Application of Information and Communication Technology in Readymade Garments Industry: A Study on Bangladesh Market

By

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DECLARATION

I hereby declare that this submission is my own work, to the best of my knowledge and that this thesis contains no material that has been previously published by anybody else, except where appropriate recognition has been given. This thesis contains no content that has been approved by any university for the granting of any other degree or diploma.

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Date:

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In the name of Allah, the Most Gracious and the Most Merciful.....

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ABSTRACT

The RMG industry is Bangladesh's most visible source of foreign cash, even though the country's economy is mainly dependent on agriculture. Bangladesh's Readymade Garment (RMG) industry has long been recognized as the country's economic "Golden Goose." Its entrance into the RMG sector began in the late 1970s, and it has quickly grown to prominence in the economy. This industry has benefited from export earnings, foreign exchange income, employment development, poverty alleviation, and women's empowerment. Information and communication technology has become an integral part of the textile industry. 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, and real-time communication with buyers.

Bangladesh has a lot of potential in terms of achieving operational excellence through the use of ICT in a broader sense, but it also has certain potential constraints. In this study, all will be analyzed to understand some revolutionary changes and adaptations of technologies. ICT is seen as a vital instrument for sustainability in the RMG industry rather than a tool for competitive advantage. In the garment sector, the use of ICT for structure, assumptions, process, efficiency, and decision-making leads to improved operational excellence. Bangladesh Garment Manufacturers and Exporters Association (BGMEA), the Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA) should move quickly to provide technical assistance in ICT infrastructure and implementation in the garment industry. Because only a few garment companies employ ICT on a wide scale, they will have an advantage in achieving sustainability. This study will aim to investigate the breadth of ICT application, existing ICT usages, significant impediments, and overall ICT application prospects in Bangladesh's RMG sector.

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

ACRONYMS

ICT: Information and Communication Technology

BGMEA: Bangladesh Garment Manufacturers and Exporters Association

RMG: Ready Made Garment

MFA: Multi Fiber Arrangement

NGO: Non-Government Organization

GSP: Generalized System of Preference

LDCs: Least Developed Countries

EU: European Union

USA: United States of America

ATC: Agreement on Textiles and Clothing

LEED: Leadership in Energy Environment Design

EPB: Export Promotion Bureau

MNC: Multinational Companies

TUFS: Technology Up gradation Fund Scheme

ILO: International Labor Organization

GAP: Gay and Proud

PPE: Personal Protective Equipment

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CHAPTER-1: INTRODUCTION

1.1 Overview

In the late 1970s, Bangladesh begun manufacturing readymade garments (RMGs). In a very short period of time, the RMG business gained prominence in the economy. This industry has contributed to Bangladesh's export earnings, foreign exchange earnings, job growth, poverty alleviation, and women's empowerment. Availability of reasonable wages, women workforce and government supervision are some of the reasons behind the industry's success.

Bangladesh is one of the world's fastest-growing economies as per the GDP growth rate increases year to year. For the fiscal year 2018-19, the Gross Domestic Product (GDP) increased by 8.13 percent. According to the final approximation, the country's growth rate was 7.86 percent in FY 2017-18. According to BBS's (Bangladesh Statistics Bureau) preliminary estimates, the business sector contributed 35.14 percent to GDP in FY 2018-19. Bangladesh's export earnings increased by 12.57 percent from July to March of FY 2018-19 to $30,903.00 million, compared to the same time of FY 2017-18. Readymade garments and knitwear merchandise dominate the country's overall export earnings.

In contrast, Bangladesh's gross import payments in FY 2018-19 (July-February) is US$40,895 million, up to US$2,180.00 million from the previous year (Finance Division, 2019). In FY 2018-19, the wide industry sector expanded by 13.02 percent (12.06 percent in the previous year). In FY 2018-19, the comprehensive service sector expanded by 6.50 percent, up from 6.39 percent the previous fiscal year. Agriculture sector growth slowed to 3.51 percent in FY 2018-19, down from 4.19 percent in FY 2017-2018 (Finance Division, 2019). Extreme poverty has decreased significantly from 44.2 percent in 2014 to 11.5 percent in 2019. It has now achieved lower middle-income status and made significant strides in the areas of industrialization, efficient education, the health of the citizens, commerce, transportation, energy and electricity, information and communication technology, and other service sectors. Bangladesh is expected to be the 28th largest economy in the world by 2030 (Hassan, 2018). Bangladesh aspires to become an upper-middle-income country in the next decade and a developing economy by 2041, thanks to rising per capita buying power and household income levels (Reaz, January2020).

Bangladesh is also the world's second-largest exporter of RMGs, after China. The brand "Made in Bangladesh" has become a global trading symbol, giving Bangladesh pride and socioeconomic progress. This fiscal year, RMG exports added $34.13 billion to Bangladesh's overall export

earnings, an increase of 11.49 percent over the previous financial year. The RMG sector contributed 84.21 out of a hundred of Bangladesh's overall exports of $40.53 billion in FY 19, up 10.55 percent from the previous year, according to data from the Export Promotion Bureau (EPB) (Ishaque, 2019). If this rate of growth continues, the RMG sector's foreign earnings could double by 2021. Like its GDP and economic advancement, Bangladesh's welfare is largely dependent on the RMG market. The largely female workforce adds to economic development when women move from home to work (M. Rock, 2003). Currently, 4 million people work in 4482 garment factories, with 3.2 million of them being women (K.M.Faridul Hasan, 2019). This development is backed up by a critical factor that is known to everyone-ICT (Information and Communication Technology).

ICT has had a profound impact on aspects of organizational functioning and encompasses internet, intranets, extranets, enterprise resource planning (ERP), and other related technologies that range from basic networking tools that improves an organization's facilities and activities (J.P. Gupta et al, 2008).

Companies, consumers, manufacturers, dealers, and future new entrants into a market are all affected by internet technologies (M. J.Porter, 2001). Adoption and use of internet technologies will help a business gain a strategic edge (Odedra & Straub, 2003). The availability of the internet has resulted in lower unit costs and the internationalization of products, labor, and knowledge markets. In developed nations, the internet can provide companies with easy access to foreign markets, streamlined operations, and equal competition. (Licker, 2005).

Without a question, the contribution of RMG is a tremendous boost to a developing country where most of the population is mired in hunger, unemployment, malnutrition, and health risks. Information technology is here to make the garment industry operate more effectively or efficiently than previously. This researcher will try to discuss the prospect and importance of IT application in RMG, the level of usage of ICT in RMG, how it will affect operational excellence and how operational excellence will lead RMG towards greater sustainability from the perspective of Bangladesh.

The following are some of the most commonly used ICT applications in Bangladesh's RMG sector

- 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 (TUFS)
- 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 buyer through online solutions like Skype, Viber and so on
- 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.

Though Bangladesh has the potential to achieve operational excellence through the use of ICT in a broader sense, there remain restrictions. Some in the industry are concerned with internet accessibility, workers' lack of technical knowledge, insufficient capital, inadequate organizational setup, unavailability of contemporary equipment, a lack of awareness of modern ICT applications, a tendency to remain unchanging, and uncertainty are all alarming impediments to implementing ICT in Bangladesh's RMG sector.

The Bangladesh Garment Manufacturers and Exporters Association (BGMEA) and the Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA), in collaboration with the Bangladesh Government should move quickly to provide all possible technical assistance in ICT infrastructure and implementation in the garment industry.

1.2 Background of Research Area

Information and networking technologies have the potential to considerably boost the RMG industry's competitiveness. Despite the potential, the RMG industry is unable to embrace technological change and prefers to stick to more traditional operating techniques.

To compete on a much higher scale, the many advantages of ICT must be considered, and recognition of these benefits must be increased. In Bangladesh, RMGs are now in the phase of adopting ICT in their operations. However, a lack of proper education and expertise, as well as consumer resistance and understanding of different technologies for use, make it difficult to implement ICT in Bangladesh's RMG market.

ICT creation, maintenance, and integration with operational excellence are very complicated subjects of study. As multinational organizations' success becomes increasingly contingent on the ability to make and distribute personalized goods and services swiftly and efficiently around the world, the realistic domain of ICT is fast changing (Halldorsson, 2007). In recent years, several corporations or firms have used ICT applications as part of their strategic management process. In Bangladesh's RMG industry, several ICT-based solutions have been adopted as a significant management tool in the clothing sector to cut lead times and enhance efficiency. There exists a serious shortage of proper ICT applications in Bangladesh, for example, would look for innovative ways to maintain its place in this fast-paced industry (K.C Jimmy. Lam, July 2006). In this regard, a new problem that has been considered in this research to increase productivity is evaluating various ICT applications in Bangladesh's RMG market.

1.3 Problem Statement and Research Questions

The adoption and application of ICT in RMG have not been uniform across the board. RMGs face various challenges and hurdles to acceptance and deployment that are dependent on both socioeconomic and technical problems, which can be caused by internal or external influences (Lloyd, 2011). 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 (J. Chitura, Mupemhi, Dube, & Bolongkikit, 2008). Other issues with ICT applications include low-level current hardware infrastructure, a need to see an instant return

on investment, while e-commerce/ICT is a longstanding investment, aversion to transition, a preference for conventional systems such as a traditional telephone system or face-to-face contact, a lack of IT expertise and technological experience among employees, and time constraints, company partners' lack of understanding of ICT's business opportunities, lack of security issues and ICT acceptance (R.Vrazalic & M.MacGregor, 2002).

Bangladesh's development and economic growth were primarily determined by industrialization. Within the garment and apparel industry, the RMG sector played a critical role in the industrialization process. It takes 90-120 days for Bangladeshi RMGs to complete the entire process from getting the order to shipping the final goods. Related procedures take roughly 19-45 days in Sri Lanka, 40-50 days in China, and 50-70 days in India (Rahman & Anwar, 2006). Readymade garments are mainly fashion products in the textile industry, with a brief life span. As a result, cutting down on lead time is critical in this industry (Haider D. M., 2007).

Minimizing lead time can be a primary example of operational excellence. Workers are hesitant to use ICT applications and behavioral intentions of using ICT applications are another factor in being behind the competition. Using ICT applications will enhance types of excellence. Reducing time and increasing the efficiency of workers, customers and producers' interactions over the internet will result in an increase in profit also. In light of the above issues, this study purposes to answer the following primary research concerns:

RQ1. How perceived usefulness gained by ICT service quality and ICT system quality will affect user behavior of ICT, and that will influence the operational excellence of the firm?

RQ2. How firm's business process performance strengthened by organization capacity (ICT resources and others) will result in affecting the organization's operational excellence?

RQ3. What are the determinants of the standard environment on the basis of using ICT applications for improving the operational excellence of a firm as well as the industry of RMG in Bangladesh?

1.4 Research Objectives

The key goal of this research is to develop a theoretical foundation for exploring how current ICT applications in Bangladesh's RMG industry contribute to operational excellence. The study's basic goals are as follows:

RO1. To show the current ICT applications condition in the RMG sector of Bangladesh.

RO2. To investigate how ICT applications affect the operational excellence of firms.

RO3. To explore how to improve the ICT infrastructure of a firm that will lead to more profitability and excellence.

1.5 Significance of the Research

Many countries in South Asia, Southeast Asia, and Africa work in the clothing industry and earn a lot of money in the process. Previous operational activities are done manually. But nowadays ICT has spread all over the world. For example, sending an invitation goes out by mail or via social media groups. The RMG sector has also grasped more ICT applications in their operation to boost their activities. Countries are desperate to keep their shares and gain more market share in either case while serving a multinational client. Bangladesh is still reliant on manufactured fabrics, but the RMG industry has grown to the point that it now accounts for around 75% of overall foreign exchange earnings (Siddiqi, 2007). Textiles and readymade garments account for 6% of global exports, with Bangladesh relying on this sector for 95% of its overall exports (Kabir, 2007).

1.5.1 Contribution to Theory

This study will examine the role of ICT in RMGs in Bangladesh, focusing on how ICT can be used to add value to RMGs. The study integrates stakeholders' perspectives, primarily owners, on the use of ICT to expand the efficiency, dynamism, and productivity of RMG operations, resulting in improved garment industry production through benefit maximization. In the fashion industry, several research projects have been conducted to improve production through the use of technology (Dossenbach, 1999).

From an organizational standpoint, incorporating ICT into the supply chain affects the mode it functions and has a significant impact on the relations between the different functional units of an organization, according to the current study. 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.

1.5.2 Contribution to Practice

The study's findings are expected to have a significant impact on the deployment of ICT applications in Bangladesh's garment industries, as it highlights several previously unrecognized problems related to the country's RMG sector's ICT infrastructure growth. The findings of the study 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, as well as steps companies have taken to get there. A variety of approaches can be created and executed to help Bangladesh's RMG business compete in the global market.

1.6 Structure of the Thesis

The overall framework of this study is arranged and summarized in nine chapters and is presented in this section. These chapters are inextricably linked and supplement one another. The brief framework of the chapters is as follows:

Table 1.1: Structure of the Thesis

Structure	Title	Description
Chapter 1	Introduction	This chapter deliberates the significance of the study as well as the void in the current literature. The debate actually aids in the development of certain research issues, which are then followed by research goals. Following that, certain terminology meanings are discussed. The 1st chapter then outlines the research's intent, as well as its functional and theoretical implications, before presenting the thesis' overall structure.
Chapter 2	RMG Industry and Bangladesh	This chapter examines the RMG industry's historical history as well as its current state in Bangladesh. It also addresses the Bangladesh RMG industry's current competition in the global garment market.
Chapter 3	Literature Review	This chapter provides a comprehensive literature analysis concentrating on ICT implementations in the RMG industry. It examines the literature on (IT) information technology, information and communication technologies (ICTs), their uses in the RMG market and how ICT increases competitiveness and sustainability. Finally, this chapter develops an original study paradigm to increase competition based on the literature review.
Chapter 4	Research Methodology and Design	It explains how this study's methodological basis was used to investigate the study's analysis concerns and goals. It addresses the methods used in this study and reflects on identifying the best analysis technique to use. The analysis methodology for the qualitative field trial, pilot test, and quantitative survey is addressed first, followed by the choice of testing model and mixed-method architecture. In addition, this chapter covers the sample acquisition, data storage, and data processing processes.

Chapter 5	Quantitative Data Analysis and Result Discussion	The quantitative survey that was done, as well as the methodology, are described in Chapter 5. The chapter next offers a full summary of the survey respondents, which was generated using the IBM SPSS 21 edition combined with regression, in order to explain the demographics of the sample group. The survey's analytical findings are then presented and interpreted using the partial least squares (PLS)-based structural equation modeling (SEM) method. Finally, confirmation of the test hypotheses is provided based on the study findings. The latter half, also recalls the analysis and discussion of the survey findings in Chapter 5. It goes over the study's primary concerns as well as theories that have been proposed. This chapter, in particular, examines the findings of both theoretical and functional viewpoints.
Chapter 6	Case Studies and Suggestions	In Chapter 6, two case studies of how ICT is used in the Readymade Garment industry are presented. Along with the suggestions from valuable respondents' comments including both owners and employees of the RMG sectors. They wrote some problems they faced and the solutions to implement Information Communication Technology in Bangladesh in open-ended questions.
Chapter 7	Conclusion and Future Directions	Key findings, recommendations and theoretical and practical contributions are presented in Chapter 8. This chapter discusses the current thesis's significance, and limitations. This chapter concludes with potential research directions in the field with conclusions.

1.7 Conclusion

This thesis is aimed at pointing out the connection between ICT application with operational excellence in Bangladesh RMG firms. So that some hypothesis and statistical analysis will show the actual reality so that owners and RMG authorities realize how important the ICT implementation is.

CHAPTER- 2: RMG INDUSTRY AND BANGLADESH

2.1 Introduction to RMG Industry in Bangladesh

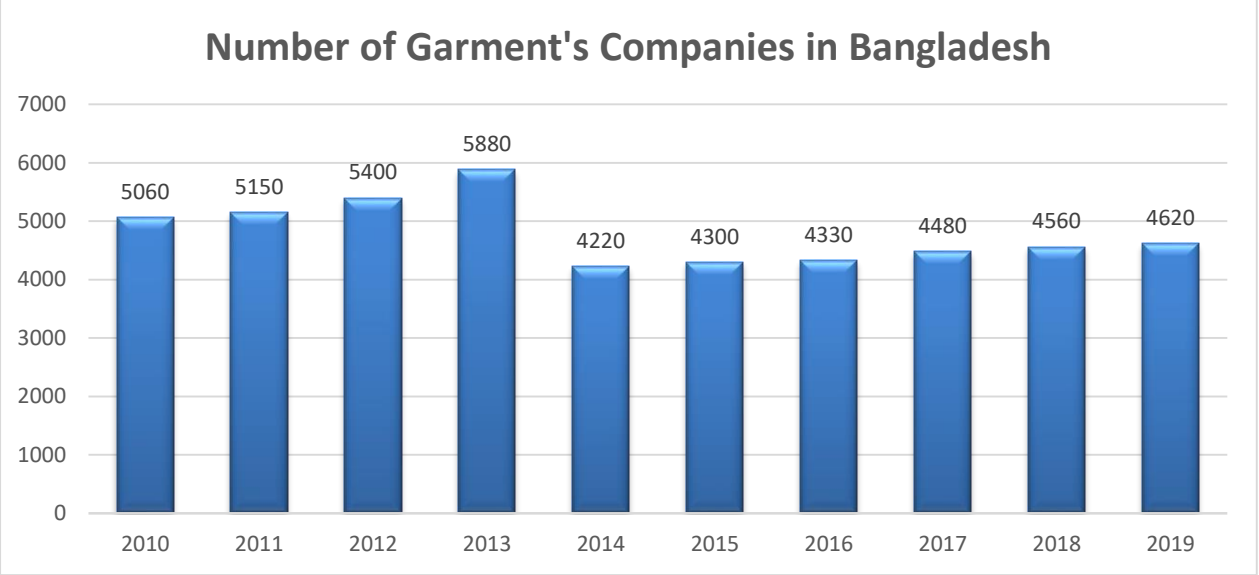
The progress of the Readymade Garments (RMG) industry in Bangladesh is discussed in this chapter. The competitiveness of this industry is also debated, presented with data demonstrating Bangladesh's relative role in the global market in the post-MFA (Multi Fiber Agreement) era. The motivation for choosing Bangladesh as a field of research is also discussed.

2.2 Historical Development of RMG Industry in Bangladesh

Bangladesh's textile industry is still in its early stages of growth. There were no textile factories in this area during the East Pakistan period under the Government of Pakistan. Dhaka was home to Bangladesh's first garment plant, which opened in 1960. In 1971, only five garment factories were available to support the local market. In 1976 and 1977, pioneers established garment factories solely focused on export. Reaz Garments and Ashraf Garments were leaders in the textile industry, having begun their companies much earlier (Rekhate, Dhore, Honmode, Sarde, & M.I., 1995).

Bangladesh's garment industry has dominated the economy and export trade of the country since the 1980s. The number of new entrants into this sector grew exponentially until the mid-1980s. Throughout the first half of the 1990s, the garment industry developed, with annual growth averaging 22% (Rashid M. A., 2006). In the socio-economic background of the region, RMG had appeared as the most attractive non-traditional export-oriented field by 1983 (Haque & Nuruzzaman, 2010).

After 1980, the Readymade Garments (RMG) industry has been the largest export market and a significant source of foreign exchange in Bangladesh, making it one of the emerging industries. About 4500 factories are now in Bangladesh, nearly four million workers are engaged in this sector directly, and another five million workers are employed indirectly through forwarding and backward linkage business. It is also one of the world's biggest clothing exporters (BGMEA, 2020). Bangladesh exports US dollars of 13908.0 million in knitwear and 14041.2 million woven wear under RMG products in 2020 (Centre for Policy Dialogue, 2021).



Source:www.statista.com

Figure:2.1: Number of ReadyMade Garments Companies in Bangladesh

2.3 Current Scenario of RMG Industry of Bangladesh

Bangladesh is the world's third-largest (second in 2022) exporter of Ready Made Garments (RMG) next to China and Vietnam (Review, 2021). Bangladesh's impressive 7.9% GDP growth rate in 2018 was a combination of industry growth of 12.1% (10.2% in 2017) and a surge in manufacturing of 13.4% (11% in 2017). Service growth slowed to 6.3% (6.7% in 2017), while agriculture was up to 4.2% (3% in 2017). The economy underwent critical structural shifts in recent decades. Export played a catalytic role in enhancing the manufacturing base and moving from an agrarian economy to an industry-led economy. Export earnings accounted for 15.05 percent of national GDP in 2017, with the RMG industry accounting for 83.5 percent of that total (Reaz, building competitive sectors for export diversification opportunities and Policy Priorities for Bangladesh, January 2020).

The sector employs about 20 million workers directly. This industry is the key driver of the country's economy. RMG will undoubtedly play a critical role in realizing Bangladesh's goal of becoming a middle-income nation by 2021.

2.3.1 Investment Opportunity and Situation

According to factory owners, RMG is the only sector in Bangladesh where a person's investment can be repaid in 3 to 5 years. Compared to other businesses or industries, the return on investment ratio is extremely high. RMG is a people-focused company. It currently employs twenty million people (Source; BGMEA,2017). As a result, it can provide many job opportunities for professional and unskilled workers. The government also supports entrepreneurs by offering a 4% incentive on export profits and a 7% incentive for non-traditional or developing markets, and a low taxation policy on wages. An RMG entrepreneur's most significant accomplishment is social recognition and distinction, as hiring many employees is a significant motivator for business owners.

2.3.2 Market Opportunities

Recent export data indicates a significant opportunity to expand the RMG market. Bangladesh has a 6.4 percent market share, while China has a 36.4 percent market share. Every year, RMG exports increase and our market share has increased by 5.1 percent, 5.9 percent, and 6.4 percent in the last three years (Source; BGMEA). The world's largest garment exporter's primary rival China is currently losing market share due to high production costs and a scarcity of skilled labor. Its market share fell to 36.4 percent in 2016 from 39.3 percent the year before (2015). Between China ($161 billion) and Bangladesh ($28.67 billion), there is a big difference in export value. Bangladesh has a fantastic chance to expand its market share.

By 2020, the global apparels industry is expected to be worth $650 billion. The estimated market value is $444 billion (2016) (source: The Financial Express).

Bangladesh's continued RMG export growth portends enormous potential to become a world leader in textile exports. It encourages RMG exporters to enter new markets and grow their businesses. Each year, exports to developing markets such as Australia, Korea, Japan, and Russia rise. It was 14.79 percent of overall export volume in 2014, 15.29 percent in 2015, and 15.30 percent in 2016. The government also declared special offers for non-traditional markets.

2.3.3 ICT Up-gradation in the RMG Industry of Bangladesh

Bangladesh has always been a late adopter of emerging technologies in the manufacturing field due to its status as a developing country. Bangladesh is the second-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. In Bangladesh, the apparel industry has brought a lot of positive things. The economic importance of this industry is constantly increasing. Bangladesh has textile educational institutions, which foster textile learning and, as a result, prosperity (Israt, 2020).

The textile industries use advanced technologies such as CAD, CAM, robotic cutting machines, and laser technology to clean denim. To meet global buyer demand for smart-wear and tech-driven goods, the vast investment behind these technical advances will need to be increased in the near future. The use of these technological resources will boost the sustainability of the RMG sector (Israt, 2020).

There is some new dimension in terms of technological and ICT related adoption and up gradation in the RMG industry of Bangladesh. Fabrics with value-adding properties such as solar protection, waterproofing, odor reduction, and bend and stretch, for example, 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 reputed Garments Companies (Ha-meem Group, Epyllion Group, Fakir Group) pioneer new technologies (Israt, 2020). Sensors for body functions and environmental control (temperature, humidity), wireless networking instruments and networks, personal localization (GPS) devices, and geographic information systems are all being adopted by garment companies (GIS). Cooling and heating elements, responsive PPE that acts as an emergency stop or reduces danger, smart textiles, cellular system monitoring and detection, physical security information management, and virtual reality have also been demonstrated.

2.3.4 Critical Success Factors in RMG of Bangladesh

Many articles have been published on critical success factors in different countries. Most of them found these four common topics: cost competitiveness, human or physical resources, supportive

environment, and capital inputs (Chan Sun C.A, Chittoo H. & Sukon K.S., Volume 16 Issue 6 Version 1.0 Year 2016), (Zafar, 2011). Some critical success factors which are working behind the success of RMG of Bangladesh have been made based on literature. The essential factors of success are the following:

1. **Vast labor force:** Bangladesh has a tremendous labor force which is the main competitive advantage in RMG. The textiles and Garments industry can hire them quickly, which creates an opportunity to develop and grow.
2. **Skilled human resources**: RMG companies in Bangladesh are now hiring experts from domestic and foreign countries. They keep and arrange proper training for the laborers. They are ensuring high quality in producing products through training the laborers properly.
3. **Technological upgrades**: Now, the technical garments industry is developing, and new IT products have been acquired.
4. **Special economic and export processing zones**: Bangladesh Government has made some economic zones and EPZ for RMG in Savar, Sonargoan, Chittagong and Musnshiganj areas.
5. **Supply-chain management:** The Bangladeshi textile industry has a well-managed supply chain. The industry is hiring many experts and specialists for ensuring Eco-friendly products: Garments companies keep a separate department with experts for ensuring the use of eco-friendly products. RMG products have been produced in an eco-friendly way.
6. **LEED (Leadership in Energy and Environmental Design):** Epyllion, Remi holdings, Ha-meem Group, and renowned garments companies have LEED factories. This is also a competitive advantage for garment companies. In 2019, Bangladesh's RMG industry had 120 green buildings and more than 500 factories are in the pipeline to become green status factories, which is also the highest globally (Humayunr, 2020) (BGMEA, 2020).
7. **Flexible rules and incentives:** The Bangladesh Government has kept relaxed rules and other favorable policies for the garments industry. On the other hand, the Government has also offered incentives to export RMG goods and products.

2.3.5 Challenges of ICT Implementation in the RMG Industry of Bangladesh

Critical Success Factors and Challenges can be stood up by interchangeably. Continuing that part, Bangladesh's RMG has been the country's highest export earner since 2005, and it has put 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. There are some challenges in terms of ICT implementation, and they are described below:

1**. Lack of infrastructure:** Most RMG companies don't have the proper infrastructure for maintaining and keeping ICT-related products and systems. On the other hand, IT training centers are not available in the RMG industry.

2. Security system: The security system in terms of ICT is not well developed. Information and system loss may happen at any time.

3. Lack of training: Most garments workers and staff don't know how to operate new technology-based machines, products and new systems. Sometimes they may bring significant loss or accidents in the workplace.

4. Internet network: Bangladesh's internet and broadband internet-based service are poor. As a result, RMG companies face many challenges and problems operating many effective systems.

5. Natural disaster: Natural disaster causes problems to the whole network system (network collapse, slow speed) as the network system is air based.

6. Training costs: Apparel companies train their employees to use IT applications, which is time-consuming and costly.

7. Time-consuming: It can take longer to reconfigure an IT device. It's difficult to pinpoint the source of the issue, so they have to examine the whole mechanism.

8. Terms and conditions: Many terms and conditions may be imposed by the foreign buyers and importers' countries.

9. Hacking: Hacking is becoming a significant challenge for ICT adoption by RMG companies. Many companies have already taken many strong firewalls to protect their systems from hacking. Information can be quickly passed or leaked at any time through external hackers and thefts.

10. Quality assurance: The quality of software and other products and hardware must be ensured to the standard for use. Otherwise, it can lead to quality problems.

11. Copyright: RMG companies create their own software and IT system. They are giving much importance to the copyright of these items. But the copyright law and protection in Bangladesh are deficient.

2.3.6 Top Garment Industries of Bangladesh

Bangladesh's readymade garments industry is essential to the country's growth. RMG makes a significant contribution to changing Bangladesh's economic landscape. The "Made in Bangladesh “label has also given the country glory and established it as a globally recognized brand. Bangladesh is also the world's second-largest exporter of RMGs. Then, in 2021, on the 50th anniversary of the Republic of Bangladesh, Bangladesh is projected to maintain its position in the global market by achieving $50 billion in exports.

Table 2.1: Top garment industries in Bangladesh in 2020

Serial No.	Name of Garment Industries
1	Ha-meem Group
2	Beximco (Textiles & Apparels Division)
3	Square Fashions Ltd.
4	Standard Group
5	Fakir Group
6	DBL Group
7	Epyllion Group
8	Asian Apparels Ltd.
9	Opex Sinha Group
10	Viyellatex Limited

Source: https://texgarmentzone.biz

2.3.7 Buyers of RMG Products of Bangladesh

Bangladesh's best garment buyers, RMG (Ready Made Garments) buyers are primarily from the United States, the United Kingdom, Australia, Switzerland, Canada, Italy, France, and the entire European continent, among other nations. The Bangladesh apparel industry is growing rapidly because of a lower cost of production as the labor costs remain low and with the capacity to produce quality goods.

Table 2.2: Top buyers of RMG of Bangladesh in 2020

Serial No.	**Name of Buyers**
1	Adidas
2	H&M
3	Wal-Mart
4	GAP
5	Levi's (Brand: Dockers, Denizer, Levi-Strauss)
6	Nike
7	VF Asia (Brand: Lee, Wrangler)
8	PVH-Philipps Von Heuson (Brand: CK)
9	Li & Fung
10	Old Navy
11	Academy
12	US Polo
13	American Eagle
14	Banana

Source: https://garmentsmerchandising.com

2.3.8 Number of Garment Factories

Bangladesh is a developing country, and the RMG sector is also increasing. The number of garment factories specifies the trends of this industry:

Table 2-3: 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

Source: https://www.statista.com

2.3.9 Export of RMG Products of Bangladesh

From 2009-2010 to 2018-2019, in the last ten years the amount of exporting of RMG products has been increasing. Here is a table of export data of RMG products in Bangladesh:

Table 2-4: Export of RMG and total export of Bangladesh

YEAR	EXPORT OF RMG (IN MILLION US$)	TOTAL EXPORT OF BANGLADESH (IN MILLION US$)	% OF RMG'S TO TOTAL EXPORT
2009-10	12496.72	16204.65	77.12
2010-11	17914.46	22924.38	78.15
2011-12	19089.73	24301.90	78.55
2012-13	21515.73	27027.36	79.61
2013-14	24491.88	30186.62	81.13
2014-15	25491.40	31208.94	81.68
2015-16	28094.16	34257.18	82.01
2016-17	28149.84	34655.90	81.23
2017-18	30614.76	36668.17	83.49
2018-19	34133.27	40535.04	84.21

Source: (Md & Habibullah, 2017)

2.3.10 Bangladesh's Top Export Destinations in FY19

Just ten countries account for more than 71 percent of Bangladeshi exports. Experts suggest that the market should be diversified. Bangladesh's exports are concentrated in ten countries, leaving the country heavily reliant on these markets without developing new markets.

The fiscal year 2018-2019 recently ended up with Bangladesh's overall exported products, amounting to $28.89 billion. The United States of America led the way with a 17 percent export share.

Bangladesh earned $40.53 billion in the fiscal year 2018-19, according to the Export Promotion Bureau (EPB), with the United States, Germany, the United Kingdom, Canada, Japan, the Netherlands, Spain, France, Italy, and Poland accounting for $28.89 billion (71.27 percent) of total exports.

Bangladesh's exports to the United States climbed by 14.92 percent, or $893 million, to $6.88 billion in the last fiscal year, up from $5.98 billion the year before. Bangladesh's single largest export destination, particularly for apparel, imported products worth $6.88 billion, or 16.96 percent of overall exports, to the United States. Apparel merchandise generated $6.13 billion in revenue, up 14.60 percent from the previous year.

Bangladesh exported in 2018-2019 to the following countries: US 16.96%, UK 10.92%, Canada 3.31%, and Germany 15.23%. Spain 6.3%, France 5.47%, Italy 4.05%, Japan 3.37%, Netherland 3.15%, Poland 3.14% and other countries 28.73% of total exports of RMG of Bangladesh.

2.4 Conclusion

Bangladesh remains a step ahead in the RMG sector over any other developing nation. Infrastructure development, continuous government support, and a large population have become strong weapons in Bangladesh's RMG infrastructure war.

CHAPTER-3: LITERATURE REVIEW

3.1 Introduction

The most relevant theoretical ideas from other scholars will be discussed in the review of the literature section to understand the facets of ICT application in the RMG field in Bangladesh. This would provide a better view of the subject field and the authors' ideas as a foundation for this study.

3.2 Information and Communication Technology (ICT)

Telecommunications-based systems that provide access to information are referred to as ICT. It's similar to information technology (IT), but with a stronger emphasis on networking applications. Examples include the Internet, satellite networks, cell phones, and other kinds of communication. Information and communication technology allow people to communicate in new ways in various contexts. Instant messaging, voice over IP (VoIP), and video conferencing are examples of common connectivity tools on social networking sites like Facebook, Twitter, and Instagram.

ICT is often discussed concerning how digital media systems impact culture because they have transformed the world into a global village where everyone can interact with someone at any time. Information and communications technology, or ICT, is the infrastructure and components that support digital computing, including all computers, networking components, software, and structures that incorporate people and company profiles (Christensson, 2018).

ICT refers to a wide range of technological instruments and services that are used to create, differentiate, preserve, and process data for communication. It encompasses all types of software and software-based operations, including ICT systems, ICT applications, software commodities, and embedded software. ICT encompasses all types of software and software-related processes and solutions, such as ICT services, ICT applications, software commodities, and embedded software (Tjia, 2005). ICT is characterized as an "electronic means of recording, encoding, preserving, and disseminating information" in general (Cheng-Min, 2006). Under ICT, it is necessary to better understand the components of ICT.

3.3 Components of an ICT System

Mobile, wired, and cellular networks are also used in ICT. It also incorporates antiquated technology like landline telephones, radio, and tv broadcasting, many of which are still commonly used today, as well as cutting-edge ICT components like artificial intelligence and robotics.

The list of ICT components is long, and it is still growing. Computers and telephones, for example, have been used for decades. Others are newer additions, such as smartphones, electric televisions, and robots.

Software, Hardware, Internet Access, Data, Communications Technology, and Transactions Facility are the core elements of ICT. According to the United Nations' Sustainable Development Goals (SDG), "significantly expand access to information and communications technology (ICT) and aim to enable universal and equitable access to the internet in least developed countries by 2020." (Christensson, 2018). Hardware and software are included in the components; therefore, brief descriptions are included. To assess the overall potential of an ICT infrastructure, hardware and software employed in ICT applications in an organization are required.

3.4 Hardware in RMG

Now, most garments companies are using hardware that is productive for the industry. Hardware, such as Computer, Tracker balls, Printers, Plotter, Flat cutting plotter, Digital cameras, Automatic Gerber spreading machine, Automatic Inspection machine, Printing Routers Punch Card Reader etc. New technologies have used some hardware and machines in many RMG industries. Some of them 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 Z., 2018).

3.5 Software in RMG

IT industries and IT Hi-tech Park 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. SAP (Systems, Applications, and Products) is an acronym that stands for Systems, Applications, and Products. It is a framework that gives users access to a real-time soft business program. It has a user interface that is thought to be highly adaptable. An SAP audit's two key areas of interest are confidentiality and data integrity.

Computer-aided design (CAD) creates two- or three-D (2D or 3D) graphical representations of physical structures using computer programs. Designers may use it to add various types of fabric to a live model, allowing them to show off new designs alongside their current ones.

As a result, it generates an infinite number of samples; for example, CAD applications such as Garber, Lectra, Fibersim, NX, and Golden Leaser.

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 J., 2018). These industries are currently using different types of software that are not described in this paper. But some of them can be described here because some scholars mentioned them in their literature.

3.6 Common ICT Applications in RMG Sector

After having ideas about hardware and software, now it is time to understand how they work like applications, from concept through post-retail; the RMG business is witnessing a change that involves the digitalization of garment production processes. Bangladesh RMG is putting the 'Apparel 4.0' concept into action, which allows manufacturers to track and computerize the whole manufacturing process while maintaining total supply chain transparency. Apparel 4.0's key applications include smart apparel, robotics, simulation, industrial IoT, augmented reality, Machine-to-Machine (M2M) communication in knitting machines, smart factory, 3D printing, smart textiles, and AI-infused Industrial ERP (enterprise resource planning) (Tareque & Islam, 2020).

(IT) becomes a crucial component of the apparel industry. Information technology is used for staff attendance (clocking in) to shipment dispatching. Like those in service sectors, few divisions in the garment sector are completely reliant on IT or ERP. In one case, an MNC research lab, due to a technical issue, the server ceased to function. What happened next? With no one willing to do their work, everything came to a halt. There is no way to build a new job; there is no way to display a report or get a production. As a result, everyone's workload increased. Pattern-making, plotting, and other CAD/CAM processes.

- FIT approval online,
- Computerized cutting unit,
- ERP for material monitoring and production control,
- Mailing solution
- MIS report preparation
- Voice messaging,
- Semi-automatic and fully automatic sewing machines,

- Real-time contact with buyers through online services such as Skype.
- PLM software.

An ERP is a system that 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 every day while sitting in the country office (Prasanta, 2017). It is helpful to have ICT applications materials and technologies in hand; business leaders can know how and why they may use these applications in the organization, especially RMG organizations. It is not easy to apply these in any organization without hassles. Every success has some failure stories too. Why are these applications needed in RMG? What will be their outcome in this particular industry? That will be supported by the next part of the literature.

3.7 Prospects and Problems of Applying ICT Applications in the RMG Sector

This literature is about the prospects and problems of applying ICT applications in the RMG industry in different country's context mainly in developing country's context. ICT (Information and communication technology) plays a critical role in developing countries' transition to the modern era. These opportunities would be provided by ICTs' willingness to open up portions of the value chain (other than simple production and processing) to developed countries. In Information for Growth, case studies of organizations that have effectively used ICTs to move into higher-value practices like architecture and logistics, or penetrate niche markets, are given. ICT plays a significant impact in how industrialized countries adjust to the modern era. To begin with, ICT, as a general-purpose technology, will assist developing-country enterprises in changing their corporate processes and increasing productivity and competitiveness. Second, in the global supply chain, information and communication technology is the key catalyst for value shifts, enabling creative business models, disaggregating distribution systems, and introducing new markets for developed countries (infoDev, June, 2008).

The digitization of manufacturing microelectronics and robotics ushered in the third industrial revolution. This promotes flexible production, where various items are made on flexible and automated production lines using programmable machines or robots. The dearth of understanding of employees, 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 (Shabur, Hridoy, & Rahman, 2021).According to one source, some employees are less concerned about data theft once

the data has been saved in computers. Those employees also believe that automation would add complexity and complication rather than boost productivity. Another claim was that manufacturing company owners, particularly those in textile garment factories, are under-educated and unfamiliar with new technologies and concepts; as a result, many of them are hesitant to implement automation.

For developed-world producers looking to compete successfully in the competitive textiles and clothing business, where speed-to-market and price are crucial variables, ICT is no longer a viable option. A move to "just in time" activities is possible with the correct deployment of ICT in the organization. At the same time, as global competition squeezes margins, ICT will aid in gaining necessary cost savings in procurement and manufacturing processes. This, in turn, is dependent on precise and timely data flows from the acquisition of raw materials to the manufacturing process to the distribution of finished goods to the ultimate consumer (MatthiasKnappe, 2004). Reduced costs and improved service levels are among the reasons that motivate businesses to implement ICT. Other motivators include process management by reporting, increased protection, and accurate consumer requests for ICT as a service enabler (Perego, 2011). When it comes to categorizing ICT, several choices depend on the sector in which the technology is used. One of Giannopoulos's (2004) 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).

Depending on the situation, the ICT conditions can change. Producers must assess which areas of the supply chain will give them a competitive advantage and compare their ICT requirements to what is already available. Businesses must understand their ICT investment needs as part of a consistent global supply chain strategy. ICT requirements, on the other hand, can be stringent, and small enterprises, in particular, may find it difficult to fund the essential investments. It is equally critical to give knowledge access (infoDev, June, 2008).

According to reports on ICT use in logistics and freight management, ICT implementations have been the since the middle of the 1990s. The quantity of ICT applications available on the market is growing, a key enabler for several ICT applications used in logistics. This is attributed to the greater variety of options provided by various forms of ICT and the lower prices of such systems due to increased competition and technical advancement (Perego, 2011). In the context of industry, logistics is described as "a community of related activities all complicated in the transportation and storage of goods and information—from raw material sources to final customers and beyond to recycling and disposal" (Encyclopedia, 2015). The concept of logistics

can be summarized as the flow of goods and resources in one direction from raw materials to end-of-life cycles. As a result, reverse logistics is the polar opposite of regular logistics. Reverse logistics is also known as going the other way on a one-way route because the great majority of commodity shipments flow in one direction (Taylor, 15th Edition of March 2015).

Information and communication technology (ICT) has only recently been developed and employed in logistics as a result of recent technical breakthroughs and the internet. Various logistics processes, such as shipping and freight, warehouse management, and customer support, are aided by information technology. These advances appear to be improving the competitiveness and efficacy of logistical procedures (Cheng-Min, 2006). Many businesses are now striving to leverage the textile and clothing industries to demonstrate the necessary research for a successful ICT-enabled growth plan in any market. Understanding the present global supply chain for the sector, assessing a country's future competitiveness as value shifts down the chain, and identifying any growth impediments in the country's local economic framework are all critical actions (infoDev, June, 2008).

Many businesses are now attempting to use the garment and apparel industries to demonstrate the type of research needed for a viable ICT-enabled growth strategy in any region.

If stock levels need to be kept low, a fully operational system would require real-time, online inventory control. In an ICT-enabled environment, a common understanding of roles and activities is critical to overall cooperation and teamwork. Once this is done, a high level of monitoring and support may be provided, with real-time data updated and communicated (infoDev, June, 2008). The transformation checklist includes a path for perpendicular integration, expansion into higher-value-added products, worker recruiting and skill upgrading, adoption of more innovative textile production processes, improved governance, and more effective bureaucracy (infoDev, June, 2008).

ERP stands for Enterprise Resource Planning applications. It is one of the most innovative ideas in the contemporary garment and clothing industry. The key goal of ERP is to get all of an organization's data under one roof so that planning and implementation decisions can be made with maximum clarity (Merchandiser, 2016). An accounting-based information system for calculating and planning the capital required to accept, manufacture, ship, and pay for customer orders across the organization. An ERP system is distinguished from a standard MRPII (Manufacturing Resource Planning II) system by functional specifications such as a graphical user interface, relational database, use of fourth-generation language, computer aided software

engineering tools in development, client/server architecture, and open-system portability (Hodge, 2002). In a production, sales, or service business, a system for effectively planning and controlling all capital required to take, make, package, and pay for customer orders (APICS, 1998). Bottlenecks can be minimized and efficiencies considerably increased by using an Enterprise Resource Planning (ERP) system that includes order administration, materials procurement, packaging, account management, and logistics. Customers will also receive correct order plans, and efficiency may increase dramatically (infoDev, June, 2008). ERP stands for enterprise resource planning, and it is a method for organizing and coordinating a variety of business operations within an organization, such as order procurement, materials procurement, manufacturing, customer management, and logistics. Blocks may be used to implement it. ERP can start as an internal company resource, but information and data from the system may be shared with other supply chain stakeholders, particularly the buyer, later on (infoDev, June, 2008). Now the next part will describe why these applications are linked with operational excellence or not?

3.8 ICT as a Tool for Gaining Operational Excellence for RMG Sector

Much literature can be linked to measuring how successful ICT applications are to gain operational excellence. This model is the combination of the UTAUT model and a new extended version of TAM2, or it may have called a pure new model of technology implementation model though there exists another TIM model by Wilkins, Holt and Swatman ((Wilkins, Holt, & Swatman, 9-11 December, 2007). However, the thing is, it is not a version of the technology acceptance model, but it links up with a profitability model. That means the model's usability can be matched up with profitability. The kind of organizations for which ICT can be fair in business measures implemented in the content and piece of the clothing industry is a key question. Certain specific ICT advancements may be used (ITC, 2005).The International Trade Center proposes three main zones of data exchange between vendors and suppliers for which ICT is important: (1) Data exchange, which includes any information that affects the operation and execution of various parts of the inventory network. This includes reports on sales, inventory management, production schedules, and shipping details. (2) Synchronized arranging so that all gatherings 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 (ITC, 2005). Within the UTAUT model, execution anticipation, exertion anticipation, and social variables have coordinated impacts on behavioral deliberateness, which together with encouraging conditions, have coordinated implications on utilization

behavior. The impacts of intelligence of each execution hope, exertion hope and social variables with each of age and sexual orientation; intelligent involvement with each of exertion anticipation and social components; and interaction of voluntariness of utilizing social variables on behavioral deliberate are too included. At long last, there are impacts of intuitive age and encouraging conditions and encounter and favorable conditions utilizing behavior (Venkatesh, 2003). To get more excellence RMG companies get different applications software launched in their companies. Many cases and examples of ICT applications are related to achieving operational excellence. Many scholars have studied to find out the dependent variables on operation excellence.

3.9 Dependent and Independent Variables

This study works on some dependent and independent variables. Behavioral intentions, work environment, perceived usefulness are some of them. Previously much literature has been done on them. In the literature, continuation intention or behavioral intention to use has been generally adopted as a primary usage result [(D. Amoroso, 2017), (M.Bae, 2018), (Gooi Sai Wenga, 2017)]. Users' 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 important determinants of users' desire to return (Aries 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 (Gooi Sai Wenga, 2017).

In this analysis, perceived usefulness is characterized as the perception that the information and services offered by the implemented ICT can meet users' needs. Trust demonstrates that the other party will limit one gathering since it anticipates that the other party should play out a specific demonstration, regardless of whether it can direct or control that gathering (Roger C. Mayer, 1995). From a mental perspective, trust is a mental state wherein one will rely upon another and has great 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 important in offline commerce, and it is much more important in the increasingly unpredictable e-commerce setting (Pavlou, 23 Dec 2014). To create long-term relationships, trust

decreases the volatility of online retailers' activities and strengthens the assumed power of unpredictable purchases (Pavlou, 23 Dec 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 key factor in improving persistence or behavioral intentions (Shahriar 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 (J Laugesen, 2015). Users' expectations of the ICT service provider's expertise and communication skills are critical aspects of the ICT service efficiency (J Laugesen, 2015). ICT's administration quality may act as focal signals since clients need to invest energy in encountering ICT administration and evaluating its administration quality. These assessments require exertion venture from clients. Also, the impact of administration quality on saw convenience has been approved in the surviving examination.

Relevance, precision, adequacy, and timeliness are all indicators of information quality (Zhou, 2012). The ICT's information in this study covers all of 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 information 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 data structure achievement model as the hypothetical premise, Zhou and Zhang (Tao Zhou, 2009) investigated the influence of the web-based business site content on customer loyalty. The outcomes show that the data quality will emphatically influence the clients' apparent convenience. As clients need to invest a lot of exertion and energy in assessing and examining data, data quality may influence apparent value. Sometimes these variables result in complete contribution to the firm’s performances, or sometimes not.

3.10 Specific ICT Application's Contribution

Over 60% of their members' businesses are exclusively focused on the Bangladeshi industry. Large-scale computerization programs in Bangladesh have recently been launched in banking, telecom, pharmaceutics, garments, and textiles, the domestic demand for software and IT (Ahamed, June 30, 2014). Manufacturing industries such as garment, apparel, and pharmaceuticals have generated long-term demand for IT technologies such as ERP (Enterprise Resource Planning), HRIS (Human Resource Information Systems), and development and financial management applications, which is great news for us (Ahamed, June 30, 2014).

A vast amount of data must be stored, analyzed, shared, and used in a manner that adds value. Nonetheless, information and communication technology (ICT) is not a goal in and of itself. A developing-country supplier needs to understand that ICT investment alone will not fix a market problem; the procurement of a new software product does not automatically attract new customers or maintain existing ones. First, determine the optimal market results and then inquire how ICT helps businesses achieve these objectives. In one insightful survey of potential procurement plans for garment buyers, respondents were asked to rank the value of numerous factory-specific considerations, like "Technological Level" (MatthiasKnappe, 2004). Countries that were almost entirely reliant on the quota system and lacked basic competitive advantage and facilities, on the other hand, are unlikely to see ICT funding to save their textile industry. ICTs will help certain developing-country businesses perform more successfully in the global garment and textiles industry (infoDev, June, 2008).

Textile Enterprise Resource Planning (Spinning, Printing, Dyeing & Weaving): Trade finance, Supply chain, Inventory & Warehousing, Production & Production Schedule Management, Sales, Marketing, Laboratory, QC & Packaging, Distribution, Accounts, DSS, MIS are some of the fields where ERP is being implemented in Bangladesh. Sourcing & Supply, Order Management, Commercial Management, Production, QC Management, Accounting, HCM, Courier Management, MIS & DSS, Dashboard: Buying House & Garment ERP. HRM & Payroll: Attendance Management, Holiday Management, Salary Scheme, Leave Management, Payroll, Disciplinary Action, Promotion, Transfer, Recruitment, Employee Role Management (Merchandiser, 2016). The key obstacles to system implementation, according to respondents, are resistance to reform, a lack of top management support, and user training and education (Hodge, 2002).

CAD/CAM technology is gaining popularity in the textile industry, especially textiles. In the design and construction of textile machinery, it has proven to be an incalculably valuable instrument (P.B.Jhala, 1991). This word means different things to people interested in architecture, construction, and mechanical engineering. CAD has revolutionized the textile industry, especially in the apparel industry. CAD has simplified the time-consuming and inconvenient method of textile design. Textile designers and suppliers can now access creative and revolutionary projects with the click of a mouse (Khan, 2017).

The material plans are the first works of the fashioners. Computer aided design (CAD) encourages them to picture and see their inventive plan in conclusive structure without delivering an example pattern. In some cases, the clients think about planning as indicated by their specific necessity (TE_Online, 2008). Computer-aided manufacturing, or CAM, is a device that is typically used in combination with CAD. A CAD system is used to create a specification, converted to a CAM system, automating the manufacturing process (Przybylek, 2015).

ICT under the class of "data and direction to clients," identified with the ICT examined as advancements that furnish clients with exceptional data dependent on gathered information regarding developments of merchandise or people in certain transportation organizations (Giannopoulos, 2004). The progression of data fixes and the material and articles of clothing inventory network and ICT is the way to accomplish proficient data sharing. Appropriate creativity will enable a provider to improve strategic initiatives, increase efficacy and intensity, and fulfill the ever-shorter lead times expected. ICT may offer a precise monitoring system within an organization, allowing real-time access to the order movement manufacturing line (INFODEV, June, 2008.)

Despite having a 50-year tradition, the Bangladeshi government only acknowledged the promise of the Bangladeshi ICT industry and its economic influence in 1997 (Nyenroad-Business-University, January, 2014). Bangladesh's lack of vertical integration, which results from low crude material output and restricted texture fabrication, is one of the country's key weaknesses when compared to India and China. The government understands that the textile manufacturing industry can't grow without more access to wool and texture (infoDev, June, 2008). The ICT industry has expanded by 20 to 30% each year in recent years. Over 800 registered ICT firms provided a total of $250 million in revenue. More than 75 percent out of hundred businesses are interested in custom application creation and management, 50 percent are focused on IT enabled services, and 45 percent have E-commerce and Web services (BASIS, 2012).

The country has limitless potential in the ICT sector, especially in the readymade garment sector (RMG) (Kamal, 2017). The local ICT sector has enormous potential next to RMG. If Bangladesh wants to harness this potential, it must increase its skills in using modern technologies of things, artificial intelligence, and robotics (Kamal, 2017). Bangladesh's readymade garment (RMG) industry will be powered by technology, giving it a comparative edge over other industries. Technology would be a crucial enabler in helping Bangladesh's labor-intensive RMG sector increase productivity (Shahriar, 2020). Innovation and development are the two premier switches that can help the RMG area in Bangladesh uphold its development yearnings. Innovation arrangements have given pivotal upper hands to many assembling organizations across the globe, including RMG enterprises. Increasingly, more RMG organizations are attempting to make a culture of innovation and advancement in their associations to improve measures, debottleneck creation, limit delays in conveyance, decrease generally cost, and improve quality to offer the greatest benefit to their clients (Rashid M., 2018).

Innovation change and advancement can help an association quickly track its campaign toward tasks greatness. Innovation modification has prompted changes in administration that can improve consumer loyalty just as authoritative viability and productivity (Rashid M., 2018). Bangladesh must increase its technological competitiveness in garment production to capture a greater share of the global apparel industry (delegation, 2009). In a dynamic environment, better technology is needed to gain an advantage over rivals. Improved equipment further boosts performance and lowers the cost of system maintenance (Cholet, 2009). Bangladesh will ultimately arrive at the esteemed 50 billion on imprint by 2021, yet only numbers cannot get a supportable future for the business. Alternatively, the business needs to reinforce its innovative essentials to stay competitive and profitable (Akter, 2017). Those software applications fulfilled the conditions of both independent and dependent variables and performed well not only in the RMG industry but in other businesses also. So it is also necessary to find out what the scholars say about ICT applications in RMG sectors in Bangladeshi context.

3.11 Present and Future of Bangladesh’s RMG Sector in Respect of Applying ICT in Operations

It is very rare to find the corresponding literature about ICT application in the RMG sector in Bangladesh but there are a lot about Bangladesh’s RMG in different perspectives like supply chain, fire safety, MFA quota and others. The quick rise of the Bangladesh RMG sector was mostly due to inexpensive labor, location, and a pleasant environment. Bangladesh has the world's

eighth-largest population. This gives Bangladesh a significant edge in providing a large workforce for the clothing sector. Furthermore, Bangladesh has a lower labor cost compared to other nations in this industry. Bangladesh's RMG sector, on the other hand, 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, Bala, & Shah, 2021)

The RMG (readymade garment) industry in Bangladesh has tremendous strengths and enormous capacity to cope with economic growth. The RMG sector is currently Bangladesh's most important manufacturing industry, accounting for more than 81 of the country's total exports. This business, among other things, contributes to socioeconomic growth by creating jobs, alleviating poverty, empowering women, educating girls, and lowering the child marriage rate.

The world is rapidly approaching the fourth-generation industry, in which smart technology will reshape the whole fashion business. Computers that improve quality, electricity, resource usage, supply chain management, internet commerce, and smart clothing are all examples of technology used by RMG. RMG factories have begun to move from semi-automatic to fully automated operations. Low-alcohol dyeing machines, ozone washing machines, SAP, and ERP-like technology are becoming increasingly prevalent. Furthermore, growth in environmentally sustainable industrialization has accelerated in recent years. Bangladesh now has 67 green factories certified by the United States Green Building Council 13 platinum, bringing the overall number of green factories to 91. It is now critical to use emerging patterns and fourth-generation innovations, such as innovative IT (information technologies) management and the Internet of Things (IoT). In the future, 3-D printing developments are expected to cause significant disruption in the apparel manufacturing and retailing industries (Faruque, 2020).

The garment industry must improve production and performance, requiring technological advancements and factory automation. The secret to future business and growth would be speed and optimal use.

It's encouraging to see Bangladesh preparing to meet the need for high-end and branded apparel. RMG's exports have recently grown to include products such as suits/blazers, underwear, active-wear and outerwear, as well as non-cotton items. To increase the industry's growth, Bangladesh must reduce its reliance on these specific goods and construct capacity to meet the demand for high-end and branded apparel segments.

Competing countries have adopted special policy funding for their clothing and textile industries, such as the Technology Upgradation Fund Scheme (TUFS), to recognize the importance of technological advancement for the fashion industry's growth. Bangladesh has made considerable

strides in digital conversion over the last decade, thanks to the government's Digital Bangladesh vision; now, the RMG sector must acquire the benefits of digitalization by embedding it in business, which will need policy support to update. As a consequence, the country's export earnings increase. Entrepreneurs must also keep up with the new technical developments in the market and adopt them.

The education system of Bangladesh should also be up to date. There exists a gap between the education system and industrial activities. Relevant issues must be identified to determine the disparity between skill demand and supply, especially for future industry tasks. It would be simpler for top-level concerns to make policies about them if suppliers, consumers, and experts collaborated to determine current and potential capability needs. Child labor was abolished in 1994, and social compliance, occupational protection, and environmental health have also been addressed (Faruque, 2020).

Bangladesh's achievements in the RMG sector serve as an inspiration to 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" (Md. Shahriar Alam, 2020).

According to many analysts, technology would be a crucial enabler in helping Bangladesh's labor-intensive RMG sector improve productivity. The secret to driving the sector's growth and achieving operational efficiency is access to infrastructure, finance, and financial resources. 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 cutting program that assists RMG manufacturers in increasing efficiency and productivity by reducing cloth waste. It maximizes the use of fabric while also reducing the amount of time and effort needed for order preparation. 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).

The benefits of using technology in the garments industry are obvious. Bangladesh draws the attention of global buyers securing the second-largest manufacturer position in producing apparel

products next after China. Due to increases in wages and raw materials and new investment needed for compliance, apparel production costs rise in Bangladesh. Tech implementation can be a perfect way to save money and stay competitive. Bangladesh must be prepared to take the challenges as it lacks experience with modern technologies because China holds the lead role in this region. Training is essential to fill the lack (Murshedy, 2019).

Automation would ensure quality and cost-effective production. It would bring a positive impact on the RMG sector. Bangladesh would not face the negative impact 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).

Innovation empowers manageable activities to be coordinated entirely into the clothing inventory network regarding the crude materials utilized. The utilization of innovation in the plan interaction is all around reported PC helped plan frameworks currently permit the improvement of virtual examples for clients to choose from, killing the requirement for the expensive, tedious, and model advancement test measure. Top brands such as Tommy Hilfiger, working virtual display areas for introductions to their clients and GAP offering clients enlarged reality changing rooms to perceive how their buys will look from the solace of their own home. Accepting innovation in the actual piece of clothing producing measure brings gigantic manageable favorable circumstances.

Different advantages like texture utilization and use, producing efficiencies and coordination, innovation can offer options regarding power supply using sun oriented, hydro, or wind energy, elective types of transportation to carbon-discharging vehicles, gigantic decreases in the utilization of water and risky synthetic compounds in the washing interaction of pieces of clothing, and generous decrease in energy use through advancements including savvy lighting and warming.

Innovation inside the piece of clothing inventory network can offer immense advantages regarding supportability and the natural effect of our industry on the planet - from fiber through to comply, there exists plenty of activities and items that permit the advancement of up to the moment plans, textures, and completions, with negligible effect on the climate and laborer's conditions. Developments in coloring strategies, producing cycles, and piece of clothing handling procedures offer enormous advantages as far as water and force utilization, with the additional favorable position of limiting the natural negative wellbeing and security parts of the representatives.

Bangladesh RMG industry is picked to acknowledge the advantages to be acquired from development - regardless of whether it be at a business or innovative level, innovation offers the chance for the area to progress in an economical way (Mostafiz, 2019).

The World Bank estimated Bangladesh's GDP to be USD 6.29 billion in 1972, and it increased to USD 173.82 billion in 2014. It is nearly multiple times higher than the most recent forty years (Latifee, 2 February 2016). About four million people work in 4328 garment factories in Bangladesh, of which 85% are women (MTBiz, 07 AUGUST 2017).

Bangladesh earned more than a third of the total fare benefit (approximately 82%) from readymade clothes (Woven and Knitwear). The total cost of readymade garments increased by 8.6% year over year in April-June 2016 but decreased by 0.7 percent from the previous quarter. The increase in ready-to-wear garments sent out in April-June 2016 was mostly due to an increase in the price of knitwear pieces of apparel. Nonetheless, against the April-June 2016 target, absolute RMG trade growth increased by 0.7 percent. In the fiscal year 2016 (July-June), woven and knitwear contributed 43.0% and 39.0% of total fare earnings, respectively. In FY 2015, these two sub sectors accounted for 41.9 percent and 39.8 percent of total fare revenue, respectively (Bangladesh_Bank, 2016).

Textiles and clothing account for about 85 percent of Bangladesh's gross export earnings (K. M. Faridul Hasan, 2016). In recent years, Bangladesh's readymade garment (RMG) industry has established itself as a capable garment producer in the global garment industry.

Thanks to this sector, Bangladesh has effectively transitioned to an export-oriented economy thanks to this sector (Morshed, 2007). The RMG sector plays a unique role in Bangladeshis; it is the country's largest exporting industry. During the last 25 years, this sector has grown at a breakneck rate. The RMG industry now plays a critical role in creating jobs and providing income to the poor. The industry employs nearly four million people, directly and indirectly, and employs over twelve million people. Over the past twenty-five years, the number of manufacturing units has grown from 180 to over 4000 (Haider M. A., 2007).

Population growth, the rise of quick fashion, and quickly evolving trends in the clothing industry have all contributed to increased textile and garment use (Zamani, 2015). Rapid changing style and overutilization inside the material business have prompted a genuine decrease in regular properties. The current pace of populace development and utilization is impractical. As an outcome, there is a developing interest in feasible arrangements. Foundations for reusing a piece of clothing's strands are being explored and created. Simultaneous builds the foundations of clothing and material memory (Mason, 2015). The population growth, the rise of quick fashion, and quickly evolving trends in the clothing industry all contributed to increased textile and garment use (UN, 1987).

Bangladesh produces half of the world's garment exports and almost three-quarters of the world's apparel exports, along with other developing countries (UNCTAD, 2005). Most developed countries now see increased competitiveness and downward market pressure (infoDev, June 2008). Mauritius, for example, has faced intensified competition from other low-cost manufacturing nations like Bangladesh and India. They are ahead of Bangladesh in terms of architecture and other techniques, but not costs (Parker, 2015). Many fashion makers in developed countries were unaware of how core communication systems altered clothing and garment exchange trends. According to recent studies, developed world manufacturers have low online document sharing and only small digitization and amalgamation of commercial activities, with "e"-collaboration in product production being the most frequent (Knappe, 2004).

The support from the locally grown material industry is too little to even think about supporting the more significant piece of clothing fabricating area. If textures are imported from India, its expense will regularly outperform the cut-sew-trim expenses inside Bangladesh. The cut-sew-trim expenses have no approach to avoid or guarantee duty decreases. The provider is powerless, since, supposing that it raised the on-location piece of clothing get-together expenses to take care of the duty issue, at that point, the item would lose its expense intensity (infoDev, June2008).

ICTs can help organizations in developing nations contend more successful articles of clothing and materials. This may be done by explicit specialties or the development of explicit points of interest that focus directly on competing with China on its vital advantages of size and vertical mix close coordination (infoDev, June 2008).

Table 3 1: Literature Review about ICT implementation in the RMG sector of Bangladesh

Authors' Name	Year of Publication	Findings
E.H. Latifee	2 February 2016	RMG sector: most noticeable source of foreign currency recipient
MTBiz	07 AUGUST 2017	According to BGMEA: Total workforce- 4 million; Total garments factories -4328; 85% women.

Authors' Name	Year of Publication	Findings
Bangladesh Bank	2016	Readymade garments accounted for more than a third of Bangladesh's overall export earnings (around 82 percent) (Woven and Knitwear).
K. M. Faridul Hasan	2016	Since 1978, the company has established itself as a major player in the RMG (Ready Made Garment) industry.
Morshed	2007	➢ In the global fashion industry, materialized as a capable garment manufacturer. ➢ Bangladesh has effectively transitioned to an export-oriented economy thanks to this sector.
Debapriya Bhattacharya	October 2002	Bangladesh can now confidently claim to have progressed from a largely aid-receiving country to an RMG trading community.
infoDev	June 2008	➢ Most developing countries are now facing competition and downward pressure on prices. ➢ Countries that were almost entirely reliant on the quota system and lacked basic competitive advantage and technology are unlikely to see ICT investment to save their textile industry. ➢ When developed nations adapt to the modern age, ICT will play a critical role. ➢ ICT will help some developing-country businesses perform more successfully in the global garment and textiles industry. ➢ The lack of vertical integration due to low raw material demand and minimal cloth processing is one of the country's major disadvantages as compared to India and China. ➢ Using an Enterprise Resource Planning (ERP) framework, which incorporates order management, materials procurement, packaging, account managing, and logistics, bottlenecks may be eliminated, and efficiencies greatly enhanced.
Tjia	2005	ICT includes: ➢ Software ➢ Activities involving software ➢ Solutions for ICT providers ➢ Applications in ICT

Authors' Name	Year of Publication	Findings
		➢ Items related to software ➢ Embedded software that is installed on a computer
Cheng-Min	2006	Capturing, encoding, preserving, and disseminating information through electronic means.
Ahamed	June 30, 2014	IT solutions such as ERP, HRIS, efficiency, and financial management applications are in high demand in the manufacturing sector.
P.B.Jhala	1991	CAD/CAM technology is gaining widespread acceptance in the textile industry to design and construct textile equipment.
R. Khan	2017	➢ Textile designers and manufacturers can access thoughtful and creative designs with the click of a mouse, thanks to computer-aided design (CAD). ➢ Technology conversion and innovation can help an organization fast-track its expedition toward operational excellence. ➢ Probably Bangladesh will eventually reach the cherished 50 billion mark by 2021, but only numbers cannot secure a sustainable future for the industry. Instead, the industry needs to strengthen its technological fundamentals to remain competitive and profitable
Nyenroad-Business-University	2014	Since 1997, the Bangladeshi government has only formally acknowledged the promise of the Bangladeshi ICT industry and its economic influence.
BASIS	2012	About 75% of businesses are interested in custom application creation and management, with 50% focusing on IT enabled services.
M. Rashid	2018	Changes in business strategies have resulted from technological advancements, increasing customer loyalty, corporate efficacy and productivity.
T. Delegation	2009	To increase its productivity in textile production, Bangladesh needs to improve its technology use.

Authors' Name	Year of Publication	Findings
E. Cholet	2009	In a dynamic environment, business leaders must use superior technologies to gain an advantage over their rivals. Improved equipment further boosts performance and lowers the cost of system maintenance.
B. Zamani	2015	Population growth, quick fashion and quickly evolving trends in the clothing industry have contributed to an increase in textile and garment use.
S. Alam	2016	Technology would be a crucial enabler in helping Bangladesh's labor-intensive RMG sector increase productivity.
G. Giannopoulos	2004	Classifications of ICT: 1. Network maintenance and operation; 2. Users' information and advice; 3. Freight transportation company operation and maintenance.
A.Merchandiser	2016	The key goal of ERP is to get all of an organization's data under one roof so that planning and implementation decisions can be made with maximum clarity. ERP is implemented in the following areas: 1. Textile ERP: Accounts, DSS, MIS, Trade financing, Supply chain, Inventory & Warehousing, Sales, Marketing, Laboratory, Production & Production Schedule Management, QC & Packaging, Distribution 2. Buying House & Garment ERP: Order Management, Sourcing & Supply, Commercial Management, Production, QC Management, Accounting, HCM, Courier Management, MIS & DSS, Dashboard. 3. HRM and Payroll area: Sift-wise Attendance Management, Leave Management, Holiday Management, Salary Scheme, Payroll, Disciplinary Action, Promotion, Transfer, Recruitment, and Employee Role Management.

Authors' Name	Year of Publication	Findings
Hodge	2002	The key obstacles to system implementation, according to respondents, are resistance to reform, a lack of top management support, and user training and education.
D. Amoroso, M.Bae, Gooi Sai Wenga	2017,2018, 2017	➢ Continuance intention, also known as behavioral intention to use, has become a common use result. ➢ Users plan to proceed using the Information Communication Technology (ICT) that has been implemented.
Aries Susanto	2016	Users' decision to stick around is heavily influenced by perceived utility and confidence.
Davis	2013	The mark to which a person assumes that using a specific device will improve their job performance is perceived usefulness.
(Roger C. Mayer	1995	Whether or not it has the right to supervise or monitor the other party, one party can be bound by the other because it wants the other party to do a certain act.
Pavlou	23 Dec 2014	➢ Trust reduces behavior uncertainty. ➢ Increases the sense of power over potentially risky purchases.
J Laugesen	2015	➢ As factors, service and information content have been chosen. ➢ The term "service" refers to an ICT-based service.
Zhou	2012	➢ Relevance, precision, adequacy, and timeliness are all information quality indicators. ➢ All the valuable knowledge contained by the ICT is included in the ICT's information.
Christensson P	2018	➢ ICT (Information and communication technology) is becoming more prevalent in the digital world. ➢ In the digital era, the components of an ICT scheme.
Faruque Hassan	2020	➢ ICT and the future of Bangladesh's RMG Sector
Prasanta Sarkar	2017	➢ ICT used in the RMG sector

Authors' Name	Year of Publication	Findings
Zaved Karim	2018	➢ Hardware using in ICT ➢ Software using in ICT
Shahriar Alam	2020	➢ IT and the Present Growth the of RMG Sector of Bangladesh
Manasij Ganguli	2020	➢ IT and the Present Growth with of RMG Sector of Bangladesh
Abdus Salam Murshedy	2019	➢ IT and the Present growth with of RMG Sector of Bangladesh
Economist Mostafizur Rahman	2019	➢ Positive and Negative Impacts of Implementation of ICT in RMG
Fazlul Hoque	2019	➢ Comparison between robotics and human labor
Mostafiz Uddin	2019	➢ Technology and innovations and advancement in RMG

3.12 Finding the Research Gap

A gap in the research can be observed in the "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 work 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 much smaller due to the shameful use of available resources and the need to demonstrate the positive effects of ICT in increasing the operational brilliance of both operational use and administrative. People are inquisitive about 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 clear 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 be possibly carried out in this area through various sources' specific collection of information (Molla, 2018).

These cavities offer considerable potential for a critical examination of the progress of information in this area. The present study believes that these research gaps will be filled up by the importance of the topic in theory, practice and contribution to this area.

3.13 Conclusion

This chapter has introduced a detailed discussion of the available relevant literature. The chapter started with a presentation of the ICT use in RMG sectors literature, including an explanation of what we refer to when talking about ICT in RMG sectors and the literature on ICT in RMG sector's success and evaluation. The following sections discuss the literature on the attributes that will be incorporated into the proposed model, including the system and the individual's benefits attributes and the benefits organizations obtain from using ICT in RMG sectors in Bangladesh. At the end of this chapter, the proposed conceptual SEM was introduced along with the proposed hypotheses.

CHAPTER 4: HYPOTHESIS DEVELOPMENT AND RESEARCH METHODOLOGY

4.1 Introduction

This approach is founded on a synthesis of available literature and the researcher's interactions in using information communication technologies in the readymade garments industry. The steps of a proposed research technique are shown in Figure 1. The steps can be arranged in any order. The arrows indicate the phases' regular interdependencies. Following that, the methodology, research architecture, test population, sample size sampling procedure, research equipment, data gathering procedure, experiment reliability and validity, data interpretation, ethical issues, and study limitations were addressed, followed by an overview and conclusion.

Phase 1: Problem Background

This process focuses on understanding the study priorities and criteria from an environmental standpoint, then translating the information into an issue concept and a preliminary strategy to achieve the goals. The proposal is the result of this process.

Phase 2: Suggestion

During this step, make a rough design based on the issue description to meet the study's goals. The tentative concept is the product of this process.

Phase 3: Development

The Tentative Design will be put into action. This phase's contribution is an artifact.

Phase 4: Evaluation

Acceptance is the result of this phase. It used a quantitative approach built on a methodology like the Technology Acceptance Model (TAM). The test was carried out to see if the device monitoring model was right.

Phase 5: Result

It is the culmination of a complex study effort and the final step of theoretical testing methods. This phase's production is documentation.

4.2 Developing the Conceptual Model

Figure 4-1 depicts our initial conceptual SEM based on prior discussions and theoretical and analytical research in the literature. This is simply to demonstrate the interrelationships between the constructs and the idea of the ultimate result or effect of using ICT in RMG sectors, which is the study's key objective.

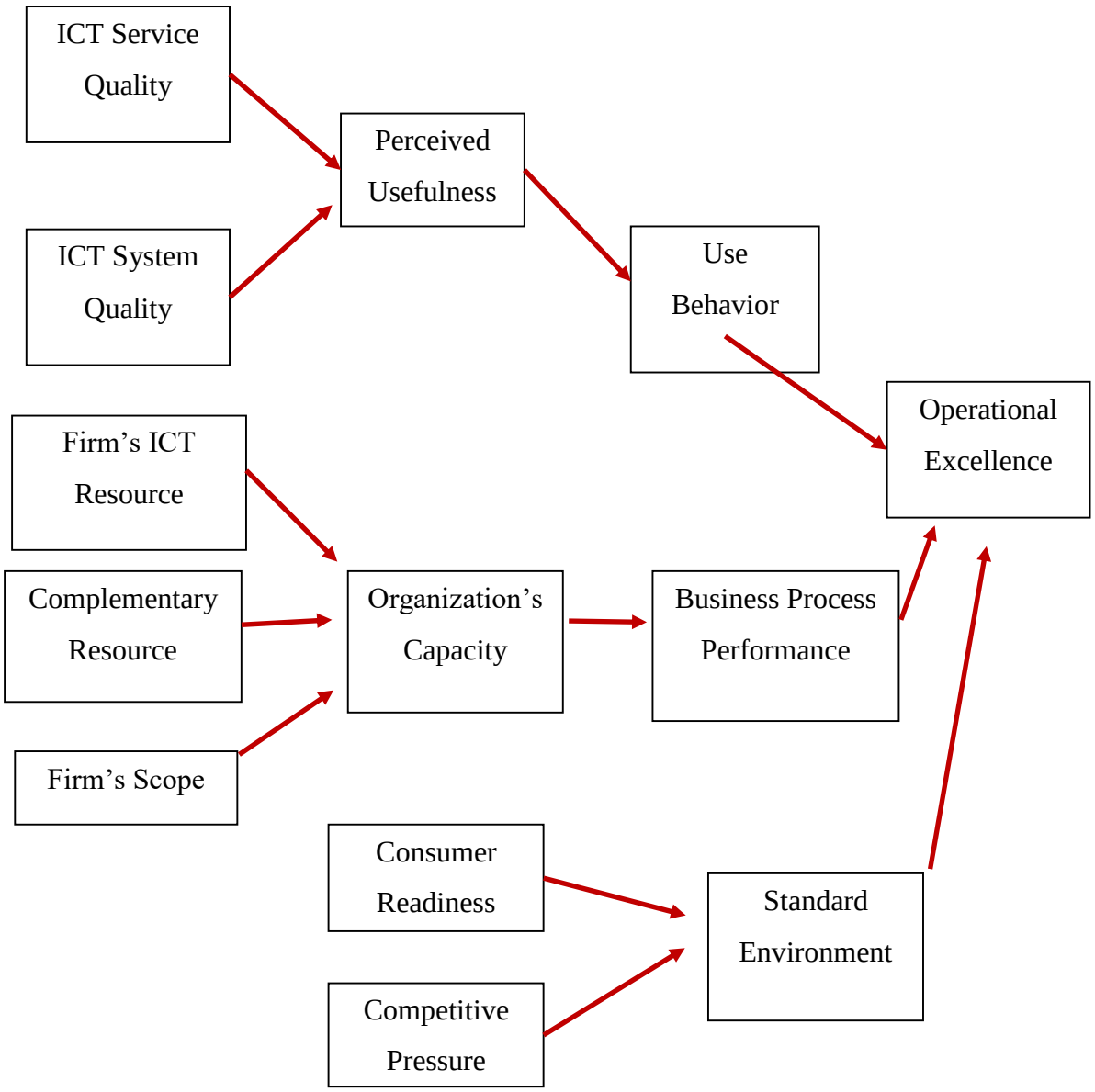


Figure 4 1: Conceptual Structural Equation Modelling (SEM)

Although this research focuses on evaluating the results in terms of the received final benefits from using ICT in RMG sectors with a specific performance operational excellence, which involve 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 important variable in this context, yet was poorly studied in the ICT use in RMG sectors literature.

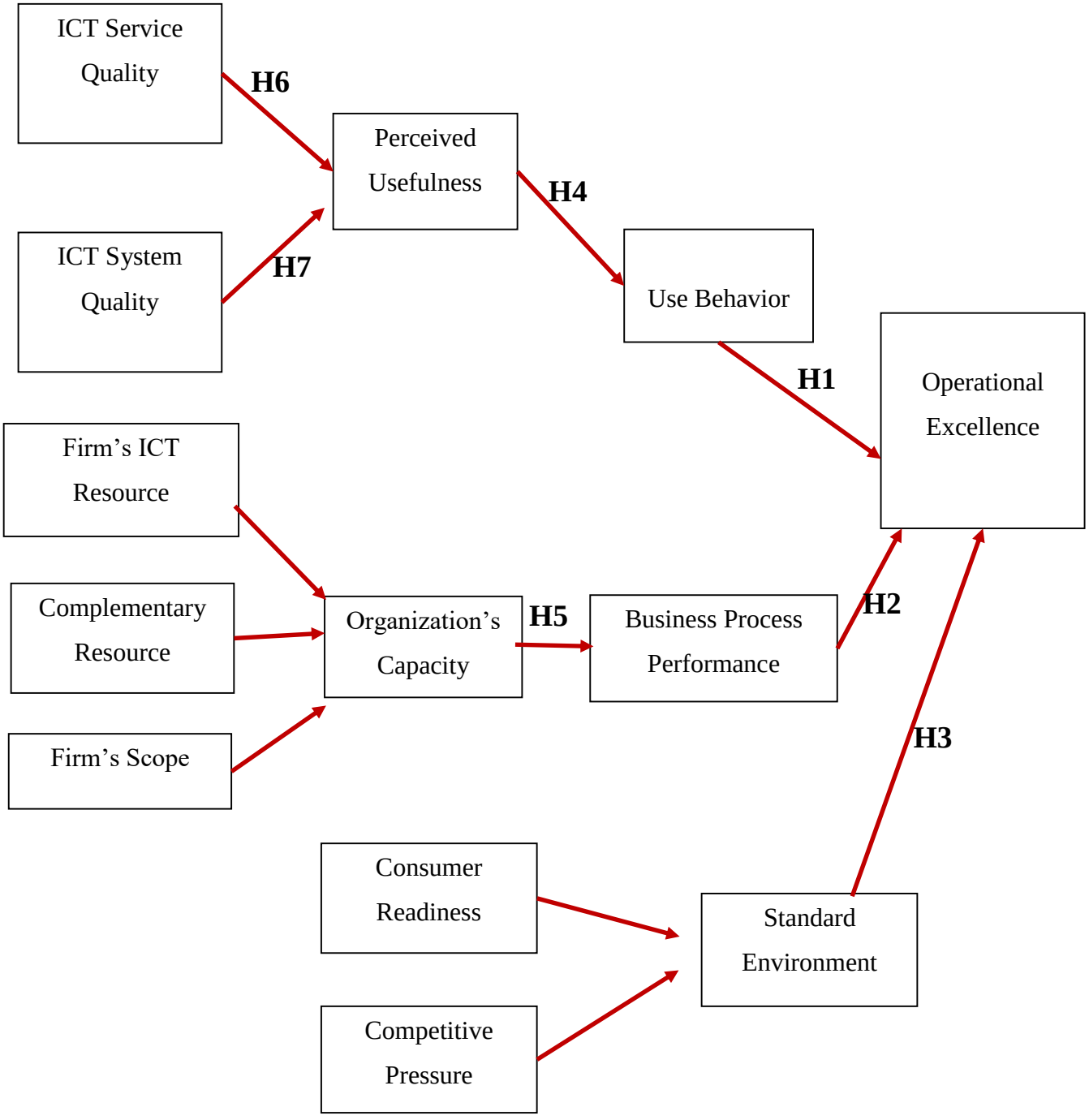


Figure 4.2 : The proposed conceptual CEM showing the hypotheses

However, a consequence of distinguishing between the Psychological and Tangible Benefits in the second version of the model (shown in Figure: 3-2) is also needed to validate the relationship between the tangible and the psychological benefits. Moreover, the quality of the system's output is related to the quality of the services that users receive and the system's outcomes which are mostly related to the 'tangible' consequences of using the system (saving time, effort, cost, etc.). Therefore, in this study, it is to be hypothesized.

Table: 4-1 lists the hypotheses of the direct/indirect paths of our proposed model (CEM) incorporated with some supporting references from the literature.

Table 4.1: The hypothesis of the direct/indirect paths

Table 4.1: The hypothesis of the direct/indirect paths	
H1	User behavior of ICT positively affects operational excellence.
H2	Business process performance positively affects operational excellence.
H3	A standard environment positively affects operational excellence.
H4	The perceived usefulness of ICT applications positively affects user behavior.
H5	An organization's capacity positively affects business process performance.
H6	ICT's service quality positively affects the perceived usefulness of ICT applications.
H7	ICT's system quality positively affects the perceived usefulness of ICT applications.

Table: 4-2 Defines the organizational meanings of the structures in the model based on the literature review.

Table 4.2: Operational definitions of the model's structures.

Constructs	**Operational definitions of the constructs**
Operational Excellence(OE)	Operational excellence involves making continuous improvements to achieve a competitive advantage.
Use Behavior (UB)	Refers to the citizen's behavior to use ICT in the future.
Business Process Performance (BPP)	Business process efficiency aims to ensure that strategic and organizational priorities are met while also assisting decision-making for continuous process optimization.
Standard Environment (SE)	Environmental standards are regulatory laws or civil law guidelines governing the environment's 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 is 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 described as a state in which a customer is ready to try out 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.

4.3 The Path to Research Objectives to Hypotheses Development to Results

It is important for a thesis to connect its research objectives to the conceptual model and then to the results. It is done here also. To get a better understanding, a table is present here. This table's research objective is related to hypotheses and a conceptual model. Then results are depicted as they are accepted or not.

Table 4.3: Matching Paths from research objectives to hypotheses to results discussion

Research Objectives	**How to Match with Results**
RO1. To analyze the current ICT applications of the RMG sector of Bangladesh.	Open-ended questions answers like demographic questions about ICT usage.
RO2. To investigate how ICT applications affect on operational excellence of firms.	Hypothesis 1, 2, 3, 4, 5
RO3. To investigate how to improve the ICT infrastructure of whole Bangladesh that will lead to more profitability and excellence	Hypothesis 6 and 7. (Data about 350 RMG organizations gave the scenario about overall Bangladesh)

4.4 The Chosen Method

To validate the proposed conceptual model, there is a need to get data about a fixed number of well-defined constructs from an enormous sample of appropriate people representing the target population. The most, if not the only, feasible way to do so is by using a survey conducted with the questionnaire method.

A questionnaire was also chosen, as the data needed to validate the model is not available in any published sources; therefore, it needed to be explicitly gathered for this study. There was no need to drill down because the constructs were well understood. In addition, interviews and focus groups may have been considered as methods; however, these options were difficult to apply because:

1. They would take too long to administer.
2. They are not well suited to gathering the same data from many people.

4.5 Research Philosophy

Since this study is solely evidence-based, positivism (highly systematic, extensive surveys, calculation, quantitative, but can use qualitative) research theory (is a concept about how data about a subject should be collected, interpreted, and used) is used in this analysis.

4.6 Research Approach

According to Saunders (2007), there are three approaches: deductive, inductive, and adductive in the third stage of the research onion model. The deductive approach (aimed at testing theory) has been used for this study. Here, the researcher has developed seven research hypotheses based on the current scenario of ICT in Bangladesh.

4.7 Research Strategy

A research strategy is a step-by-step course of action that directs one's thoughts and actions, allowing one to perform a study consistently and on time, resulting in high-quality findings and detailed reporting. Malhotra stated that three different research strategies could be used: exploratory, descriptive, and causal research (Malhotra, 2010).

This study style aims to shed light on existing challenges or concerns by a data collection approach that allows them to explain the situation in greater detail than was previously feasible. The method used in this analysis is descriptive testing. Descriptive research can describe the current situation, with the researcher not influencing the variables. Furthermore, descriptive research can be described as an effort to assess, explain, or classify what exists.

4.8 Research Types

Malhotra suggested qualitative and quantitative analysis methods (Malhotra, 2010). Quantitative analysis uses numbers to explain, infer, and solve problems. The compilation of numerical data, the description of such data, and the drawing of inferences from the data are all emphasized. On the other hand, qualitative analysis is focused on non-numerical and unquantifiable elements such as sentences, thoughts, impulses, and sounds. It has been pointed out that knowledge should be classified as qualitative if it cannot be interpreted using mathematical techniques. This trait may also indicate that an event occurs infrequently enough to retrieve accurate evidence (Dudovskiy, 2018). This thesis used the quantitative approach to complete the analysis, which aligns with the research philosophy.

4.9 Research Methods

Deductive analysis is often correlated with a survey technique. Survey and observation are the two methods to conduct descriptive research, which is proposed by Malhotra (Malhotra, 2010). In this research, the survey method is applied. It provides the researcher with a cost-effective method of gathering vast data to answer the questions of who, what, where, why, and how about any given subject or problem (Derby, 2009).

4.9.1 Population Definition

The prime respondents and participants of this research will be from the RMG sector in Bangladesh. The respondents will include both females and males from various garments institutions, focusing on the garment's IT staff, managers, and owners.

4.9.2 Sampling Method

Malhotra proposes two alternatives to sampling: probability sampling, in which each object has an equal chance of being chosen, and non-probability sampling, in which each object does not have an equal opportunity of being chosen (Malhotra, 2010). Judgmental sampling is used in this analysis. Judgmental sampling is a non-probability sampling procedure in which the researcher chooses sample units depending on their experience and expert judgment. Purposive sampling and authoritative sampling are two terms for this method of technique.

4.9.3 Sampling Frame

Information is collected from the RMG sector's staff, managers, and owners of the various Garments organizations.

4.9.4 Sample Size

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). According to the ten times rule of PLS SEM (*researchgate.net*, 2018), there should be at least eighty samples in our study. This study's sample size would include at least 300 employees (including IT and managerial personnel), 30 managers, 10 business owners, and others.

Sample Size Determination step-1

Formula- S = Z^2 * P *(1-P)/ M^2

- S = Sample Size for infinite population
- Z = Z score Value (At confidence level 95% = 1.96)
- P = Population Proportion (Assume to be 50% = 0.5)

- M = Margin of Errors (At 5% = 0.05)

= 1.96^2 *.5 (1-.5)/.05^2

= 384.16

Sample Size Determination step-2

Formula- SS = (S)/1+[(S-1)/Population]

- SS = Sample Size
- S = Sample Size for infinite population
- Population = Total Population Size

= 384.16/1+ [(384.16-1)/3500]

=346

4.10 Survey Design

A closed-ended questionnaire with a five-point Likert scale, varying from strongly disagree to strongly accept, was used in the survey. The most widely used instrument in survey studies is the Likert scale, typically used in questionnaires. Since "satisfaction," a psychometric indicator, was used as a dependent variable. Since other structures in the model are focused on perceptual variables, the survey questions were asked on a Likert scale. Respondents specify their level of agreement to a statement when reacting to a Likert questionnaire subject. It's used to gauge people's beliefs, desires, and feelings. Likert scales and other attitudinal scales assist in the method design by helping to consider people's subjective and preferential reactions.

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 important measures but were not found explicitly in the previous similar studies in the RMG sectors of Bangladesh, were added. Three categories of calculation elements were added to the questionnaire as a result of the literature review:

a. An exact copy of questions found in previous studies, or,
b. Questions were similar to those in previous surveys, but the terminology was subtly changed to suit the RMG sector's ICT application sense or,
c. New steps were added as a result of the literature review's principles.

All of the questions in the questionnaire were obligatory. This was done to ensure that all questions were answered and to minim missing answers.

In the survey questionnaire, all questions are arranged in three major parts. The first part dealt with gathering detailed knowledge about the organization and its use of ICT. The second section was created to assess perception, mood, and how these factors contribute to the choice assessment. The final part was developed to identify the respondent's problems and suggestions.

4.10.1 Measuring Instrument

There are two categories of measuring instruments, Researcher-completed Instruments and Subject-completed Instruments (Research Rundowns, 2018). Of the two categories of Measuring Instruments, Rating scales of Researcher-completed Instruments and Questionnaires of Subject-completed Instruments have been used in this research.

4.10.2 Scaling method

In the questionnaire, 5 points Likert scale is used under itemized rating scale, which is under the noncompetitive scale.

4.10.3 Data Collection

Logically, choosing a large, representative random sample provides an opportunity to gather data and understand the different views of ICT users in RMG sectors. Therefore, in an attempt to obtain a sufficient number of responses, the following was conducted:

a. Recruited participants through different channels (i.e., different kinds of email campaigns, personal invitations). Personal invites involved interviewing university students who were invited to participate in the research and issued the questionnaire willingly. Another approach was through requests to various friends and colleagues, and all were requested to publicize the survey further. The targeted individuals were from both genders and with different educational backgrounds and occupations and,
b. Provided an English version of the online questionnaire and offline questionnaire.

4.11 Validating the Model - the Statistical Approaches and the Analytical Processes

4.11.1 Potential Statistical Approaches

For any researcher to choose a statistical tool for testing something, one should consider the context of the study and the nature of the model or approach to be tested. In other words, it is important to choose the methodology which suits this objective. Since a numerical scale is being used in the questionnaire, in determining the strength of the association and statistically significant relationships between the variables, Chi^2 test and Pearson coefficient test could be used to test the hypotheses.

Path analysis is a technique for describing the guided relationships between variables. Rather than just investigating a direct correlation between two constructs, it is necessary to understand all the connections and accumulative effects of the model constructs. Hence, the model developed here is based on the accumulated effects of the factors that impact one's intentions

to use the system to obtain an understanding of the psychological and Tangible Benefits. This means that the conceptual model has different direct and indirect paths leading to the attainment of benefits, and the significance of each path needs to be measured. For that reason, the most appropriate statistical technique to be used is the structural equation modeling (SEM) technique.

4.11.2 Regression Analysis

In statistical modeling, regression analysis includes some statistical processes for assessing relationships between dependent and independent variables. It can be applied to assess the strength of the relationship between variables and for modeling the future relationship between them. Regression analysis consists of several variations, such as linear, multiple linear, and nonlinear. The most common models are simple linear and multiple linear. Simple linear regression analysis is used to s the relationships between the dependent and independent variables. Nonlinear regression analysis is generally used for more complicated data sets in which the dependent and independent variables demonstrate a nonlinear relationship.

4.11.2 Structural Equation Modeling (SEM)

SEM is a mathematical methodology that uses a mixture of statistical evidence and contextual causal observations to test and estimate causal relationships. It's used to look at ‘complex' correlations between observable (measures) and unobserved (latent) variables and between two or more latent variables. It's an efficient multivariate tool for evaluating a set of concurrent assumptions regarding the effect of latent and manifest variables on other variables, and it can have several dependent variables when accounting for calculation errors. Path analysis, multiple regression, factor analysis, and concept component analysis are examples of multivariate statistical methods. SEM is used to assess path importance in confirmatory and explanatory modeling, but it performs better in the confirmatory model.

4.11.3 Data Analysis Techniques

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.

4.12 The Common Steps and the Related Concepts of PLS Validation

Since it is important to consider the principles and terms used in PLS-path modeling to understand the findings described, this section includes a brief explanation of PLS-path modeling. 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). Figure 4-2 shows the proposed conceptual model as it appears in Smart-PLS; it can be used as a guide to explain further the ideas discussed in this section.

In PLS-path modeling statistical analysis, one must distinguish between an outer and an inner model, referred to as the calculation model and the structural model, respectively.

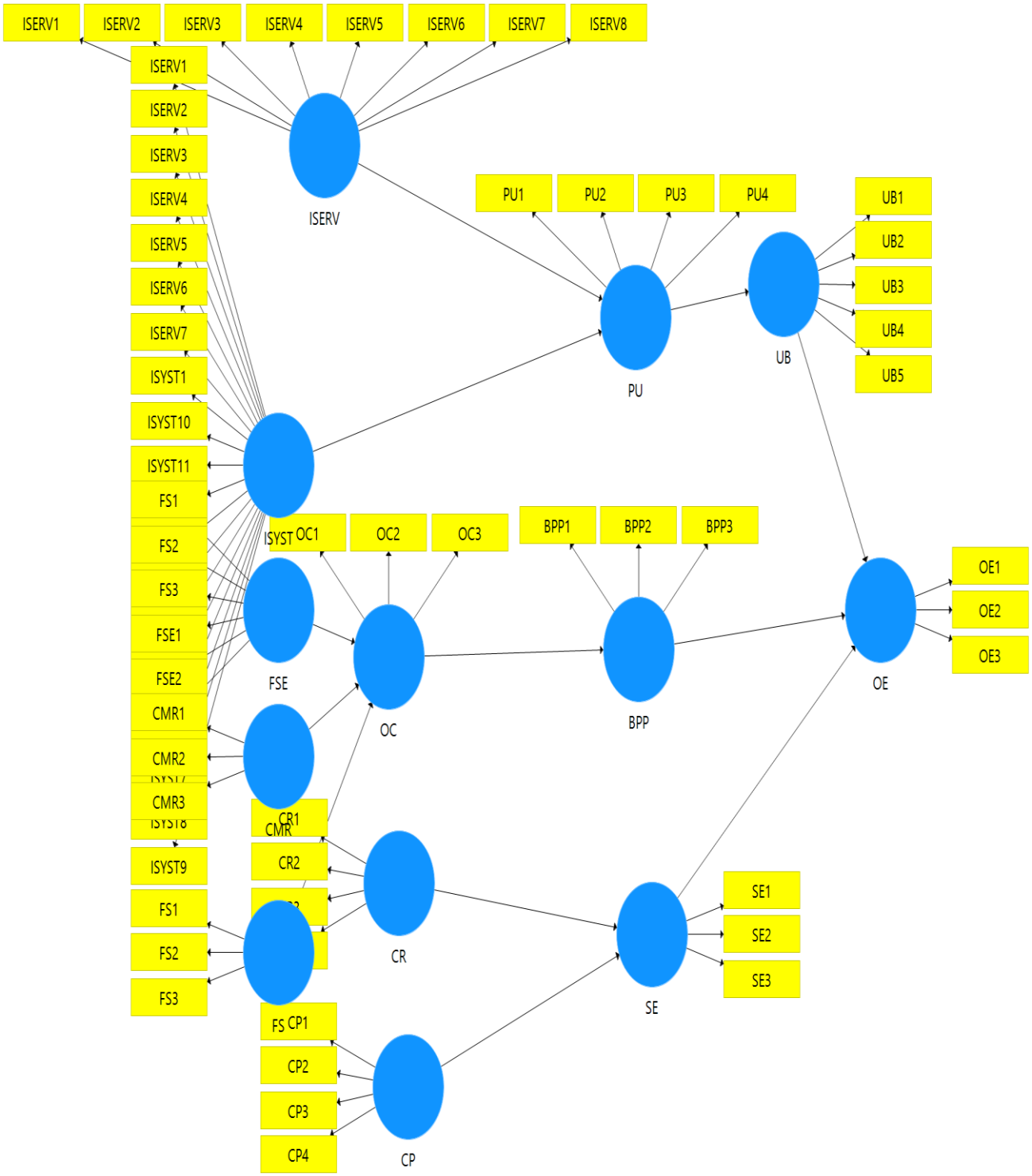


Figure 4.3: The Structural Model and Measurements

The relation between each ‘unobserved' construct or latent variable (LV) (blue circles) that need to be predicted and the independent ‘predictors,' which are the ‘indicators' or ‘observed measurement objects' (yellow squares) that are often referred to as ‘manifest variables,' is redirected by an outer or measurement model (MVs) (Ringle, 2010). Factorial analysis is used in the estimation (outer) model study (G.Mateos-Aparicio, 2011).

The measurement model could be one of two kinds: a formative or a reflective model (J.Hulland, 1999), or even a combination of both. In a reflective model, the LV causes the MV to happen, i.e., the MVs reflect the ‘effect’ of the LV; and the values that appear on the paths leading from an LV to each of its corresponding MVs are called ‘factor loadings’ (Henseler J. M., 2009).

On the other hand, in a formative model, the MVs forecast or cause the LV to happen, i.e., the relation between the MVs and the corresponding LV is causal, and the LV is considered to be “a combination of its indicators.” The values that appear on the paths that lead from each MVs to their corresponding LV in a formative calculation model represent the ‘weight' of influence for each MV in relation to its LV and are thus referred to as ‘weight coefficients' (Ringle, 2010). Deciding whether the indicators should be formative or reflective is very much reliant “on the nature of the unintentional relationship between the indicator and the LV” (A.K.Bollen, 1989). This relationship has been considered a reflective model in the proposed conceptual model, so the paths in the measurement (outer) model in Figure: 6-1 are shown pointing from the LV to the MVs.

An inner or structural model is a series of guided paths that reflect a “causal chain” between constructs or LVs, (Henseler J. M., 2009). The relationship begins with one constructor LV and ends with another LV. In some instances, a structural model is a computational model that has been proposed (Ringle, 2010). The relationship between the LVs in a structural model is called "formative" due to the "predictive" structure of the routes. An “exogenous” LV is independent of and forecasts another LV, while an “endogenous” LV is projected, based on, or explained by another LV (Chin, 2009).

A ‘path analysis' method interprets the structural (inner) model (G.Mateos-Aparicio, 2011). The values on the paths between each of the LVs in the structural model are called ‘path coefficients.' the amount of change (increase/decrease) in the endogenous LV when the exogenous LV increases by one standard deviation recalled a direction coefficient (assuming standardized data). For example, if a particular path coefficient were X, an increase of 1 SD in the exogenous LV would increase X in the SD of the dependent variable.

The validation of a model can be done in two steps, with estimation and structural model evaluations taking place separately (Weisz, 2010). Before trying to conclude the existence of

the constructs' relationships, this is done to ensure that the measuring objects for each construct are dependable and accurate (J.Hulland, 1999). Assess the goodness of the calculation (outer) model first before validating the structural (inner) model (Ahlemann, 2010). Given that the proposed measurement model is entirely reflective, the evaluation parameters discussed in this chapter are only applicable to reflective models.

4.12.1Assessment of the Measurement Model

4.12.1.1 Validity

Validity refers to the degree to which an assessment's nominated assessment evaluation objects conform to a certain construct or LV as expected by a hypothesis. The measuring instrument measures the properties it is supposed to measure to ensure no bias or misrepresentation. If an assessment measurement is valid, then the full content of a concept's definition is encompassed in the measure.

Content and construct validity are also checked during the factor study. Content validity is described as the evaluation of metrics and their associated LV to ensure that researchers conclude that an instrument has content validity because it includes all of the measurement objects that cover all of the aspects that should be evaluated for a given variable (construct) (Bhaskar, 2010). In other words, the content validity of an instrument refers to the extent to which it provides sufficient coverage of the measures used in the investigation or study where all the variables that share the same concept are included under the study (Bhaskar, 2010). On the other hand, the construct validity reflects the aptitude of the measurement items in adequately measuring a proposed theoretical construct (Prous M. J. G. D. Y., 2009).

Convergent and discriminant validity was used to evaluate the outer model's validity. Convergent validity determines the degree of correlation between objects that are ostensibly linked to one another. It "indicates that a group of measures all reflect the same fundamental construct, as shown by their uni-attributability" (Henseler J. M., 2009).

The Average Variance Extracted (AVE) is a metric of convergent validity that compares the proportion of explained variance captured for a given LV in a family member to the sum of variance attributed to measuring error .AVE ranges between 0 and 1 and is considered acceptable at a minimum threshold of 0.5 (Fornell, 1981). An AVE greater than 0.5 indicates that an LV can describe more than half of the variation in its measures on average (Henseler J. M., 2009). The variance due to measuring error is larger than the variance due to the construct if the AVE is less than 0.5. In this case, the construct's convergent validity is debatable. Discriminant validity determines whether the factor loadings are well recognized. On the other hand, discriminant validity refers to the degree of association between measurement items from

one construct and measurement items from other dissimilar constructs that should not be associated. This test shows how much the variance is attributed to a block of constructs where two “conceptually different” constructs should be sufficiently dissimilar to one another (Henseler J. M., 2009). The Fornell-Larcker-Criterion and cross-loadings are two methods for measuring discriminant validity; the former is done on the building level, while the latter is done on the indicator (measurement item) level (Henseler J. M., 2009). The Fornell-Larcker-Criterion is based on the idea that certain measurement elements can describe more variation in their given LV than others. When discriminant validity exists, each LV's AVE exceeds the squared correlations with all other LVs, or the square root of the difference is greater than the derived correlation with the other LVs. This implies that each LV has more variation in its own set of measurement products than any other LV (Henseler J. M., 2009).

The second method for determining discriminant validity is to degerming the loading of markers, such as cross-loading and factor loading. The cross-loads concern is deciding if the loadings of the measurement items on their given LV are the largest compared to the loadings of the other measurement items on this particular LV. To put it another way, an indicator's loading on an LV should be higher than its loading on any other LV (Fornell, 1981). As with the assessment of the factor loadings, each indicator on its apportioned LV should be higher than 0.7, which indicates that each indicator contributes to explaining at least 50% of the variance in the corresponding LV (W.W.Chin, 1998).

4.12.1.2 Reliability

Reliability refers to the level of confidence that can be proposed instrument in providing the same numeric values of the results throughout repeated or replicated measurements. Internal consistency reliability is the term for this. It shows the extent to which a measurement gives consistent results. The indicator reliability and the proportion of indicator variation explained by the LV are also reflected in the reliability. It tests the internal dependability and indicator reliability to determine the measurement model's reliability, which is especially important in reflective models.

Composite Reliability (for Dillon Goldstein's Rho) 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, and 0.8 is considered good and 0.9, which 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. In general, researchers believe that an LV should be able to justify a significant amount of uncertainty for each indicator (at least 50) and that a "reflective" indicator should be removed from the calculation model if its loading is less than 0.4 (Henseler J. M., 2009). To consider an item loading trustworthy, it must exceed the threshold of 0.7, and the squared loading (i.e., the variance explained for the indicator) must be higher than 0.5.

Table 4-4 summarize the evaluation parameters used to determine the validity and reliability of a reflective calculation (outer) model (Ahlemann, 2010)

Table 4-4: The assessment criteria to determine the validity and reliability

Measurement reliability of the indicator	***Internal consistency***	
	Criterion	Description
	Cronbach α	The minimum acceptable threshold is 0**.7**, preferably is more than 0**.8**.
	Composite	The composite reliability must not be lower than 0**.7**. **reliability**
	Indicator reliability	
	Criterion	**Description**
	Factor Loadings	At the 0.05 stage, absolute uniform outer (component) loadings should be substantial and greater than 0.7. Higher thresholds are appropriate in an exploratory study.

Measures of validity of the factors of the LV	***Convergent validity***	
	Criterion	**Description**
	AVE	The derived average variance should be greater than 0.5.
	Discriminant validity	
	Criterion	**Description**
	Fornell Larcker	The AVE of each LV should be higher than the squared correlations for all other LVs to ensure discriminant validity, which ensures that each LV shares more uncertainty with its block of indicators than with any other LV.
	Cross-Loadings	The model's appropriateness should be reconsidered if an indicator has a greater association with an LV than its respective LV.
Measures of unidimensionality of the LV	**Criterion**	**Description**
	Exploratory factor analysis (EFA)	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 to be expected.

Table 4-4 summarize the evaluation parameters used to determine the validity and reliability of a reflective calculation (outer) model (Ahlemann, 2010)

4.12.1.3 The Effect Size (f^2)

Researchers and general practitioners who use PLS-path modeling should also analyze their hypothesized path model of direct results compared to the former two conventional studies. They should do further research into mediating and moderating effects to learn more about potential imaginary or suppressor effects (Henseler J. M., 2009). This test is generally conducted by hand and is referred to as the Cohen (1988) F-test. The F-test is 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 J. M., 2009). For example, a researcher might test a 'full model' (which included a particular moderating LV) and calculate the R^2. Then exclude the moderating LV and recalculate the R^2 in the reduced model to see the change of proportion in the explained variance of the ultimate DV (AU, 2008). 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 J. a., 2010) A low f^2 should not be overlooked, however, since it does not always imply that the resulting moderating effect is insignificant; instead, a minor interaction effect may also be considered important to some degree (W. W., 2003).

4.12.1.4 The Prediction Relevance (Q^2)

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 J. a., 2010) The blindfolding protocol (Tenenhaus, 2005) , can be used to determine the predictive importance of endogenous LV in reflective measurement models (Henseler J. a., 2010).

The blindfolding algorithm can occasionally be called "boot-cross" because it is a "cross-validation" (CV) procedure used with standardized data. It is, to some extent, a combination between PLS algorithms and bootstrapping. This technique gives a Q^2 statistic which is a criterion that tells how good the model is in predicting missing values in the data set or how well the model estimates the omitted data blind-folds some of the data set (say, for instance, every seventh one) and makes it blank, then endeavors to predict the model, which is then compared to the actual model (without the missing values) (Tenenhaus, 2005).

The sum of the squares of prediction errors (SSE) is compared to the sum of the squares of the initial "omitted" values to determine Q2's statistical significance (SSO). The Q^2 can be measured to be used for two things; CV redundancy and CV commonality, where the former measures the predictive relevance of each separate regression model within the structure model, and the latter measures how good is the block of indicators (the LV) to predict (by itself) the missing values (Tenenhaus, 2005).

Table: 4-5 summarizes the assessment criteria for the structural (inner) model validity (Henseler *et al.*, 2009; Urbach and Ahlemann, 2010).

Table 4 5: The systemic model validity evaluation criterion.

Measuring the path significance	**Criterion**	**Description**
	Path coefficient	The significance (using t-values produced by bootstrap), algebraic sign (to determine if the relationship between the LVs is positive or negative), and magnitude of path coefficients between the LVs should all be considered.
Measuring the explained variance(R^2)	**Criterion**	**Description**
	R^2	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.
Measuring the effect size of moderating effects (f^2)	**Criterion**	**Description**
	f^2	Measures whether an independent LV has a significant impact on a dependent LV. The values of 0.**02**, 0.**15** and 0.**35** in the predictor variable indicate a low, medium, and large impact in the structural model, respectively.
Measuring the predictive relevance(Q^2)	**Criterion**	**Description**
	Q^2	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 high 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.

When assessing the validity of a structural model using PLS, IS research papers do not commonly use predictive relevance, although it is used in marketing research. Most research articles that use PLS to assess a structural model use only the path significance (t-value) and

the explained variance (R^2). See, for example, (Weisz, 2010). So, given the nature of the study's model and the context of this research, it uses only the path significance and the explained variance (R^2) to assess the structural model in the proposed model (SEM).

4.13 Ethical Consideration

In this research, personal data of the respondents have been collected, such as their name, email, and work experience. However, this privacy and security information will not be leaked instead be perfectly protected by the researcher.

4.14 Research Limitations

There is very little research conducted on ICT usage or ICT applications in the Garments Sector in Bangladesh. This research could fill the void by investigating ICT implementation and sustainability initiatives in Bangladesh's RMG sector.

In the context of Bangladesh, ICT application in the RMG sector is limited to certain routine works. Few studies have been done in this area, so it would be a great trouble to provide a great deal of literature review. Future research could focus on the factors that influence ICT demand in RMG industries.

4.15 Conclusion

The research was conducted by adopting an exploratory approach among industry stakeholders and quantitative and qualitative methods using primary and secondary data. A combination of methodologies using a mixed method approach was used in the study to show how inferences from mixed methods may be greater at concluding. All data relevant to the case have been gathered and organized to analyze specific details often overlooked by other methods. The results will come along with data analysis, results, and findings.

CHAPTER-5: QUANTITATIVE DATA ANALYSIS AND RESULTS DISCUSSION

5.1 Introduction

The previous section presented the methodology and research approach for developing and validating the conceptual SEM. This chapter presents the actual procedure of the proposed-model's validation, where the collected data have been used in the statistical analysis, and the results have been acquired, presented, and discussed.

5.2 Results and Discussions

For analyzing the data, 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. All of the bootstrap algorithm's checked cases were set to "no sign shift, 600 sample, 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 paths in the model seem to have a flawless directionality (i.e., positive direct relationship), so tested at the minimum of $P<0.001$ one tailed, which seems 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.

The data used was solely obtained for the constructs calculation artifacts since the methodological method chosen to verify the proposed conceptual SEM and assess the significant relationships between the model constructs were PLS. An initial analysis of the distribution of respondents across the various characteristics. For example, gender did not suggest that systemic partiality existed in the sample. Therefore, the data was not utilized in this research. However, it was determined necessary and relevant to include gender item in the proposed questionnaire as a guide for use in the appraisal. Such information could be very useful where researchers may collect a higher number of responses.

The following result discussions aligned with the research objectives of the study which can indicate that results do or do not satisfy the objectives.

5.3 Open-Ended Question Analysis:

Analyzing Quantitative and Survey Data

The statistics of the respondent's gender is given below

Table 5.1: Respondent's gender

Gender	***Frequency N=347***	***Percentage***
Male	293	84.44%
Female	54	15.56%
Total	347	100%

Table 5.1: reveals that men account for 84.44 percent of respondents, while women account for 15.56 percent. As seen in this table, males are more enthusiastically interested in the RMG's ICT sectors than females.

The willingness of executives and corporate leaders to use information communication technology (ICT) is rated by respondents in the following survey.

Table 5.2: The willingness of executives and corporate leaders to use ICT depends on the company.

Ability of ICT use	***Frequency N=347***	***Percentage***
Minimal	20	5.78%
Less than Adequate	41	11.85%
Adequate	212	61.27%
More than adequate	51	14.74%
World Class	22	6.36%
		Total = 100%

In the Table: 5.2 Respondents score their company's executive and corporate leaders' willingness to use ICT. The table shows that 5.78% of respondents rate their company as minimal, 11.8.5% of respondents rate their company as less than adequate, 61.27% respondents rate their company as adequate, 14.74% respondents rate their company as more than adequate and 6.36% of the respondents seem their company is world class. Maximum the company's executive and business leaders' ability to can are use ICT.

A number of staff are needed to operate a company as the staff do not have the same expertise. The statistics of ICT staff of the company are given below.

Table 5.3: ICT staffs of the company

Number of staff	***Frequency***	***Percentage***
50 or Fewer	129	37.50%
51 to 100	70	20.35%
101 to 150	86	25.00%
151 to 200	20	5.81%
201 to 250	17	4.94%
More than 300	22	6.40%
		Total= 100%

Table: 5.3 shows that 37.50% participants mention less than 50 ICT related staff work in their company, 20.35%participants mention 51 to 100 ICT related staff work in their company,25% participants mention 101 to 150 ICT related staff work in their company, 5.81% participants mention 151 to 200 ICT related staff work in their company, 4.94% participants mention 201 to 250 ICT related staff work in their company and 6.40% participants mention more than 300 ICT related staff work in their company. The table shows that ICT related staff are inadequate in the RMG sectors.

Companies collect their data using various ICT-based applications and analyze them for daily operation and competitive advantages. The collection of the data, analysis of the data and preparation of the ICT based reports are not the same for every organization-

Table 5.4: Collection of the data, analysis of the data and preparation of the ICT based reports

Methods	***Frequency***	***Percentage***
In-house	156	41.82%
Out-house	29	7.78%
Both	188	50.40%
		Total = 100%

Table: 5.4 shows that 41.82% of the RMG companies' data collection, analyses and ICT based report preparation are in-house, 7.78% are out-house, and 50.40% are using both in-house and out-house. It means out-sourcing is quite common in RMG industries for their data collection, analysis and ICT based report making.

The company generates market data for analysis and report making. However, the methods of generating market data are different from one another. Statistics are shown in the table below.

Table 5.5: Company generates market data for analysis and report making

Methods / Media	***Frequency***	***Percentage***
Channel Members(retailers and Wholesalers)	179	28.01%
Customers	132	15.65%
Experimental	100	3.91%
Market Observation	67	20.66%
Projective Techniques	69	10.49%
Secondary Sources	69	10.49%
Social Media/ Web Analytics	25	10.80%
		Total = 100%

Table: 5.5 shows that 28.01% of companies generate their market data by channel members (retailers and Wholesalers), 15.65% generate their market data by customers, 3.91% generated by experiments, 20.66% of companies generate by market observation, 10.49% of companies generate by projective techniques, 10.49% of companies generate by secondary sources and 10.80% of companies generate their market data by social media or web analytic.

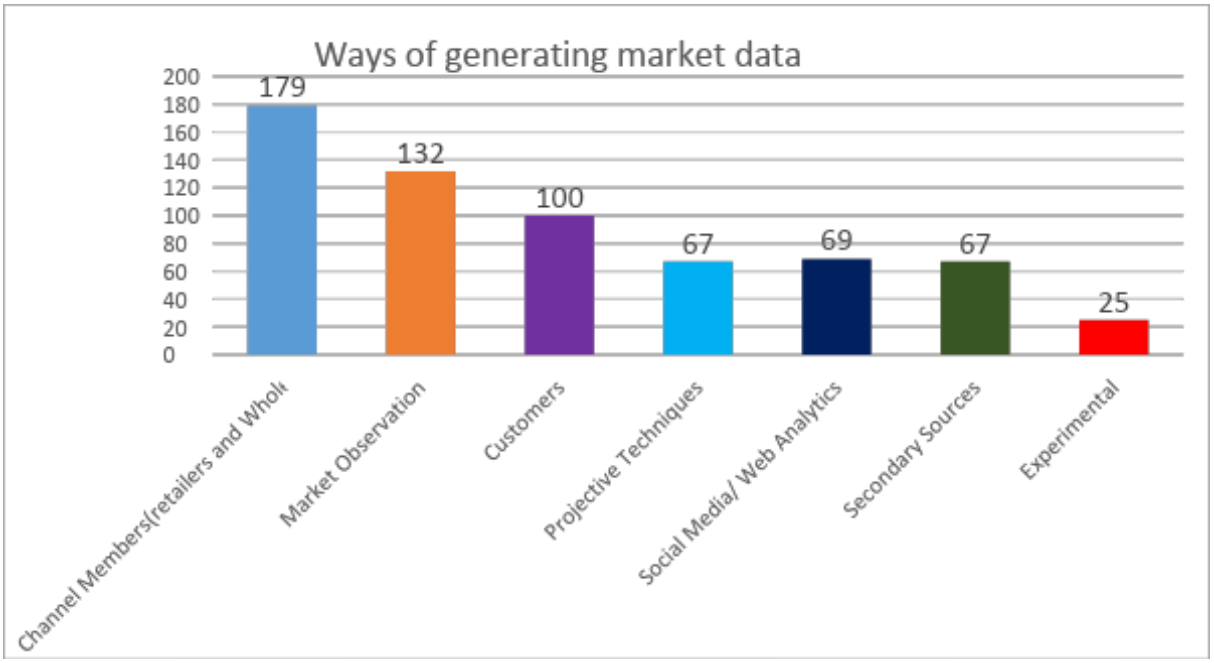


Figure 5.1: Companies'` way to generate market data

Successful ICT applications provide various types of tangible and intangible benefits for the organization. The respondents hope to achieve tangible benefits through their successful ICT application. (Multiple answers accepted)

What tangible benefits do you hope to achieve through successful ICT application? (You can circle more than one answer).

Table 5.6: Tangible benefits do you hope to achieve through your successfully ICT application

Types of tangible benefits	***Frequency***
Increased sale	244
Lower cost	139
Higher quality products and services	158
More efficient operation	211
Better decision making	164
Risk reduction	105
Better market targeting	102
Improved customer feedback	95
Better customer-company relationship	74
Better insight into the market and market competition	60
	Total = 1352

Table:5.6 shows that 244 respondents hope to achieve tangible benefits through successful ICT application like sale increase, 139 respondents hope to achieve tangible benefits through successful ICT application like lower cost, 158 respondents hope to achieve tangible benefits through successful ICT application like higher quality products and services, 211 respondents hope to achieve tangible benefits through successful ICT application like More efficient operation, 164 respondents hope to achieve tangible benefits through successful ICT application like better decision making, 105 respondents hope to achieve tangible benefits through successful ICT application like Risk reduction, 102 respondents hope to achieve tangible benefits through successful ICT application like better market targeting, 95 respondents hope to achieve tangible benefits through successful ICT application like improved customer feedback, 74 respondents hope to achieve tangible benefits through successful ICT application like better customer-company relationship, 60 respondents hope to achieve tangible benefits through successful ICT application like better insight into the market and market competition.

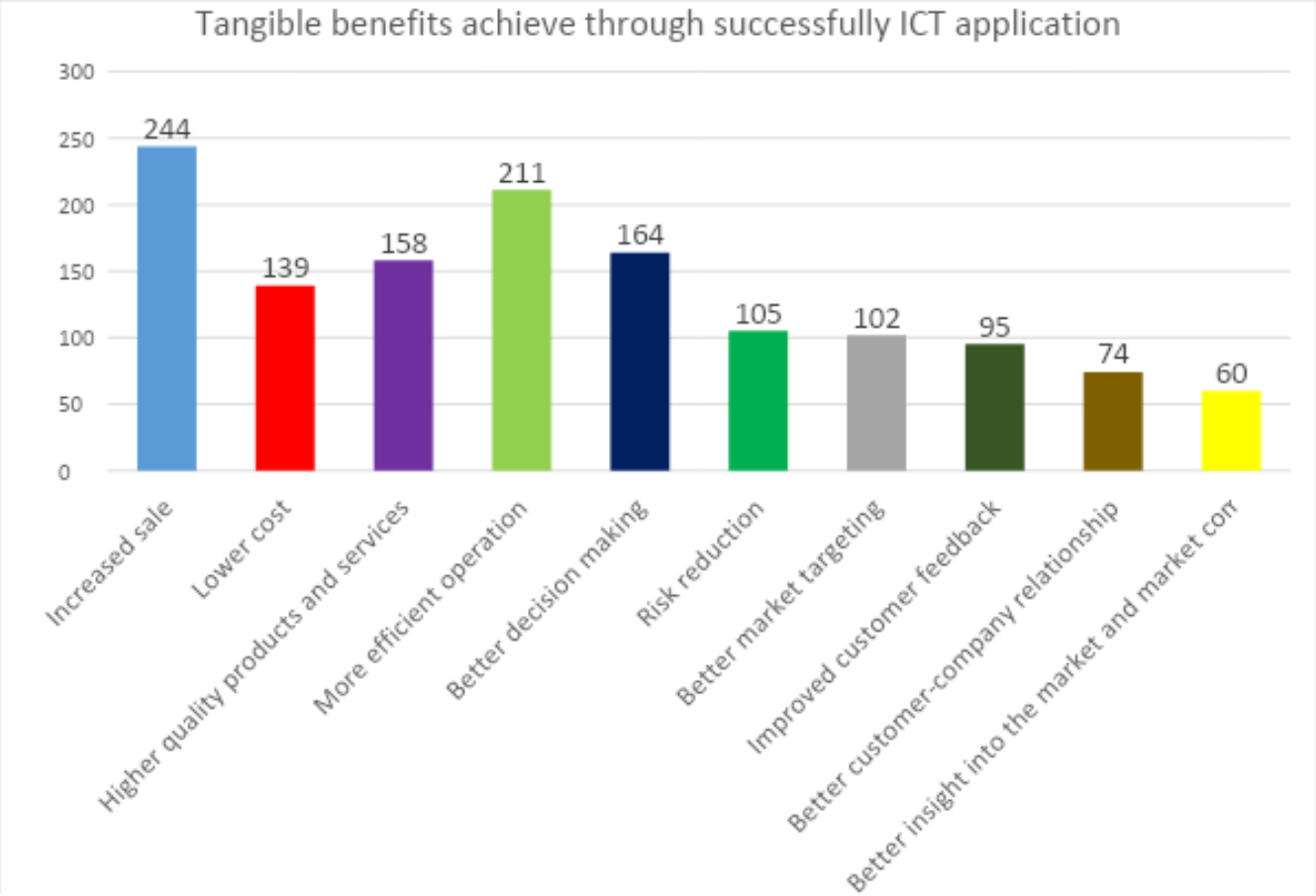


Figure 5.2: Tangible benefits achieved through successful achieve successful achieve ICT application

The use of ICT in RMG sectors is a new concept. the ICT users face many problems. Statistics for the problem while using ICT in RMG sectors are given below. (Multiple answers accepted)

Table 5.7: The problem while using ICT in RMG sectors

Problem faces	***Frequency***
Inadequate technical know-how	200
Inadequate analytical know-how	122
Cost related to technical problems	141
Business privacy issues	102
Lack of handling business case	59
Government inadequate incentives and support	60
	Total = 684

Table: 5.7 shows the problems encountered when using ICT. Two hundred respondents face Inadequate technical know-how problems, 122 respondents face Inadequate analytical know-how, 141 respondents face costs related to technical problems, 102 respondents face Business privacy issues, 59 respondents face Lack of handling business cases, and 60 respondents face Government inadequate incentives and support.

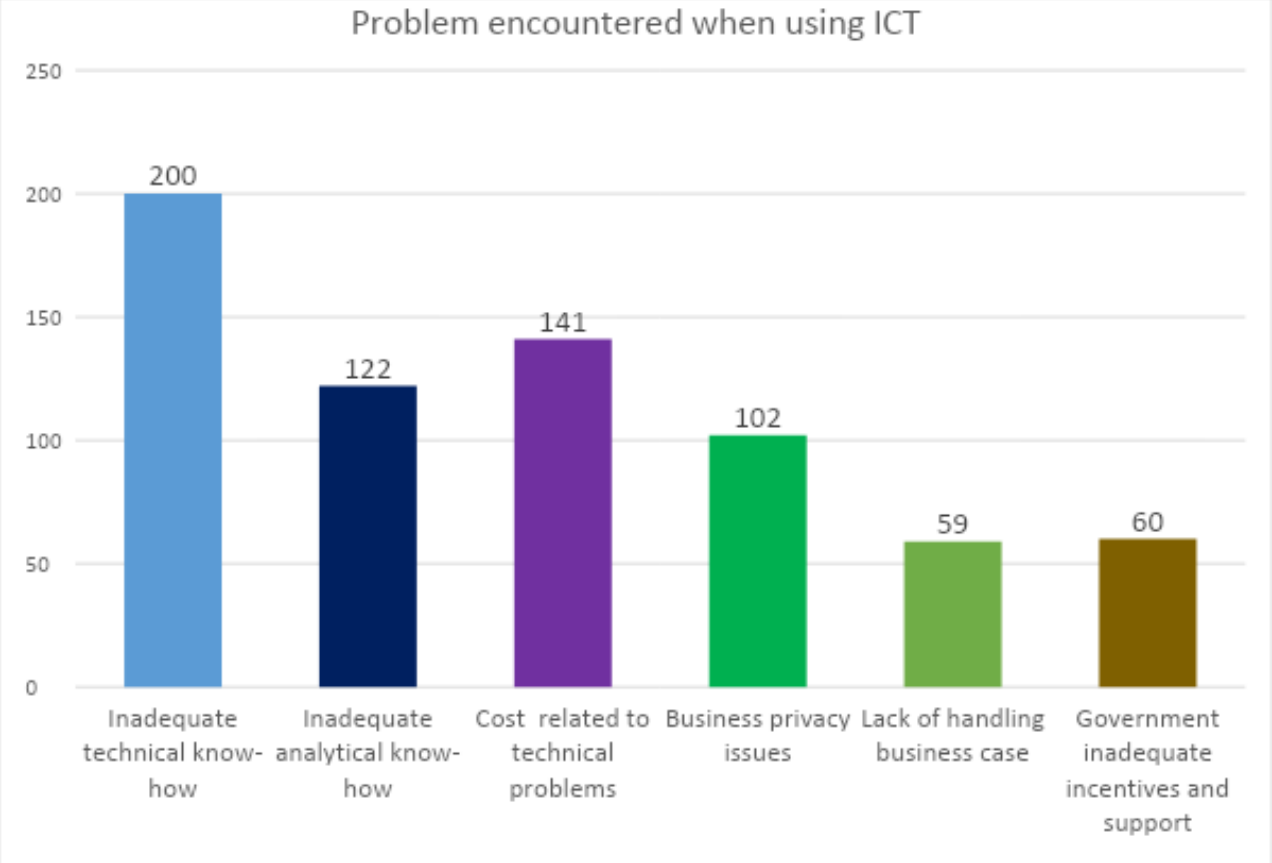


Figure 5.3: Problem encountered when using ICT

5.4 Assessment of the Measurement Model

'I' is used to evaluate the third-order reflective hierarchical service efficiency model in figure 4-1 (PLS) (Chin W. W., 2010). To calculate the outer and inner model parameters. For the inside approximation, PLS path simulation with a path weighting arrangement is used for the inside approximation. (Oppen, 2009). The standard errors of the predictions are then calculated using nonparametric bootstrapping (P.T.Thongrattana, 2010) with 600 replications.

Wold suggests using the method of replicated indicators to estimate higher order latent variables (J. M., 2005). Confirmatory factor analysis (CFA) is used to assess the properties of measurement scales, including reliability, convergent validity, and discriminant validity. To determine the reliability of all the measurement scales, the average variance derived (AVE) (Chin W. W., 2010) and the composite scale reliability (CR) (Chin W. W., 2010) are determined first. All scales' CR and AVE are equal to or exceed 0.80 and 0.50, respectively

(Larcker, 1981). The lowest AVE for Perceived Usefulness is 0.513, and the lowest CR for Standard Environment (SE) is 0.707; however, both of these values far outweigh their respective cut off values.

Then, convergent validity is assured since all PLS indicators load even more on their hypothesized component than on other variables (own loading is higher than cross loadings) (Chin, 2009). In addition, the square root of the AVE is calculated in Table 5-8, ensuring discriminant validity by exceeding the intercorrelations of the construct with the other constructs in the model (Fornell, 1981). With proof of sufficient reliability, convergent validity, and discriminant validity, the calculation model was deemed satisfactory and was used for hypothesis checking and study model validation.

Table 5.8: First - Properties for First, second and third Order Constructs

Table: 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. OE2: Our Company will continue using ICT in the future. OE3: Our Company will regularly use ICT in the future.	0.88 0.71 0.82	0.847	0.950
Use Behavior (UB)	UB1: ICT reduce cycle time UB2: ICT ensure accuracy UB3: ICT ensure timeliness UB4: ICT ensure relevancy UB5: ICT ensure adequacy	0.85 0.69 0.60 0.67 0.69	0.829	0.796
Business Process Performance (BPP)	BPP1: Business processes will be improved after using ICT applications. BPP2: Business Processes implies the competencies of the firm. BPP3: Improved Business process will increase operational excellence of the firm.	0.78 0.74 0.74	0.797	0.567

Table: first - Properties for First, second and third Order Constructs				
Constructs	**Items**	**Loadings**	**CR**	**AVE**
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	0.707	0.773
	SE3: Consumers, competitors, suppliers are part of the firm's environment	0.78		
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	0.807	0.513
	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		0.712	0.968
	OC3: Applications of ICT depends on firm's size	0.50		
		0.45		
ICT Service Quality (ISERV)	ISERV1: Proper communication accelerates ICT service quality.	0.71		
	ISERV2: The company can exchange information about information technology with others.	0.44		
	ISERV3: The vendors and the ICT customer have a strong working relationship.	0.52		

Table: first - Properties for First, second and third Order Constructs				
Constructs	**Items**	**Loadings**	**CR**	**AVE**
	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.	0.45 0.63 0.59 0.77 0.49	0.791	0.732
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 of the areas of the company. ISYST10: Applied ICT is current. ISYST11: Applied ICT is continuously updated.	0.51 0.66 0.61 0.76 0.52 0.51 0.58 0.54 0.52 0.59 0.48	0.876	0.778

Table: first - Properties for First, second and third Order Constructs				
Constructs	**Items**	**Loadings**	**CR**	**AVE**
	ISYST12: In general, the service of the ICT is timely.	0.49		
Firm's Scope (FS)	FS1: ICT makes organization's work easier. FS2: ICT favors firms over its rival group. FS3: Wide ranges of work need ICT applications.	0.70 0.72 0.69	0.747	0.796
Firm's IT Resources (FSE)	FSE1: My organization has ERP, SCM, and Payroll for managing its huge activities. FSE2: We have sufficient IT expertise for support. FSE3: Being a part of the RMG industry, we have ICT to help to do day to day activities.	0.62 0.57 0.63	0.775	0.768
Complementary Resource (CMR)	CR1: My organization has backup ICT resources in case of difficulty. CR2: My organization has ICT test and development facilities. CR3: Backup resources are sufficient to support in case of difficulty.	0.77 0.86 0.90	0.897	0.708
Consumer Readiness(CR)	CR1: Consumers are aware of the existing IT service. CR2: Consumers have knowledge of the IT service benefits. CR3: Consumers like and tend to use ICT applications often. CR4: Consumers have a preference over competing IT products.	0.76 0.79 0.72 0.77	0.845	0.578
Competitive Pressure (CP)	CP1: Competitive pressure is high enough	0.71		

Table: first - Properties for First, second and third Order Constructs				
Constructs	**Items**	**Loadings**	**CR**	**AVE**
	CP2: Competitors gain advantages because of using ICT applications CP3: ICT application is your company's major competitive advantage CP4: ICT application is one of the main sources of sustainability	0.73 0.70 0.73	0.810	0.515

Table 5.9: Inter-correlations of the latent variables for the first order constructs

Table 5.9: Inter-correlations of the latent variables for the first order constructs													
	BPP	**CMR**	**CP**	**CR**	**FS**	**FSE_**	**ISERV**	**ISYST**	**OC**	**OE**	**PU**	**SE**	**UB_**
BPP	**0.753**												
CMR	**0.801**	**0.842**											
CP	0.383	0.419	**0.718**										
CR	0.181	0.473	0.459	**0.760**									
FS	0.572	0.162	0.548	0.159	**0.704**								
FSE_	0.537	0.449	0.541	0.337	0.864	**0.606**							
ISERV	0.343	0.365	0.452	0.299	0.410	0.489	**0.577**						
ISYST	0.479	0.522	0.600	0.461	0.545	0.695	0.800	**0.528**					
OC	0.514	0.166	0.417	0.305	0.526	0.552	0.294	0.467	**0.606**				
OE	0.409	0.090	0.288	0.168	0.260	0.297	0.341	0.377	0.374	**0.806**			
PU	0.534	0.290	0.516	0.238	0.454	0.483	0.597	0.661	0.406	0.410	**0.716**		
SE	0.611	0.241	0.557	0.268	0.531	0.507	0.365	0.433	0.457	0.366	**0.717**	**0.787**	
UB_	0.451	0.184	0.395	0.228	0.434	0.382	0.414	0.373	0.341	0.262	0.403	0.535	**0.705**

*square root of the AVE on the diagonal

5.5 Regression analysis Result Discussion

SPSS Statistics will generate quite a few tables of output for a multiple regression analysis. In this analysis only the three main tables required to understand main results from the multiple regression procedure, assuming that no assumptions have been violated. In SPSS Statistical regression, there are thirteen variables: (1) OE, which is the Operational Excellence; (2) UB, which is the Use Behavior; (3) BPP, which is the Business Process Performance;(4) SE, which is the Standard Environment; (5) PU, which is the Perceived Usefulness ; (6) OC, which is the Organization's capacity; (7) ISQ, which is the ICT Service Quality ; (8) ISYQ, which is the ICT System Quality; (9) FS, which is the Firm's Scope; (10) FIS, which is the Firm's IT Resources; (11) CR, which is the Complementary Resource; (12) CONR, which is the Consumer Readiness and (13) CP, which is the Competitive Pressure.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	CP, UB, CR, ISQ, BPP, CONR, OC, FIS, SE, PU, FS, ISYQ[b]	.	Enter

a. Dependent Variable: OE

b. All requested variables entered.

The table of interest is the **Model Summary** table. This table provides the *R*, R^2, adjusted R^2, and the standard error of the estimate, which can be used to determine how well a regression model fits the data:

Table 5.10: Model Summaryb

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.662[a]	.438	.386	.56891

a. Predictors: (Constant), CP, UB, CR, ISQ, BPP, CONR, OC, FIS, SE, PU, FS, ISYQ

b. Dependent Variable: OE

The "**R**" column represents the value of *R*, the ***multiple correlation coefficient***. *R* can be considered to be one measure of the quality of the prediction of the dependent variable; in this case, OE. A value of 0.662 indicates a good level of prediction. The "**R Square**" column represents the R^2 value (also called the coefficient of determination), which is the proportion of variance in the dependent variable that can be explained by the independent variables (technically, it is the proportion of variation accounted for by the regression model above and beyond the mean model). It is obvious that value of 0.438 that independent variables explain 43.8% of the variability of dependent variable, OE.

Table 5.11: ANOVAa

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.407	4	1049.29	32.393	.000[b]
	Residual	108.100	95	32.387		
	Total	137.507	99			

a. Dependent Variable: OE

b. Predictors: (Constant), CP, UB, CR, ISQ, BPP, CONR, OC, FIS, SE, PU, FS, ISYQ

The *F*-ratio in the **ANOVA** table (see below) tests whether the overall regression model is a good fit for the data. The table shows that the independent variables statistically significantly predict the dependent variable, F (4, 95) = 32.393, $p < .0005$ (i.e., the regression model is a good fit of the data).

5.5.1 Estimated model coefficients

The general form of the equation to predict OE from CP, UB, CR, ISQ, BPP, CONR, OC, FIS, SE, PU, FS, ISYQ, is:

Predicted OE= 67.430 + (0.078 x UB) + (0.126 x BPP) + (0.064 x SE) + (0.259 x PU) + (0.077 x OC) + (0.015 x ISQ) + (0.139 x ISYQ) + (0.024 x FS) + (0.114 x FIS) + (0.172 x CR) + (0.104 x CONR) + (0.131 x CP).

Table 5.12: Co-efficient variables Table

This is obtained from the **Coefficients** table, as shown below:

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	67.430	.440		3.253	.001	.565	2.295
	UB	.078	.071	.060	1.095	.074	-.062	.217
	BPP	.126	.069	.112	1.839	.067	-.009	.261
	SE	.064	.076	.053	.850	.096	-.085	.214
	PU	.259	.073	.233	3.533	.000	.115	.403
	OC	.077	.071	.060	1.074	.083	-.064	.217
	ISQ	.015	.074	.012	.199	.143	-.131	.161
	ISYQ	.139	.108	.092	1.296	.096	-.072	.351
	FS	.024	.079	.021	.304	.061	-.180	.132
	FIS	.114	.069	.100	1.641	.102	-.023	.251
	CR	.172	.066	.153	2.627	.009	-.301	.043
	CONR	.104	.075	.085	1.376	.070	-.252	.045
	CP	.131	.098	.088	1.345	.179	-.061	.323
a. Dependent Variable: OE								

Unstandardized coefficients indicate how much the dependent variable varies with an independent variable when all other independent variables are held constant. Consider the effect of UB. The unstandardized coefficient, B, for UB is equal to .078 (see **Coefficients** table). This means that for each one unit of UB increase, there is an increase in OE of 0.078 units. Similarly, one unit of BPP increase, there is an increase in OE of 0.126 unit, one unit of SE increase, there is an increase in OE of 0.064 unit, one unit of PU increase, there is an increase in OE of 0.259 unit, one unit of OC increase, there is an increase in OE of 0.077 unit, one unit of ISQ increase, there is an increase in OE of 0.015 unit, one unit of BPP increase, there is an increase in OE of 0.126 unit, one unit of ISYQ increase, there is an increase in OE of 0.139 unit, one unit of FS increase, there is an increase in OE of 0.024 unit, one unit of FIS increase, there is an increase in OE of 0.114 unit, one unit of CR increase, there is an increase in OE of 0.172 unit, one unit of CONR increase, there is an increase in OE of 0.104 unit and one unit of CP increase, there is an increase in OE of 0.131 unit.

The above discussion indicates that all of the independent variables positively impact on the dependable variable. For the increase of every unit of independent variables, the dependent variable increases positively.

5.6. Assessment of the Higher Order Models'

The parameters of service quality are represented as a third-order reflective hierarchical build model in Figure 5-4. 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 5-10 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 5.13: Reliability of Higher Order Constructs

Table 5-***11: 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

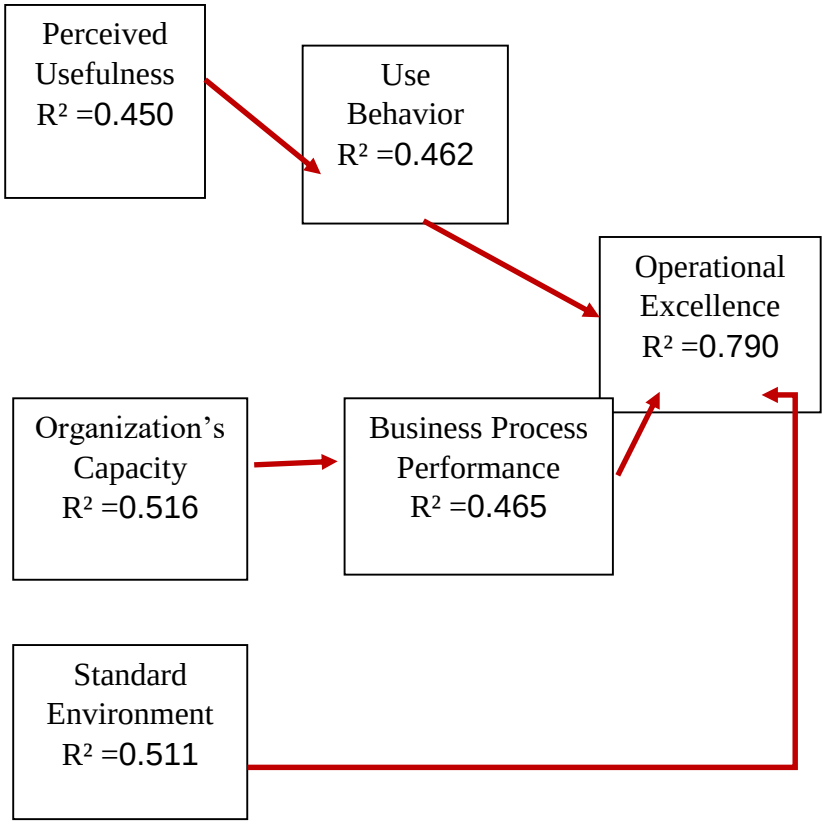


Figure 5.4: Second and Third order constructs

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:

1. The inner model in terms of the path significance and probably the explained variance (R^2),
2. The relationship between the ICT and its antecedents, and affect
3. 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 5-4 displays the effects of checking the convergent validity for all exogenous reflective measurement objects in the' all evidence' group. The element and cross loadings show that all of the things loaded:

1. From a lower bound of 0.44 to an upper bound of 0.92 on their respective reflective latent constructs;
2. They loaded more heavily on their own latent construct than on any other latent construct; and
3. At p 0.001, the factor loading of each object on its respective build is statistically important.

Table 5-14: Factor Loadings and Cross Loadings for model validation

Table 5.14: Factor Loadings and Cross Loadings for model validation

	BPP	CMR	CP	CR	FS	FSE_	ISERV	ISYST	OC	OE	PU	SE	UB_
BPP1	**0.78**	0.15	0.37	0.23	0.59	0.54	0.38	0.45	0.39	0.29	0.42	0.61	0.50
BPP2	**0.74**	0.16	0.16	0.14	0.24	0.25	0.18	0.24	0.34	0.40	0.25	0.28	0.23
BPP3	**0.74**	0.08	0.34	0.04	0.48	0.43	0.22	0.40	0.44	0.22	0.55	0.50	0.29
CMR1	0.10	**0.77**	0.18	0.40	0.12	0.37	0.33	0.43	0.09	0.13	0.18	0.21	0.21
CMR2	0.12	**0.86**	0.33	0.36	0.17	0.42	0.27	0.44	0.13	0.04	0.28	0.16	0.18
CMR3	0.19	**0.90**	0.47	0.44	0.12	0.36	0.33	0.46	0.18	0.08	0.26	0.24	0.11
CP1	0.32	0.22	**0.71**	0.35	0.30	0.29	0.24	0.34	0.23	0.34	0.37	0.39	0.28
CP2	0.37	0.29	**0.73**	0.33	0.44	0.37	0.24	0.42	0.38	0.15	0.35	0.42	0.17
CP3	0.20	0.29	**0.70**	0.32	0.41	0.35	0.26	0.32	0.19	0.12	0.21	0.32	0.42
CP4	0.20	0.39	**0.73**	0.32	0.42	0.51	0.52	0.61	0.37	0.21	0.50	0.45	0.29
CR1	0.06	0.43	0.35	**0.76**	-0.01	0.17	0.24	0.30	0.11	0.17	0.26	0.18	0.26
CR2	0.23	0.34	0.30	**0.79**	0.05	0.19	0.25	0.40	0.33	0.16	0.21	0.17	0.19
CR3	0.16	0.35	0.37	**0.72**	0.26	0.34	0.11	0.30	0.34	0.03	0.10	0.15	0.12

Table 5.14: Factor Loadings and Cross Loadings for model validation													
	BPP	**CMR**	**CP**	**CR**	**FS**	**FSE_**	**ISERV**	**ISYST**	**OC**	**OE**	**PU**	**SE**	**UB_**
CR4	0.12	0.33	0.37	**0.77**	0.18	0.30	0.27	0.39	0.19	0.13	0.16	0.27	0.13
FS1	0.48	0.03	0.40	0.11	**0.70**	0.54	0.37	0.36	0.31	0.34	0.48	0.41	0.35
FS2	0.42	-0.04	0.40	0.12	**0.72**	0.51	0.22	0.31	0.35	0.11	0.26	0.47	0.41
FS3	0.33	0.30	0.36	0.11	**0.69**	0.73	0.29	0.46	0.43	0.13	0.25	0.27	0.19
FSE1	0.20	0.46	0.34	0.34	0.31	**0.62**	0.35	0.53	0.33	0.18	0.26	0.25	0.23
FSE2	0.16	0.53	0.23	0.28	0.29	**0.57**	0.29	0.45	0.18	0.09	0.19	0.14	0.11
FSE3	0.30	0.48	0.20	0.34	0.29	**0.63**	0.28	0.44	0.32	0.23	0.31	0.25	0.07
ISERV1	0.26	0.19	0.18	0.18	0.15	0.19	**0.71**	0.50	0.17	0.29	0.38	0.27	0.32
ISERV2	0.24	0.29	0.23	0.24	0.20	0.24	**0.44**	0.40	0.16	0.13	0.12	0.09	0.17
ISERV3	0.08	0.33	0.21	0.22	0.17	0.31	**0.52**	0.40	0.03	0.31	0.18	0.12	0.09
ISERV4	-0.02	0.13	0.22	0.03	0.16	0.21	**0.45**	0.35	-0.03	-0.05	0.29	0.05	0.04
ISERV5	0.26	0.17	0.29	0.20	0.21	0.25	**0.63**	0.54	0.26	0.21	0.48	0.25	0.14
ISERV6	0.22	0.18	0.44	0.24	0.37	0.40	**0.59**	0.48	0.20	0.37	0.36	0.34	0.43
ISERV7	0.32	0.29	0.31	0.18	0.39	0.41	**0.77**	0.61	0.31	0.20	0.49	0.28	0.39
ISERV8	0.08	0.50	0.20	0.23	0.28	0.44	**0.49**	0.40	0.09	0.02	0.09	0.10	0.25
ISYST1	0.03	0.41	0.37	0.34	0.22	0.36	0.25	**0.51**	0.24	0.07	0.18	0.14	-0.01
ISYST10	0.20	0.41	0.46	0.34	0.36	0.50	0.26	**0.59**	0.37	0.27	0.34	0.23	0.31
ISYST11	0.04	0.29	0.19	0.36	0.22	0.42	0.22	**0.48**	0.18	0.21	0.13	0.08	-0.03
ISYST12	0.06	0.18	0.30	0.28	0.21	0.29	0.18	**0.49**	0.11	0.13	0.23	0.16	0.15
ISYST2	0.32	0.35	0.38	0.38	0.35	0.44	0.36	**0.66**	0.31	0.10	0.37	0.19	0.09
ISYST3	0.49	0.25	0.31	0.25	0.38	0.45	0.41	**0.61**	0.25	0.37	0.46	0.35	0.13
ISYST4	0.49	0.34	0.49	0.33	0.46	0.54	0.48	**0.76**	0.47	0.33	0.61	0.42	0.32
ISYST5	0.31	0.26	0.33	0.08	0.40	0.44	0.20	**0.52**	0.30	0.24	0.31	0.21	0.16
ISYST6	0.17	0.40	0.32	0.27	0.33	0.50	0.24	**0.51**	0.39	0.12	0.31	0.23	0.18
ISYST7	0.26	0.42	0.35	0.39	0.31	0.46	0.35	**0.58**	0.25	0.03	0.19	0.19	0.22
ISYST8	0.34	0.35	0.23	0.41	0.18	0.38	0.35	**0.54**	0.33	0.13	0.20	0.10	0.06
ISYST9	0.16	0.39	0.30	0.22	0.13	0.20	0.16	**0.52**	0.03	-0.04	0.21	0.14	0.12

Table 5.14: Factor Loadings and Cross Loadings for model validation													
	BPP	**CMR**	**CP**	**CR**	**FS**	**FSE_**	**ISERV**	**ISYST**	**OC**	**OE**	**PU**	**SE**	**UB_**
OC1	0.51	0.16	0.37	0.26	0.46	0.51	0.28	0.45	**0.92**	0.37	0.40	0.43	0.30
OC2	0.17	0.06	0.19	0.21	0.29	0.26	0.08	0.16	**0.50**	0.12	0.16	0.20	0.16
OC3	0.01	0.06	0.18	-0.08	0.13	0.07	0.22	0.15	**0.45**	-0.01	-0.02	0.06	0.22
OE1	0.43	0.02	0.25	0.10	0.22	0.19	0.27	0.30	0.34	**0.88**	0.39	0.33	0.26
OE2	0.25	-0.08	0.09	0.16	0.16	0.23	0.21	0.23	0.29	**0.71**	0.26	0.13	0.03
OE3	0.27	0.24	0.31	0.18	0.24	0.31	0.34	0.37	0.28	**0.82**	0.32	0.36	0.28
PU1	0.48	0.32	0.43	0.13	0.37	0.40	0.55	0.58	0.26	0.33	**0.80**	0.47	0.30
PU2	0.40	0.15	0.28	0.02	0.32	0.34	0.37	0.44	0.22	0.16	**0.64**	0.40	0.18
PU3	0.17	0.03	0.23	0.20	0.30	0.29	0.26	0.33	0.29	0.22	**0.63**	0.27	0.26
PU4	0.42	0.26	0.49	0.32	0.32	0.35	0.48	0.50	0.39	0.41	**0.78**	0.34	0.39
SE1	0.44	0.25	0.42	0.17	0.43	0.47	0.21	0.32	0.33	0.32	0.37	**0.83**	0.43
SE2	0.31	0.09	0.21	0.20	0.19	0.20	0.34	0.39	0.27	0.16	0.26	**0.55**	0.21
SE3	0.49	0.13	0.47	0.21	0.43	0.34	0.27	0.26	0.35	0.25	0.42	**0.78**	0.42
UB1	0.49	0.17	0.36	0.27	0.39	0.36	0.32	0.32	0.26	0.39	0.36	0.46	**0.85**
UB2	0.30	-0.03	0.21	0.17	0.23	0.16	0.30	0.26	0.25	0.15	0.23	0.30	**0.69**
UB3	0.13	0.05	0.09	-0.02	0.25	0.22	0.30	0.16	0.11	0.01	0.22	0.29	**0.60**
UB4	0.07	0.19	0.26	0.17	0.13	0.12	0.20	0.16	0.24	0.01	0.24	0.26	**0.67**
UB5	0.38	0.23	0.37	0.10	0.42	0.39	0.35	0.34	0.31	0.12	0.31	0.50	**0.69**

The object loadings and cross loadings of the latent constructs, as well as their statistical importance, help to confirm the reflective indicators' convergent validity as distinct latent constructs in the study model.

The findings of the discriminant validity checking of the reflective measurement scales are shown in Table 5-11. The square roots of the Average Variance Extracted (AVEs) that are represented diagonally in bold are almost always greater than the off-diagonal elements in their corresponding row and column, indicating that the scales are discriminately true (D.F.Larcker, 1981). Despite this, the association between CMR and BPP tends to be very similar to the square root of AVE for CMR, which should not be the case since each element should represent a different attribute. BPP, on the other hand, is not as similar to the square root of AVE. Even, while being higher, the square root of AVE for the PU build seems to be similar to the association between PU and SE. This high correlation could be inferred to the high path

coefficient between the variables PU and SE, as shown in Figure -222

Table 5.15: Discriminant Validity

Table 5.15: Discriminant Validity													
	BPP	**CMR**	**CP**	**CR**	**FS**	**FSE_**	**ISERV**	**ISYST**	**OC**	**OE**	**PU**	**SE**	**UB_**
BPP	**0.753**												
CMR	**0.801**	**0.842**											
CP	0.383	0.419	**0.718**										
CR	0.181	0.473	0.459	**0.760**									
FS	0.572	0.162	0.548	0.159	**0.704**								
FSE_	0.537	0.449	0.541	0.337	0.864	**0.606**							
ISERV	0.343	0.365	0.452	0.299	0.410	0.489	**0.577**						
ISYST	0.479	0.522	0.600	0.461	0.545	0.695	0.800	**0.528**					
OC	0.514	0.166	0.417	0.305	0.526	0.552	0.294	0.467	**0.606**				
OE	0.409	0.090	0.288	0.168	0.260	0.297	0.341	0.377	0.374	**0.806**			
PU	0.534	0.290	0.516	0.238	0.454	0.483	0.597	0.661	0.406	0.410	**0.716**		
SE	0.611	0.241	0.557	0.268	0.531	0.507	0.365	0.433	0.457	0.366	**0.717**	**0.787**	
UB_	0.451	0.184	0.395	0.228	0.434	0.382	0.414	0.373	0.341	0.262	0.403	0.535	**0.705**

Note: All correlations are significant at the level of P < .05

The reliability findings from checking the reflective measuring model as seen in Table 5.15. The average variance derived (AVE) for each reflective measure approaches the minimum recommended level of 0.5, as recommended by Fornell and Larcker (1981).

Table 5.16: The Reliability Assessment of the Reflective Measurement Model

Table 5.16: The Reliability Assessment of the Reflective Measurement Model			
	Cronbach's Alpha	**Composite Reliability**	**Average Variance Extracted (AVE)**
BPP	**0.719**	**0.797**	**0.567**
CMR	**0.801**	**0.879**	**0.708**
CP	**0.789**	**0.810**	**0.515**
CR	**0.766**	**0.845**	**0.578**
FS	**0.804**	**0.747**	**0.796**
FSE	**0.956**	**0.775**	**0.768**
ISERV	**0.728**	**0.791**	**0.732**
ISYST	**0.859**	**0.876**	**0.778**
OC	**0.727**	**0.712**	**0.968**
OE	**0.740**	**0.847**	**0.950**
PU	**0.987**	**0.807**	**0.513**
SE	**0.738**	**0.707**	**0.773**
UB	**0.756**	**0.829**	**0.796**

Furthermore, the data shows that the reflective measures are reliable in terms of internal accuracy, as measured by composite reliability. The findings reveal that the model's composite reliabilities range from 0.707 to 0.879, above the minimum recommended threshold of 0.7 (Nunnally, 1978)

Table 5.17: Total Effect.

Table 5-17: Total effect						
	BPP	**OC**	**OE**	**PU**	**SE**	**UB_**
BPP			0.288			
CMR	-0.033	-0.064	-0.009			
CP			0.092		0.550	
CR			0.003		0.016	
FS	0.070	0.136	0.020			
FSE_	0.238	0.463	0.069			
ISERV			0.003	0.191		0.077
ISYST			0.009	0.508		0.205
OC	0.514		0.148			
OE		0.651		0.553	0.611	
PU			0.017			0.403
SE			0.167			
UB_			0.043			

Table 5.17 displays the standardized total effects on the predicted (dependent) endogenous latent variables. Any cumulative influence from a forecasting, independent variable (i.e., the ‘left hand' column) to a forecast dependent variable (i.e., the top row) is the number of all direct and indirect paths from the independent variable to the dependent variable. Of the three ‘ultimate’ predicted variables (i.e., OE, OC and SE), the strongest total effects are from OC to OE (0.651) and from SE to OE.

A t-test using the Smart PLS bootstrap technique (Figure 5-5) revealed that all of the inner-model structural path coefficients are important, with the exception of the two non-significant paths from OC to OE and from PU to SE, as seen in Figure 5-6. The figure also shows the explained variances (R2 values) for the expected (dependent) endogenous latent variables. It is clear that 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 (1998), fell into the mild (anything greater than 33%) to high category (higher than 67 percent).

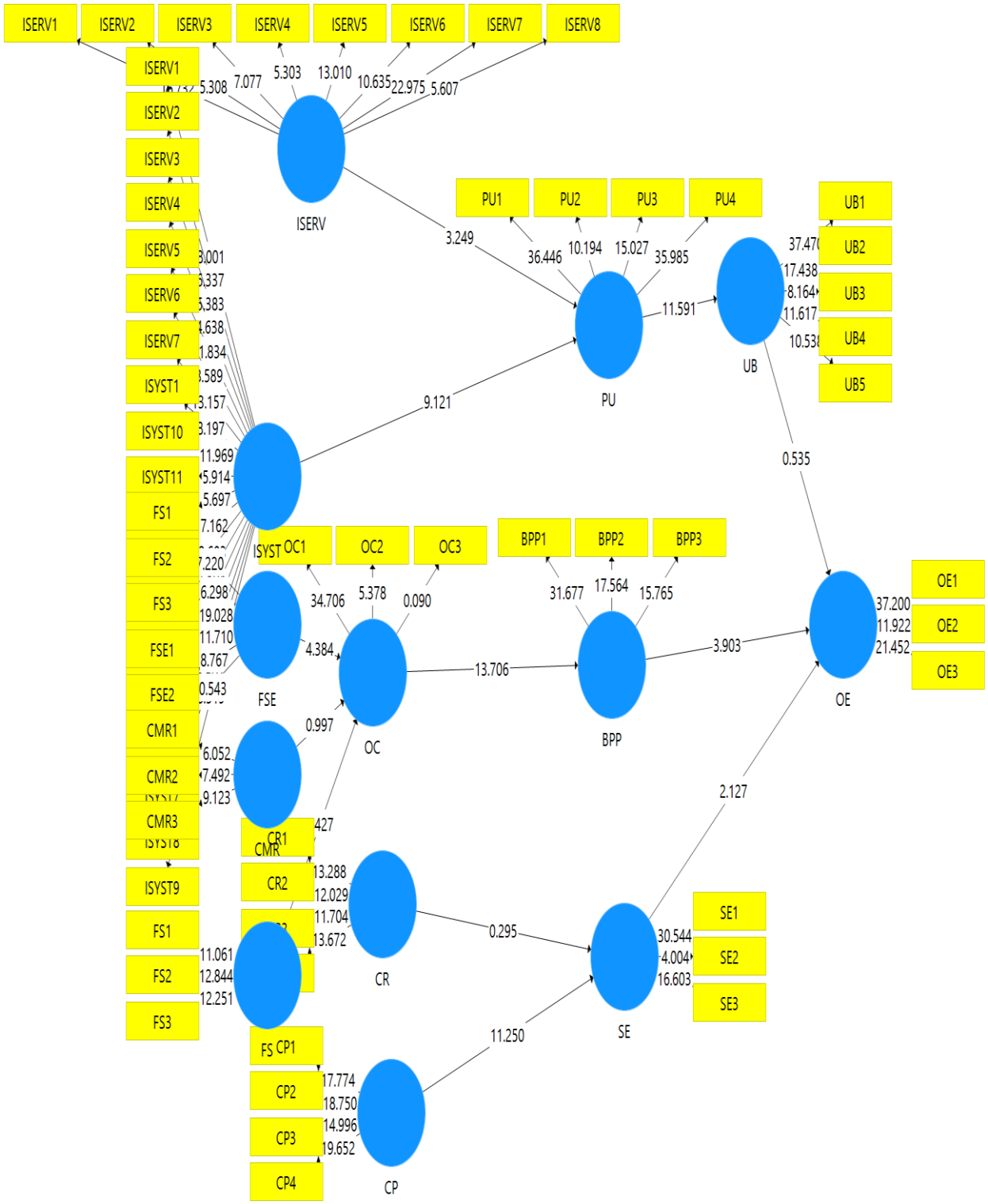


Figure 5.5: Bootstrap result for the structural and measurement model

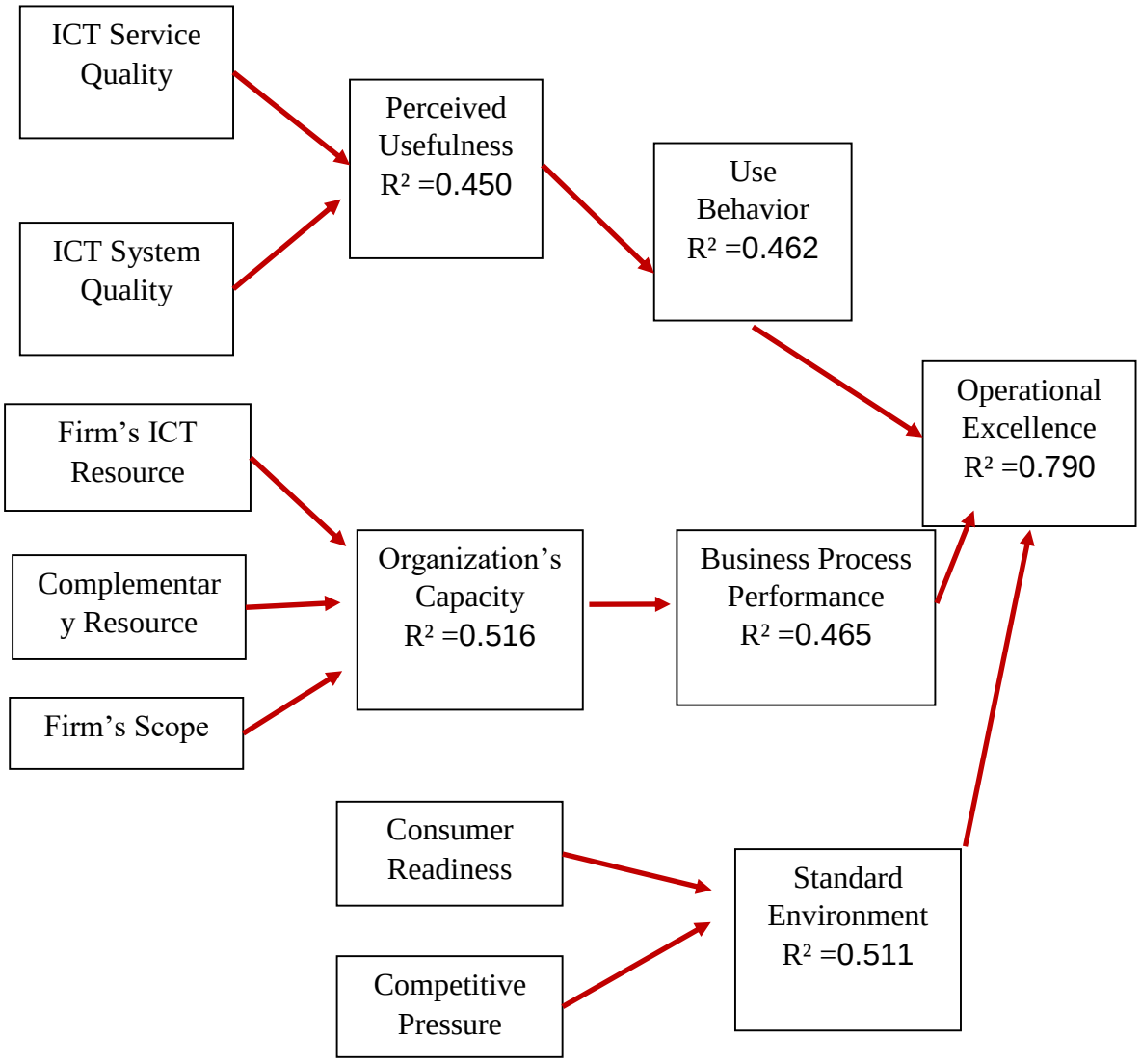


Figure 5.6: SEM showing path coefficients and R²

Significance levels:

*****p < 0.001**

****p < 0.01**

***p < 0.05**

As with the second part of 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. (see Table-5-15).

Table 5.18: The level of significance of paths

Table 5.18: 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**

H1: Use behavior of ICT positively affects operational excellence.

As shown in Table 5-15, 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:

1. 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.
2. 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.
3. 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.

H2: Business process performance positively affects operational excellence.

As shown in Table 5-15, 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:

1. After using ICT applications Business process will be improved.
2. Business Processes implies the competencies of the firm
3. Improved Business process will increase operational excellence of the firm

H3: Standard environment positively affects operational excellence.

As shown in Table 5-15, 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:

1. 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.

2. All RMG organizations should be tended to adapt to the standard ICT environment.

3. Consumers, competitors, suppliers all should be competitive and cautious about using ICT applications as they are part of the organization's environment.

H4: Perceived usefulness of ICT application positively affects user behavior.

As shown in Table 5-15, 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:

1. Using ICT in the RMG company of Bangladesh will increase the company's productivity.
2. ICT is used in RMG companies to help them manage their day-to-day activities.
3. Using ICT will enhance the effectiveness of the RMG company's managerial activities.
4. 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.

H5: Organization's capacity positively affects business process performance.

As shown in Table 5-15, 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:

1. With all its hardware and software, ICT makes an organization capable and efficient, and aftermath, it has good business process performances.

2. Application of ICT in the business processes varies depending on the organization's scope.

3. An organization has so many resources which help the ICT system work together.

H6: ICT's service quality positively affects the perceived usefulness of ICT applications perceived usefulness, leading to more profitability.

As shown in Table 5-15, 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:

1. Proper communication must be ensured for service quality. Without proper communication, a communication gap can arise between parties.

2. Service Quality of ICT must be capable and proficient to adequately meet the customers' requirements.

3. Service quality of ICT service must be competent and effective in providing service.

H7: ICT's system quality positively affects the perceived usefulness of ICT applications' perceived usefulness, leading that to more profitability.

As shown in Table 5-15, 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:

1. ICT components must be trustworthy, accurate, reliable, and sufficient otherwise; can't bring the expected result from the ICT applications.

2. 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.

5.7 Conclusion

Results and data analysis are aligned. Research objectives are fully matched with the discussion of the results as it is told before. Analyzing the demographic results started from 5.3 depicts the research objective 1- analyze the current ICT applications of the RMG sector of Bangladesh, Hypothesis 1, 2, 3, 4, 5 shows the unity to fulfill objective 2- investigate how ICT applications affect on the operational excellence of firms and Hypothesis 6, 7 proves that objective 3-investigate how to improve ICT infrastructure of whole Bangladesh that will lead more profitability and excellence. The next chapter's case studies also show practically whether the conceptual model is proven or not.

CHAPTER-6: CASE STUDIES AND SUGGESTIONS

6.1 Introduction

In this chapter, hypothesis results are backed with practical world examples. Here, two RMG firms are chosen to evaluate and support the above analyses. The main objective is to increase Information and communication technology (ICT) usage resulting in improved operational excellence and increased profit.

6.2 CASE-1: Square Textiles Limited

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. In Bangladesh, the industry is one of the leading knitting and spinning yarn producers. It now has one of the most advanced vertically integrated setups globally, allowing it to produce 90,000 kg of yarn every day.

Their 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 general 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 6.1: Annual Report 2018-19 of SQUARE

(Figures in '000')

Year	Gross Profit	Net Profit (Before Tax)	Net Profit (After Tax)
2014-15	868,716	644,992	541,191
2015-16	787,050	573,967	486,236
2016-17	525,634	297,592	252,494
2017-18	671,530	348,045	290,914
2018-19	951,351	435,911	346,462

[Source: Annual Report 2018-19 of SQUARE Textile Limited]

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, gross profit margin rose by 1.33 percent while net profit margin fell by 14.88 percent. The cost

of goods sold rose during the reporting year due to increases in 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) in 2018-2019 to the previous year.

6.3 Case-2: Tosrifa Industries Limited

Being a member of an industry that employs nearly four million people in Bangladesh, Northern Tosrifa 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 readymade apparel retailers have entrusted NTG as one of the premier suppliers of high-quality merchandise. Northern Tosrifa 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 and hard work behind every mission they completed, as well as 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 both 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 6.2: Annual Report 2018-19 of TOSRIFA Industries Limited

(Figures in '000000')

Year	Gross Profit	Net Profit (After Tax)
2016-17	226.96	77.78
2017-18	241.25	79.92
2018-19	299.75	83.34

[Source: Annual Report 2018-19 of TOSRIFA Industries Limited]

The company's overall financial performance is steady through direct export increase compared to the previous year. But, operational and finance costs significantly increase but upward 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 an 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 deem 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.

6.4 Problem Encountered When Using ICT (For Both Companies)

The valuable respondents from those companies wrote some problems they faced to implement 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 about 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

6.5 Suggestions to Overcome the Problem to Implement ICT Applications (For Both Companies)

The valuable respondents gave some suggestions to overcome the problems they faced to implement 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 application 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 application 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.

6.6 SWOT Analysis of ICT Implementation in RMG Industry of Bangladesh Based on Square and Northern Toshrifa'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.

6.6.1 Strengths

1. RMG companies have large capital for ICT implementation.
2. Garments companies have possessed skilled and substantial human capital, which is available in Bangladesh.
3. There are many growing IT firms around all cities of Bangladesh.
4. The government of Bangladesh has taken many easy policies like tax rebates, industrial loans, quick LC opening in terms of RMG and RMG related development.
5. Garments Companies are investing more in ICT related research for new system development.
6. 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).
7. Foreign experts are available for ICT implementation, especially from Japan and China.

8. Products (hardware, software) are available.
9. Bangladesh has IT parks in each district like Gazipur, Chittagong, Jashore, and it is a great strength.
10. Trained employees are available in the RMG industry of Bangladesh.

6.6.2 Weakness

1. Internet accessibility is not reached to all employees and staff of the RMG industry.
2. Infrastructural development in ICT implementation is not available to all areas of Bangladesh.
3. Training centers and trainers are not sufficient.
4. Guidelines and policies in ICT are not enough and improper.
5. Adoption of ICT and new technology cannot be easily taken by labors staff of the RMG industry.
6. Most of the staff are uneducated and lack the general knowledge of ICT.
7. Maintenance of ICT related products and new technologies is possible by many RMG companies.
8. Lack of experience of employees in terms of ICT implementation.
9. Employees have less interest in adopting and implementing new systems and technologies.
10. Copyrights issues are on the rise, and weakening is rising ICT implementation.

6.6.3 Opportunities

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

6.6.4 Threats

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

Bangladesh is a developing nation that has recently experienced improved development growth. Bangladesh has made remarkable strides in the garment industry. Bangladesh is developing through the RMG sector. Employment opportunities are being created and growing the economy. The garments industry should diversify and increase the buyers and destinations of foreign countries to which products will be exported.

6.7 Conclusion

Both the organization Square and Northern Toshrifa played a significant role in implementing the concept of ICT in the organization's management, operation, production, and sales. The organizations of the RMG sector should follow them so that the successful implementation can lead the industry to success. The knowledge and strategies that influence the organizations to use the ICT technologies from these case studies will be followed carefully. ICT has helped them in different aspects, but some problems have increased. Proper management can help create these problems and an opportunity for the industry. The specialists in these sectors can analyze these for future studies that can be useful for the RMG industry of Bangladesh. These problems and suggestions can be helpful to concerned authorities to take necessary steps ahead.

So, successfully implemented ICT applications in organizations like Square and Northern Toshrifa increased profitability and operational excellence.

CHAPTER-7:

CONCLUSION AND FUTURE DIRECTIONS

7.1 Introduction

The validation of the conceptual SEM, which was largely supported, was presented in the previous chapters. In implementing, non-supported hypotheses were expected and justified. The case studies, problems, and solutions are useful for RMG industries. This chapter summarizes the most important components discussed in the preceding chapters. This chapter describes the study's core problems, such as the study's rationale and the most important results and conclusions.

7.2 Summary of Key Issues

7.2.1 Motivations for This Study

The importance of ICT implementation in Bangladesh's RMG sectors and its repercussions necessitates careful examination and evaluation of their effectiveness. This may be achieved by evaluating each goal as a success factor. One of the main goals of introducing ICT in Bangladesh's RMG sectors is to give an easily available tool to serve the organizations better. It's critical to analyze their perceptions of what they get and the implications of utilizing this system. For authorities to analyze their continuous development, performance, and service quality, they must use a valid and realistic assessment tool. So the focused research question for this study was: ***"Application of Information and Communication Technology (ICT) in Readymade Garments Industry in Bangladesh Market accelerating operational excellence?***

7.2.2 The Process of Producing the Model

This study experimentally evaluated our suggested model (SEM) using data acquired from Bangladesh's RMG sectors to confirm its validity. The Partial Least Squares (PLS) of Structural Equation Modeling statistical methodology validated the model and the data acquired using the suggested survey instrument (SEM). PLS was chosen for its known robustness in dealing with complex models and is commonly used for exploratory research of a priori models like ours. It is not demanding in its underlying assumptions related to small sample sizes, reflective constructs, and the number of measurement items of each construct.

7.2.3 Key Findings and Interpretations

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 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. This is especially true because organizations are not interested in using ICT for what may be perceived to be 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 Bangladeshi, to accelerate operational excellence.

7.2.4 Significance of the Research

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 the effectiveness and how it eventually impacts their obtained operational excellence.

This section is concerned with highlighting the areas of importance of this research. The significance of this research will be presented from three perspectives:

1. 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?
2. How could researchers benefit from this contribution?
3. How could government practitioners and decision-makers benefit from this research?

7.2.5 Implication to Methodology

The method used in this study is the main contribution of this study. This study used a mixed-methods approach to data analysis, which incorporated qualitative and quantitative methodologies. The interviewed data were first analyzed through content analysis to refine and revise the model. The Quantitative data were collected and analyzed using the PLS-based SEM technique based on the final model. To achieve a better result in the quantitative phase, a mixed-method approach was used to collect reliable information from the field, then combined with literature.

This is a relatively new methodology in the field of RMG research. The use of ICT in a specific firm is examined to improve the firm's and the RMG industry's operational excellence. Many research studies have been conducted to improve performance or competitive advantages in various industries in the context of developed nations in Western culture, using either qualitative or quantitative methods, but there has been little use of both approaches in these research studies. This study was conducted in Bangladesh's RMG (clothing) industry, and data was collected on the employees who used ICT software in the RMG industry. There was no

significant research into improving the use of ICT applications in the garment industry or developing countries like Bangladesh.

7.2.6 Implication to Theory

This study contributes to theory by combining theoretical views to identify the RMG industry's ICT application variables that impact the RMG industry's operational excellence. It combines the perspectives of employees directly involved in adopting ICT applications in RMG enterprises and resource dependency theories and operational excellence to improve the RMG industry's effectiveness, dynamism, competitiveness, and profitability in Bangladesh. One of the research's significant contributions is ICT theory and literature, ICT applications, operational excellence, and Bangladesh's RMG business.

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 offer a distinctive contribution to the academic literature by addressing the RMG industry's condition in deploying ICT applications in a developing nation like Bangladesh.

7.2.7 Implication to Practice

The study's findings have been revealed to have made a significant contribution 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. According to the RMG manufacturers' wishes, the research has revealed that various influential constructions of the RMG industry's software applications impact the RMG industry's competitiveness and profitability. The study's findings are valuable to multiple of Bangladesh's RMG business players, from the government to private companies. Consequently, manufacturers and other stakeholders can take action that is both valuable and required to reach a better outcome. 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 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 in their efforts to execute the numerous steps necessary to improve the image and competitiveness of Bangladesh's RMG

business. 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 study's key contribution is the development of a methodology that allows RMG owners to quickly assess if ICT impacts operational excellence. As a result, ICT applications have become strengths and weaknesses of a business that impact the RMG industry's competitiveness and profitability, as the model can detect.

Another contribution of this research is to improve the efficiency and competitiveness of ICT applications. There has previously been no substantial research on improving the efficiency of the RMG industry's ICT software. Few research studies on how ICT may help reduce lead times, reduce costs, increase worker efficiency, or improve overall operational excellence. However, this study has aided in developing ICT applications and demonstrated to the government and bureaucrats how ICT applications may lead to operational excellence in an RMG organization. Finally, it is hoped that this research project would enable local Bangladeshi garment producers to take steps toward future preparation in the competitive garment market as more companies engage in developing ICT applications. Furthermore, the study will be useful to government policymakers and practitioners in Bangladesh and worldwide.

7.3 Limitations and Future Research Directions

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 this type of 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 more 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 study might look at the effects of contextual elements on the study model, such as demographic variables (income, education, sex, etc.) and

situational constructs (use frequency, cost, etc.). To have a better grasp of 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.

After directing a survey and finalizing this paper, there are some restrictions and wrong sides of the application of ICT in the RMG sectors of Bangladesh. Now, it is time to provide some Future Directions to overcome these restrictions. Some such possible future directions 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 in Bangladesh, and they can also study.
3. Scrutinizing the current technological environment and ICT infrastructure very carefully
4. Determining the adaptability of the ICT applications according to the industry requirements
5. Improving the IT skills of the employees by offering the training facilities
6. Improving the security system of the ICT setup
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 modern ICT applications
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 have to be introduced to review product superiority.

As one of the hypotheses proves unacceptable, the model can be illustrated further, which can guide future researchers to work with. The model is given below-

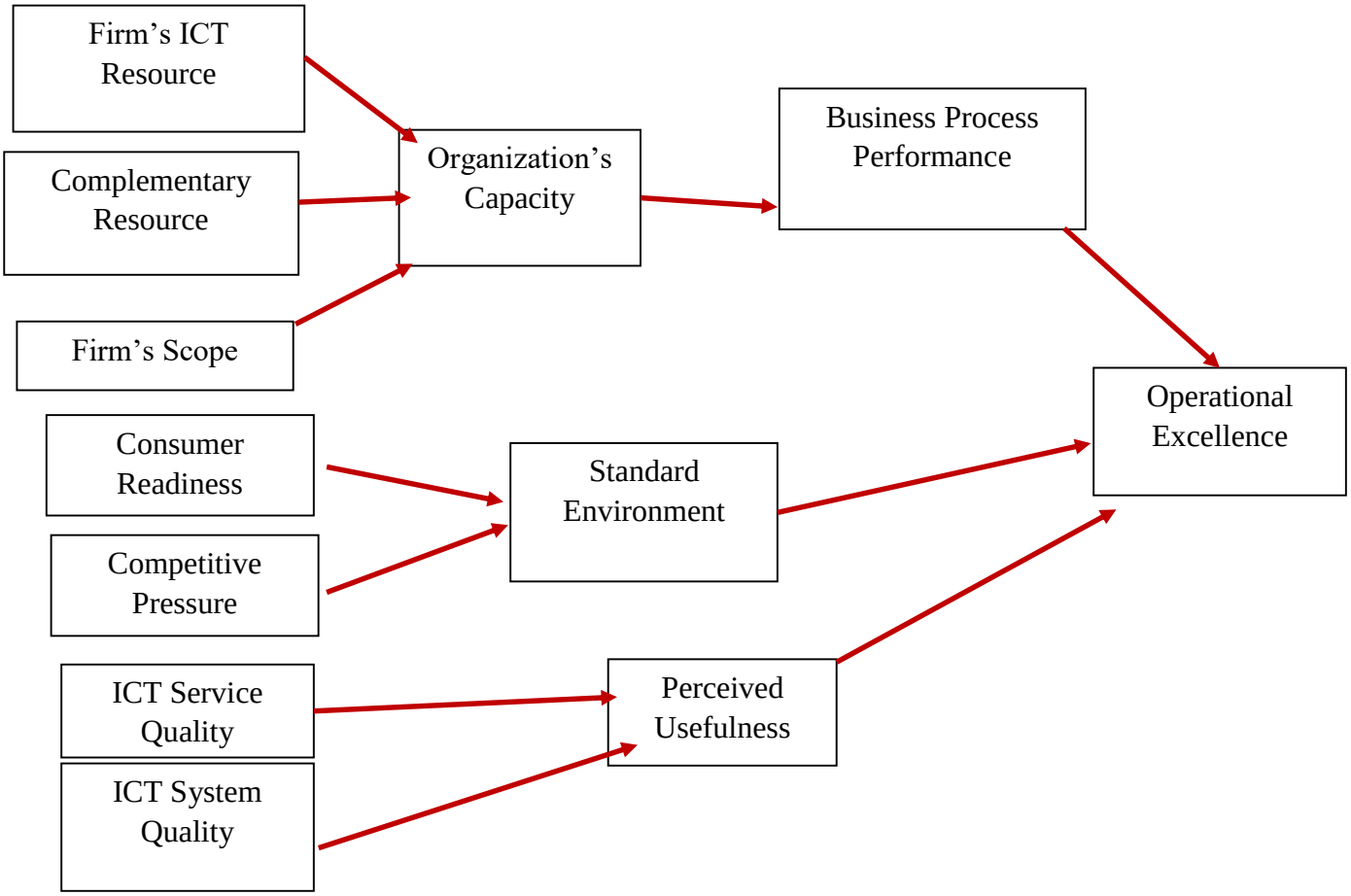


Figure 7.1: Research Model

7.4 Conclusion

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 take action.

The objective of this study was to construct a theoretical framework for examining existing applications of ICT used in the RMG industry in Bangladesh to lead to the operational excellence of a firm. To serve the objective, a systematic literature review of ICT, the RMG sector, the situation in Bangladesh and factors affecting operational excellence of RMG services was undertaken. A conceptual framework and a set of hypotheses were developed using the literature.

The research model was specified as a hierarchical-reflective model that was then tested in the context of ICT application in the RMG sector in Bangladesh. A total of 346 samples were analyzed to test the conceptual model. The study applied PLS path modeling to estimate the hierarchical model and test the relationships among constructs. The study's findings confirmed the research model's adequate measurement and structural properties, proving seven core hypotheses. In addition, the study confirmed the significant impact of operational excellence as a mediator.

Overall, the findings show that using ICT in the RMG sector will be the ultimate solution for boosting in 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.

The End

References

Shabur, M., Hridoy, M., & Rahman, K. (2021, March 12 – 13). THE INVESTIGATION OF CHALLENGES OF IMPLEMENTING. *Proceedings of the International Conference on Sustainable Development in Technology for 4th Industrial Revolution 2021*.

A.K.Bollen. (1989). Structural Equations with Latent Variables. *NewYork,NY, Wiley*.

Ahamed, P. M. (June 30, 2014). *A report on Information Communication Technology (ICT) Sector of Bangladesh.* Japan Bangladesh Business Center.

Ahlemann, N. U. (2010). Structural Equation Modeling in Information Systems Research Using Partial Least Squares. *Journal of Information Technology Theory and Appllication*, 11(2): 5-40.

Akter, M. K. (2017, November 27). Technology Management in Textile and RMG Industry. Dhaka, Bangladesh.

APICS. (1998). *APICS Dictionary North Edition.* VA, USA: Falls Church.

Aries Susanto, Y. C. (2016). Determinants of continuance intention to use the smartphone banking services. *Industrial Management & Data Systems*, Vol. 116 Iss 3 pp 508 - 525.

AU, N. a. (2008). Extending the Understanding of End User Information Systems Satisfaction Formation: An Equitable Needs Fulfilment Model Approach. *MIS Quarterly*, 32(1): 43-66.

Bangladesh_Bank. (2016). *Quarterly Review on RMG April-June 2016.* Dhaka: Bangladesh Bank.

BASIS. (2012). *ICT in Bangladesh.* BASIS.

BATEXPO. (2013). *Dhaka: BATEXPO 2013 to be held in October*. Retrieved from https://www.textileexcellence.com/news/dhaka-batexpo-2013-to-be-held-in-october/

BGMEA. (2017). *BGMEA Upbeat on Export Growth.* Dhaka: Bizbangladesh.com.

BGMEA. (2020). BGMEA Sustainability Report.

BGMEA. (2021).

Bhaskar, B. a. (2010). The learning enabling structure: validating a measuring instrument. *Indian Journal of Industrial Relations* , 46(1).

Buxey, G. (2005). Globalisation and Manufacturing Strategy in the Tcf Industry. *International journal of operations & production management* , 100-113.

Centre for Policy Dialouge. (2021, February 15). State of the Bangladesh Economy in FY2021. Retrieved from bdembassy: https://bdembassy.gr/23rd-bangladesh-apparel-textile-exposition-batexpo-2012/

Chan Sun C.A, Chittoo H. & Sukon K.S. (Volume 16 Issue 6 Version 1.0 Year 2016). Evolution of Critical Success Factors in the Clothing and Textile Industry in Mauritius. *Global Journal of Management and Business Research: A Administration and Management*, pp. Online ISSN: 2249-4588 & Print ISSN: 0975-5853.

Cheng-Min, F. a.-Y. (2006). The impact of information and communication. *International Journal of Management, [online]Available at: http://search.proquest.com/docview/233230322?accountid=9670*.

Chin W. W., B. L. (2010). A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study. *Information Systems Reserch*, 189-217.

Chin, W. W. (2009). A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study. *Information Systems Research* , 14(2): 189-217.

Cholet, E. (2009, April 28). RMG sector needs better technology. Dhaka, Bangladesh.

Christensson, P. (2018). WAMP (Windows, Apache, MySQL, and PHP) Definition . *Techterms.com.*

D. Amoroso, R. L. (2017). The mediating effects of habit on continuance intention. *International Journal of Management*, 693-702.

D.F.Larcker, C. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research (JMR)*, 18(1): 39-50.

Dahlberg, T. M. (2008). A Past, present and future of mobile payments research: A literature review. *Electronic Commerce Research and Applications*, 165-181.

Davis, F. D. (2013). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, Vol. 13, No. 3, pp. 319-340.

Debapriya Bhattacharya, M. R. (October, 2002). *Contribution of the RMG Sector to the Bangladesh Economy.* Dhaka, Bangladesh: Centre for Policy Dialogue.

delegation, t. l. (2009, April 28). RMG sector needs better technology. Dhaka, Bangladesh.

Derby, U. o. (2009). *About The Onion*. Retrieved from University of Derby: https://onion.derby.ac.uk/

Dossenbach, T. (1999). Basic Supply Chain Management=Greater Profits. *Wood & Wood Products 104 (10)*, 109.

Dudovskiy, J. (2018). *Types of Research Methods*. Retrieved from Reasearch Methodology: https://research-methodology.net/research-methodology/research-types/#_ftnref2

Encyclopedia, B. (2015). *Business Logistics. Available at:http://www.referenceforbusiness.com/encyclopedia/Bre-Cap/Business-Logistics.html.*

Faruque, H. (2020). *textile today*. Retrieved from https://www.textiletoday.com.bd/faruque-hassan-to-contest-for-the-post-of-bgmea-president/

Finance Division, M. o. (2019). *BANGLADESH ECONOMIC REVIEW 2019.* Dhaka: www.mof.gov.bd.

Fornell, C. a. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research (JMR)*, 18(1): 39-50.

G.Mateos-Aparicio. (2011). Partial Least Squares (PLS) Methods: Origins, Evolution, and Application to Social Sciences. *Communications in Statistics - Theory and Methods* , 40(13): 2305-2317.

Ganguli, M. (2020). *Interview with Manasij Ganguli*. Retrieved from fibre 2 fashion: https://www.fibre2fashion.com/interviews/face2face/threadsol/manasij-ganguli/1565-1

Geisser, S. (1974). A Predictive Approach to the Random Effect Model. *Biometrika*, 61(1): pp. 101-107.

Giannopoulos, G. (2004). The application of information and communication technologies in transport. *European Journal of International Research.Available at:http://www.sciencedirect.com.lib.costello.pub.hb.se/science/article/pii/S0377221703000262*.

Gooi Sai Wenga, S. Z. (2017). Mobile taxi booking application service's continuance usage. *ELSEVIER*, 207 - 2016.

Haider, D. M. (2007). Competitiveness of the Bangladesh ready-made garment industry in major international markets. *Asia-Pacific Trade and Investment Review*, 3-27.

Haider, M. A. (2007). Competitiveness of the Bangladesh Ready-made Garment Industry in Major International Markets. . *Asia-Pacific Trade and Investment Review, Vol. 3, No.1*.

Halldorsson, A. (2007). Complementary Theories to Supply Chain Management. *Supply chain management: An International Journal 12 (7)*, pp. 284-296.

Haque, A., & Nuruzzaman, A. R. (2010). Is Bangladeshi Rmg Sector Fit in the Global Apparel Business? Analyses the Supply Chain Management. *The South East Asian Journal of Management* , 53-72.

HASSAN, F. (2018, April 23). *Technology and the Future of Bangladesh's Apparel Industry*. Retrieved from RMGTimes.com: https://www.rmgtimes.com/news-article/9324/

Henseler, J. a. (2010). A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling. *Structural Equation Modeling* , 17(1): 82-109.

Henseler, J. M. (2009). The Use of Partial Least Square Path Modeling in International Marketing." . *Advances in International Marketing* , 20: 277–319.

Hodge, G. L. (2002). Enterprise Resource Planning in Textile. *Journal of Textile and Apparel, Technology and Management*, 1.

Hoque, F. (2019). Job characteristics model of Hackman and Oldham in garment sector in Bangladesh: a case study at Savar area in Dhaka district. *International Journal of Economics, Finance and Management Sciences* , 19.

Humayunr, S. K. (2020, December 3). *Product diversification as well as market diversification is key in today's fashion*. Retrieved from textile today: https://www.textiletoday.com.bd/

infoDev. (June, 2008). *The Global Textile and Garments Industry: The Role of Information on and Communication on Technologies (ICTs) in Exploiting the Value Chain.* An infoDev publication prepared by Enlightenment Economics.

INFODEV. (June, 2008.). *The Global Textile and Garments Industry: The Role of Information on and Communication on Technologies (ICTs) in Exploiting the Value Chain.* An infoDev publication prepared by Enlightenment Economics.

Ishaque, M. (2019, September 9). *RMG Industry Outlook 2019*. Retrieved from textilefocus.com: https://textilefocus.com/rmg-industry-outlook-2019/

Israt, J. (2020). Growth History of the Textile and Rmg Industries: Mfa Impact Analysis in the Perspective of Bangladesh.

ITC. (2005). *Appropriate ICT for Garments & Textile industry.* International Trade Center .

J Laugesen, K. H. (2015). The impact of internet health information on patient compliance: a research model and an empirical study. *Journal of medical Internet*.

J. Chitura, T., Mupemhi, S., Dube, T., & Bolongkikit. (2008). Barriers to electronic commerce adoption in small and medium enterprises: a critical literature review. *MSUIR*.

J. M., W. E. (2005). Design, Implementation, and Evaluation of Trust-Supporting Components in Virtual Communities for Patients. *Journal of Management Information Systems*, 101-135.

J.Cohen. (1988). *Statistical power analysis for the behavioral sciences.* Hillsdale, NJ, Lawrence Erlbaum Associates, Inc.

J.Hulland. (1999). Use of Partial Least Squares (PLS) in Strategic Management Research: A Review of Four Recent Studies. *Strategic Management Journal* , 20(2): 195-204.

J.P.Gupta, P. S., Selvaraju, S., Pal, D. T., Ravikiran, G., & Ravindran. (2008). Amelioration of reproductive problems in crossbred cattle with high blood urea nitrogen levels by ragi (finger millet) supplementation - A field study. *Indian J. Anim*, 78 (12):.

K. M. Faridul Hasan, M. S. (2016). Role of Textile and Clothing Industries in the Growth and Development of Trade & Business Strategies of Bangladesh in the Global Economy. *International Journal of Textile Science*.

K.C Jimmy . Lam, R. P. (1 July 2006). Textile and apparel supply chain management in Hong Kong. *International Journal of Clothing Science and Technology*.

K.M.Faridul Hasan, M. M. (2016). Role of textile and clothing industries in the growth and development of trade & business strategies of Bangladesh in the global economy. *International Journal of Textile Science*.

K.M.Faridul Hasan, M. M. (2019). Role of textile and clothing industries in the growth and development of trade & business strategies of Bangladesh in the global economy. *International Journal of Textile Science*.

Kabir, A. (2007). The End of Textile Quotas, Dilemma and Vision in the Garment Sector: A Case Study on Bangladesh MPRA . *University of East London*, 7.

Kamal, A. M. (2017, 19 October Wednesday). planning minister of Bangladesh. (T. D. SUN, Interviewer)

Karim, J. (2018). Fully-Automatic Marker making. *Management Information Systems* .

Karim, Z. (2018). Barriers to Electronic Commerce Adoption in Small and Medium Enterprises: A Critical Literature Review.

Khan, R. (2017). *Textile Flowchart* . Retrieved from http://www.textileflowchart.com/2015/01/working-flow-chart-of-cad-section-in.html

Knappe, M. (2004). *The Changing Global T&C Market and the role of "e" Applications to Increase Competitiveness.* International Trade Centre UNCTAD/WTO.

Larcker, C. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research (JMR)*, 39-50.

Latifee, E. H. (2 February 2016). *"RMG sector towards a thriving future".* Dhaka: The Daily Star.

Licker, P. (2005). eCommerce adoption in developing countries: a model and instrument. *Information and Management*, 42, 877-899.

Lloyd, M. (2011). The Role of ICT within Small and Medium Enterprises in Gauteng. *Communications of the IBIMA.*

M. J.Porter, C. J. (2001). Justice at the millennium: A meta-analytic review of 25 years of organizational justice research. *Journal of Applied Psychology*, 86(3), 425–445.

M.Bae. (2018). Understanding the effect of the discrepancy between sought and obtained gratification on social networking site users' satisfaction and continuance intention, Comput. 137-153.

M.Rock. (2003). Labor Conditions in the Export Oriented Garment Industry in Bangladesh. *South Asia: Journal of South Asian Studies*, Vol. 26 Iss. 3, pp. 391-407.

Malhotra, N. k. (2010). *Marketing Research.* Noida, india: PEARSON.

Mason, I. T. (2015). *The role of ICT in optimizing reverse textile supply chains.* The Swedish School of Textiles, University of Boras .

MatthiasKnappe. (2004). *International TradeCentre UNCTAD/WTO. The Changing Global T&C Market and the role of "e" Applications to Increase Competitiveness.*

Md & Habibullah, M. &. (2017). Readymade Garment Industry in Bangladesh: Growth, Contribution and Challenges. *IOSR Journal of Economics and Finance.* , 08. 01-07. 10.9790/5933-0803010107.

Md. Shahriar Alam, M. (2020). *bangladesh embassy*. Retrieved from http://bangladeshembassy.nl/state-minister/

Merchandiser, A. (2016, March 29). Retrieved from Garment Merchandising : http://www.garmentsmerchandising.com/application-of-erp-software-in-textile-and-apparel-industry/

Molla, E. M. (2018). Role of ICT in promoting sustainable consumption and production patterns of RMG sectors in the context of Bangladesh. . *Journal of Environmental Sustainability*, 4.

Morshed, M. M. (2007). *A Study on Labour Rights Implementation in Readymade Garment (RMG) Industry in Bangladesh - Bridging the Gap between Theory and Practice*. University of Wollongong.

Mostafiz, U. (2019). *Why bankruptcy laws need reform*. Retrieved from Dhaka Tribune: https://www.dhakatribune.com/opinion/op-ed/2020/05/09/why-bankruptcy-laws-need-reform

MTBiz. (07 AUGUST 2017). *MONTHLY BUSINESS REVIEW VOLUME: 08 ISSUE.* MTBiz.

Murshedy, A. S. (2019). *All BFF financial reports approved in AGM*. Retrieved from Dhaka Tribune: https://www.dhakatribune.com

Northan Tosrifa Group. (2020). Retrieved from https://www.ntg.com.bd/who-we-are.php

Nunnally, J. C. (1978). *Psychometric theory.* New York: McGraw-Hill.

Nyenroad-Business-University. (January, 2014). *'What creates the gap between the supply of the Bangladeshi ICT sector and the demand of the Dutch ICT sector and how this gap can be bridged best'.* Nyenroad Business University.

Odedra-Straub, M. (2003). E-Commerce and Development": Whose development? *EJISDC*.

Oppen, W. M.-S. (2009). Using PLS Path Modeling for Assessing Hierarchial Contruct Models: Guidlines and Empirical Illustration. *MIS Quarterly*, 177-195.

P.B.Jhala. (1991). *Application of CAD/CAM in the Textile Industry.* Springer-Verlag Berlin Heidelberg.

P.T.Thongrattana. (2010). Assessing reliability and validity of a measurement instrument for studying uncertain factors in Thai rice supply chain. *SBS HDR Student Conference, University of Wollongong*, Paper 4.

Parker, A. (2015). Information Technological impact on RMG. (S. Knitwear, Interviewer)

Pavlou, P. A. (23 Dec 2014). Consumer acceptance of electronic commerce: integrating trust and risk with the technology acceptance model. *International Journal of Electric Commerce* , 101-134.

Perego, A. P. (2011). ICT for logistics and freight transportation: A literature review and research agenda. *International Journal of Physical Distribution & Logistics Management, [online] Available at: http://dx.doi.org/10.1108/09600031111138826 [Accessed 4 April 2015]*.

Prasanta, S. (2017). Partnering through Co-Operative Goals in Supply Chain Relationships. *International Journal of Scientific Research and Education* .

Prous M. J. G. D. Y., F. R. (2009). Validation of Questionnaires. *Reumatol Clin*.

Przybylek, S. (2015). *study.com*. Retrieved from https://study.com/academy/lesson/how-is-cad-cam-used-in-textiles.html

R.Vrazalic, L. C., & M.MacGregor. (2002). The Impact of Business Size and Business Type on Small Business Investment in Electronic Commerce: A Study of Swedish Small Businesses,. *Australian Journal ofInformation Systems*, 31-39.

Rahman, & Anwar. (2006). Effectiveness of Fraud Prevention and Detection Techniques in Malaysian Islamic Banks. *Procedia - Social and Behavioral Sciences* .

Rashid, M. (2018, January 24). Bangladesh RMG: Achieving Excellence through Technology Transformation. Dhaka, Bangladesh.

Rashid, M. A. (2006). Rise of Readymade Garments Industry in Bangladesh: Entrepreneurial Ingenuity or Public Policy . *In workshop on Governance and Development Dhaka. world Bank and BIDS.* Dhaka.

Reaz, H. F. (January, 2020). *building competitive sectors for export diversification opportunities and Policy Priorities for Bangladesh.* International Finance Corporation.

Reaz, H. F. (January,2020). *building competitive sectors for export diversification opportunities and Policy Priorities for Bangladesh.* International Finance Corporation.

Rekhate, D. H., Dhore, R. N., Honmode, J., Sarde, P. P., & M.I., A. (1995). Is Bangladeshi Rmg Sector Fit in the Global Apparel Business? Analyses the Supply Chain Management. *Indian Journal*.

Review, W. T. (2021). *World Trade Statistical Review.*

Ringle, C. S. (2010). Response-Based Segmentation Using Finite Mixture Partial Least Squares: Theoretical Foundations and an Application to American Customer Satisfaction Index Data. *Annals of Information Systems* .

Roger C. Mayer, J. H. (1995). An integrative model of organizational trust. *Academy of Management Review*, 709-734.

Rumi, M., Bala, S., & Shah, A. (2021). Future Tradeoff under Fourth Industrial Revolution in Bangladesh: A Study on RMG Sector. *International Journal of Social, Political and Economic Research,*, 198-215.

Shahriar Akter, J. D. (2011). Trustworthiness in mHealth Information Services: An Assessment of a Hierarchical Model with Mediating and Moderating Effects Using Partial Least Squares (PLS). *JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE AND TECHNOLOGY,*, 100-116.

Shahriar, A. (2020, December 6). state minister of foreign affairs. (RMGBD.NET, Interviewer)

Siddiqi, G. (2007). *Banglapedia: Garment Industry*. Retrieved from Banglapedia: Garment Industry: http://banglapedia.search.com.bd/HT/G_0041.htm.

SQUARE textile. (2020). Retrieved from https://textile.squaregroup.com/tex_financialStat.html

SQUARETextileLtd. (2018-19). *Annual Financial Report.* Dhaka,Bangladesah: SQUARE.

Tao Zhou, S. Z. (2009). Examining the Effect of E-commerce Website Examining the Effect of E-commerce Website . *Second International Symposium on Electronic Commerce and Security, IEEE*.

Tareque, A., & Islam, A. (2020). Leading in the digital age: the perspectives of the readymade garments sector of Bangladesh. *Business Managemnet.*

Taylor, G. (15th Edition of March 2015). *Logistics Engineering Handbook.* p. 25-5.

TE_Online. (2008). *The Textile Exchange*. Retrieved from http://www.teonline.com/articles/2008/11/cad-in-textile-industry.html

Tenenhaus, M. V.-M. (2005). PLS path modeling. *Computational Statistics & Data Analysis* , 48(1): 159-205.

Tjia, E. C. (2005). Offshoring Information Technology. *Cambridge University Press*.

TOSRIFAIndustriesLtd. (2018-19). *Annual Financial Report.* Dhaka,Bangladesh: TOSRIFA Group.

UN. (1987). *Report of the World Commission on Environment and Development: Our Common Future.* World bank.

UNCTAD. (2005). *TNCs and the Removal of Textiles and Clothing Quotas.* UNCTAD.

Venkatesh, V. M. (2003). "User Acceptance of InformationTechnology: Toward a Unified View. *MIS Quarterly, vol.27*, 425-478.

W. W., B. L. (2003). A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study. *Information Systems Research.*, 14(2): 189-217.

W.W.Chin. (1998). Issues and Opinion on Structural Equation Modeling. *MIS Quarterly:*, 1-1.

Weisz, J. a. (2010). Emotions At Work: The Role of Emotional Intelligence and Emotional Labor in Predicting Work-Family Conflict, Psychology Distress and Life Satisfaction. *International Journal of Arts & Sciences (IJAS) Conference.* Rome, Itali.

Wilkins, L., Holt, D., & Swatman, P. (9-11 December, 2007). 'Through A Glass Darkly': Can Theoretical Models for Technology. *CollECTeR 2007.* Melbourne Australia.

Yang, S. (2015). Role of transfer-based and performance-based cues on initial trust in mobile shopping services: a cross-environment perspective. *Inform. Syst. e-Bus. Manag*, 47-70.

Zafar. (2011). Mauritius: An Economic Success Story. *World Bank.*

Zamani, B. (2015). *Towards understanding sustainable textile waste management:Environmental impacts and social indicators.* Chalmers University of Technology.

Zhou, T. (2012). Understanding users' initial trust in mobile banking: An elaboration likelihood perspective. *Computers in Human Behavior,* 1518-1525.

Appendix:

Respondents Companies

Company Name	Frequency N=347	Percentage
A B Mart Fashionwear ltd	1	0.29%
A M Design Ltd	1	0.29%
A Plus sweater Ltd.	1	0.29%
Aandti Enterprise	1	0.29%
Aarong	2	0.58%
ABA FASHIONS LTD.	8	2.31%
Abdullah Fashion Ltd	1	0.29%
Abedin Garments	1	0.29%
ABLY GARMENTS LTD.	1	0.29%
Aboni Fashion Ltd.	1	0.29%
Absulate Quatity Wear Ltd.	1	0.29%
ACME APPARELS (PVT) LTD.	1	0.29%
Aditi Garments	1	0.29%
Agami Fashion	3	0.86%
Ahsan Composit Ltd	4	1.15%
AJ Fashion Ltd	1	0.29%
AKIK APPARELS LTD	1	0.29%
AKIL DESIGN LTD	1	0.29%
AKR FASHIONS LTD.	2	0.58%
AL-AMIN GARMENT INDS. LTD	1	0.29%
Alauddin Garments Ltd	2	0.58%
ALEAYA SWEATER LTD.	1	0.29%
ALFA TEXTILES LTD	1	0.29%
Ali garments ltd	1	0.29%
Aliance Garmants	1	0.29%
Alif Apperials Ltd	1	0.29%
Alif Group Ltd	2	0.58%
ALIM KNITWEARS LTD	3	0.86%

AL-MUSLIM GARMENTS LTD	2	0.58%
AL-PACA SWEATER (PVT) LTD	1	0.29%
AL-SAHABI MODEMAKER LTD	1	0.29%
Alvenus Fashion Ltd	2	0.58%
AMC Sweater Ltd	1	0.29%
Ananta Apparels Ltd	2	0.58%
ANB Apperials	1	0.29%
Anika Apparels PVT Ltd.	3	0.86%
Aparupa Garments Ltd.	1	0.29%
Apex Garments Ltd	4	1.15%
Aranta Apperals private Ltd	1	0.29%
Asian Apparels Ltd.	1	0.29%
Asrotex Ltd	1	0.29%
Azmira Group	2	0.58%
Babylon Garments Ltd.	1	0.29%
Banaga Garments Ltd.	1	0.29%
Beximco Fashions Ltd.	8	2.31%
Bhuyan Fashion	2	0.58%
Brothers Group Ltd	1	0.29%
BurlingTons LLtd.	1	0.29%
Chaity Garments Ltd	3	0.86%
Concord Garments Ltd	1	0.29%
Corony Garemnts Ltd	2	0.58%
Creative Design Ltd.	1	0.29%
Crescent Fashion & Design Ltd	1	0.29%
Crross Line net febrics Ltd	2	0.58%
Dainty Tex Apperals Sourcing	1	0.29%
Dargon Sweater Bangladesh Ltd	1	0.29%
DBL Group	3	0.86%
Dekko Garments Ltd.	1	0.29%
Delta Group.Ltd	2	0.58%
Desh Garments LTD	3	0.86%

Devine Group	1	0.29%
Echotex LTD	2	0.58%
Egyllion Group	2	0.58%
EH Fabrics Ltd.	2	0.58%
Epic Garments Manufacturing Co. Ltd	1	0.29%
Epyllion Group	1	0.29%
Exim Tex Knet Composit Ltd	1	0.29%
Factory Outlet Ltd	1	0.29%
Fakir Group	1	0.29%
Far East Knitting and Dyeing Industries Limitied	2	0.58%
Fashion power Bangladesh	1	0.29%
Fashion Power Bangladesh Limited	2	0.58%
Fiza Sweater Ltd.	1	0.29%
FL Garments Ltd	1	0.29%
Fresh Fashion Ltd	1	0.29%
Fresh Fashion Wear Limited	2	0.58%
Genex infosys LTD	2	0.58%
Givensee Group of Industries Ltd	3	0.86%
Gold Hill Apperals Resources	1	0.29%
Ha-Meem Group	12	3.46%
Incredible Fashions Limited	2	0.58%
Inter Sports PVT . Ltd.	1	0.29%
International Classic Coposite Limited	2	0.58%
Interstop Garments Ltd	2	0.58%
Jamuna Apparels Ltd	2	0.58%
Jann Composite Mills Limited	3	0.86%
JF & Co. Ltd	3	0.86%
K. L. Fashion Ltd	5	1.44%
K.A.W Garments Industry Ltd.	2	0.58%
Karim Textile Ltd	1	0.29%
KAW Garments	1	0.29%

Latif Kneting Mills Ltd	4	1.15%
Liberty Knetware Ltd	3	0.86%
M & W Fashion Ltd	4	1.15%
M.S. Dyanig Printing & Finishing Ltd	3	0.86%
Maleka Fashion	1	0.29%
Malibag Dressar	1	0.29%
Mars Stitch Ltd.	2	0.58%
Masco Group	14	4.03%
Mavis Garments Ltd	1	0.29%
MB knit	2	0.58%
Merit Fashion	1	0.29%
MIM Fashion Wear Limited	4	1.15%
MM Garments	1	0.29%
MM Printing	1	0.29%
Mondal Group	2	0.58%
Mother Color Ltd	5	1.44%
MS Dyeing printing & Finishing Ltd	2	0.58%
Nassa Denin Ltd.	1	0.29%
Nipa Knetware Garments	2	0.58%
Norban Context Ltd	1	0.29%
Nur Knit BD Ltd	1	0.29%
Olira fashions Ltd	2	0.58%
Opex Sinha Group	2	0.58%
Orient Alure knetware Ltd	3	0.86%
Pakiza Group Ltd.	1	0.29%
Pioneer Apparels Ltd	2	0.58%
Posh Garments	1	0.29%
Radiance Group	1	0.29%
Ratul Group	2	0.58%
Renaissance Garments Ltd	6	1.73%
Rishad Group	1	0.29%
Rising Group	1	0.29%

Risnal Group of Industries	1	0.29%
Rose Sweater Ltd	6	1.73%
Rupa Group	5	1.44%
Ruposhi Fashion LLtd	4	1.15%
S.M. Net wares Ltd	5	1.44%
Salma Group	2	0.58%
Salman Spinning Mills Ltd	1	0.29%
Santa Garments Ltd	5	1.44%
Sawftex Ltd	2	0.58%
Seowan Bangladesh Ltd.	1	0.29%
Sepal Garments Limited	2	0.58%
Shanta Garments Ltd	1	0.29%
Shasha Denims Ltd.	2	0.58%
Shikder Group Of Industries	1	0.29%
Sicili Garments Ltd	1	0.29%
silk Route Design Limited	2	0.58%
Silver Group	2	0.58%
SNOWTEX	2	0.58%
Sourcing Bangladesh Ltd.	2	0.58%
Square Fashion LTD.	3	0.86%
Standard Group	3	0.86%
Star Let Apperals Ltd	3	0.86%
Starlet Apperals	1	0.29%
Stylex Collection	2	0.58%
Sultana Garments	3	0.86%
TAHSIN APPARELS LTD	1	0.29%
Tamishna Group	4	1.15%
Tecno Fiber	1	0.29%
Textil Fashions Ltd.	2	0.58%
The DACCA Dyeing & Manufacturing Co. Ltd.	2	0.58%
Tonoy Trading	1	0.29%

Torque Fashions Ltd.	2	0.58%
Triple Seven apperals	1	0.29%
Tuba Garments Ltd.	1	0.29%
Urmi Group Ltd	3	0.86%
Urozone	1	0.29%
Vaajon Apperals Ltd	3	0.86%
Versatile Jeans Ltd	1	0.29%
Viyella Tex Ltd	3	0.86%
Wal Mart Fashion Limited	1	0.29%
Wega Stylewiae LLtd	2	0.58%
West Apperals Ltd.	1	0.29%
Young One	4	1.15%
Youth Spinning Mills Ltd	2	0.58%
Zioxo	2	0.58%
Zyta Garments Ltd.	1	0.29%

Work Schedule

Work	**Year 1**				**Year 2**				**Year 3**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Developing Literature Review												
Identifying Research Problem and Developing Research Question												
Questionnaire's Development based on Research Problem and Question												
Conducting Survey and Collecting Responses												
Running tests												

Analyzing data and Findings and Comment on Finding and Overviewing on Prospective Future Development												
Writing Up, Revising and Re-writing												
Submission												

Questionnaire for Data Collection

A Survey for Ph.D. Thesis Titled: "Application of Information and Communication Technology (ICT) in Readymade Garments Industry: Study on Bangladesh Market".

Assalamualikum/Hello!

Thank you for taking the time to complete this survey questionnaire. The study will investigate **Prospects of Information and Communication Technology (ICT) in Readymade Garments Industry of Bangladesh**. For most questions simply circle the number or tick that corresponds to your answer. For other questions please record your answer in the space provided.

Before answering this questionnaire, please read a short introduction on **Information and Communication Technology (ICT) in Readymade Garments Industry of Bangladesh**.

Though Bangladesh's economy is mostly based on agriculture, the RMG industry is the most visible source of foreign cash. Bangladesh's Readymade Garments (RMG) industry has long been regarded as the country's "Golden Goose" for economic development. Bangladesh's ready-made garment (RMG) industry began its journey in the late 1970s. The RMG industry has risen to prominence in the economy in a short period of time. The clothing industry has adopted information and communication technology as an essential component. Employee attendance (clocking in), shipment dispatching, ERP software implementation, CAD/CAM system for pattern making or plotting, computerized cutting machine, online FIT approval, ERP for inventory tracking in the production management, mailing solution, preparation of MIS reports, voice chatting, semi-automatic and fully automatic sewing machines and real-time communication with buyer through online solutions like Skype- all these jobs are done by the ICT applications. The RMG industry views ICT as an essential tool for efficiently conducting day-to-day business, rather than a vehicle for competitive advantage. ICT's impact on the garment industry's structure, assumptions, processes, efficiency, and decision-making yields significant advantages. The Bangladesh Government, in collaboration with BGMEA and BKMEA, should move quickly to provide technical assistance in ICT infrastructure and implementation in the garment sector. This research will aim to investigate the literature on ICT applications as well as their potential in Bangladesh's RMG sector.

Questionnaire for Owners/Managers/It Staffs

Part-A

1. Your Name:……
2. E-mail:…….
3. Gender**:**

a) Male ☐	b) Female ☐

4. Company Name: …….. (Strictly maintained confidentiality)

5. Year of incorporation/ commercial operation of your organization: …….
6. How would you rate your company on the ability of executive and business leaders to use ICT?

a) Minimal ☐	b) Less than Adequate ☐	c) Adequate ☐
d) More than Adequate ☐	e) World Class ☐	

7. Approximately how many staffs are in your company related to ICT?

a) 50 or Fewer ☐	b) 51 to 100 ☐	c) 101 to 150 ☐
d) 151 to 200 ☐	e) 201 to 250 ☐	f) More than 300 ☐

8. In your organization, the collection of data for ICT based report is-

a) In-house ☐	b) Out-house ☐	c) Both ☐

9. In your organization, the ICT based report is made-

a) In-house ☐	b) Out-house ☐	c) Both ☐

10. How do you generate market data for your company?

☐ Channel Members(retailers and Wholesalers)	☐ Market Observation
☐ Customers	☐ Projective Techniques
☐ Social Media/ Web Analytics	☐ Secondary Sources
☐ Experimental	Others (specify): ……..

11. What tangible benefits do you hope to achieve through your successfully ICT application? (You can circle more than one answer).
    a) Increased sale
    b) Lower cost
    c) Higher quality products and services
    d) More efficient operation
    e) Better decision making
    f) Risk reduction
    g) Better market targeting
    h) Improved customer feedback
    i) Better customer-company relationship
    j) Better insight into the market and market competition

12. What problem have you encountered when using ICT?
    a) Inadequate technical know-how
    b) Inadequate analytical know-how
    c) Cost related to technical problems
    d) Business privacy issues
    e) Lack of handling business case
    f) Government inadequate incentives and support

Part-B

Please read following each statement and rate each statement on 5-point Likert scales by putting √ (tick) in the number that best describes you. All statements will be measured on a 5-point Likert scale, where 1 = Strongly disagree, 2 = Disagree, 3= Neither Disagree nor agree, 4 = Agree, and 5 = Strongly agree.

(1=Strongly Disagree, 2=Disagree, 3= Neither Disagree nor agree, 4=Agree, 5= Strongly agree)

Operational Excellence(OE)						
OE1	Our Company intends to continue using ICT in the future to accelerate Operational Excellence.	1	2	3	4	5
OE2	Our Company will continue using ICT in the future.	1	2	3	4	5
OE3	Our Company will regularly use ICT in the future.	1	2	3	4	5
Use Behavior (UB)						
UB1	ICT reduce cycle time	1	2	3	4	5
UB2	ICT ensure accuracy	1	2	3	4	5
UB3	ICT ensure timeliness	1	2	3	4	5
UB4	ICT ensure relevancy	1	2	3	4	5
UB5	ICT ensure adequacy	1	2	3	4	5
Business Process Performance (BPP)						
BPP1	Business process will be improved after using ICT applications.	1	2	3	4	5
BPP2	Business Processes implies the competencies of the firm.	1	2	3	4	5
BPP3	Improved Business process will increase operational excellence of the firm.	1	2	3	4	5
Standard Environment (SE)						
SE1	Standard environment promote organizations to focus on operational excellence	1	2	3	4	5
SE2	Standard environment provide adaptability to the organization.	1	2	3	4	5
SE3	Consumers, competitors, suppliers are the part of the firm's environment	1	2	3	4	5
Perceived Usefulness(PU)						
PU1	Using ICT will address the company's management needs.	1	2	3	4	5
PU2	Using ICT will enhance the effectiveness of the company's management.	1	2	3	4	5
PU3	Overall, using ICT will be useful in managing company's activities.	1	2	3	4	5

PU4	Using ICT increases company's productivity.	1	2	3	4	5
Organization's capacity (OC)						
OC1	ICT application improve business processes that made your organization more capable	1	2	3	4	5
OC2	Scope of the works demand use of ICT in larger scale	1	2	3	4	5
OC3	Applications of ICT depends on firm's size	1	2	3	4	5
ICT Service Quality (ISERV) (Communication)						
ISERV 1	Proper communication accelerates ICT service quality.	1	2	3	4	5
ISERV 2	Company is willing to share ICT related information with others.	1	2	3	4	5
ISERV 3	There is good communication between the vendors and the ICT user	1	2	3	4	5
ISERV 4	The vendor of ICT is willing to provide any type of information.	1	2	3	4	5
ICT Service Quality (ISERV) (Competence)						
ISERV 5	ICT is competent and effective in providing service.	1	2	3	4	5
ISERV 6	ICT performs its role of providing service very well.	1	2	3	4	5
ISERV 7	ICT is capable and proficient to meet the customers' requirements.	1	2	3	4	5
ISERV 8	ICT is enough updated to compete in the market.	1	2	3	4	5
ICT System Quality (ISYST) (Relevance)						
ISYST1	Service provided by the ICT is relevant as per company's objective.	1	2	3	4	5
ISYST2	Service provided by the ICT is related to customer's expectation.	1	2	3	4	5
ISYST3	In general, service provided by the ICT is relevant to compete in the market.	1	2	3	4	5
ICT System Quality (Accuracy)						
ISYST4	Application of ICT is trustworthy	1	2	3	4	5
ISYST5	Application of ICT is accurate.	1	2	3	4	5

ISYST6	In general, application of ICT is reliable.	1	2	3	4	5
ICT System Quality (Adequacy)						
ISYST7	Application of ICT is sufficient.	1	2	3	4	5
ISYST8	Application of ICT is adequate.	1	2	3	4	5
ISYST9	Application of ICT covers all of the areas of the company.	1	2	3	4	5
ICT System Quality (Timeliness)						
ISYST10	Applied ICT is current.	1	2	3	4	5
ISYST11	Applied ICT is continuously updated.	1	2	3	4	5
ISYST12	In general, service of the ICT is timely.	1	2	3	4	5
Firm's Scope (FS)						
FS1	ICT makes organization's work easier.	1	2	3	4	5
FS2	ICT favors firm over its rival group.	1	2	3	4	5
FS3	Wide ranges of works need ICT applications.	1	2	3	4	5
Firm's IT Resources (FSE)						
FSE1	My organization has ERP, SCM, and Payroll for managing its huge activities.	1	2	3	4	5
FSE2	We have sufficient IT expert to support.	1	2	3	4	5
FSE3	Being as a part of RMG industry, we have ICT to help to do our day to day activities.	1	2	3	4	5
Complementary Resource (CR)						
CR1	My organization has backup ICT resources in case of difficulty.	1	2	3	4	5
CR2	My organization has ICT test and development facilities.	1	2	3	4	5
CR3	Backup resources are sufficient to support in case of difficulty.	1	2	3	4	5
Consumer Readiness(CR)						
CR1	Consumers are aware of the existent IT service.	1	2	3	4	5
CR2	Consumers have knowledge of the IT service benefits.	1	2	3	4	3

CR3	Consumers like and tend to use ICT applications often.	1	2	3	4	5
CR4	Consumers have preference over the competing IT products.	1	2	3	4	5
Competitive Pressure (CP)						
CP1	Competitive pressure is high enough	1	2	3	4	5
CP2	Competitors gain advantages because of using ICT applications	1	2	3	4	5
CP3	ICT application is your company's major competitive advantage	1	2	3	4	5
CP4	ICT application is one of the main reason of sustainability	1	2	3	4	5

Part-C

1. What are the types of problems faced by the concerned authority to implement ICT in RMG?
   a) ……..
   b) …….
   c) …….
   d) ……..
   e) …….

2. What type of ICT needs to be initiated by RMG sector that has impact on achieving operational excellence?
   a) ……..
   b) …….
   c) ……
   d) ……
   e) ……

Thanks a lot for giving me your valuable time.