Regency.

Envoy Textile and other RMG manufacturers use Lectra, a pioneer in advanced technology solutions for garments, industrial textiles, and composite materials (Ganguli, 2020). Automation would ensure quality and cost-effective production. It would bring a positive impact on the RMG sector. Bangladesh would not face the adverse effects of automation in the Readymade Garments (RMG) industry as it is still gaining ground in the global business and has vast opportunities to expand in the world market (Hoque, 2019). Bangladesh's RMG industry is picked to acknowledge the advantage acquired from development. Whether the business or innovative level, innovation offers the chance for the area to progress economically (Mostafiz, 2019). The World Bank estimated Bangladesh's GDP to be USD 6.29 billion in 1972, which increased to USD 173.82 billion in 2014. It is nearly multiple times higher than the most recent forty years. About four million people work in 4328 garment factories in Bangladesh, of which 85% are women (MTBIZ, 2017).

This study theoretical framework works on dependent variable like operational excellence and independent variables like behavioral intentions, work environment, perceived usefulness, standard environment. Previously much literature has been done on them. In continuation intention or behavioral intention to use has been generally adopted as a primary usage result (Amoroso, 2017), (M. Bae, 2018), (Wenga, 2017). User's intention to continue using the applied Information Communication Technology can be described as continuance intention or behavioral intention in the sense of this research. Perceived utility and confidence are essential determinants of users' desire to return (Susanto, 2016). TAM (technology acceptance model) defines perceived utility as "the degree to which an individual feel that using a specific

device will improve their job efficiency" (Davis, 2013).

A substantial number of experiments have shown that perceived utility significantly impacts consumers' decision to continue using or engaging in such behaviors (Wenga, 2017). In this analysis, perceived usefulness is characterized as the perception that the information and services the implemented ICT offers can meet users' needs. Trust demonstrates that the other party will limit one gathering since it anticipates that the other party should perform a specific demonstration, regardless of whether it can direct or control that gathering (Mayer, 1995). From a mental perspective, trust is a mental state wherein one will rely upon another and has significant convictions about different ascribes. Regarding this exploration, trust alludes to the overall faith in great expectation, skill, and dependability of the applied ICT. In general, it is problematic for consumers to determine whether service benefactors have kept their promises and whether they adequately secure customer privacy information. As a result, confidence is essential in offline commerce and is much more critical in the increasingly unpredictable e-commerce setting (Pavlou, 2014). To create long-term relationships, trust decreases the volatility of online retailers' activities and strengthens the assumed power of unpredictable purchases (Pavlou, 2014). Clients also question whether the ICT application has a useful function or can afford high-quality data and administration as promised. In such a situation, confidence can help to reduce dynamic vulnerability to some extent.

Some recent studies have discovered that reliance plays a vital role in promoting by removing critical mistrust in the buyer complex cycle (Dahlberg, 2008). Moreover, in ICT studies, confidence has often been emphasized as a crucial factor in improving persistence or behavioral intentions (Shahriar, 2011). The variables of service quality and information quality have been chosen (Yang, 2015). In the form of an ICT, program service corresponds to a specific ICT service. Communication and expertise are two factors that can be used to assess the consistency of ICT services (Laugesen, 2015). Users' expectations of the ICT service provider's expertise and communication skills are critical aspects of ICT service efficiency (Laugesen, 2015). ICT's administration quality may be a focal signal since clients must invest energy in encountering ICT administration and evaluating its quality. These assessments require exertion venture from clients. Also, the impact of administration quality on effective convenience has been approved in the surviving examination. Relevance, precision, adequacy, and timeliness are all indicators of information quality (Zhou, 2012).

The ICT information in this study covers all the useful information offered by the ICT, such as consultation information, operation information, and information about the ICT's credentials, among other things. Users access ICT service information through ICT applications; however, if the data has a low correlation, low accuracy, is obsolete, or insufficient, users can question the application's functional value. This mistrust could lead to a decrease in the perceived utility of ICT applications. With TAM and the data structure achievement model as the hypothetical premise, Zhou and Zhang investigated the influence of web-based business site content on customer loyalty. The outcomes show that data quality will

influence the clients' convenience. As clients need to invest a lot of exertion and energy in assessing and examining data, data quality may affect apparent value. Sometimes these variables contribute entirely to the firm's performance, or sometimes not.

3. Conceptual Framework and Hypotheses Development

Following diagram depicts our initial conceptual SEM based on prior discussions and theoretical and analytical research in the literature to demonstrate the interrelationships between the constructs and the idea of the ultimate result or effect of using ICT in RMG sectors; the study's key objective.

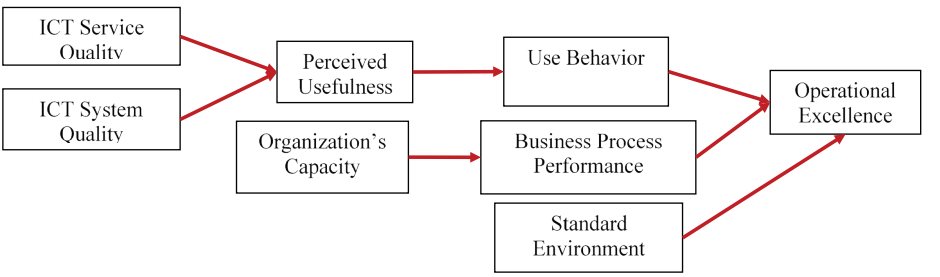


Figure 1: The proposed conceptual SEM showing the hypotheses

This research focuses on evaluating the results in terms of the final benefits from using ICT in RMG sectors with a specific performance operational excellence. It involves both psychological and tangible benefits. This study chooses to separate both attributes and assess them on a lower or first-order basis. That is because it is focused on the need to measure the Operational excellence of organizations who use ICT, which is an essential variable in this context yet was poorly studied in the ICT use in RMG sectors literature. Therefore, in this study, it is to be hypothesized.

Definition of Hypotheses with their Dependent and Independent variables:

Table 1: The hypothesis of the direct/indirect paths

	Independent Variable:	Dependent Variable:	Definition
H_1	Use Behavior	Operational Excellence	User behavior of ICT positively affects operational excellence.
H_2	Business Process Performance	Operational Excellence	Business process performance positively affects operational excellence.
H_3	Consumer Readiness, Competitive Pressure, Standard Environment	Operational Excellence	A standard environment positively affects operational excellence.
H_4	Perceived Usefulness	Use Behavior	The perceived usefulness of ICT applications positively affects user behavior.

	Independent Variable:	Dependent Variable:	Definition
H_5	Firm's ICT Resource, Complementary Resource, Firm's Scope, Organization's Capacity	Business Process Performance	An organization's capacity positively affects business process performance.
H_6	Perceived Usefulness	ICT Service Quality	ICT's service quality positively affects the perceived usefulness of ICT applications.
H_7	ICT System Quality	Perceived Usefulness	ICT's system quality positively affects the perceived usefulness of ICT applications.

Source: Primary data collection and analysis by author

4. Methodology

The deductive approach (aimed at testing theory) has been used for this study. The method used in this analysis is descriptive. Malhotra suggested two types of analysis methods qualitative and quantitative (Malhotra, 2010). This paper used the quantitative approach to complete the analysis, which aligns with the research philosophy. This research's prime respondents and participants will be from the RMG sector in Bangladesh. The respondents will include females and males from various garment institutions, focusing on the garment's IT staff, managers, and owners. Judgmental sampling is used in this analysis. Judgmental sampling is a non-probability procedure in which the researcher chooses sample units depending on their experience and expert judgment. According to Malhotra, there are two kinds of SEM analysis: CB SEM (covariance-based structural equation modeling) and PLS SEM (partial least squares structural equation modeling) (Malhotra, 2010). For obtaining the objectives, a quantitative research method has been used to collect the necessary data. This research has considered participants of at least 300 employees including IT and managerial personnel), 30 managers, ten business owners, and others. Total 120 garments industries were randomly selected to collect the data. 370 personnel of various ranks were selected randomly, where 347 complete data were found using a structured questionnaire.

Finally, data have been presented in the procedure of findings and discussion based on the issues acknowledged through the literature review relating to the application of information and communication technology in readymade garments industry in Bangladesh Market. A closed-ended questionnaire with a five-point Likert scale, varying from strongly disagree to strongly accept, was used in the survey. The questionnaire used the measurement items for each construct based on the definitions identified in the literature. Some measures were adopted from previous empirical studies in the literature, and others, which reflected necessary measures but were not found explicitly in the previous similar studies in the RMG sectors of Bangladesh, were added. PLS SEM path modeling is a dynamic model with many latent variables (LV), markers, and relationships (paths) that span several layers of structures and directly and indirectly affect certain constructs. It may also have formative and retrospective elements (Ahlemann,

2010). To analyze the quantitative data from questionnaires, the researcher hopes to conduct statistical analysis using smart PLS, R and others. Using those methods would verify and validate the questionnaires and summarize the findings. Since it is essential to consider the principles and terms used in PLS-path modeling to understand the findings described, this section includes the assessment criteria to determine the validity and reliability and the systemic model validity evaluation criteria below.

4.1 The assessment criteria to determine the validity and reliability

Composite Reliability and Cronbach's alpha are used to assess internal consistency reliability. The aggregate reliability determines if all metrics are measuring the same LV. The values vary from 0 to 1, with 0.7 being the minimum suitable baseline value for internal accuracy (Nunnally, 1978). Cronbach's alpha is thought to be an informal estimate of how well a group of metrics tests a single uni-attributed LV. Cronbach's alpha is a measure of internal accuracy that varies from 0 to 1, with 0.7 being the lowest suitable threshold. However, a higher alpha is desirable, 0.8 is considered good, and 0.9 is considered excellent. The factor loadings of the measures or measurement items on their respective LV are analyzed to ensure that the variance explained by each measurement item associated with a certain LV is greater than the variance explained by some other measurement item related to another LV. At 0.05, absolute uniform outer (component) loadings should be substantial and greater than 0.7. Higher thresholds are appropriate in an exploratory study. Measurement objects should be related to their corresponding LV and have the maximum loading on just one LV, which is the one it is intended to calculate technically. If the loading coefficient is more significant than 0.6, the item loading is considered high, and if the coefficient is less than 0.4, the item loading is deemed expected.

4.2 The systemic model validity evaluation criterion

R-squared tells you the percentage of the variance in the dependent variable that is described by the independent variable(s) in a regression model. It measures the goodness of appropriateness of the model to the observed data, indicating how well the model's predictions match the actual data points. The proportion of an endogenous LV's overall variance can be clarified. Substantial, moderate, and weak values of 0.67, 0.33, and 0.19 are substantial, moderate, and weak. Researchers and practitioners using PLS-path modeling should also analyzed bythe Cohen (1988) F-test. The F-test helped to calculate the "strength of the moderating" effect size (f^2) by including or excluding a paradigm to a previously tested model and calculating the transformation in the mentioned variance R^2 of the 'ultimate' endogenous latent dependent variable (DV) (Henseler, 2009). Small, medium, and high, respectively, f^2 impact sizes of 0.02, 0.15, and 0.35 are commonly used (J.Cohen, 1988) cited in (Henseler, 2010). A low f^2 should not be overlooked. The model's ability to forecast the measurement artifacts of any endogenous LV in the model (Geisser, 1974) is measured by the Prediction Relevance (Q2) or Stone-Q2 Geisser's test (Henseler, 2010). Calculates the predictive value of a collection of variables (using the blindfolding technique). $Q2 > 0$ is the

suggested baseline value for a validated model, with a higher Q2 indicating greater predictive significance. Small, medium and increased predictive relevance values are 0.02, 0.15, and 0.35, respectively. By comparing the Q2 values, any changes to a standard may be tested.

5. Data Analysis and Results Discussion

Smart-PLS was used to run the PLS algorithm and validate the model. Published data has been normalized so that loadings and coefficients reflect proportions of values ranging from 0 to 1 (or from 0 to -1). Furthermore, the respondents' responses of "Not Available/ Not Applicable" in the questionnaire were treated as missing values in the statistical study due to their lack of familiarity with information communication technology (ICT) in readymade garments facilities of functionality.

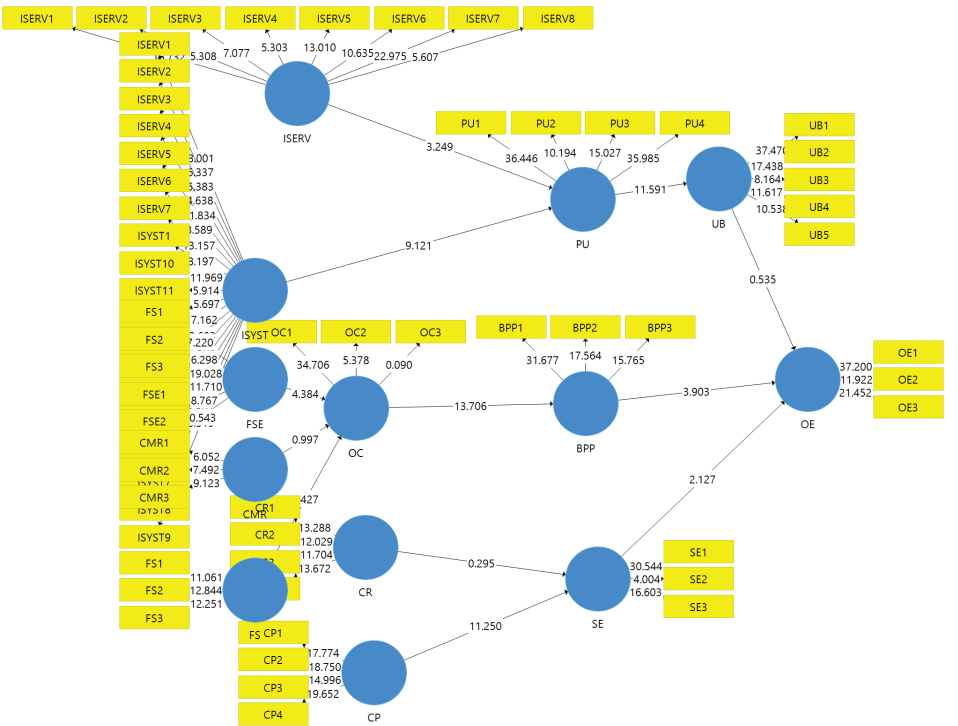


Figure 2: Bootstrap result for the structural and measurement model

All the bootstrap algorithm's checked cases were set to "no sign shift, 600 samples, and several cases equal to the number of records in each tested category." An initial analysis of the dissemination of respondents by their recruitment did not recommend that any systemic partiality existed in the sample. Furthermore, all but one of the models' paths seem to have a flawless directionality (i.e., positive direct relationship), so tested at the minimum of P<0.001 one tailed, which appears to be more appropriate. The relationship between ICT use and operational excellence seems non-directional. It is expected that the use of ICT will alter operational excellence; however, increased use of ICT could result in higher levels of Operational Excellence.

This is particularly true in the digital Bangladesh setting, where ICT usage is not voluntary. In some circumstances, RMG feels somewhat grateful to use it even if they didn't like its quality. These thankful feelings could occur when a user cannot physically visit an agency and uses ICT to accomplish the task. A t-test using the Smart PLS bootstrap technique (Figure-2) revealed that all the inner-model structural path coefficients are important, except for the two non-significant paths from OC to OE and from PU to SE, as seen in Figure-3. The figure also shows the explained variances (R^2 values) for the expected (dependent) endogenous latent variables. The sum of variation explained in the predicted latent variables varies from around 45 percent (e.g., PU) to 79 percent (e.g., PU) (e.g., OE). These relative proportions of variation clarified, according to W. Chin fell into the mild (anything greater than 33%) to high category (higher than 67 percent) (Chin, 1998).

Table 2: First - Properties for First, second and third Order Constructs

Constructs	Items	Loadings	CR	AVE
Operational Excellence (OE)	OE1: Our Company intends to continue using ICT in the future to accelerate Operational Excellence.	0.88		
	OE2: Our Company will continue using ICT in the future.	0.71		
	OE3: Our Company will regularly use ICT in the future.	0.82	0.85	0.95
Use Behavior (UB)	UB1: ICT reduce cycle time	0.85		
	UB2: ICT ensure accuracy	0.69		
	UB3: ICT ensure timeliness	0.60	0.829	0.79
	UB4: ICT ensure relevancy	0.67		
	UB5: ICT ensure adequacy	0.69		
Business Process Performance (BPP)	BPP1: Business processes will be improved after using ICT applications.	0.78		
	BPP2: Business Processes implies the competencies of the firm.	0.74	0.79	0.56
	BPP3: Improved Business process will increase operational excellence of the firm.	0.74		
Standard Environment (SE)	SE1: Standard environment promote organizations to focus on operational excellence	0.83		
	SE2: Standard environment provides adaptability to the organization.	0.55		
	SE3: Consumers, competitors, suppliers are part of the firm's environment	0.78	0.70	0.77
Perceived Usefulness(PU)	PU1: The company's management needs can be met using ICT.	0.80		
	PU2: The use of ICT would improve the management efficiency of the organization.	0.64		
	PU3: Overall, using ICT to manage a company's operations would be beneficial.	0.63	0.80	0.51
	PU4: Using ICT increases the company's productivity.	0.78		
Organization's capacity (OC)	OC1: ICT application improve business processes that make your organization more capable	0.92		
	OC2: Scope of the works demand the use of ICT in a larger scale	0.50	0.71	0.96
	OC3: Applications of ICT depends on firm's size	0.45		

Constructs	Items	Loadings	CR	AVE
ICT service Quality (ISERV)	ISERV1: Proper communication accelerates ICT service quality. ISERV2: The company can exchange information about information technology with others. ISERV3: The vendors and the ICT customer have a strong working relationship. ISERV4: The vendor of ICT is willing to provide any type of information. ISERV5: ICT is capable and efficient when it comes to delivering support. ISERV6: ICT does a fantastic job of fulfilling its position as a service provider. ISERV7: ICT is competent and proficient in meeting the needs of clients. ISERV8: ICT is updated enough to compete in the market.	0.71 0.44 0.52 0.45 0.63 0.59 0.77 0.49	0.79	0.73
ICT System Quality (ISYST)	ISYST1: Service provided by the ICT is relevant as per the company's objective. ISYST2: Service provided by the ICT is related to the customer's expectations. ISYST3: In general, the service provided by ICT is relevant to compete in the market. ISYST4: Application of ICT is trustworthy ISYST5: Application of ICT is accurate. ISYST6: In general, the application of ICT is reliable. ISYST7: Application of ICT is sufficient. ISYST8: Application of ICT is adequate. ISYST9: Application of ICT covers all the areas of the company. ISYST10: Applied ICT is current. ISYST11: Applied ICT is continuously updated. ISYST12: In general, the service of the ICT is timely.	0.51 0.66 0.61 0.76 0.52 0.51 0.58 0.54 0.52 0.59 0.48 0.49	0.87	0.77

Source: Primary data collection and analysis by author

The parameters of service quality are represented as a third-order reflective hierarchical build model in Figure 2. The second-order components of the third-order service quality construct, namely platform quality (77%), interaction quality (89%), and result quality (89%) represent the degree of explained variance of the third-order service quality construct (87%). As a result, the variation of second order constructs is expressed in the first order constructs that refer to them. At P 0.01, all route coefficients from service quality to second and third-order components are statistically important. In addition, the findings in Table-3 indicate that the CRs and AVEs of the second and third-order models are equal to or greater than 0.70 and 0.50, respectively, indicating that higher-order measurements are accurate.

Table 3: Reliability of Higher Order Constructs

Model	Construct	CR	AVE
Third Order	Operational Excellence	0.847	0.950
Second Order	Standard Environment	.707	.773
	User Behavior	.829	.796
	Organization's Capacity	.612	.968
	Perceived Usefulness	.807	.513
	Business Process Performance	.797	.567

Source: Primary data collection and analysis by author

As with the assessment, which is concerned with testing the validity of the structural (inner) model, in general, the proposed conceptual SEM is supported, regardless of how OE overall was measured. 6 out of 7 hypotheses were supported. The unsupported hypothesis as H1, was found to be insignificant.

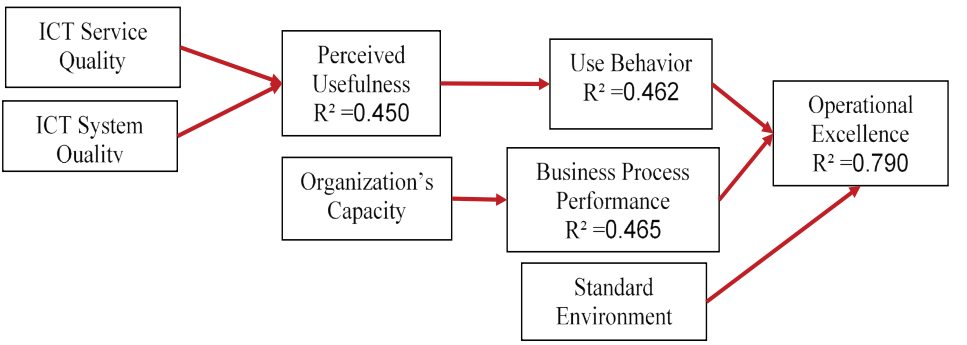


Figure 3: SEM showing path coefficients and R^2

In this step, the validation of the models is carried out using the sample of data which contains all valid, completed questionnaires. This *'all data'* group consists of a total of 347 responses. Since the data used for the model that test. Also, it is expected these preceding construct results will have no significant changes, especially those in the measurement model. The expected change will most likely affect: the inner model in terms of the path significance and probably the explained variance (R^2); the relationship between the ICT and its antecedents, and affect and the relationship between the ICT and Operational Excellency of the worker. After confirming the validity of the model in general, the result discussion is focused as well as recommendations.

Table 4: The level of significance of paths

	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/ STDEV|)	P Values	Remarks
UB_ -> OE (H1)	0.050	0.077	0.557	**0.578**	**Reject**
BPP -> OE (H2)	0.286	0.070	4.108	**0.000**	**Accept**
SE -> OE (H3)	0.173	0.077	2.159	**0.031**	**Accept**
PU -> UB (H4)	0.413	0.035	11.369	**0.000**	**Accept**
OC -> BPP (H5)	0.517	0.040	13.018	**0.000**	**Accept**
ISERV- > PU(H6)	0.194	0.056	3.393	**0.001**	**Accept**
ISYST -> PU(H7)	0.514	0.055	9.242	**0.000**	**Accept**

Source: Primary data collection and analysis by author

H_1: Use behavior of ICT positively affects operational excellence.

As shown in Table-4, the results of empirical validation for H1, are not supported, revealing a contrary position to that postulated in the literature. That is, despite the agreement found in the literature confirming the significant correlation between the User Behavior of the ICT Systems to Operational Excellence; this proposition was not supported in this research. The results suggest that the concept of this relationship does not apply in the RMG sectors. The insignificance of H1 suggests three possible interpretations. Primarily, the performance of an ICT device or program would have no impact on the user's decision because the authority decides it would be beneficial and provide them with possible benefits. Next, similarly, the Perceived Usefulness of the ICT will not impact their intention to use it unless they believe the system they will successfully obtain is as accurate as they need. Further, it is difficult for users to use ICT effectively without having proper knowledge and training on the systems. So, whether ICT is perceived to be of good quality or not is not significantly correlated with the perceived usefulness of the system. Perceived usefulness is linked with service quality and system quality, which depend on top level management implications, not mid-level or lower level managers' applications based on their behavior.

H_2: Business process performance positively affects operational excellence.

As shown in Table-4, the results of empirical validation for H2 were supported by both literature and results. The agreement found in the literature confirms the significant correlation between Business Process Performance to Operational Excellence. The results suggest that the concept of this relationship is eligible to apply in the RMG sectors. In other words, the use of ICT has been effective and overall quality directly impacts on RMG, especially when the business process performance is improving by using ICT. The significance of H2 suggests possible interpretations. Primarily, after using ICT applications Business process will be improved. Next, business Processes implies the competencies of the firm and finally improved Business process will increase operational excellence of the firm

H_3: Standard environment positively affects operational excellence.

The results empirical validation for H3, which was supported, to that postulated in the literature. The agreement found in the literature confirms the significant correlation between the Standard Environment of the ICT Systems to Operational Excellence. The results suggest that the concept of this relationship is eligible to apply in the RMG sector. The significance of H3 suggests has these possible interpretations. Primarily, benchmarks should be established based on the organizations that provide a Standard environment of ICT in the RMG as well as have satisfactory operational excellence. Case studies are given in the next chapters to support this hypothesis also. Next, all RMG organizations should be tended to adapt to the standard ICT environment. Further, consumers, competitors, suppliers all should be competitive and cautious about using ICT applications as they are part of the organization's environment.

H_4: Perceived usefulness of ICT application positively affects user behavior.

Empirical validation for H4 was supported by that postulated in the literature. The agreement found in the literature confirms the significant correlation between the Perceived Usefulness of the ICT Systems to User Behavior; proposition was supported in this research. The results suggest that the concept of this relationship is eligible to apply in the RMG sectors. The significance of H4 suggests possible interpretations. Primarily, using ICT in the RMG company of Bangladesh will increase the company's productivity. Next, ICT is used in RMG companies to help them manage their day-to-day activities. Further, using ICT will enhance the effectiveness of the RMG company's managerial activities. Furthermore, ICT systems and services have all those components to make the whole system work as a complete information system that serves every RMG firm's department.

H_5: Organization's capacity positively affects business process performance.

The result of empirical validation for H5 was supported by that postulated in the literature. The agreement found in the literature confirms the significant correlation between the Organization's Capacities to Business Process Performance proposition was supported in this research. The results suggest that the concept of this relationship is eligible to apply in the RMG sectors. The significance of H5 suggests possible interpretations. Primarily, with all its hardware and software, ICT makes an organization capable and efficient, and aftermath, it has good business process performances. Next, application of ICT in business processes varies depending on the organization's scope. Further, an organization has so many resources which help the ICT system work together.

H_6: ICT's service quality positively affects the perceived usefulness of ICT applications perceived usefulness, leading to more profitability.

Empirical validation for H6 was supported by that postulated in the literature. The agreement found in the literature confirms the significant correlation between the ICT Service Quality to Perceived Usefulness. The results suggest that the concept of this relationship is eligible to apply in the RMG sectors. The significance of H6 suggests possible interpretations. Primarily, proper communication must be ensured for service quality. Without proper communication, a communication gap can arise between parties. Next, service Quality of ICT must be capable

and proficient to adequately meet the customers' requirements. Finally, service quality of ICT service must be competent and effective in providing service.

H_7: ICT's system quality positively affects the perceived usefulness of ICT applications' perceived usefulness, leading that to more profitability.

As shown in Table-4, the result of empirical validation for H7 was supported by that postulated in the literature. That is, the agreement found in the literature confirms the significant correlation between the ICT System Quality to Perceived Usefulness. The results suggest that the concept of this relationship is eligible to apply in the RMG sectors that lead to more profitability. The significance of H7 suggests possible interpretations. Primarily, ICT components must be trustworthy, accurate, reliable, and sufficient otherwise; can't bring the expected result from the ICT applications. Finaly, ICT systems or applications must be capable of competing in the market. The results, in general, show that the SEM was, by and large, supported, and the non-supported hypotheses were justifiable. The path 'Operational Excellence' (OE) was not significant, as expected in the RMG sectors in the Bangladesh context, unless mediated by 'Use Behavior' (UB). This is true because organizations are not interested in using ICT applications for useless purposes. Rather, they are more interested in being more efficient while they perform their required task. Also, those organizations who have already adapted the ICT applications could be great examples for the other organizations. The rest of the paths are significant, as expected in the RMG sectors in Bangladesh, ICT applications usages accelerate operational excellence.

6. Findings from Data Analysis

The results generated from SEM analysis show that the path 'Operational Excellence' (OE) was not significant, as expected in the RMG sectors in the Bangladeshi context unless mediated by 'Use Behavior' (UB). As expected in the RMG sectors in Bangladesh, the rest of the paths are substantial to accelerate operational excellence. So, no matter how beneficial ICT is perceived, organizations will not intend to use it unless they believe that the system is beneficial. Organizations are not interested in using ICT for what may be perceived as useless purposes. Instead, they are more interested in being more efficient while performing their required task. From the study, it is common to find the following applications in most RMG firms. Employee attendance (clocking in), ERP (Enterprise resource planning) software implementation, computerized cutting machine, CAD/CAM (Computer Aided Design)/CAM (Computer Aided Manufacturing) system for pattern making or plotting, shipment dispatching, online FIT approval, mailing solution, MIS reports preparation, voice chatting, ERP for inventory tracking in manufacturing management, semi-automatic and fully automatic sewing machines, real-time communication with buyers, use of RFID, Smart Phones, Cloud Computing, Big Data, modeling and simulation, automation in quality monitoring of fabrics, use of advanced tools and equipment in industrial engineering, Advancements in production planning and control, Mobile Technologies, 3D Printers, CRM and Product Traceability.

The general results show that the SEM was supported by and large, and the non-supported hypotheses were justifiable. The path 'Operational Excellence' (OE) was

not significant, as expected in the RMG sectors in the Bangladeshi context unless mediated by 'Use Behavior' (UB). So, no matter how beneficial ICT is perceived, organizations will not intend to use it unless they believe that the system is beneficial. Organizations are not interested in using ICT for what may be perceived as useless purposes. Instead, they are more interested in being more efficient while performing their required task. The rest of the paths are significant, as expected in the RMG sectors in Bangladesh, to accelerate operational excellence.

6.1 Theoretical Contribution

This study examines the role of ICT in RMGs in Bangladesh, focusing on how ICT can add value to RMGs. The study integrates stakeholders' perspectives, primarily owners, on using ICT to expand the efficiency, dynamism, and productivity of RMG operations, resulting in improved garment industry production through benefit maximization. Several research projects have been conducted in the fashion industry to improve production using technology (Dossenbach, 1999). From an organizational standpoint, incorporating ICT into the supply chain affects the mode of its functions and significantly impacts the relations between the different functional units of an organization. As a result, it is proposed that the new research strategy offers a unique theoretical contribution to the IT infrastructure for readymade garments. This study will also offer a unique contribution to the academic literature by focusing on the RMG industry's ICT applications in a developing country like Bangladesh. The study findings will be useful to a number of stakeholders in Bangladesh's RMG industry, including the government and commercial companies. Stakeholders will be able to see for the first time what can improve a company's sustainability, and the steps companies have taken to get there and sustainability can be get after gaining operational excellence consecutively year by year. Various approaches can be created and executed to help Bangladesh's RMG business compete in the global market.

6.2 Practical Contribution

This study's findings have significant implications for government practice and ICT researchers. It aids system designers and government decision makers in understanding how ICT in RMG sectors perceives effectiveness and how it eventually impacts their obtained operational excellence. The significance of this research will be presented from three perspectives. Primarily, what makes SEM an important model in terms of how the model was constructed and other models presented in the literature for evaluating operational excellence in RMG sectors? Next, how could researchers benefit from this contribution? Finally, how could government practitioners and decision-makers benefit from this research?

The specific research gap of this research was "Application of ICT (information and communication technology) in the readymade garment industry: A study on the Bangladesh market," as no research has been carried out on this in Bangladesh.

The study is scarce in this area. In Bangladesh, numerous studies on RMG have been performed on production, protection and safety issues for workers, supply chain, and free quota systems. Furthermore, there is insufficient in-depth research on ICT in Bangladesh's

RMG market and on how organizational excellence can be enhanced by successful ICT applications to increase productivity. Regarding the efficiency of the RMG department, the advantage is exceptionally smaller due to shortage of available resources and the need to demonstrate the positive effects of ICT in increasing the operational brilliance of operational use and administration. People are interested in RMG's data innovation and execution, but inadequate evidence prevents them from using the desired IT framework that collectively made the loopholes request. Therefore, there are apparent research gaps related to applying information and communication technology in the garment industry: A study on the Bangladesh market regarding conceptual models, reliable and valid tools, and simplistic conclusions. In this regard, E. Majid Molla points out that more research can possibly be carried out in this area through various sources' specific information collection (Molla, 2018). This study's findings have significant implications for government practice and ICT researchers. It aids system designers and government decision makers in understanding how ICT in RMG sectors perceive effectiveness and how it eventually impacts their obtained operational excellence. Moodley stated that the increasing globalization and upcoming challenge in RMG sectors has reduced the significance of e-business in local apparel sectors. He also observed that there is an essential criterion for achieving global competitiveness by a firm which is the mutual integration of information and communication systems in the organizational value chain (Moodley, 2022).

Though Few studies have been conducted in the garment business to improve performance, profitability, and operational excellence via information technology. As a result, the current study's method is projected to provide a one-of-a-kind theoretical contribution to the RMG industry's ICT application. Furthermore, this research will contribute to the academic literature by addressing the RMG industry's condition in deploying ICT applications in a developing nation like Bangladesh (Nipa, 2023). A new level of compliance collaboration has been found, in which stakeholders from the government, suppliers, purchasers, and other stakeholders join forces to embed ethical and sustainable business practices alongside the deployment of ICT in every sector of RMG enterprises. 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's RMG business. The study's essential contribution is the development of a methodology that allows RMG owners to assess if ICT impacts operational excellence quickly. As a result, ICT applications have become strengths and weaknesses of a business that affect the RMG industry's competitiveness and profitability, as the model can detect (Nipa, 2023).

7. Conclusion and Future Research Directions

The Technology Acceptance Model, which was developed by Davis (1989), assumes that when users perceive that a type of technology is useful and also

easy to use, they will be willing to use it. Consequently, the more employees recognize that the systems will make their tasks easier to perform; the higher is the probability that they will use it and accept the new technology as being useful (Dillon and Michael, 1996). TAM model was more appropriate for individual use and acceptance of technology rather than in a corporate or institutional application that requires integration of information technology (Ajibade, 2018). The newly proposed model by the author is not beyond the limitations. It is useful for the acceptance of technology in a corporate or institutional application that requires integration of information technology. On the other hand, it's final focused on operational excellence through internal environment as well as external environment with the quality of the systems and services.ICT as a "Global Market Maker" Communication technology also serves as a "Market maker" giving the intense economic competition among nations (Nipa, 2023). There are a few drawbacks to be aware of. To begin with, this study was limited to a single country's use of ICT in the RMG industry. Second, because the data was obtained using a cross-sectional design, the study has limitations in this research approach. The model, for example, depicts the static nature of service evaluation, with results limited to a particular moment in time. This study proposed longitudinal research to better understand users' behavior and company operational performance over time. Data collection from the RMG sector was challenging, as detailed in the research methods chapter; the field study participants were chosen based on convenience sampling. The clothing firms were purposefully selected for the main survey, where access was straightforward. Because of these challenges, only garment makers and Dhaka-based garment firms were permitted to participate in the study's primary survey. Another drawback was that the samples were primarily confined to significant enterprises in the capital city due to time and budgetary restrictions. Future studies might look at contextual elements' effects on the study model, such as demographic variables (income, education, sex, etc.) and situational constructs (use frequency, cost, etc.) to better grasp the links described in the integrated model. Finally, future studies compare the performance of components-based SEM (PLS) and Covariance-based SEM under various research situations to assess hierarchical modeling.

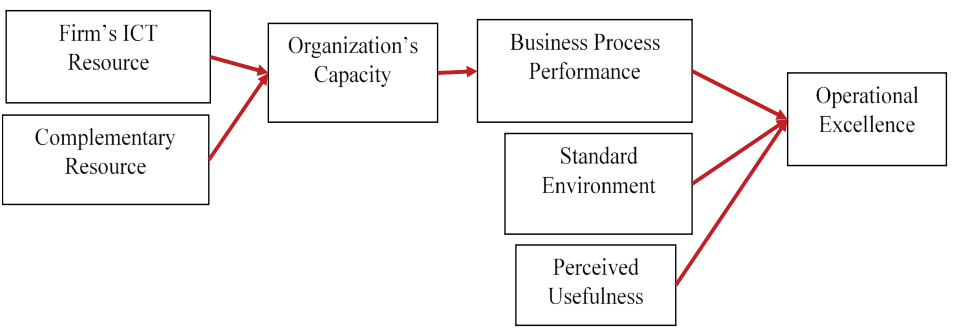


Figure-4: Research Model after removing rejected hypothesis

After directing a survey and then finalizing this paper, restrictions, and wrong sides of the application of ICT in the RMG sectors of Bangladesh have been identified to provide future directions to overcome restrictions. Some possible implications are given below:

1. New researchers can work on the rejected hypothesis and devise further studies.
2. New researchers can propose better models for operational excellence in the RMG sector.
3. Scrutinizing the proposed model to find out the drawbacks and limitations.
4. Scrutinizing the current technological environment and ICT infrastructure very carefully.
5. Determining the adaptability of the ICT applications according to the industry requirements.
6. Improving the IT skills of the employees by offering training facilities.
7. Making the ICT infrastructure more elastic and easier to use.
8. Introducing a common way of communication inside and outside of the organizations through ICT.
9. Improving the reliability and timeliness of the infrastructure.
10. Viewing the ICT infrastructure as essential to maintain the quality.
11. Different quality control applications must be introduced to review product superiority.
12. Overall situation will change very rapidly carrying financial discomfort.

As one of the hypotheses proves unacceptable, the model can be illustrated further, guiding future researchers to work with it (Figure-4)

This research mainly looked at the application of Information Communication Technology in Ready Made Garments sectors of Bangladesh. It has already discussed the various ICT infrastructure, applications, tools and technologies, operational excellence, factors affecting operational excellence etc. At the same time, there are some restrictions to implementing modern ICT in Bangladesh's RMG sectors. This study will be helpful for both researchers and government officials to make decisions and act. Overall, the findings show that using ICT in the RMG sector will be the ultimate solution for boosting operational excellence in developing countries like Bangladesh. However, the overall development of this RMG platform will be driven by service quality perception and its effects on service satisfaction, continuance intentions and quality of RMG services.

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Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to restrictions.

Conflicts of Interest: The author declare no conflict of interest.

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