Unveiling the Effects of ICT Adoption in the Apparel Sector of Bangladesh Based on Technology-Organization-Environment Framework

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A B S T R A C T

The study is based on the technology-organization-environment (TOE) model which, attempted to determine the factors that are going to influence ICT adoption. The proposed research model evaluates the interplay among technological context (IT infrastructure, system security, and user capacity), organizational context (top management commitment, and innovations strategies), environmental context (quick response to the external agencies, interactive network infrastructure, and competitive pressure) and ICT adoption (productivity growth, organizational change, and competitiveness). Data were collected from 243 senior executives of full member firms of the Bangladesh Garments and Manufacturers Association (BGMEA) of examining the relationships among the constructs in the proposed framework utilizing structural equation modeling (SEM). The analysis of TOE factors revealed that environmental, organizational, and technological factors have a significant impact on the successful implementation of ICT tools. The study also discusses implications for management practitioners.

Keywords: ICT, Business Performance, Technology-Organization-Environment (TOE), Structural Equation Modeling (SEM)

Ⅰ. Introduction

The apparel sector in Bangladesh has been considered an immensely imperative part of the economy of Bangladesh over the last few decades. This sector has made significant yield from international trade and commerce, employment generation, mitigation of poverty, and especially the empowerment of women. It has been found that almost 82 percent of the export yield has been received from the apparel sector of Bangladesh (BBS, 2021). Thus, a Sustainable action plan has become a necessity to ascertain the future steady advancement of this sector which requires time-proven strategies. In this connection, this study attempted to unveil the critical indigenous factors of ICT adoption in the apparel sector of

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Bangladesh from the perspective of the TOE framework. The study conducted by Hoque et al. (2016) identified that the trade operation of the apparel industry of Bangladesh has been significantly affected by improper use of technology especially the adoption of ICTs. They also argued that one of the main challenges of the apparel sector is the mismatch of work settings and IT infrastructure. Critics argued that the use of obsolete technology and equipment along with inadequate ICT adoption made this sector vulnerable which eventually led to a decline in competitiveness compared to its competitors such as India and China (Yunus and Yamagata, 2012). Thus, the apparel sector of Bangladesh is in dire need of establishing continuous improvement which to a large extent depends on increasing utilization of IT applications that are expected to exert more effective means of operations. The total supply chain of the RMG industry and quality control in every sphere of the sector is instrumentally dependent on appropriate ICTs. Several management practitioners identify that the adoption of ICTs even not in the form of competitive advantage but also an essential weapon to the successful operation of the apparel business. Being a globalized export-oriented industry, adoption of appropriate ICTs has become an integral part of the core business processes in the apparel sector of Bangladesh (Hasan et al., 2016).

Organizations in developing countries are still lacking behind in terms of significant studies addressing the appropriate ICT infrastructure for attaining sustainable goals. Just technology transfer from advanced countries does not provide an adequate solution to the challenges faced. The country-specific indigenous factors are to be addressed properly to yield the benefits of the adoption ICTs (Debnath et al., 2023). Several critiques argue that the apparel industry of Bangladesh might attain a competitive advantage through proper investigation casing crucial implementations of ICT adoption across the business processes. Even though the management practitioners recognized the standing and benefits of adequate adoption of ICTs, this sector of Bangladesh observed limited studies in comparison with competitors (Khan et al., 2021). In this connection, this study intended to unveil the crucial factors to ease the adoption of ICTs considering the elements of the TOE framework. It is evident that the apparel industry of Bangladesh is required to devise appropriate strategies to reform and modernize the adoption of ICTs so that they can be comprehensively applied to augment productivity and competitiveness further. By taking advantage of ICTs, firms will be able to compete more efficiently and effectively both locally and globally. Further, this study conceives that to be sustainable in the knowledge economy the apparel industry of Bangladesh should have to act now accordingly (Salam, 2017).

The business sector has recognized that the adoption of ICT has been instrumental to the performance of firms around the world. Dastane (2020) mentioned that firm productivity could be enhanced through the successful adoption of ICT. Some of the empirical evidence endorses the constructive impact of ICTs on the performance of firms in the area of value addition, market share, productivity, process efficiency, service quality, and process flexibility (Mikalef et al., 2021; Melville et al., 2004). Falk (2005) established in his research that ICT plays a role as an enabler in initiating positive changes in every functional area of the organization. The adoption of ICT can also allow firms to attain a competitive advantage by enhancing primary support efforts and cost reduction that are supposed to lead to differentiation and premium prices (Porter and Millar, 1985). Management practitioners recognized that the tools of ICTs can

significantly aid the apparel industry by supplementing capacity in the area of design, ensuring flexibility, reducing production time, observing the flow of work and materials, etc. (Gu and Jung, 2013). Hence, apparel firms are to adopt ICT in such a way that they can optimize the benefits expected from it (Shiralkar et al., 2021). Thus, to understand the critical role of ICT in attaining competitiveness, studies are expected to focus on the ways by which ICT could be adopted for enhancing firm performance (Arvanitis, 2005; Karim et al., 2022).

The study conducted by Huang et al. (2021) revealed that during the last decade, the adoption ICTs in the form of visualization of knowledge has been contributing significantly to the decision support systems in China. Several case studies on Taiwanese have been carried out by Chen (2019) who found that IoT as-a-service is very valuable for firm performance in the context of the 4th industrial revolution (industry 4.0) while considering the global value chain (GVC). The study conducted in India found that initially ICTs had been considered just as a tool for enhancing productivity, however, nowadays apparel firms have been adopting ICTs in multifarious fields of the apparel industry to attain competitive advantage (Lahiri et al., 2021). It has been emphasized by Rasiah and Vinanchiarachi (2013) that technological upgradation especially ICTs inspires innovation in the apparel sector which in turn helps manufacturers remain competitive in the market. The competitors of Bangladesh in the apparel market e.g., India, Vietnam, and China have been adopting ICT upgradation to gain competitive advantages (Hoque et al., 2021). Park-Poaps et al. (2020) recognized that competitive pressure is pushing the apparel sector of Bangladesh to move to the enhanced adoption of information and software technologies.

It is felt that the textile industry in Bangladesh is at crossroads as competitiveness has taken a new dimension in the global market. Standing on this footing, the integration of ICTs in the business decision-making context has become a necessity to attain competitiveness (Djalic et al., 2021). Previously many studies have been carried out considering the quantitative aspects of competitiveness but few of them addressed the challenges concerning the indigenous factors or country-specific factors of ICT adoption in a developing country like Bangladesh (Elasrag, 2010). In this context, this research attempts to find an answer to the question of how the essentials of ICT adoption in relation to TOE constructs have interplays in relation to the apparel sector of Bangladesh. The study contributes to the field of development of competitive intelligence by understanding ICT adoption strategies to be devised for new skill sets to cope with the challenges of the new era of competitiveness in the context of the apparel industry of Bangladesh. For operational purposes, the study utilized Rogers (1995)'s innovation model for unveiling the crucial factors of the adoption of ICTs. The model essentially comprises social systems, communication networks, and innovation. This model holds that the adoption of ICT is significantly influenced by the characteristics of the prevailing practices and know-how, compatibility with the existing atmosphere, and ease of use. To evaluate the proposed model, available ICT infrastructure, applications, tools, and technologies relevant to the apparel industry have been taken care of. While considering the issues related to infrastructure, capacities like adequate hardware, internet accessibility, and technical expertise have been included. Applications include both computer software and manufacturing-related software whereas tools and technologies capture appropriate system analysis and design of the overall system.

Ⅱ. Literature Review

Currently, the apparel industry has become globalized and demand-driven, therefore, apparel firms are to adapt themselves to the dynamics of the global environment (Sen, 2008; Yen, 2002). Being global, apparel firms must take a holistic approach considering the global value chain. Hence, at every stage of operation, apparel firms are getting critically dependent on the extensive use of ICTs to attain a competitive edge (Ding et al., 2011). Because of globalization, apparel firms encounter tremendous competition nationally and internationally (Lam and Postle, 2006). The apparel industry is experiencing a shift from labor-intensive to ICT-adopting due to agility in the market. Consequently, apparel firms have to adopt ICT applications to interact with intra-organizational and inter-organizational connections (Saif et al., 2021). The study conducted by Andersen and Segars (2001) revealed that there is a strong association between ICT, decision structure, and the performance of the firms. The study found that high adoption of ICT in organizations leads to enhanced competitiveness of firms.

From the perspective of knowledge-based views, Jiang et al. (2016) recognized that the competitiveness of firms is ascertained by knowledge assets. Besides, information flow in successful business coalitions bears substantial strategic magnitude. The study also mentioned that defending valuable information from misappropriation or reproduction expedites the organizations to establish and maintain competitiveness. Camagni and Capello (2009) worked on the impact of investment in information and communication technology and innovation on competitive advantage. The study found that sources of competitive advantage are being constantly altered by the transition to the global knowledge economy. Investment in

ICTs along with innovation and knowledge flows are considered instrumental to labor productivity and efficiency of the whole economic system. In connection with the implication of ICT, many researchers (Chirumalla, 2021) identified a new collection of competitiveness that leads to the formation of innovative strategic, managerial, and dynamic practices. These studies recognize the role of network firms which are constructed upon the independence of work, and managerial delegation through the use of ICTs. Empirical evidence validates those new interconnected sources of competitive abilities like international strategy, rigorous utilization of ICTs, diversity of knowledge, novelty, innovative work methods, attitude to human resource, and implementation of systems approaches which are found in network-firms powered by effective adoption of ICTs (Cardona et al., 2013; Mouzas and Ford, 2012).

Several studies have been carried out to examine various influences of the expected benefits of the adoption of ICT decisions. It has been found that the anticipated benefits of adopting ICT yield a positive impact on ICT adoption decisions (Bresnahan et al., 2002). ICT is supposed to enhance the overall efficiency of utilizing inputs such as accelerating internal business processes, communication among members, dropping the cost of coordination, and cost of transactions, etc. (Kagermann et al., 2010). A survey by Goodacre and Tonks (1995) revealed that critical investment cost might be a matter of decision at the beginning. However, this is considered as a favorable investment in innovation eventually. Arvanitis (2005) in a study found a substantial positive association between ICT and human capital which is instrumental to labor productivity. This link leads to skillful employees which is possible due to the contribution of ICT as a new technology. At present, the association between the adoption of ICT and

the development of human resources is being taken as a basis for the skill base of organizations (Bresnahan et al., 2002). ICT adoption might be jeopardized due to the shortage of IT-skilled manpower which may stem from insufficient IT specialists. This impetus has been stressed by a number of researchers (Chapman et al., 2000). In this regard, Kristl Volfová (2022) suggested that obstacles of inadequate IT skilled manpower can be handled by substantial ICT-related training.

Bayo-Moriones and Lera-López (2007) conducted their study with the aim to see the role of structural characteristics, and human capital with regard to ICT adoption. They established that these factors are driving forces for setting competitive strategies related to ICT adoption. It is further opined that organizational dynamics have a great impact not only on innovative capacity but also on the principles followed by the organization. The study by Han and Ravichandran (2006) considered different structural traits of a firm and found that structural characteristics tend to serve as very influential determinants of ICT adoption. These forces in reality interact with each other and form the basis for ICT adoption decisions. It has been further recognized that the decisions of a firm are restricted by structural characteristics which in turn shape up the capability of a firm to adopt innovation (Bayo-Moriones and Lera-Lopez, 2007).

Nowadays e-commerce has become imperative in the successful operation of firms doing business in the apparel sector. In this connection, the study conducted by Chong et al. (2009) revealed that the factors like readiness of organizations, inventive features, government influence, and culture may have a significant impact on the adoption of e-commerce capability of textile firms. B2B e-commerce has been considered to be one of the important pillars of digital marketing. ICT-supportive policy, markets, organizational aspects, and culture generally play a crucial role in the successful implementation of B2B e-commerce (Krishna and Singh, 2018).

In order to establish a cost-effective business process the apparel industry is required to establish appropriate infrastructure to sustain its competitiveness (Yen and Su, 2007). Since the apparel sector of Bangladesh has been one of the crucial contributors to the economy of Bangladesh and considering the future trends in the apparel sector, the Bangladeshi apparel firms will have to transfer their business models which are equipped with high adoption of ICT applications. Understanding the strategic implication of firm competitiveness and in the context of growth over a few decades, a big volume of literature on the competitiveness of Bangladeshi apparel firms would have been expected. However, competitiveness issues in the apparel sector of Bangladesh remain an understudied field of business so far. The review of the literature reveals that until now very few studies have been carried out empirically with comprehensive analysis of the indigenous factors of adoption of ICT in the apparel industry of Bangladesh. Besides, the absence of cohesion in the underlying constructs in the existing frameworks gives rise to the need for further research in relation to the adoption of ICTs (Smallbone et al., 2002). Thus, the study attempts to investigate the association among the salient aspects of ICT adoption from the perspective of the TOE framework for the robust development of the apparel industry of Bangladesh.

Ⅲ. Theoretical Background and Research Hypotheses

The technology, organization, and environment
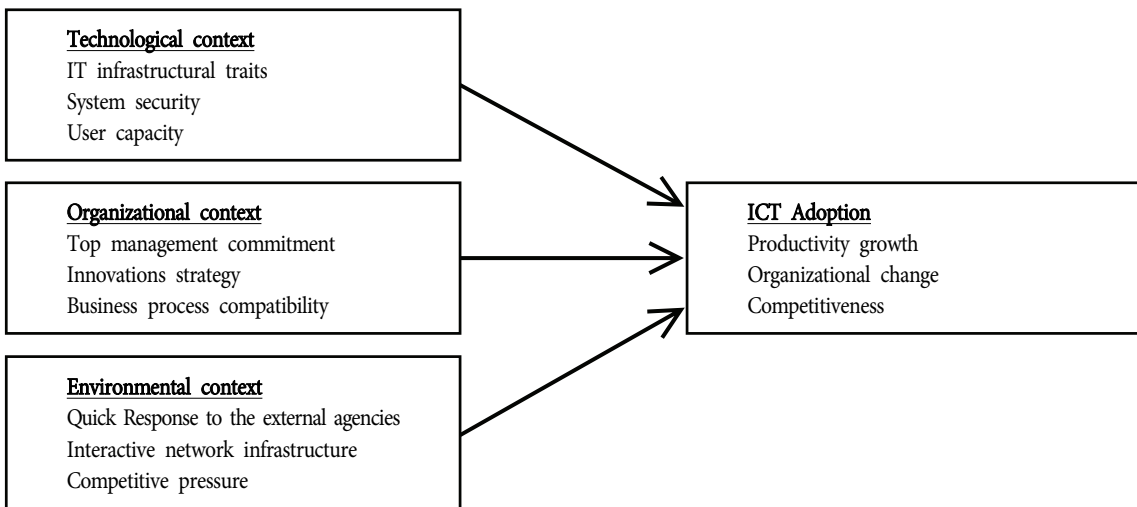
<Figure 1> The Study Framework

framework has been considered a very suitable investigative tool while conducting the study on the adoption of ICT. The reason behind its popularity is that it has a sound theoretical foundation and reliable empirical support too. Tornatzky et al. (1990) established the process of inventive and proactive ICT systems adoption. This approach considers internal as well as external technological tools which are compatible with firms along with their expected and potential benefits. Firm-specific features hold various measures like – the willingness of the firm to adopt novel and innovative technology, compatible resources for effective adoption, and infrastructure of the IT system. The overall context of the industry, the structure of the competitors and partners, and regulatory authority have been considered as factors related to the environment in relation to adopting new technology.

The TOE approach has been useful in a number of studies in relation to the adoption of ICTs. Kuan and Chau (2001) while formulating a framework for the adoption of electronic data interchange utilized the TOE model effectively. Their findings were consistent with Tornatzky and Klein (1982) on earlier ICT adoption research. It has been revealed that the contextual factors identified in the TOE model are very crucial for having insight in relation to the adoption of technology in successful firms.

After understanding the usefulness of the TOE framework, this study attempts to incorporate technology, organization, and environment as critical components in adopting ICTs in the apparel sector of Bangladesh. The adoption of ICTs refers to the study utilized by Rogers (1995)'s innovation model for understanding the adoption of ICTs. The model essentially encompasses social systems, communication networks, and innovation strategies. This model holds that the adoption of ICT is significantly influenced by the characteristics of the prevailing practices and know-how, compatibility with the existing atmosphere, and ease of use. This model also highlights the characteristics like beliefs, cultural values, education levels, shared concepts, interpersonal contacts, and other behavioral aspects. Based on the TOE framework three research hypotheses have been devised.

3.1. ICT Adoption

The adoption of ICT is expected to have a progressive impact on the sustainable development of productivity and growth. The use of various ICT tools can substantially contribute to the efficient utilization of organizational resources that are found instrumental to long-term achievements (Bayo-Moriones et al., 2013). The relationship between skill set and ICT adoption brings about organizational change. Data analysis using sophisticated ICTs leads to attaining actionable information that helps transform the existing system into a new one to accommodate changes in the environment. Effective system analysis requires a cognitive computing environment that can deal with heterogenous sources of data for managing business dynamics. Thus, in effect, the adoption of ICT causes significant modifications in the form of analytics and cognitions (Gudivada et al., 2016). Further, the appropriate utilization of ICT enhances decentralization that initiates flexibility (Giuri et al., 2008). Empirical evidence reveal that the adoption of ICT is directly linked to efficiency in organizations which leads to the need for significant investment in the sector of ICTs. ICT is expected to increase a higher level of collaboration among the stakeholders and in turn enhance the capacity of the firms to perform better in the competitive market (Becchetti et al., 2003).

3.2. Technological Context

The infrastructure along with system security has been considered a very important component for the effective adoption of ICT (Lin and Lee, 2005). Firms are to put an impetus on the user capacity since without enhancing the skill set of the user the potential benefits of adoption of ICT could not be extracted (Moore and Benbasat, 1991). Thus, IT infrastructural traits, system security, and user capacity altogether capture the impact of technological context on ICT adoption in the apparel sector of Bangladesh. The study conducted by Nurruzaman et al. (2016) recognized that inappropriate installation of IT technology and infrastructure in the apparel industry of Bangladesh poses to be one of the main hindrances in gaining a competitive edge over the competitors however, this issue has not been duly addressed by scientific studies. Based on this context the following research hypothesis has been devised:

H_1: Technological context has a positive impact on ICT adoption in the apparel sector of Bangladesh

3.3. Organizational Context

The application of ICT tools ought to be aligned with the plans and company strategies in order to achieve the potential benefits of the adoption of ICT. Top management commitment would play a very critical role in incorporating strategies in relation to organizational context by ensuring favorable investment (Vega et al., 2008). Hult et al. (2004) found innovation initiatives as a crucial capability of the organization which contributes substantially to the successful implementation of ICT adoption. Homburg et al. (2002) found innovations as one of the functions of the firm that are to be strongly recommended for effective ICT adoption. The ICT's readiness is greatly influenced by compatibility with the concerned business processes. The pressure from the perspective of business processes dictates how ICT could be adopted. Thus, the structural traits determine the capability of the firms' existing business process compatibility (Manueli et al., 2007). Hence, the study attempted to illustrate the impact on ICT

adoption through the indicator variables comprising top management commitment, and innovations strategy in the organizational settings. Haque (2016) found that the studies conducted in the apparel sector of Bangladesh lack in integrating the organizational aspects like company strategies, business process innovation, management's commitment, etc. with appropriate adoption of ICTs. Therefore, the following hypothesis has been developed:

H₂: Organizational context has a positive impact on ICT adoption in the apparel sector of Bangladesh

3.4. Environmental context

The adoption of ICT is supposed to deal with the unpredictability stemming from the environment since the dynamics and complexity of the environment create difficulties relating to the prompt response to external agencies (Kapucu, 2006). Advances in response systems enhance access to information that in turn increases effectiveness in the area of networked firms (Horan and Schooley, 2007). Interactive network infrastructure accelerates sharing and collaboration that reduce the risk of probable failure. By establishing an inter-agency link in the business arena, firms can attain the capacity of dealing with contingencies (Junglas and Ives, 2007). Appropriate innovation strategies due to competitive pressure have been found on the determinants in the way of ICT adoption. Competitive pressure has been presumed to be a potential drive to adopt appropriate ICT tools in the firm for attaining a competitive edge. Firms generally respond to the requirements of the market related to ICT for responding in time with external agencies (Fuentelsaz et al., 2003). While evaluating the impact of environmental context, the study considered quick response to external agencies,

interactive network infrastructure, and competitive pressure. The apparel sector of Bangladesh is a demand-driven and globalized industry where the firms are to adjust policies, strategies, and action plans in connection with ICT tools to cope with the changes in the environment (Ding et al., 2011). In this context, the study attempted to evaluate the following hypothesis:

H₃: Environmental context has a positive impact on ICT adoption in the apparel Industry of Bangladesh

Ⅳ. Research Methodology

4.1. Developing Questionnaire and Survey Administration

Following the recommendation given by Churchill (1979), a survey questionnaire and scales for measurement has been established. Firstly, after conducting a rigorous literature review, an open-ended questionnaire was developed to obtain insight about the competitive capacity at the firm or business level in the context of Bangladesh. The developed questionnaire was then distributed to the reputed academicians and professionals in the concerned field. Besides, a focus group discussion (FGD) was organized with renowned experts in the field of the apparel industry of Bangladesh to filter the responses found from the open-ended questionnaire.

The final questionnaire has been devised incorporating the responses of the open-ended survey, relevant literature, objectives of the research, and outcome of FGD. The Validness of the Content of the questionnaire has been attested through the evaluation of renowned academicians and researchers. At this stage, the layout, construction of the scale items,

the wording of questions, content, readability, and understandability were revised to make the questionnaire clear and understandable to the respondents. The questionnaire was embraced with closed-ended questions which employed a five-point Likert scale.

A pilot survey was organized to analyze the validity, understandability, and reliability of the items of the questionnaire. After incorporating feedback from the pilot survey, the researcher distributed the final version of the questionnaire to the target respondents one week ahead of the collection of the questionnaire.

The survey questionnaire was comprised of two main sections. The first part of the questionnaire represents questions on the perception of the subject regarding firm-level competitiveness. The second part included questions about the demographic profile of respondents including age, gender, education level, occupation, designation, and years of experience.

4.2. Population and Sample Area of Study for Opinion Survey

The study utilized primary research to gather data in this respect. The population for the opinion survey of this research was comprised of relevant experts/managers of the apparel industry. An opinion survey was conducted on the mid-level or higher-level personnel of the concerned organizations who are expected to have an understanding of the firm's competitiveness. This study considered the firms which are full members of the Bangladesh Garments Manufacturers and Exporters Association (BGMEA).

4.3. Sampling Frame and Sampling Technique

Gorsuch (1983) recommended that at least five observations for each construct and at least 100 observations in total are satisfactory for the purpose of analysis of data in SEM. It has been suggested by Harris and Schaubroeck (1990) that the size of the sample is supposed to be not less than 200 to ascertain robust SEM. Kline (2005) also proposed that the size of the sample is supposed to be at least 200 for complicated a model.

In order to examine the research framework empirically, the study sample has been taken from the BGMEA member firms in June 2021. The sample of 30 firms has been selected randomly out of 453 member firms. The respondents were asked to fill up the structured questionnaire about providing their opinion regarding the adoption of ICT in their firm from the perspective of technology, organization, and environment. The respondents were comprised of mid-level or senior executives. The researcher collected the information through a face-to-face interview. Among 250 distributed questionnaires 243 completed questionnaires were found valid for data analysis.

4.4. Measurement Development

Measurement items used in the study have been based on appropriate literature support. The measures used in the model focused on the indicators variables which are supposed to have a positive impact on ICT adoption. <Table 1> summarizes the literature support for determining measures of technological, environmental, and organizational context.

Ⅴ. Data Analysis

Based on the two-stage approach recommended by Anderson and Gerbing (1988) data analysis has

<Table 1> Summary of the Literature Support For Indicator Variables

Technological Context (TEC)	
IT infrastructural traits (TEC1)	Lin and Lee (2005)
System security (TEC2)	Straub and Waston (2001)
User capacity (TEC3)	Moore and Benbasat (1991)
Organizational Context (ORG)	
Top management commitment (ORG1)	Vega et al. (2008)
Innovations strategy (ORG2)	Hult et al. (2004)
Business process compatibility (ORG3)	Manueli et al. (2007)
Environmental Context (ENV)	
Quick Response to the external agencies (ENV1)	Kapucu (2006); Horan and Schooley (2007)
Dealing with contingencies (ENV2)	Junglas and Ives (2007)
Competitive pressure (ENV3)	Fuentelsaz et al. (2003)
ICT Adoption (ICT)	
Productivity growth (ICT1)	Bayo-Moriones et al. (2013)
Organization change (ICT2)	Giuri et al. (2008)
Competitiveness (ICT3)	Becchetti et al. (2003); Phene et al. (2006)

been carried out. At the first stage, the measurement model has been evaluated and at the second stage structural model has been examined among the constructs.

<Table 2> depicts the questionnaire items that have been used for measuring the four constructs. The composite reliability (CR) for each construct ranges from 0.825 to 0.853 signifying adequate scale reliability. The factor loadings of every indicator variable are higher than 0.7 which indicates satisfactory convergence with the constructs. <Table 3> reveals that average variance extracted (AVE) values are also safely higher than 0.5 signifying the adequacy of convergent validity of the constructs. The discriminant validity of the measurement model is evaluated by Fornell and Larcker (1981)'s criterion . The measurement model is supposed to pass the discriminant validity test if the AVE is more than the correlations between the corresponding measure and all other measures (Bagozzi and Yi, 1988). According to the results depicted in <Table 3>, every squared root of the average variance extracted is found to exceed the values on off-diagonal position in the corresponding row and column. Elements in bold font exhibit squared roots of AVE. the results signify that the required criterion for establishing discriminant validity is adequately met.

The confirmatory factor analysis (CFA) was utilized for assessing the reliability and validity of the study framework. The results of the CFA analysis are depicted in <Table 4>. In order to be a fit model, the chi-square normalized by df (chi-square/df) is not to be exceeded by 3 (Bagozzi and Yi, 1988). The Non-Normed Fit Index (NNFI) and corresponding Comparative Fit Index (CFI) ought to be more than 0.9. The data analysis revealed that the chi-square/df = 1.197, NNFI = 0.981, and CFI = 0.997 are suggestive of sufficient model fitness. The composite reliability of the constructs safely exceeds the cut-off value of 0.7 (Bagozzi and Yi, 1988).

<Table 2> Summary of Measurement Scales

Constructs/Measures	Factor Loading
Technological context (TEC) composite reliability = 0.829	
TEC1	0.923
TEC2	0.959
TEC3	0.806
Organizational context (ORG) composite reliability = 0.846	
ORG1	0.807
ORG2	0.853
ORG3	0.857
Environmental context (ENV) composite reliability = 0.825	
ENV1	0.817
ENV2	0.883
ENV3	0.880
Adoption of ICT (ICT) composite reliability = 0.853	
ICT1	0.837
ICT2	0.770
ICT3	0.834

<Table 3> Correlations and AVE

	CR	AVE	TEC	ENV	ORG	ICT
TEC	0.829	0.607	**0.779**			
ENV	0.825	0.572	0.221	**0.757**		
ORG	0.846	0.589	0.438	0.213	**0.767**	
ICT	0.853	0.598	0.342	0.193	0.241	**0.782**

<Table 4> Model Fit Indices for the Structural Model

Model Fit Indices	Results	Recommended Value
Chi-square statistic (chi-square/df)	1.197	≤ 3
NNFI	0.981	≥ 0.90
CFI	0.997	≥ 0.90
RMSEA	0.023	≤ 0.05

The structural model with linear and causal associations among the latent factors was evaluated based on the data collected by means of validated measures. All relevant indices of fit were accepted since they are within the acceptable cut-off points: ratio of x^2 to degrees of freedom is 1.197 ($x^2 = 57.441$; df = 48), NNFI = 0.981, CFI = 0.997, RMSEA = 0.023 (<Table 3>).

<Table 5> above depicts three hypotheses that were conceived by the research framework. All the

\<Table 5\> Results of Estimation of the Structural Model

Hypothesis	Path From	Path To	Path Coefficient	Supported
H_1	Technological aspects	ICT adoption	0.47***	Yes
H_2	Organizational aspects	ICT adoption	0.52***	Yes
H_3	Environmental aspects	ICT adoption	0.49***	Yes
R^2	0.56			

Note: *$p < 0.05$, *$p < .01$, ***$p < 0.001$

hypotheses have come up with a *p-value* of less than 0.01 revealing adequate statistical significance. Technological, organizational, and environmental constructs positively affect ICT adoption. Hence, all the proposed hypotheses are supported by the data analysis. \<Table 4\> also depicts the explanatory power of the proposed model. The R^2 value reveals that 56% of the variance in ICT adoption has been explained by technical aspects, organizational aspects, and Environmental aspects.

Ⅵ. Discussion and Implication

This paper aims to bring forward the indigenous indicator variables in the context of the apparel industry of Bangladesh by evaluating the associations between technological, organizational, and environmental aspects and ICT adoption. This study has extended the constructs with a large number of observed variables to supplement the existing literature by providing substantial insights through empirical assessment, particularly in the apparel sector.

Data analysis confirmed that the technological context of the TOE framework positively and significantly affects ICT adoption in the apparel sector of Bangladesh. Similar results have been found in other studies conducted earlier. Ramdani et al. (2013) found that technological contexts have a significant impact on the adoption of ICTs. The findings suggest

that the TOE framework is to be considered as one of the very influential tools for devising strategies for adopting successful ICTs in apparel firms. Lack of proper attention to the appropriate technology might cause substantial loss in relation to the successful utilization of ICT tools. The strategic value of fitting technology in the organization has been revealed by Al-Douri et al. (2012) through an empirical study identifying that adopting emerging technology is a prerequisite for supporting the fruitful adoption of ICT tools to cope with the agility of the apparel sector of Bangladesh.

The findings of this study conform to a number of previous studies that the environmental context of the TOE frame has a significant impact on fruitful ICT adoption in the context of the apparel sector of Bangladesh. It has been reflected in the study by Karim et al. (2009) that environmental contextual factors of the TOE model are to be synchronized with issues of ICT adoption in order to attain reliable applications that are aimed to provide useful information which is expected to have a link with attaining competitiveness in the global value chain of the apparel industry. System performance can be achieved by integrating the environmental factors with the ICT adoption techniques which are expected to exert compatibility with various applications utilized in the firms (Liu et al., 2012; Muller et al., 2008). The environmental dimension in effect highlights the attributes of the organization that are ex-

pected to enable innovation and adoption. These attributes focus on physical characteristics, managerial configuration, capacity of human resources, and communication technologies in the indigenous context of the apparel sector of Bangladesh. The environmental context also manifests in different stakeholders around the organization via connection through ICTs (Ismail and Ali, 2013; Ven and Verelst, 2011). Arpaci et al. (2012) concluded that environment-contextual facets concentrate on how the compatibility of structural components and ICT tools implementation could be established which has a significant impact on the successful implementation of ICTs.

Several studies concluded the same research findings as the current one revealing that the organizational context has a positive impact on the successful adoption of ICTs in the apparel firms of Bangladesh (Kannabiran and Dharmalingam, 2012) which is in line with the current research. The organizational dimension of the TOE model has been one of the key determinants of ICT adoption because this dimension focuses on attributes that are expected to augment the competitiveness of the firm (Bayo-Moriones and Lera-López, 2007) which are expected to enhance the effectiveness of communication flow (Al-Qirim, 2007), upgrade production flexibility, and integrate business process innovations (Raymond and Bergeron, 2008). Lin and Lin (2008) also validated the significant link between the organizational context of the TOE framework and the successful utilization of ICTs. The link between organizational aspects and performance gauges has been found instrumental to enhancing corporation-wide integration and effective decision-making in the ever-changing apparel sector (Hausladen and Bechheim, 2004).

To maintain sustainable growth of the apparel

sector of Bangladesh, it has become instrumental to delve into the issues of the successful adoption of ICTs. Thus, the study comes up with important theoretical and practical implications with respect to ICT adoption from the perspective of the TOE framework in the context of the Bangladeshi apparel sector. The study illustrates the critical interplay among different aspects of technology, organization, and environment of the apparel industry of Bangladesh. It demonstrates that different aspects of the TEO framework have a positive impact on ICT adoption in the apparel sector of Bangladesh. This study embraced a unique combination of different aspects indigenous to the context of the apparel industry of Bangladesh from the perspective of the TOE framework and went through empirical testing. This study also exhibits that to adopt ICTs effectively management of the organization is to think holistically.

6.1. Implications for Management Practitioners

The findings of this study have several implications for management practitioners. First, technological aspects considered in the conceptual framework are salient features related to the apparel industry representing a higher degree of sophistication of infrastructure and capacity that link to the successful implementation of ICT adoption. The management of firms is required to evaluate the firm's investment and capacity building in relation to the findings recommended by the study findings. This dimension of the TOE is to be considered in order to integrate ICT adoption with state-of-the-art infrastructure and information system applications (Auramo et al., 2005). Second, potential opportunities crucial for the successful implementation of ICT tools stemming

from the environment of the agile apparel sector of Bangladesh are to be grabbed on a proactive basis. Management is to exert appropriate effort to identify and materialize the emerging technology-based prospects compatible with the firm's indigenous attributes. Third, management is to be aware of the pressure stemming from the competitive atmosphere that is to be made conversant with the organizational context particular to the firm. Top management commitment has to be ensured for enhancing the ICT capacity of the firm since this very issue might expect substantial investment to exploit the benefits of extensive ICT adoption.

6.2. Limitations and Future Research

The main limitation of this study is that the study collected data at a point in time, however, businesses at present are performed in a very complex and dynamic context which requires evaluation of the relationships among the constructs over a period. This study has also considered the firms of Bangladesh which are full members of BGMEA. In this connection, other firms might have contributed to the evaluation of the proposed model. Therefore, a longitudinal study covering more firms would be carried out in the future.

Ⅶ. Conclusion

In today's extremely emulous and rapidly shifting business context, only organizations which are com-

petent and effective in terms of sustainability and proactive to ups and downs will survive. Several investigations are found concerning quantitative aspects of firm competitiveness in the context of the apparel industry of Bangladesh, however, almost no study delved into Bangladesh-specific indigenous issues in relation to ICT adoption. Hence, this study has been conducted to address the indigenous factors of ICT adoption in the context of Bangladesh based on the postulated TOE framework. In line with the study of Rodriguez et al. (2002), this study provides evidence in favor of adopting ICTs in apparel firms of Bangladesh for sustainable management of firms. The results of the hypotheses tests reveal that IT infrastructural traits, system security, and user capacity as the components of Technological context have a positive impact on adopting ICTs. The organizational context comprising top management commitment, innovations strategy, and business process compatibility while the quick response to the external agencies, interactive network infrastructure, and competitive pressure as the environmental context of the TOE framework have a positive impact on the effective adoption of ICTs. The implications of the study are expected to extend to the practitioners who may exert efforts to delve into which aspects and capabilities are to be taken care of on a priority basis. While the list of factors included in the model is not very extensive, it poses to be the cornerstone for the effective adoption of ICT in the apparel industry of Bangladesh. Therefore, managers may consider the outcome of this research imperative and achieve sustainable ICT adoption in the firms.

<References>

[1] Al-Douri, Y. K., Karim, R., Parida, A., and Kumar, U. (2012). Model-based security system for data acquisition in e-Maintenance using artificial immune system and cloud computing. *International Journal*

of Condition Monitoring and Diagnostic Engineering Management, *15*(4), 26.

[2] Al-Qirim, N. (2007). The adoption of eCommerce communications and applications technologies in small businesses in New Zealand. *Electronic Commerce Research and Applications, 6*(4), 462-473. https://doi.org/10.1016/j.elerap.2007.02.012

[3] Anderson, J. C., and Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411-423. https://doi.org/10.1037/0033-2909.103.3.411

[4] Andersen, T. J., and Segars, A. H. (2001). The impact of IT on decision structure and firm performance: evidence from the textile and apparel industry. *Information and Management, 39*(2), 85-100. https://doi.org/10.1016/S0378-7206(01)00081-7

[5] Arpaci, I., Yardimci, Y. C., Ozkan, S., and Turetken, O. (2012). Organizational adoption of information technologies: A literature review. *International Journal of eBusiness and eGovernment Studies, 4*(2), 37-50.

[6] Arvanitis, S. (2005). Computerization, workplace organization, skilled labour and firm productivity: Evidence for the Swiss business sector. *Economics of Innovation and New Technology, 14*(4), 225-249. https://doi.org/10.1080/1043859042000226257

[7] Auramo, J., Kauremaa, J., and Tanskanen, K. (2005). Benefits of IT in supply chain management: An explorative study of progressive companies. *International Journal of Physical Distribution & Logistics Management, 35*(2), 82-100. https://doi.org/10.1108/09600030510590282

[8] Bangladesh Bureau of Statistics. (BBS) (2021).

[9] Bagozzi, R. P., and Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science, 16*(1), 74-94. https://doi.org/10.1007/BF02723327

[10] Bayo-Moriones, A., Billón, M., and Lera-López, F. (2013). Perceived performance effects of ICT in manufacturing SMEs. *Industrial Management & Data Systems, 113*(1), 117-135. https://doi.org/10.1108/02635571311289700

[11] Bayo-Moriones, A., and Lera-López, F. (2007). A firm-level analysis of determinants of ICT adoption in Spain. *Technovation, 27*(6-7), 352-366. https://doi.org/10.1016/j.technovation.2007.01.003

[12] Becchetti, L, Londono Bedoya, D. A, and Paganetto, L. (2003). ICT investment, productivity and efficiency: Evidence at firm level using a stochastic frontier approach. *Journal of Productivity Analysis, 20*(2), 143-167. https://doi.org/10.1023/A:1025128121853

[13] Bresnahan, T. F., Brynjolfsson, E., and Hitt, L. M. (2002). Information technology, workplace organization, and the demand for skilled labor: Firm-level evidence. *The Quarterly Journal of Economics, 117*(1), 339-376. https://doi.org/10.1162/003355302753399526

[14] Camagni, R., and Capello, R. (2009). Knowledge-based economy and knowledge creation: The role of space. In *Growth and Innovation of Competitive Regions* (pp. 145-165). Springer, Berlin, Heidelberg.

[15] Cardona, M., Kretschmer, T., and Strobel, T. (2013). ICT and productivity: Conclusions from the empirical literature. *Information Economics and Policy, 25*(3), 109-125. https://doi.org/10.1016/j.infoecopol.2012.12.002

[16] Chapman, P., James-Moore, M., Szczygiel, M., and Thompson, D. (2000). Building internet capabilities in SMEs. *Logistics Information Management, 13*(6), 353-361. https://doi.org/10.1108/09576050010355662

[17] Chen, C. L. (2019). Value creation by SMEs participating in global value chains under industry 4.0 trend: Case study of textile industry in Taiwan. *Journal of Global Information Technology Management, 22*(2), 120-145. https://doi.org/10.1080/1097198X.2019.1603512

[18] Chirumalla, K. (2021). Building digitally-enabled process innovation in the process industries: A dynamic capabilities approach. *Technovation, 105*, 102256. https://doi.org/10.1016/j.technovation.2021.102256

[19] Chong, A. Y. L, Ooi, K. B, Tak, Y. K, and ShuYang,

Z. (2009). Factors affecting the adoption of e-commerce: A study of the textile industry in Wujin, China. *International Journal of Business and Management Science*, *2*(2), 117-130.

[20] Churchill Jr, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, *16*(1), 64-73. https://doi.org/10.1177/002224377901600110

[21] Dastane, D. O. (2020). The impact of technology adoption on organizational productivity. *Journal of Industrial Distribution & Business*, *11*(4), 7-18.

[22] Ding, J. H., Chen, P. S., and Lyu, J. (2011). Evolutionary strategy to apply information and communication technology: A case study in the apparel industry. *Production Planning & Control*, *22*(3), 282-297.

[23] Djalic, N., Nikolic, M., Bakator, M., and Erceg, Z. (2021). Modeling the influence of information systems on sustainable business performance and competitiveness. *Sustainability*, *13*(17), 9619. https://doi.org/10.3390/su13179619

[24] Debnath, B., Siraj, M. T., Rashid, K. H. O., Bari, A. M., Karmaker, C. L., and Al Aziz, R. (2023). Analyzing the critical success factors to implement green supply chain management in the apparel manufacturing industry: Implications for sustainable development goals in the emerging economies. *Sustainable Manufacturing and Service Economics*, *2*, 100013. https://doi.org/10.1016/j.smse.2023.100013

[25] Elasrag, H. (2010). Enhancing the competitiveness of the Arab SMEs. *Available at SSRN 1586454*.

[26] Falk, M. (2005). ICT-linked firm reorganisation and productivity gains. *Technovation*, *25*(11), 1229-1250. https://doi.org/10.1016/j.technovation.2004.07.004

[27] Fornell, C., and Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39-50. https://doi.org/10.1177/002224378101800104

[28] Fuentelsaz, L., Gomez, J., and Polo, Y. (2003). Intrafirm diffusion of new technologies: An empirical application. *Research Policy*, *32*(4), 533-551. https://doi.org/10.1016/S0048-7333(02)00081-1

[29] Gorsuch, R. L. (1983). *Factor analysis.* Hillsdale, NJ: Lawrence Erlbaum Associates.

[30] Gu, J. W., and Jung, H. W. (2013). The effect of IS resources, capabilities, and qualities on organizational performance: An integrated approach. *Information and Management*, *50*(2), 87-97. https://doi.org/10.1016/j.im.2013.02.001

[31] Gudivada, V. N., Irfan, M. T., Fathi, E., and Rao, D. L. (2016). Cognitive analytics: Going beyond big data analytics and machine learning. In *Handbook of statistics* (Vol. 35, pp. 169-205). Elsevier.

[32] Homburg, C., Hoyer, W. D., and Fassnacht, M. (2002). Service orientation of a retailer's business strategy: Dimensions, antecedents, and performance outcomes. *Journal of Marketing*, *66*(4), 86-101. https://doi.org/10.1509/jmkg.66.4.86.18511

[33] Giuri, P., Torrisi, S., and Zinovyeva, N. (2008). ICT, skills, and organizational change: Evidence from Italian manufacturing firms. *Industrial and Corporate Change*, *17*(1), 29-64. https://doi.org/10.1093/icc/dtm038

[34] Goodacre, A., and Tonks, I. (1995). Finance and technological change. In *Handbook of the Economics of Technological Change* (pp. 298-341). Oxford: Basil Blackwell.

[35] Han, S., and Ravichandran, T. (2006). Does IT impact firm innovativeness: An empirical examination of complementary and direct effects. In *AMCIS 2006 Proceedings*.

[36] Harris, M. M., and Schaubroeck, J. (1990). Confirmatory modeling in organizational behavior/ human resource management: Issues and applications. *Journal of Management*, *16*(2), 337-360. https://doi.org/10.1177/01492063900160020

[37] Hasan, K. F., Mia, M. S., Rahman, M. M., Ullah, A. A., and Ullah, 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*, *5*(3), 39-48. https://doi.org/10.5923/j.textile.20160503.01

[38] Hausladen, I., and Bechheim, C. (2004). E-maintenance platform as a basis for business process integration. In *2nd IEEE International Conference on Industrial Informatics, 2004* (pp. 46-51). *IEEE*.

[39] Hoque, M. A., Rasiah, R., Furuoka, F., and Kumar, S. (2021). Linkages among automation, job displacement, and reshoring: Evidence from the Bangladeshi apparel industry. *Research Journal of Textile and Apparel, Vol. ahead-of-print No. ahead-of-print*, 1-17.

[40] Hoque, M. R., Saif, A. N. M., AlBar, A. M., and Bao, Y. (2016). Adoption of information and communication technology for development: A case study of small and medium enterprises in Bangladesh. *Information Development, 32*(4), 986-1000. https://doi.org/10.1177/0266666915578202

[41] Haque, M. Z. (2016). Prospective area of ICT use to improve the performance of Corporate Governance in Bangladesh. *The Cost and Management, 44*(2), 4-18.

[42] Horan, T. A., and Schooley, B. L. (2007). Time-critical information services. *Communications of the ACM, 50*(3), 73-78. https://doi.org/10.1145/1226736.1226738

[43] Huang, R., Yan, P., and Yang, X. (2021). Knowledge map visualization of technology hotspots and development trends in China's textile manufacturing industry. *IET Collaborative Intelligent Manufacturing, 3*(3), 243-251. https://doi.org/10.1049/cim2.12024

[44] Hult, G. T. M., Hurley, R. F., and Knight, G. A. (2004). Innovativeness: Its antecedents and impact on business performance. *Industrial Marketing Management, 33*(5), 429-438. https://doi.org/10.1016/j.indmarman.2003.08.015

[45] Ismail, W. N. S. W., and Ali, A. (2013). Conceptual model for examining the factors that influence the likelihood of computerised accounting information system (CAIS) adoption among Malaysian SME. *International Journal of Information Technology and Business Management, 15*(1), 122-151.

[46] Jiang, X., Bao, Y., Xie, Y., and Gao, S. (2016). Partner trustworthiness, knowledge flow in strategic alliances, and firm competitiveness: A contingency perspective. *Journal of Business Research, 69*(2), 804-814. https://doi.org/10.1016/j.jbusres.2015.07.009

[47] Junglas, I., and Ives, B. (2007). Recovering IT in a disaster: Lessons from Hurricane Katrina. *MIS Quarterly Executive, 6*(1).

[48] Kagermann, H., Österle, H., and Jordan, J. M. (2010). *IT-Driven Business Models*. Hoboken: John Wiley & Sons.

[49] Kannabiran, G., and Dharmalingam, P. (2012). Enablers and inhibitors of advanced information technologies adoption by SMEs: An empirical study of auto ancillaries in India. *Journal of Enterprise Information Management, 25*(2), 186-209. https://doi.org/10.1108/17410391211204419

[50] Kapucu, N. (2006). Interagency communication networks during emergencies: Boundary spanners in multiagency coordination. *The American Review of Public Administration, 36*(2), 207-225. https://doi.org/10.1177/0275074005280605

[51] Karim, R., Candell, O., and Söderholm, P. (2009). E-maintenance and information logistics: Aspects of content format. *Journal of Quality in Maintenance Engineering, 15*(3), 308-324. https://doi.org/10.1108/13552510910983242

[52] Karim, M. S., Nahar, S., and Demirbag, M. (2022). Resource-based perspective on ict use and firm performance: A meta-analysis investigating the moderating role of cross-country ICT development status. *Technological Forecasting and Social Change, 179*, 121626. https://doi.org/10.1016/j.techfore.2022.121626

[53] Khan, S. A. R., Yu, Z., Golpira, H., Sharif, A., and Mardani, A. (2021). A state-of-the-art review and meta-analysis on sustainable supply chain management: Future research directions. *Journal of Cleaner Production, 278*, 123357. https://doi.org/10.1016/j.jclepro.2020.123357

[54] Kristl Volfová, M. (2022). Evidence on the use of information and communication technology for employee training in selected companies in us-pilot

study. https://doi.org/10.36689/uhk/hed/2022-01-036

[55] Kline, R. B. (2005). *Principles and Practice of Structural Equation Modeling* (2nd ed.). New York: Guilford.

[56] Krishna, N., and Singh, J. (2018). Factors affecting B2B e-commerce adoption decision: An analysis of Indian textile industry. *Academy of Marketing Studies Journal, 22*(2), 1-9.

[57] Kuan, K. K., and Chau, P. Y. (2001). A perception-based model for EDI adoption in small businesses using a technology-organization-environment framework. *Information & Management, 38*(8), 507-521. https://doi.org/10.1016/S0378-7206(01)00073-8

[58] Lahiri, S., Roy, A. D., and Jana, P. (2021). A study of digital literacy and its importance for the Indian apparel industry.

[59] Lam, J. K. C., and Postle, R. (2006). Textile and apparel supply chain management in Hong Kong. *International Journal of Clothing Science and Technology, 18*(3-4), 265-277. https://doi.org/10.1108/09556220610668491

[60] Lin, H. F., and Lin, S. M. (2008). Determinants of e-business diffusion: A test of the technology diffusion perspective. *Technovation, 28*(3), 135-145. https://doi.org/10.1016/j.technovation.2007.10.003

[61] Lin, H. F., and Lee, G. G. (2005). Impact of organizational learning and knowledge management factors on e-business adoption. *Management Decision, 43*(2), 171-188. https://doi.org/10.1108/00251740510581902

[62] Liu, J., Wang, W., Ma, F., Yang, Y. B., and Yang, C. S. (2012). A data-model-fusion prognostic framework for dynamic system state forecasting. *Engineering Applications of Artificial Intelligence, 25*(4), 814-823. https://doi.org/10.1016/j.engappai.2012.02.015

[63] Manueli, K., Latu, S., and Koh, D. (2007, July). ICT adoption models. In *20th Annual Conference of the National Advisory Committee on Computing Qualifications (NACCQ 2007)* (pp. 175-181).

[64] Melville, N., Kraemer, K., and Gurbaxani, V. (2004). Information technology and organizational performance: An integrative model of IT business value. *MIS Quarterly, 28*(2), 283-322. https://doi.org/10.2307/25148636

[65] Mikalef, P., Pateli, A., and van de Wetering, R. (2021). IT architecture flexibility and IT governance decentralisation as drivers of IT-enabled dynamic capabilities and competitive performance: The moderating effect of the external environment. *European Journal of Information Systems, 30*(5), 512-540. https://doi.org/10.1080/0960085X.2020.1808541

[66] Moore, G. C., and Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research, 2*(3), 192-222. https://doi.org/10.1287/isre.2.3.192

[67] Mouzas, S., and Ford, D. (2012). Leveraging knowledge-based resources: The role of contracts. *Journal of Business Research, 65*(2), 153-161. https://doi.org/10.1016/j.jbusres.2011.05.015

[68] Muller, A., Marquez, A. C., and Iung, B. (2008). On the concept of e-maintenance: Review and current research. *Reliability Engineering and System Safety, 93*(8), 1165-1187. https://doi.org/10.1016/j.ress.2007.08.006

[69] Nurruzaman, N., Haque, A., and Azad, R. (2016). Is Bangladeshi RMG sector fit in the global apparel business? Analyses the supply chain management. *The South East Asian Journal of Management, 4*(1), 53-72. https://doi.org/10.21002/seam.v4i1.5631

[70] Park-Poaps, H., Bari, M. S., and Sarker, Z. W. (2020). Bangladeshi clothing manufacturers' technology adoption in the global free trade environment. *Journal of Fashion Marketing and Management: An International Journal, 25*(2), 354-370. https://doi.org/10.1108/JFMM-06-2020-0119

[71] Phene, A., Fladmoe-Lindquist, K., and Marsh, L. (2006). Breakthrough innovations in the US biotechnology industry: The effects of technological space and geographic origin. *Strategic Management Journal, 27(4)*, 369-388. https://doi.org/10.1002/smj.

522

[72] Porter, M. E., and Millar, V. E. (1985). How information gives you competitive advantage. *Harvard Business Review*, *63*(4), 149-160.

[73] Ramdani, B., Chevers, D., and A. Williams, D. (2013). SMEs' adoption of enterprise applications: A technology-organisation-environment model. *Journal of Small Business and Enterprise Development*, *20*(4), 735-753. https://doi.org/10.1108/JSBED-12-2011-0035

[74] Rasiah, R., and Vinanchiarachi, J. (2013). Institutional support and technological upgrading: Evidence from dynamic clusters in Latin America and Asia. *World Social and Economic Review*, *2*(1), 24-47.

[75] Raymond, L., and Bergeron, F. (2008). Enabling the business strategy of SMEs through e-business capabilities: A strategic alignment perspective. *Industrial Management and Data Systems*, *108*(5), 577-595. https://doi.org/10.1108/02635570810876723

[76] Rodriguez, M. A., Ricart, J. E., and Sanchez, P. (2002). Sustainable development and the sustainability of competitive advantage: A dynamic and sustainable view of the firm. *Creativity and Innovation Management*, *11*(3), 135-146. https://doi.org/10.1111/1467-8691.00246

[77] Rogers, E. M. (1995). Diffusion of innovations: Modifications of a model for telecommunications. In *Schriftenreihe des Wissenschaftlichen Instituts für Kommunikationsdienste* (vol 17). Berlin, Heidelberg: Springer. https://doi.org/10.1007/978-3-642-79868-9_2

[78] Saif, A. N. M., Rahman, A. A., and Mostafa, R. (2021). Post-implementation challenges of ERP adoption in apparel industry of developing country. *LogForum*, *17*(4), 512-529. http://doi.org/10.17270/J.LOG.2021.624

[79] Salam, M. A. (2017). A Framework for developing sustainability index for ready-made garments sector in Bangladesh. *Theory and Applications in the Knowledge Economy*, *710*.

[80] Shiralkar, K., Bongale, A., Kumar, S., Kotecha, K.,

and Prakash, C. (2021). Assessment of the benefits of information and communication technologies (ICT) adoption on downstream supply chain performance of the retail industry. *Logistics*, *5*(4), 80. https://doi.org/10.3390/logistics5040080

[81] Smallbone, D., North, D. J., Baldock, R., and Ekanem, I. (2002). *Encouraging and Supporting Enterprise in Rural Areas*. London, UK: Small Business Service.

[82] Sen, A. (2008). The US fashion industry: A supply chain review. *International Journal of Production Economics*, *114*(2), 571-593. https://doi.org/10.1016/j.ijpe.2007.05.022

[83] Straub, D. W., and Watson, R. T. (2001). Research commentary: Transformational issues in researching IS and net-enabled organizations. *Information Systems Research*, *12*(4), 337-345. https://doi.org/10.1287/isre.12.4.337.9706

[84] Tornatzky, L. G., Fleischer, M., and Chakrabarti, A. K. (1990). *Processes of Technological Innovation*. Lexington books.

[85] Tornatzky, L. G., and Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management*, *29*(1), 28-45. https://doi.org/10.1109/TEM.1982.6447463

[86] Vega, A., Chiasson, M., and Brown, D. (2008). Extending the research agenda on diffusion: The case of public program interventions for the adoption of e-business systems in SMEs. *Journal of Information Technology*, *23*(2), 109-117. https://doi.org/10.1057/palgrave.jit.2000135

[87] Ven, K., and Verelst, J. (2011). An empirical investigation into the assimilation of open source server software. *Communications of the Association for Information Systems*, *28*(1), 117-140. https://doi.org/10.17705/1CAIS.02809

[88] Yen, B. P. C., and Su, C. T. (2007). Information technology infrastructure for textile and apparel industry in Hong Kong. *Electronic Markets*, *7*(2), 9-12. https://doi.org/10.1080/10196789700000017

[89] Yen, B. P. C. (2002). Electronic commerce front-end in apparel supply chain. *Computers & Industrial*

Engineering, 42(2-4), 471-480. https://doi.org/10.1016/S0360-8352(02)00041-4

[90] Yunus, M., and Yamagata, T. (2012). The garment industry in Bangladesh. *Dynamics of the Garment Industry in Low-Income Countries: Experience of Asia and Africa (Interim Report). Chousakenkyu Houkokusho, IDE-JETRO, 6*, 29.

<Appendix> Questionnaire for Data Collection

This questionnaire is intended to know how important each of the listed variables is according to your judgment for ascertaining the impact of technological, organizational, and environmental impact on the ICT adoption of a firm.

	Unimportant (1)	Of Little Importance (2)	Somewhat Important (3)	Important (4)	Very Important (5)
Technological context					
IT infrastructural traits					
System security					
User capacity					
Organizational context					
Top management commitment					
Innovations strategy					
Business process compatibility					
Environmental context					
Quick Response to the external agencies					
Interactive network infrastructure					
Competitive pressure					

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