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Environmental Dynamics in the Technology Adaptation of Digital Supply Chain for Bangladesh's Readymade Garments Sector

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***Abstract*— The study aims to investigate the challenges of technology adoption in the Digital Supply Chain (DSC) of the Readymade Garment (RMG) sector, focusing on environmental barriers. The study utilizes the T-O-E framework to examine a sample of 380 participants, consisting of owners and top managers from RMG facilities. The data is analyzed using PLS-SEM Modeling with the aid of SmartPLS4 software. It examines the complex interrelationships between competitive pressure, consumer, external support, stakeholder networks, environmental concerns, and technology adoption within the digital supply chain of the RMG industry. The finding shows that the technology adoption is substantially influenced by environment (correlation: 0.598), particularly regarding the alignment with customers. The analysis of mediation sheds light on the significance of the environment in both partial and complete mediation, as it exerts influence on competitive pressures, customer involvement, external support, and stakeholder networks. Comprehending this interrelationship is crucial for making well-informed business and policy formulation decisions. Organizations must incorporate environmental factors into their strategic decision-making processes, ensuring sustainable technologies are adopted. Policymakers can employ these findings to implement environmentally sustainable policies, promoting innovation within the RMG sector. These measures guarantee the long-term viability of the industry and promote ecological accountability.**

***Index Terms*—Digital Supply Chain, Environmental Factors, Technology Adaptation**

I. Introduction

THE technology adoption process, which holds significant importance in the current digital era, encompasses the acceptance and integration of novel technologies within the Digital Supply Chain (DSC). The complex procedure involves the acquisition of novel abilities and adjustment to evolving technology and is influenced by various elements, including social pressure, enabling conditions, performance expectations, and effort expectations [1]. In the context of the digital supply chain, it is crucial to have a comprehensive grasp of the technology adoption lifecycle. The sociological framework presented by Beal and Bohlen in 1956 outlines the process of accepting new products or inventions, considering adopters' demographic and psychological characteristics [2]. Over time, the model has undergone evolution and adaptation across diverse industries, influencing how technology is adopted in the present-day digital environment [2].

The achievement of successful technology adoption extends beyond ordinary consumption. It encompasses the integration of state-of-the-art innovations into corporate processes, thereby using their complete potential and attaining the advantages of innovation [3]. In the digital supply chain context, integrating technology is not merely a means to improve operational efficiency but a necessary strategic course of action for organizations. The optimization of accepted technology not only guarantees a return on investment (ROI) but also positions organizations to flourish in the digitally oriented marketplace. Failure to comply with these requirements poses the risk of incurring financial losses and hampers the potential for growth and efficiency within the dynamic and ever-changing digital supply chain environment [3].

II. Literature Review

A digital supply chain refers to a supply chain that leverages digital technologies to enhance operational efficiency, promote transparency, and facilitate effective communication among various participants involved in the supply chain. digital supply chain management encompasses the utilization of several technologies, including the Internet of Things (IoT), blockchain, artificial intelligence (AI), and big data analytics, to enhance the efficiency and effectiveness of supply chain operations [4, 5]. The implementation of a digital supply chain has the potential to yield cost reductions, enhance customer service, and expedite delivery processes. Additionally, it has the potential to enhance the transparency of the supply chain, facilitating the ability to trace products and oversee their quality. The significance of the digital supply chain is growing in emerging economies such as Bangladesh since it presents potential solutions to the obstacles encountered by conventional supply chains [6].

Standardizing the Supply Chain Management (SCM) process, sharing information along the supply chain, adapting to new technologies, reducing waste, shortening wait times, and others will be significant for keeping its growth going. Evidence from only high-quality, peer-reviewed journals shows

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that RMG's policymakers should coordinate their supply chain plans and cooperate with all of their partners [7].

An analysis of several ready-to-wear factories in Bangladesh reveals that the use of Industry 4.0 technology has a considerable positive impact on sustainability performance. Circular economy principles and green supply chain management help supply chains run sustainably by reducing the impact of Industry 4.0 technologies. Research indicates that businesses that are among the first to adopt new technologies and innovative processes will reap the benefits of doing so. First-mover enterprises will have competitive advantages over latecomers [8].

Trust and learning between firms can improve relationship governance and innovation performance. Corporations' relationship governance affects innovation performance to a partial extent. This leads to an improvement in innovation performance. The research indicates that external connections enhance the integration and optimization of information and professional expertise at the enterprise level. Trust between firms can improve relationship governance in related industries [9].

Five companies' top and middle managers were randomly chosen to be part of a study that illustrated how 'Green Supply Chain Management' practices like 'Internal Environmental Management,' 'Green Purchasing,' 'Green Information Systems,' 'Cooperation with Customers,' 'Eco-Design and Packaging,' and 'Investment Recovery' affected the success of environmental-based marketing. Successful environmental marketing relies heavily on carefully managing the company's internal environment [10].

Research shows a positive correlation between supply chain cooperation and productivity and that knowledge exchange mediates this relationship. Uncertainty in the external mental environment moderates supply chain cooperative relationships, encouraging business knowledge exchange. However, this has no discernible effect on the effects of knowledge sharing on performance [11].

AI technologies like Artificial Neural Networks (ANN), Genetic Algorithms (GA), Virtual Reality (VR), and Artificial Immune Systems (AIS) have been used in supply chain management. Artificial intelligence (AI) has been shown to reduce resource waste and business risk through improved forecasting and planning in supply chain management [12].

The collaboration between various supply chain players, including suppliers, manufacturers, and retailers, is enhanced by AI, according to research. By facilitating communication and information sharing, AI can help businesses collaborate more effectively, enhancing performance. Blockchain technology and AI are anticipated to combine more and more, offering a more transparent and secure supply chain management solution [13].

Companies have rarely integrated supply chain management and customer relationship management in the past. Integrating CRM with SCM allows businesses to reach breakthroughs in financial and performance measures that would have been impossible with separate approaches. Developing digital loyalty networks can help a company achieve superior performance in various areas, including sales, market share, customer service, etc. Companies must design a customer, partner, and supply chain strategy to build this network and retain customers [14].

Reclassifying all supply chain network participants as customers is optimal for the supply chain operation as a whole and can facilitate SCM-CRM integration. Technological developments and platform-based e-commerce have enhanced traditional business. Improvements in SCM-CRM integration is needed to realize the lean operational objectives brought on by these shifts [15].

A study looks at 25 more minor barriers that affect IDT adoption in organizations that work in the humanitarian supply chain. The five significant barriers are strategic, organizational, technological, financial, and human. Strategic barriers (SBs) were the most significant, followed by other hurdles involving organizational structures, technologies, resources, and people. Compared to the commercial supply chain, the hierarchy of barriers affecting the adoption of IDTs in HSCs differs from the commercial supply chain [16].

III. Theoretical Background and Hypothesis

The famous academicians Tornatzky and Fleischer created the Technology–Organization–Environment (TOE) paradigm in their book "The Processes of Technological Innovation" [17]. This framework provides a comprehensive understanding of the complex dynamics of adopting innovation inside organizations. The primary objective of this framework is to examine the influence of a firm's business environment on the process of assimilating innovations. This analysis examines three essential elements: the technological context, the organizational context, and the environmental context. The factors above influence the organization's choices about adopting technology, providing a complete comprehension of the interaction between the business environment and the integration of innovation.

The environmental context refers to the encompassing sphere in which a firm operates, comprising several stakeholders, including industry participants, rivals, suppliers, customers, governmental bodies, and the local community. These stakeholders possess the ability to either endorse or impede technological innovation. The influence of external factors on a firm's perception of the importance of innovation, its capacity to get the necessary resources for innovation endeavors, and its ability to effectively implement innovation can be significant.

The environmental context comprehends the industry's structure, the availability or lack of technological service providers, and the regulatory framework. Various methodologies have been employed to examine the organization and composition of the industry [18]. According to Lii and Kuo, the role of innovation orientation in facilitating the integration of supply chains and harnessing the full potential of supply chain management mechanisms [19].

The Technology-Organization-Environment (T-O-E) paradigm has emerged as a comprehensive theoretical perspective for understanding the adoption of information technology. The T-O-E framework has been beneficial compared to other selection models for examining innovation appropriation, innovation use, and value creation resulting from innovation development due to its incorporation of technological, organizational, and environmental elements [20].

According to the study, environmental players in a business context encompass customers, suppliers, competitors, stockholders, and regulatory agencies [21, 22]. The supplier furnishes the necessary raw materials to the firms to manufacture the product. Lastly, the completed products are transported to the customer. The research findings suggest that a range of environmental elements, such as customer dynamics, external support systems, stakeholder ecosystems, and competitive pressures, exert a substantial impact on the adoption of technology within the business [23, 24, 25].

A. *Competitive Pressure:*

It is a significant component that influences the decision-making process of organizational technology adoption, as indicated by research in organizational behavior and digital supply chain. Additionally, these studies highlight the role of contextual environmental factors in shaping this decision-making process. According to Bhattacharya (2015), an organization's decision to accept an innovation can be influenced by several environmental elements, such as competitive pressures, vendor influence, and regulatory influences [26]. According to research, several environmental elements were found to impact the adoption of innovation [17]. These aspects include competitive pressure, governmental rules, and customer readiness.

H_1: There is a relationship between competitive pressure and environment in RMG DSC.

B. *Customer:*

It is advantageous for a company to establish collaborative partnerships with its customers to address environmental concerns in an economically viable and environmentally sustainable manner. Such collaborations enable the identification of solutions for existing issues and exploring innovative approaches that can yield future advantages [27]. Environmental issues often encompass recurrent and uncertain fluctuations in consumer preferences, governmental laws, and perceived competitive conduct. According to a study, companies operating within dynamic business settings exhibit a higher degree of proactivity and employ more innovative methods than firms operating in less chaotic contexts [25].

H_2: There is a relationship between customers and environment in RMG DSC.

C. *External Support:*

It is one of the critical components in the framework, alongside competitive pressure and the preparedness of trading partners. These factors were chosen for their brief and focused nature. According to research, within the environmental framework, government policies and vendor assistance favor individuals' inclination to utilize electronic signatures [28]. The authors Awa et al. (2016) and Al-Qirim (2006) have acknowledged the presence of a perpetual cycle of retribution and actions in their respective investigations [23, 29].

H_3: There is a relationship between external support and environment in RMG DSC.

D. *Stakeholder Ecosystems:*

The concept of stakeholder ecosystems refers to the effective exchange of information and communication among stakeholders via various communication channels. The social community of a corporation includes many entities, such as environmental organizations, community groups, and other special interest groups [25]. Historically, organizations had a diminished susceptibility to the impact of the social community, perceiving it as either a source of annoyance or disregarding it altogether [30].

H_4: There is a relationship between stakeholder ecosystems and environment in RMG DSC.

E. *Environment and Technology Adoption:*

Internal and external environmental factors can influence adopting technology in supply chain management [31]. The utilization of information technology can augment the robustness and efficacy of supply chains by enabling external integration. The integration discussed here pertains to the cooperative interaction between customers and suppliers, which facilitates the development of a harmonious relationship between parties involved in upstream and downstream activities [32]. As a result, this collaborative effort enhances the organization's capacity to efficiently address market requirements [31].

H_5: There is a relationship between environment and technology adaptation in RMG DSC.

F. *Mediating role of environment*

The environment assumes a mediating function in the relationship between the adoption of technology and the influence of competitive pressures. Technology adoption is significantly influenced by the environmental context, particularly the pressure exerted by competition [33]. The utilization of e-commerce and the performance of small and medium enterprises are notably influenced by competitive pressure, widely recognized as a crucial determinant in numerous research studies concerning adopting novel technologies to improve firm performance [34].

H_{1A}: Environment mediates the relationship between Competitive Pressure and Technology Adoption.

The role of the environment, particularly the satisfaction of customers, serves as a mediator between technology adaption and the customer. A study revealed a partial influence of customer satisfaction on the association between information technology and the quality of e-banking services, thereby influencing the propensity of customers to make purchases [35]. A separate research study revealed that integrating Information and Communication Technology (ICT) has a noteworthy impact on frugal innovation and consumer satisfaction [36].

H_{2A}: Environment mediates the relationship between Customer and Technology Adoption.

The studies indicate that the environment, mainly external variables, mediates the relationship between technology adoption and external support. The impact of the external environment, particularly environmental turbulence, can influence the level of innovation exhibited by a corporation [37]. In addition, the integration of advanced technologies such as artificial intelligence (AI), Internet of Things (IoT), Blockchain, quantum computing, and big data analytics can support organizations in perceiving, capturing, and leveraging possibilities to address the ever-changing market conditions that affect the sustainability of production systems [38].

H_{3A}: Environment mediates the relationship between External Support and Technology Adoption.

The study's findings indicate that the environment, particularly the influence of stakeholders and the provision of environmental training, mediates the relationship between technology adoption and stakeholder ecosystems. The theory of stakeholders claims that the demands exerted by stakeholders serve as a substantial motivator for enterprises to implement diverse environmental measures [39]. The implementation of environmental practices, driven by stakeholder pressures, is influenced by environmental training initiatives targeted towards employees [39]. Furthermore, the implementation of advanced technologies can aid organizations in perceiving, capturing, and altering circumstances to effectively respond to the ever-changing market conditions that influence the sustainability of production systems [33].

H_{4A}: Environment mediates the relationship between Stakeholder Ecosystems and Technology Adoption.

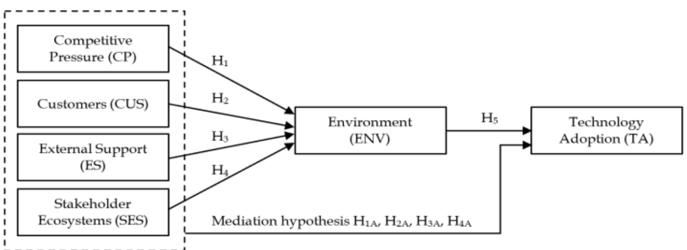

Fig 1: Research model

IV. Research Methodology

A. Questionnaire design

All constructs were measured using 5-point Likert reflective scales. Specifically, the measures for measuring the Environment's (ENV) impact on Technology Adaptation (TA). The respondents are asked to indicate the degree to which they agreed with the statements that their DSC could meet the use of technology to speed up the DSC process and have an outstanding delivery performance with "1" for "strongly disagree" and "5" for "strongly agree". They were asked to fill out the self-administered online and hard-copy questionnaires. They are asked to evaluate how much their firms use these IT tools with the major suppliers and customers in the explorative activities.

B. Sampling and data collection

According to the two significant garments exporter associations, there are 4329 woven and sweater factories [40]. At the same time, 2,085 knitting factories are currently operating in Bangladesh [41]. The total number of factories in Bangladesh is 6,414. Considering the four top managers [42], including the owners of each factory, the total possible population size is 25,564. The Cochran formulas determine the sample size [43]. The sample size is 379; considering Z-value is 1.96 (the confidence level 95%), CU and the margin of error 0.05. The data is collected from the senior management or owners of the firms or their representatives. A total of 416 respondents are participating in the survey. From those responses, 15 samples were removed during the cleaning process due to redundant responses to the same question. 401 samples and another 21 were removed from the rest due to outlier issues. Finally, 380 samples were tabulated for the study.

V. Data Analysis and Findings

A. Demographic data

Using primary data, the study analyzed various demographic variables such as factory location and respondent position. Data analysis involved frequency, percentages, means, and standard deviations. Most factories (84.20%) were located in the Dhaka division, comprising 320 out of 380 sampled industries, while 12.40% were in the Chattogram division (47 factories), and the remaining 3.40% were distributed across other divisions. The sample accurately represents the distribution of garment factories in Bangladesh. According to the Mapped in Bangladesh data, 88% of the factories are in the Dhaka division, while 11% are in Chittagong [44]. Survey participants included business owners (23.40% of the sample) and senior managers (approximately 50% of respondents), with mid-level managers accounting for 13% and operation-level managers less than 6%. Delegated respondents from owners or top management represented the last two categories. These findings are detailed in Table 1.

TABLE I
Demographics of Respondents

Location (Division)	**Frequency**	**Percent**
Chattogram	47	12.40
Dhaka	320	84.20
Khulna	2	0.50
Mymensingh	1	0.30
Rajshahi	3	0.80
Rangpur	5	1.30
Sylhet	2	0.50
Total	**380**	**100**
Position of Respondents	**Frequency**	**Percent**
Owner	89	23.40
Senior Manager	220	57.90
Mid-Level Manager (delegation)	49	12.90
Operation Level Manager (delegation)	22	5.80

B. Reliability test:

The reliability and validity of the focus constructs were assessed using the methodologies of Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). This study employed exploratory factor analysis (EFA) to assess the internal reliability of the scale, aiming to determine the extent of internal consistency among the components. The reliability of the scale was assessed using SPSS software. The calculated Cronbach's alpha coefficient yielded a value of 0.928. The Cronbach's alpha coefficient exceeds 0.7, while the composite reliability surpasses 0.8, suggesting that the scale exhibits favorable levels of internal consistency [45].

TABLE II

CONSTRUCT RELIABILITY AND VALIDITY ANALYSIS

Construct/ Items	Loadings	Cronbach's α	Composite Reliability (CR)	Variance Inflation Factor (VIF)
CP		0.806	0.873	1.799
CP1	0.791			
CP2	0.794			
CP3	0.766			
CP4	0.830			
CUS		0.757	0.861	2.002
CUS1	0.788			
CUS2	0.824			
CUS3	0.848			
ES		0.739	0.851	1.963
ES1	0.760			
ES2	0.846			
ES3	0.823			
SES		0.774	0.855	1.931
SES1	0.771			
SES2	0.783			
SES3	0.758			
SES4	0.773			
ENV		0.641	0.807	1.000
ENV1	0.770			
ENV2	0.768			
ENV3	0.750			
TA		0.793	0.866	-
TA1	0.769			
TA2	0.819			
TA3	0.833			
TA4	0.720			

Note: Competitive Pressure (CP), Customers (CUS), External Support (ES), Stakeholder Ecosystems (SES), Environment (ENV), Technology Adoption (TA)

Structural validity was verified by utilizing confirmatory factor analysis (CFA). Table 2 displays the findings of convergent and discriminant validity's analytical outcomes. All factor loadings have values over 0.7. Hence, the above scale exhibits a strong degree of Convergent Validity [46]. Except for ENV, which has a Cronbach Alpha value of 0.642, all other variables exhibit Cronbach Alpha values exceeding 0.70, indicating satisfactory internal consistency. Although somewhat below the standard threshold, the ENV value can nevertheless be deemed quite near to the expected value. Simultaneously, the Composite Reliability values surpass the threshold value of 0.7 [45], with values above 0.8. Hence, the manifestation of construct dependability is observable.

Discriminant validity was established by examining the square root of the average variance extracted (AVE) for each construct, in conjunction with assessing the correlations between said construct and other components. According to Bagozzi et al. (1981), if the square root of the average variance extracted (AVE) on the diagonal exceeds the correlation between a particular construct and other constructs, the constructs possess favorable discriminant validity. The results in Table 3 demonstrate that the findings satisfy the criteria for satisfactory discriminant validity.

TABLE III

DISCRIMINANT VALIDITY (FORNELL AND LARCKER CRITERION) USING AVE.

	CP	*CUS*	*ENV*	*ES*	*SES*	*TA*	***AVE***
CP	**0.796**						0.633
CUS	0.574	**0.821**					0.673
ENV	0.690	0.642	**0.763**				0.657
ES	0.573	0.616	0.627	**0.810**			0.595
SES	0.570	0.608	0.623	0.595	**0.771**		0.582
TA	0.624	0.578	0.598	0.484	0.560	**0.786**	0.618

Note: Square roots of Average Variances Extracted (AVEs) shown diagonally.

C. Hypothesis testing

The correlation and significance of the relationships in the structural model, as hypothesized (H_1, H_2, H_3, H_4, and H_5), were evaluated using SmartPLS4 software, as depicted in Figure 2. The findings of the route analysis are presented in Figure 2, which displays standardized path coefficients, outer loads, and correlations. Table 4 comprehensively summarizes the precise statistical outcomes derived from the hypothesis testing, such as beta, sample mean, standard deviation, T statistics, significance levels, and decisions. Based on the result, the independent variables (IVs) significantly impact the dependent variables. All the IVs values of > 0.10. indicated that Customers (CUS), External Support (ES), Stakeholder Ecosystems (SES), and Competitive Pressure (CP) have a significant positive relationship with the Environment (ENV) in RMG-SCM. A value of 0.598 supports that there is a relationship between Environment (ENV) and Technology Adoption (TA) in RMG SCM. A lower standard deviation expresses the strong correlation among variables. The T value reveals that among four IVs, Customers (CUS) have a stronger relationship with the Environment (ENV) than others. CUS (7.456), ES (3.812), SEC (3.542), CP (3.715)>1.96 clarify the statement. The specific Indirect Effect also illustrated that Customer (CUS), Environment (ENV), and Technology Adoption (TA) are strongly correlated. All the P values < 0.05 also support that null hypotheses are rejected as this study designed no null hypothesis in this study, so all hypotheses are accepted.

TABLE IV

PATH COEFFICIENTS ANALYSIS

Hypothesis	Causal path	β	S. Mean	SD	T stat.	P values	Decision
H_1	CP -> ENV	0.361	0.360	0.048	7.456	0.000	Accepted
H_2	CUS -> ENV	0.214	0.210	0.056	3.812	0.000	Accepted
H_3	ES -> ENV	0.182	0.184	0.051	3.542	0.000	Accepted
H_4	SES -> ENV	0.179	0.183	0.048	3.715	0.000	Accepted
H_5	ENV -> TA	0.598	0.600	0.041	14.665	0.000	Accepted

D. Coefficient of Determination

The R^2, also known as the Coefficient of Determination, quantifies the fraction of the variability observed in the dependent variable that can be accounted for by the independent variables included in a regression model. In the given context, the coefficient of determination (R^2) for the Environment (ENV) variable is 0.612 concerning the area of the Environment shown in Table 5. This value suggests that approximately 61.2% of the variability in the Environmental factor can be collectively accounted for by the variables of Competitive Pressure (CP), Customer (CUS), External Support (ES), and Stakeholder Ecosystems (SES). The high R^2 value indicates a robust correlation between the environmental factors and the specified independent variables. The R^2 value for Technology Adoption (TA) is 0.358, suggesting that approximately 35.8% of the variability in technology adoption can be explained by fluctuations in the Environment (ENV) variable. Although the R^2 value for this variable is lower than the Environment variable, it still indicates a moderate degree of explanatory capability, thereby demonstrating the impact of the environment on decisions regarding technology adoption. The R^2 values play a crucial role in regression research as they measure the degree to which independent variables contribute to the observed variability in the dependent variables. This offers vital insights into the relationships among the elements under investigation.

TABLE V
COEFFICIENT OF DETERMINATION (R^2 VALUE)

	R-square	R-square adjusted
ENV	0.612	0.608
TA	0.358	0.356

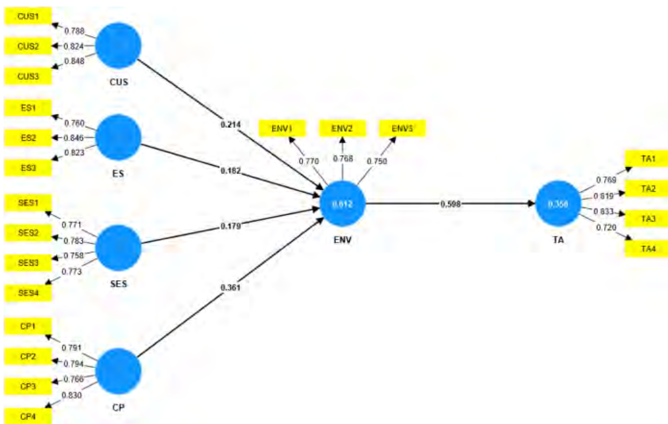

Fig 2: Structural model results

E. *Mediation Analysis*

H_{1A}: ENV mediates the between CP and TA

Mediation analysis was performed to assess the mediating role of ENV. The results (see Table 6) revealed significant ($p < 0.001$) partial mediating roles of ENV (H_{1A}: $\beta = 0.315$, $t = 5.397$, $p = 0.000$). The total effect of CP on ENV was significant ($\beta = 0.361$, $t = 7.444$, $p < 0.001$), with the inclusion of the mediator the direct effect was still significant ($\beta = 0.055$, $t = 2.245$, $p < 0.05$). The indirect effect and the direct effect are both significant and point in the same positive direction. Hence, ENV complementary partially mediates the relationship between CP and TA.

H_{2A}: ENV mediates the between CUS and TA

The results found in Table 6 revealed significant ($p < 0.01$) partial mediating roles of ENV between CUS and TA (H_{2A}: $\beta = 0.211$, $t = 3.261$, $p = 0.001$). The total effect of CUS on ENV was significant ($\beta = 0.214$, $t = 3.815$, $p < 0.001$), with the inclusion of the mediator the direct effect was still significant ($\beta = 0.033$, $t = 2.162$, $p < 0.05$). The indirect effect and the direct effect are both significant and point in the same positive direction. Hence, ENV complementary partially mediates the relationship between CUS and TA.

H_{3A}: ENV mediates the between ES and TA

The results found in Table 6 revealed insignificant ($p > 0.005$) full mediating roles of ENV between ES and TA (H_{3A}: $\beta = -0.021$, $t = 0.327$, $p = 0.372$). The total effect of ES on ENV was significant ($\beta = 0.182$, $t = 3.526$, $p < 0.001$), with the inclusion of the mediator the direct effect was still significant ($\beta = 0.028$, $t = 1.785$, $p < 0.05$). The indirect effect is significant but direct effect is insignificant. Hence, ENV possesses indirect-only mediates the relationship between ES and TA.

H_{4A}: ENV mediates the between SES and TA

The results found in Table 6 revealed significant ($p < 0.01$) partial mediating roles of ENV between SES and TA (H_{4A}: $\beta = 0.170$, $t = 2.789$, $p = 0.003$). The total effect of SES on ENV was significant ($\beta = 0.178$, $t = 3.656$, $p < 0.001$), with the inclusion of the mediator the direct effect was still significant ($\beta = 0.027$, $t = 1.859$, $p < 0.05$). The indirect effect and the direct effect are both significant and point in the same positive direction. Hence, ENV complementary partially mediates the relationship between SES and TA.

TABLE VI
MEDIATION RESULTS

Total Effects			Direct Effects			Indirect Effects					
	β	Sig.		β	Sig.		β	SD	T stat	Sig.	Results
CP-> ENV	0.361	0.000	CP-> TA	0.315	0.000	CP-> ENV-> TA	0.055	0.025	2.245	0.012	CPM
CUS-> ENV	0.214	0.000	CUS-> TA	0.211	0.001	CUS-> ENV-> TA	0.033	0.015	2.162	0.015	CPM
ES-> ENV	0.182	0.000	ES-> TA	-0.021	0.372	ES-> ENV-> TA	0.028	0.016	1.785	0.037	IFM
SES-> ENV	0.178	0.000	SES-> TA	0.170	0.003	SES-> ENV-> TA	0.027	0.015	1.859	0.032	CPM

CPM=Complementary partial mediation; IFM=Indirect-only full mediation

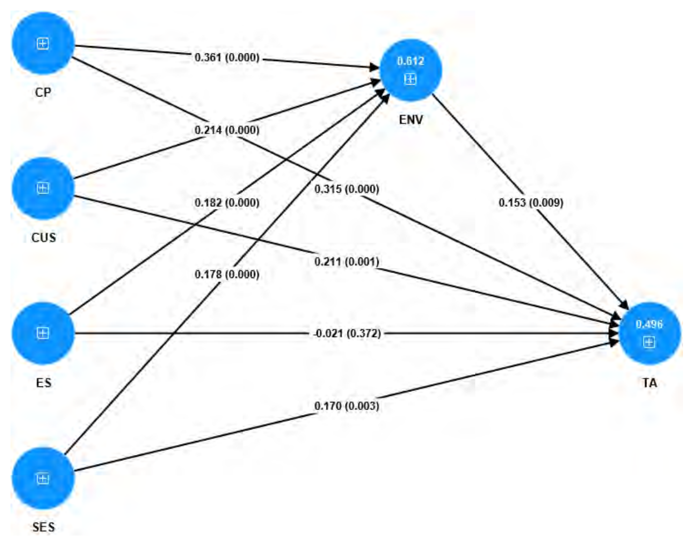

Fig 3: Mediation model results

VI. DISCUSSIONS AND IMPLEMENTATION

The research findings about demographic characteristics provide valuable insights into the spatial distribution of factories and the occupational roles held by respondents within the industries under study. The sources from which the data was acquired facilitated a thorough examination of several elements, including the geographical placement of factories and the respondents' roles. The concentration of factories in the Dhaka division, which accounts for 84.20% of the sampled industries, is a notable indicator of the region's importance. The concentration observed can be ascribed to various variables, including infrastructure, the availability of skilled labor, and government policies promoting industrial development in the specific region. Moreover, including a wide range of participants, such as firm owners, senior managers, mid-level managers, and operation-level managers, contributes to a comprehensive comprehension of the hierarchical structure within these sectors. The data indicates that top managers, accounting for nearly 50% of the respondents, significantly influence decision-making processes. Furthermore, including delegated responders from owners or top management highlights the collaborative aspect of the research. The findings above, as presented in Table 1, provide a basis for conducting additional analysis and enhancing comprehension of the complex relationship between demographic characteristics and industrial dynamics within the investigated region.

In addition to demographic findings, the study found it challenging to obtain factory owners and top managers, the research's focus group. Due to many obstacles, contacting these crucial decision-makers proved difficult. Higher-level authorities transferred their duties to mid-level managers, personal aides, and even operational managers to handle things on their behalf. This study shows how researchers struggle to communicate and make decisions with high-level industry personnel. The study's findings emphasize the importance of intermediary roles of mid- and operation-level managers in communicating senior management's views. Considerations regarding intermediaries' effects on answers highlight the need for a complete data analysis.

The results of the SmartPLS4 analysis conducted in this research, as depicted in Figure 2 and Table 4, elucidate the interconnections within the suggested structural framework. The standardized path coefficients and outer loads depicted in Figure 2 indicate that the independent variables (IVs), namely Customers (CUS), External Support (ES), Stakeholder Ecosystems (SES), and Competitive Pressure (CP), have a positive influence on the dependent variable Environment (ENV) within the context of RMG-DSC. A minor standard deviation implies a strong correlation between variables and robust relationships.

A strong positive correlation of 0.598 exists between the Environment (ENV) and Technology Adoption (TA) variables in the context of RMG DSC. The finding above implies that environmental factors significantly influence technology adoption in supply chain management within the RMG industry. The T statistics indicate a stronger association between the Customers (CUS) and the Environment (ENV) than the other independent variables. This study examines the influence of consumer factors on environmental issues within the context of ready-made garment supply chain management.

The research additionally identified robust associations among Customer (CUS), Environment (ENV), and Technology Adoption (TA), underscoring their interdependence. The rejection of the null hypothesis and the support for all study hypotheses are indicated by the statistical significance of all p values being less than 0.05. This finding provides empirical evidence that aligns with the study's proposed theoretical relationships across variables. Specifically, it demonstrates that consumer preferences, external support, stakeholder ecosystems, and competitive pressure influence environmental components within the RMG digital supply chain and the adoption of technology practices.

The results highlight the significance of considering customer preferences, external support systems, and stakeholder relationships while implementing ecologically sustainable RMG digital supply chain operations. Businesses should align their strategies with the criteria above to facilitate the advancement of environmental practices and technology adoption. Implementing this alignment will contribute to enhancing effectiveness and sustainability in RMG supply chain management. Policymakers and industry experts can also utilize these findings to develop interventions and formulate policies that foster environmentally sustainable practices and technological progress within the ready-made garment (RMG) supply chain. This intervention can potentially enhance the sector's long-term viability and environmental responsibility.

The mediation analysis results from this study provide light on how Environment (ENV), Competitive Pressure (CP), Customer (CUS), External Support (ES), Stakeholder Ecosystems (SES), and Technology Adoption interact. These data show that the environment mediates different interactions partially and fully, illuminating complicated processes.

The results show that the environment partially mediates competitive pressure and technology adoption. It appears that the environment mediates the competitive pressure and technology adoption connection. Competitive pressure has a significant direct effect on the environment, even with the mediator. Competitive pressure affects technology adaptation directly and indirectly, with the environment complementing it.

For customer and technology adaptation, the environment also partially mediates. Even with the environment as a mediator, the customer has a significant direct effect on the environment. This shows that the environment mediates the customer and technology adoption link, suggesting its complementing effect.

For external support and technology adaptation, the environment mediates indirectly only. External support considerably affects the environment, but adding the environment as a mediator negates the direct effect. This means the environment fully mediates the link between external support and technology adaptation, underlining its importance.

Finally, stakeholder ecosystems and technology adaptation show that the environment partially mediates in digital supply chain. Like the other situations, stakeholder ecosystems have a substantial direct effect on the environment, even with the environment as a mediator—this highlights the environment's complimentary role in mediating stakeholder ecosystems and technology adaptation.

In terms of implementation, these mediation findings show how complex these interactions are and how much the environment affects competitive pressure, customer, external support, and stakeholder ecosystems on technology adaptation. Organizations should consider environmental conditions as a significant mediating component when establishing competitive pressure, customer, external support, and stakeholder ecosystem initiatives. Businesses can make better judgments and improve technology adoption by appreciating the complementary role of the environment. These insights can also help policymakers and industry stakeholders promote environmentally responsible practices and technological advances in competitive pressure, customer relationships, external support, and stakeholder ecosystems.

VII. Conclusion

In conclusion, this research offers a thorough comprehension of the complex interconnections within the ready-made garment (RMG) digital supply chain, particularly emphasizing the substantial influence of environmental issues. The study provides significant contributions to understanding manufacturing facilities' geographical dispersion and the sector's occupational functions. Additionally, it explores the intricate relationships among competitive forces, consumer preferences, external assistance, stakeholder networks, environmental factors, and technology adoption. The results highlight the significant role of the environment (ENV) in mediating these interactions, shedding light on the complex processes involved.

The findings of this study have significant consequences for both corporate entities and governmental decision-makers. In the context of company operations, it is imperative to acknowledge the environment as a crucial intermediary element when formulating strategies about competitive pressures, consumer engagements, external assistance, and stakeholder networks. Recognizing the reciprocal relationship between the environment and the RMG digital supply chain helps enhance decision-making processes, fostering technology adoption and implementing environmentally conscious practices. Furthermore, policymakers and industry stakeholders can use these findings to develop specific actions and regulations promoting sustainable practices and technical progress. By adopting these discoveries, the ready-made garments (RMG) sector can augment its enduring feasibility, ecological accountability, and comprehensive sustainability, engendering a favorable influence on the sector and the natural surroundings.

VIII. References

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