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Article

COVID-19 impact on B2B e-commerce: A multi-group analysis of sports and surgical SME's

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COVID-19 Impact on B2B E-Commerce: A Multi-Group Analysis of Sports and Surgical SME's

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Abstract

The COVID-19 has forever changed the way firms use digital solutions for their B2B e-commerce activities. During this pandemic, only those industries are surviving, which have shifted their business model to online. Most of the counties' SME growth is badly affected by the COVID-19. Business-to-business e-commerce (B2B) is essential for a rapidly changing business environment and increases SME's overall performance. The study aims to explore the influence of technological (relative advantage and technology readiness), organizational (cost of adoption and top management support), and environmental (government support and competitive pressure) factors of the technological, organizational, and environmental (TOE) model on B2B e-commerce. The research framework was developed based on diffusion of innovation (DOI) theory and the TOE model. The research collects data from two heterogeneous groups sports and surgical. The 500 questionnaires were distributed to top and middle-level managers of Pakistan's manufacturing SMEs. Thus, 262 were returned. The study applies multi-group analysis by using the SmartPLS 3.3.2 to investigate the hypothesized relationships. The result shows that technological factors have a significant positive relationship with B2B e-commerce in sports and surgical SMEs. However, competitive pressure as an environmental factor differs in sports and surgical SMEs to use B2B e-commerce. The study provides theoretical

and practical implications. The study helps SME managers and practitioners in understanding the underlying factors for the successful implementation of e-commerce.

Keywords: relative advantage, cost of adoption, top management support, technology readiness, competitive pressure, government support, small and medium enterprises.

1. Introduction

The COVID-19 started in China, and it tremendously affected governments, societies, and organizations worldwide (Clark et al., 2020). While some businesses affected with minor consequences, firms related to the manufacturing sector decreased their production capacity because of the unavailability of raw material during lockdowns. Likewise, small and medium enterprises (SMEs) lost their businesses largely due to fewer resources and survival capacity (Okorie et al., 2020). Consequently, most developed countries' manufacturing firms are badly affected and shifted their operations from conventional to e-commerce to remain competitive worldwide (Shahzad et al., 2020).

The B2B e-commerce provides many benefits to SMEs, such as improving productivity, facilitating customer-supplier interaction, access to the international market, reducing cost, and gaining competitive advantage (Ocloo et al., 2020). The firm using B2B e-commerce can expand their market share and sales, enhancing performance compared to non-e-commerce using firms (Jovanović et al., 2020). However, several developing countries are far behind in adopting B2B e-commerce. How different factors affect the use of e-commerce in developing countries' SMEs is considered a research gap (Amornkitvikai & Lee, 2020; Hassen et al., 2019). Consequently, SMEs need to embrace technology innovation to improve production processes for achieving a competitive position in the global market (Baporikar & Shikokola, 2020).

Despite the common consensus of several experts and research scientists, SMEs are contributing to the economic growth, the advancement of innovation, employment creation, and increase in exports of the country (Kemayel, 2015; Nikolić et al., 2019). It is highlighted in previous literature that the SMEs failed within the initial five years of their operations because of having less survival capacity in terms of resources (Sutrisno et al., 2019). In Pakistan, SMEs collapse at the early stages of their business operations (Raza et al., 2018). Specifically, researchers stated that 25% of newly registered Pakistani SMEs fail within four years, and 19% fail after five years from their startup (Alkahtani et al., 2020; Anwar et al., 2018). Likewise, to admit the significance of e-commerce usage, Pakistan's e-commerce market is tiny compared to regional countries, and only 20% of the SMEs are using e-commerce to export their products (Ahmed, 2019; Khan et al., 2014).

Pakistan is among the developing countries of the world which affected severely because of the COVID-19 pandemic. In the second half of the fiscal year 2019, due to the outbreak, the country rose at 28 points in terms of the world bank ease of doing business index compared to the world's top-10 countries in the year 2018 (Hyder et al., 2020). Moreover,

this unpredicted outbreak has affected almost every industry, particularly small and medium enterprises, due to less financial and survival capacity (Okorie et al., 2020). Similarly, the surgical SMEs production is also dropped from 95% to 45% because of a huge decrease in exports of surgical instruments during pandemic (Khan, 2019). Likewise, according to exporters, there is a decrease of 70% in the new order of sports goods during the COVID-19 (Latif, 2020). However, SMEs all over the world are shifting their business from the traditional way to click and mortal to remain competitive in the future (Hussain et al., 2020). Therefore, there is a need to introduce a B2B e-commerce platform to sustain Pakistan's sports and surgical SMEs' exports.

Furthermore, theoretically, technological innovation and adoption have been examined by several theories such as the unified theory of acceptance, the theory of planned behavior (Ajzen, 1991), and the technology acceptance model (Davis et al., 1989). However, very few studies have looked into Technology, Organizational, Environmental, TOE model (Depietro et al., 1990) and diffusion of innovation (DOI) theory. However, past researchers have discussed and investigated big data adoption (Yadegaridehkordi et al., 2020), the use of ERP (Heredia-Calzado & Duréndez, 2019), the use of e-government (Silal et al., 2019), and the use of e-marketing (Sheikh et al., 2018). However, the use of e-commerce is not tested with underlying factors of the TOE Model, particularly in developing countries. This research's main objective is to investigate the effect of relative advantage, technology readiness, adoption cost, top management support, competitive pressure, and government support on B2B e-commerce. Thus, the research focuses on group comparison between sports and surgical SMEs of Pakistan.

This research paper is compiled into five sections. Section 2 focuses on the previous scholars work related to B2B e-commerce and TOE factors. Section 3 focuses on the methodological aspects of the study. Section 4 consist of key findings of the paper, which is well explained through descriptive and inferential statistics. Section 5 focuses on focuses on the discussion of the study concerning the stated research objectives.

2. Literature Review

2.1 Industries Overview

In 1998, SMEDA was established by the government of Pakistan for the development of SMEs. The primary objective of SMEDA is to encourage and create new SME divisions. SMEDA is also responsible for defining rules and regulations for the SME's growth and improvement. In Pakistan, 90% of all enterprises are constituted under the heading of SMEs. Currently, around 3.2 million SMEs are registered in Pakistan (SMEDA, 2018). Thus, Pakistani SMEs contribute approximately 40% to the GDP (Economic Survey of Pakistan, 2018). According to the Economic Survey of Pakistan (2018), it is clearly illustrated that the industrial sector plays a substantial role in uplifting the country's economic growth and enhancing the socio-economic conditions of the people. Though the industrial sector, on one side, raises the demands for agricultural products by utilizing it as raw material, and on the other hand, it provides the latest instruments and machinery to

modernize the cultivation of the crops. Furthermore, the industrial sector also creates the demand for different types of manufacturing units and provides the necessities and other associated equipment to modernize the sector.

Likewise, sports goods SMEs are playing an essential role in the manufacturing sector. There is a wide product category in manufacturing units such as polo sticks, hockey sticks, cricket bats, etc. Although, the sports products division has procured a critical repute in the worldwide exchange of sports products. For instance, more than 200,000 individuals are specifically working within the sports product division and trading sports products worth US$ 450 million every year from 2,400 different units in Pakistan (Kazmi, 2018). At times, the sports goods industry contributes 1.51% in total exports of Pakistan, with the major export of football, almost 43% of the sector's total export (Zafar et al., 2017). At present, the sports goods industry shows a negative growth of 9.04 percent in terms of exports (Economic Survey, 2019).

The surgical instrument industry of Pakistan is serving around for more than a hundred years. At that time, British doctors bring their surgical instruments to repair from the experienced workers of Sialkot. This was the initial stage of the surgical industry of Pakistan. The surgical instruments division of Sialkot excels due to the technical capabilities of the workers. Besides, exporters and manufacturers of surgical instruments mostly deal with the surgical industries, veterinary instruments, dental instruments, tailor scissors, beauty salon instruments, manicure and pedicure items, and hairstylist scissors. Moreover, around 1900 SME surgical units produce a range of 10 to 500 products by using approximately 100,000 workers (Arifeen, 2018). Pakistan's surgical instrument industry was exporting surgical goods worth 339 Million US dollars approximately in 2016-17 (Sandhu & Azhar, 2020). In 2018, Surgical SMEs were contributing 221 Million US dollars in exports of the country. However, in 2018-2019, there is a negative exports' growth of Pakistani surgical SMEs (Pakistan Bureau of Statistics, 2018).

2.2 Theoretical Foundation

The research framework of the study shown in Figure 1 is conceptualized as follows. The model's right-hand side relates to capabilities (i-e B2B e-commerce usage). The DOI theory can explain this perspective. Among the wide range of factors that are discussed in ax ante studies. On the left-hand side of the framework, there are six independent variables, which are explained by the TOE framework. The independent variables are (1) relative advantage, (2) technology readiness, (3) top management support, (4) adoption cost, (5) competitive pressure, and (6) government regulations, while the dependent variable of the study is B2B e-commerce usage.

The DOI theory has been applied in numerous IS adoption studies (Luong & Wang, 2019; Mohtaramzadeh et al., 2018; Sheffield, 2019). According to the theory, innovation is defined as "an idea, practices, or object that is perceived to be new by an individual or

another unit of adoption" (Roger, 2003). While diffusion refers to "the process by which an innovation is communicated through certain channels over time among the member of a social system" (Roger, 2003). Thus, the four essential innovation theory diffusion elements are time, social system, innovation, and communication channels.

TOE model describes that technology adoption/usage innovation is influenced by the technological, organizational, and environmental context factors (Depietro et al., 1990). These model contexts act as opportunities and constraints for 'technological innovation' (Tornatzky and Fleisher, 1990). Furthermore, the TOE model works as an analytical tool to identify the adoption/usage of innovative technological change for an enterprise (Zhang et al., 2020). Therefore, numerous studies have considered the TOE model focused on technology adoption.

Technological context identifies an organization's ability to move towards new technology and innovation (Scupola, 2009; Turban & Volonino, 2010). The technology factors define the technical features of e-commerce usage like technology readiness and relative advantage (Rahayu & Day, 2015). The organizational factors include the organization's characteristics, attributes, and resources. The most common organization characteristics include centralization, formalization, firm size, managerial structure (top management support), and the amount of available slack resources (adoption cost) (Mohtaramzadeh et al., 2018). Likewise, the environmental factors refer to the domain where the firm experiments with its businesses. The industry influence consists of the factors that are competitive pressure and government policies/support on the usage of e-commerce (Duan et al., 2012; Mohtaramzadeh et al., 2018; Sila, 2013). These factors mentioned above facilitate the adoption/usage of technology innovations such as e-commerce (Tornatzky et al., 1990).

In addition, several studies have depicted that the TOE framework is consistent with other adoption theories such as the DOI theory (Hussein et al., 2019; Oliveira & Martins, 2010; Zhu et al., 2006). For example, the adoption predictors in DOI include individual leader characteristics and internal organization characteristics that are compatible with the organizational context of the TOE. Likewise, the system openness in DOI is compatible with the environmental context of the TOE. Finally, researchers implicitly emphasized that Rogers's innovation attributes are compatible with the technological context (Baker, 2012; Luong & Wang, 2019).

Moreover, the scholars emphasize that the TOE framework is a suitable analytical tool to study technology adoption/usage determinants. However, they also believe that it lacks a theoretical foundation and it is just an arrangement or classification for variables (Dedrick & West, 2003). In the same line, (Guo et al. (2010) stated that the TOE framework does not provide causality among the underlying factors to decide the innovation. Furthermore, the TOE framework did not offer adequate constructs to explain inter-organization behavior (Hsu et al., 2006).

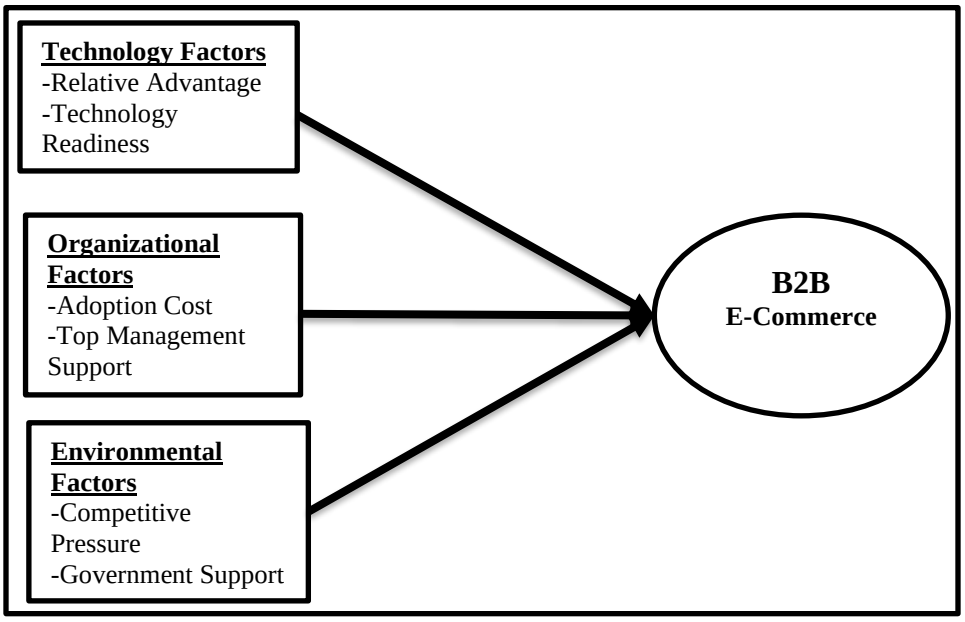

Figure 1: Research Framework

2.3 Hypotheses Development

2.3.1 Relative Advantage and B2B E-Commerce Use

In previous literature, the relative advantage is considered the positive predictor to increase the technology innovation usage (Sultan et al., 2018), which eventually enhances the firm's competitiveness (Ocloo et al., 2018). Different researchers have defined a relative advantage in different ways. Relative advantage and perceived usefulness are also used interchange while studying IT adoption as the extent to which innovation influences firms' performance in a way that it overtakes the conventional methods being applied (Karahanna et al., 2006). Other studies found that the concept of relative advantage is higher and has a greater chance to influence the manufacturing firm's decision to adopt e-commerce (Scupola, 2003). The determinants of e-commerce adoption in the SME sector are analyzed through various drivers and discovered that relative advantage is a crucial contributor towards the decision to adopt e-commerce and it has a significant impact on SME performance (Alam et al., 2011). The above discussion formulates the following hypothesis:

- **H_1:** Relative advantage has a significant positive influence (in sports and surgical SMEs) on B2B e-commerce.

2.3.2 Technology Readiness and B2B E-Commerce Use

In this study, technology readiness is a combination of the employees' IT infrastructure and technical skills. However, it is suggested that if an organization wants to introduce technology innovation as part of their value chain, they need both IT infrastructure and technical skills of the employees (Oliveira & Martins, 2010). The study investigates the combined effect of IT infrastructure and IT human resources (which is termed as technology readiness) on the B2B use of e-commerce in the Pakistani context to fill the existing gap.

Adoption of a certain technology requires the infrastructure that supports its implementation having in place all the hardware and software requirements to operate the system. Owing to the monetary factors, SMEs usually have limited access to technology; however, the incremental cost of e-commerce adoption is less than the cost incurred to sun conventional business processes (Shahzad et al., 2020). Moreover, the firm with advanced infrastructure seems to be better positioned to reduce the cost of operations. Some studies also reveal an insignificant relation between firms' performance and IT infrastructure after e-commerce adoption due to the perceived complexity of some financial transactions and payment methods (Govinnage & Sachitra, 2019). The discussion postulated the below hypothesis:

- **H_2**: Technology readiness has a significant positive influence (in sports and surgical SMEs) on B2B e-commerce.

2.3.3 Adoption Cost and B2B E-Commerce Use

In addition to top management support, another significant factor in an organizational context is the cost of using e-commerce technology (Mohtaramzadeh et al., 2018; Silal & Jha, 2019). The higher cost of technology will result in lower usage of technology in the organization, particularly in SMEs. Many scholars also stress on lack of funding as a major barrier for SMEs to adopt technologies (Palm, 2018). That's why adoption cost is another major factor in SMEs for e-commerce usage and an essential consideration in the decision-making process for developing countries (Elahi & Hassanzadeh, 2009; Mohtaramzadeh et al., 2018). More specifically, manufacturing SMEs related adoption cost impact on firm performance is still not identified by the scholars. Therefore, there is a need for further in-depth studies to explore the relationship between adoption cost and firm performance. The above discussion leads towards the following hypothesis:

- **H_3**: Adoption cost has a significant negative influence (in sports and surgical SMEs) on B2B e-commerce.

2.3.4 Top Management Support and B2B E-Commerce Use

The role of top management in the adoption of e-commerce is pivotal as it fosters the implementation by welcoming the change of infrastructure from conventional to the technological system. Top management's behavior in communicating the change and describing the role that innovation plays in formulating the overall strategy (Baker, 2012).

The management should also emphasize the incremental productivity achieved by using e-commerce and building a skilled executive team that casts the vision for the firm's future by its effective use. In the Pakistani industrial sector, top management support has emerged as a critical organizational factor that affects technologies' usage (Nizamani et al., 2017). Normally, in Pakistani organizations, information flows only from top to bottom (Sheikh et al., 2018). Moreover, it is suggested that top management support is an essential element to implement the technology change like the use of e-commerce, particularly in SMEs (Singh et al., 2019). Thus, top management's support relationship with the use of e-commerce needed further investigation. Therefore, the discussion formulates the following hypothesis:

- **H_4:** Top management support has a significant positive influence (in sports and surgical SMEs) on B2B e-commerce.

2.3.5 Competitive Pressure and B2B E-Commerce Use

In the compelling literature, empirical studies have proved that competitive pressure is the key element that serves as a driver to adopt technology to accelerate the business processes (Altaf & Shahzad, 2018). Organizations are more likely to adopt e-commerce methodologies when they operate in a competitive atmosphere (Sila, 2013). A significant positive impact is empirically proved in studying competitive pressure leading to support e-commerce adoption (Hussain et al., 2020). Furthermore, competitive pressure plays a unique role in the use of innovation by organizations. Competitive pressure impacts the use of the information system and helps SMEs achieve superior performance and competitive advantage (Ocloo et al., 2018). However, very few studies are available on competitive pressure (Ruivo et al., 2014). These limited findings motivate the researcher to identify the relationship between competitive pressure and firm performance of Pakistani SMEs. The above discussion formulates the following hypothesis:

- **H_5:** Competitive pressure has a significant positive influence (in sports and surgical SMEs) on B2B e-commerce

2.3.6 Government Support and B2B E-Commerce Use

In addition to competitive pressure, another big problem in technology usage is government support, particularly in developing countries. Government support is a potential factor as it facilitates the adoption of technology, which is beneficial for productivity in financial as well as non-financial terms, especially in developing countries. Small and Medium Enterprises striving to survive the market competition may get support through legislation. Government regulatory support and resource support act as facilitators for SMEs and startups to use advanced technology for daily activities (Trang et al., 2016). The discussion leads to the following hypothesis:

- **H_6:** Government support has a significant positive influence (in sports and surgical SMEs) on B2B e-commerce

3. Method

3.1 Research Design and Instrument Development

Research design combines research components in reasonable, logical, and efficient methods. Integrating an overall strategy by measuring and analyzing data ensures effective, credible, and systematic ways to resolve research problems and answer research questions. The current study employs the quantitative method approach (Siddiqi et al., 2015). In the quantitative approach, the survey method is used to get more in-depth knowledge about TOE factors affecting the B2B e-commerce usage in Pakistan's surgical and sports manufacturing SMEs. The questionnaire has been adapted from past researches; the measurement scales of the relative advantage and technology readiness were adapted from Premkumar et al. (1994) and Molla and Licker (2005), respectively; adoption cost was measured from the scale of Al-Qirim (2007); Likewise, top management support has been adapted from Soliman and Janz (2004); government support scale has been adapted from Looi (2005) with four items; competitive pressure measurement items were adapted from Jaworski and Kohli (1993). Lastly, the use of the e-commerce scale was taken from (Gibbs & Kraemer, 2004).

3.2 Data Collection, Sampling, and Analysis Technique

The present study employed a convenience sampling technique by using a structured questionnaire through the GOOGLE form link (because of a global pandemic of COVID-19) from the top and middle-level managers to collect data. According to the Pakistan Bureau of Statistics (2018), 65% of SMEs are located in the largest province (Punjab) of Pakistan. Likewise, 18 percent of SMEs are located in the province of Sindh, only 3 percent of SMEs are in Baluchistan, 14 percent are in Khyber Pakhtunkhwa, and only 2 percent are in the capital city of Islamabad. The manufacturing SMEs of sports ad surgical in Punjab targeted. According to the Manzoor (2018), there are approximately 2300 surgical SMEs satiated in Sialkot, Punjab (One province of Pakistan) (Manzoor, 2018). Likewise, according to SMEDA, the total number of sports goods SMEs in Punjab is 2170 (Asad, Rizwan, Shah, & Munir, 2018). A sample of 500 SMEs was selected by using the convenience sampling technique. However, only 262 (121 Sports, 141 Surgical) SMEs have replied to the questionnaire and used it for further analysis. The current study applied multi-group analysis (MGA) by using Smart PLS software 3.3.2 to collected data. Table 1 shows the demographic information along with the respondent experience, education, and position.

Table 1: Demographic Profile of the Respondents of Sports and Surgicals

Variable	Items	Frequency(F)	Percentage (%)
Age	20-30 years	96	36.6
	30-40 years	87	33.3
	41-50 years More than 50 years	46 33	17.6 12.5
Gender	Male	187	71.3
	Female	75	28.7
Experience of Using E-Commerce	1-3 years	119	45.4
Education	More than three years	143	54.6
	Graduation	165	62.9
	Masters	97	37.1
Position in the Organization's Hierarchy	Top-level managers	91	34.7
	Mid-level managers	171	65.3
Manufacturing SMEs Type	Sports	121	46.1
	Surgical	141	53.9

4. Data Analysis in Smart PLS

In recent years, under the domain of structural equational modeling (SEM), a variance-based partial least square (PLS) technique, also referred to as a component-based approach, has become popular in social sciences researches (Sarstedt et al., 2020). Moreover, PLS is a more useful technique for complex path model hypotheses testing in an explorative manner (Ali et al., 2018). In the present study, Structural Equational modeling (SEM) using Smart PLS software 3.3.2 was employed to analyze the collected data for several reasons. The SEM addressed the causality among the variables beyond the conventional multiple regression. Precisely, it explains statistical relationships in more detail among all variables in one model (Ryan, 2020). The PLS-SEM is a second-generation technique applied in many disciplines like social sciences (Hair et al., 2019). Smart PLS mainly applied two-measure models, which are measurement (outer model) and structural (inner model) (Shmueli et al., 2019).

4.1 Internal Consistency Reliability

The internal consistency / reliability can be assessed by examining the composite reliability (CR) of the model. Composite reliability (CR), which is also referred to as construct validity indicated as the "shared variance among the observed variables used as an indicator of latent constructs" (Fornell & Larcker, 1981). In the present study, composite reliability (CR) is measured and compares with a standard value higher than 0.60 (Hair et al., 2014). Table 2 showed that each construct's composite reliability (CR) is above the threshold values, and the AVE value is above 0.5 (Hair et al., 2016). Further, it shows that all the Surgical and Sports groups' constructs have AVE's and CR value are above the standard values. The reliability of the measurement model is shown in Figures 2, 3, and 4.

Table 2: Assessment Result for the Measurement Model

Construct	**Loading**			**CR**			**AVE**		
Reflective	Full Model	Sports	Surgical	Full Model	Sports	Surgical	Full Model	Sports	Surgical
Adoption Cost (AC)				0.881	0.875	0.804	0.789	0.778	0.684
AC1	0.968	0.921	0.994						
AC3	0.801	0.842	0.617						
Competitive Pressure (CP)				0.860	0.869	0.844	0.555	0.572	0.528
CP1	0.735	0.745	0.719						
CP2	0.772	0.763	0.778						
CP3	0.823	0.801	0.836						
CP4	0.802	0.826	0.768						
CP5	0.565	0.631	0.478						
Government Support (GS)				0.908	0.821	0.874	0.767	0.612	0.703
GS1	0.857	0.619	0.997						
GS3	0.822	0.743	0.758						
GS4	0.943	0.949	0.735						
Relative Advantage (RA)				0.872	0.860	0.881	0.631	0.609	0.650
RA1	0.725	0.640	0.801						
RA2	0.771	0.780	0.753						
RA3	0.843	0.830	0.862						
RA4	0.832	0.853	0.804						

Top Management Support (TMS)				0.979	0.978	0.979	0.939	0.938	0.939
TMS2	0.967	0.972	0.964						
TMS3	0.972	0.962	0.979						
TMS4	0.967	0.971	0.964						
Technology Readiness (TR)				0.782	0.813	0.750	0.555	0.600	0.514
TR1	0.871	0.879	0.875						
TR2	0.515	0.555	0.474						
TR5	0.801	0.847	0.743						
B2B E-Commerce (EC)				0.926	0.934	0.918	0.716	0.739	0.695
UEC1	0.875	0.884	0.871						
UEC2	0.907	0.903	0.914						
UEC3	0.907	0.905	0.914						
UEC4	0.822	0.854	0.785						
UEC6	0.703	0.742	0.654						

4.2 Discriminate Validity

Discriminant validity refers to “the extent to which the constructs are different from one another empirically” (Hamid et al., 2017). This criterion demonstrated as discriminating validity specifying the degree of distinction of indicators across constructs assessed by the Fornell and Lacker criteria. Table 2 below explains that the AVE square root is higher than the latent variables' correlation indicating acceptable discriminant validity (Fornell & Larcker, 1981).

Table 3: Discriminant Validity Full Model

	AC	**B2B EC**	**CP**	**GS**	**RA**	**TR**	**TMS**
AC	**0.888**						
B2B EC	-0.057	**0.846**					
CP	-0.027	0.420	**0.745**				
GS	-0.050	-0.051	0.027	**0.876**			
RA	0.000	0.549	0.213	-0.033	**0.794**		
TR	-0.071	0.691	0.435	-0.036	0.389	**0.745**	
TMS	0.020	0.420	0.104	-0.032	0.449	0.423	**0.969**
Sports SMEs							
	AC	B2B EC	CP	GS	RA	TR	TMS
AC	**0.882**						
B2B EC	-0.084	**0.860**					
CP	0.022	0.428	**0.756**				
GS	0.101	-0.121	0.030	**0.782**			
RA	0.070	0.590	0.247	-0.064	**0.780**		
TR	-0.060	0.744	0.486	-0.101	0.546	**0.774**	
TMS	0.041	0.456	0.185	-0.187	0.503	0.479	**0.968**
Surgical SMEs							
	AC	B2B EC	CP	GS	RA	TR	TMS
AC	**0.827**						
B2B EC	-0.047	**0.833**					
CP	-0.039	0.429	**0.727**				
GS	-0.075	-0.079	-0.010	**0.838**			
RA	-0.045	0.531	0.191	-0.045	**0.806**		
TR	-0.055	0.639	0.393	-0.104	0.242	**0.717**	
TMS	0.027	0.397	0.062	0.028	0.416	0.373	0.969

4.3 Assessment of Measurement Invariance

Measurement of two strata of manufacturing SMEs of Pakistan, sports and surgical, the invariance test is applied in the present study. It is essential to perform an invariance test before conducting a multi-group analysis. Therefore, the aim is to evaluate "whether, under diverse circumstances of observation and study of phenomena, measurement models yield measurement results of the same attribute" (Henseler et al., 2016). The study is divided into three stages: Configural Invariance, Compositional Invariance, and Equal Composite Means and Variances, all of which are used to test measurement invariance (Henseler et al. 2016).

Besides, the measurement models have the same number of unobservable variables for both models. Thus, the configural invariance was tested for sports and surgical SMEs data. Further, the permutation test was applied to measure the compositional invariance to ensure the composite score is the same for each industry group. Lastly, the mean values and compositive variance were assessed, as shown in Table 4. The results of Table 4 reveals that compositional constructs have non-significant difference as far as compositional means and variance ratios are concerned. Therefore, it is deduced that various model estimation of Pakistan's sports and surgical SMEs are not distinct for B2B e-commerce usage.

4.4 Assessment of Group Differences

The research calculated the differences between the sports and surgical SMEs groups using PLS-MGA and the Welch-Satterthwait test (Sarstedt et al. 2011). The path coefficient (Path Mean Difference) also appears in Table 5. Meanwhile, several sets of sports and surgical data are found to be divergent. Research shows that B2B (business-to-to-business) e-commerce and B2C (business-to-to-consumer) were used differently.

4.4.1 Assessment of Sports Industry

Providently, as per the sports goods SMEs are concerned. Table 5 shows the hypotheses results, H1 found that relative advantage has significantly positive influence on B2B e-commerce (path coefficient= 0.256, T= 3.978, p-value< 0.05); H2 identified that the technology readiness has found significantly positive influence on B2B e-commerce (path coefficient= 0.518, T= 6.952, p-value< 0.05); H3 result found that adoption cost has insignificantly negative influence on B2B e-commerce (path coefficient = -0.072, T= 1.248, p-value> 0.05). Further, H4 identified that the top management support has found an insignificantly positive influence on B2B e-commerce (β= 0.055, T= 0.819, p-value> 0.05). However, H5 found that the government support has an insignificant positive influence on B2B e-commerce (β= -0.037, T= 0.542, p-value> 0.05). Likewise, H6 has identified that competitive pressure also has an insignificant positive influence on B2B e-commerce (β= 0.015, T= 1.586, p-value> 0.05). As shown in Table 5 and Figure 5,6 and 7.

4.4.2 Assessment of Surgical Industry

The results pertaining to Surgical SMEs as follows; Table 5 shows the hypotheses results, H_1 found that relative advantage has significantly positive influence on B2B e-commerce (path coefficient= 0.359, T= 6.111, p-value< 0.05); H_2 identified that the technology readiness has found significantly positive influence on B2B e-commerce (path coefficient= 0.456, T= 6.808, p-value< 0.05); H_3 result found that adoption cost has insignificantly negative influence on B2B e-commerce (path coefficient = -0.001, T= 0.021, p-value> 0.05). Further, H_4 identified that the top management support has found an insignificantly positive influence on B2B e-commerce (path coefficient= 0.067, T= 1.130, p-value> 0.05). However, H_5 found that the government support has an insignificant positive influence on B2B e-commerce (path coefficient = -0.016, T= 0.303, p-value> 0.05). Likewise, H_6 has identified that competitive pressure also has a significant positive influence on B2B e-commerce (path coefficient = 0.176, T= 2.528, p-value<0.05). As shown in Table 7 and Figure 5, 6, and 7.

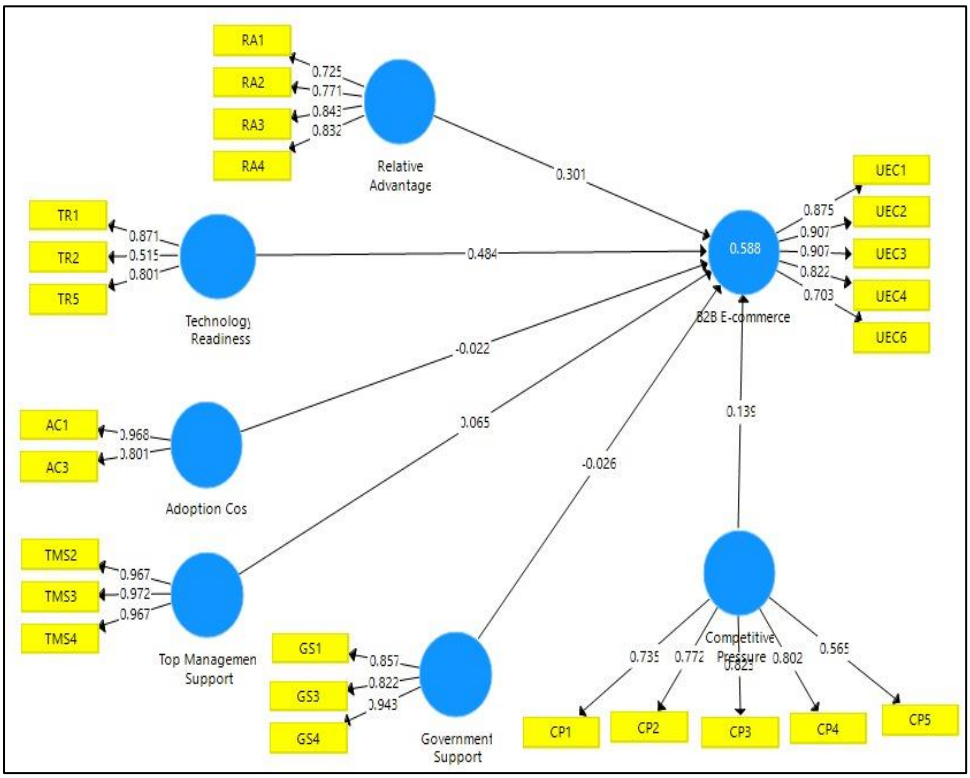

Figure 2: Full Measurement Model

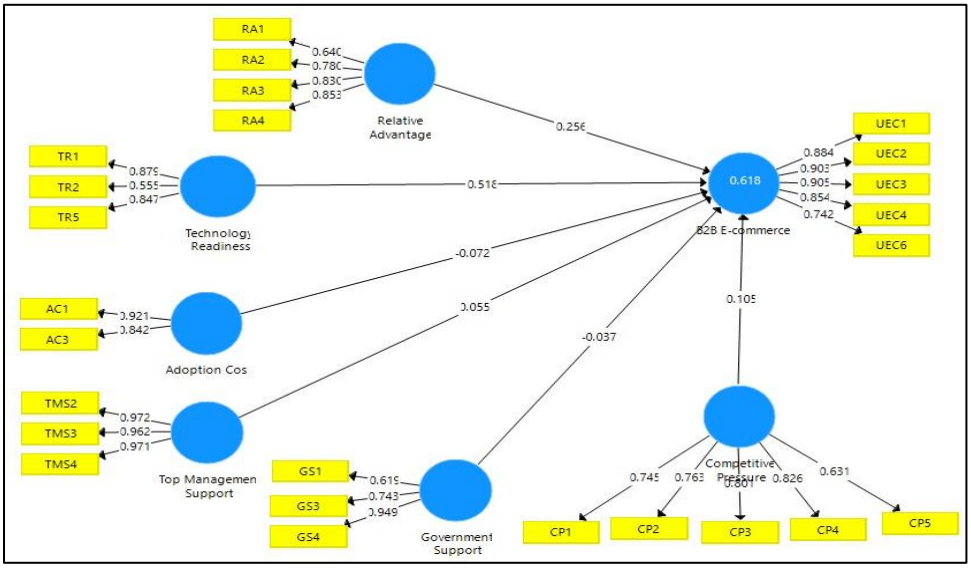

Figure 3: Sports Measurement Model

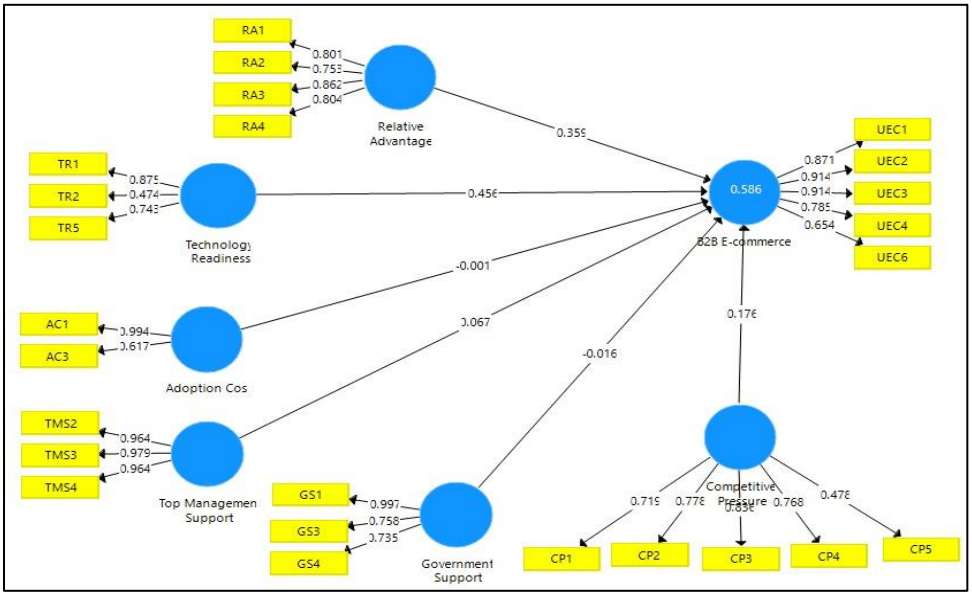

Figure 4: Surgical Measurement Model

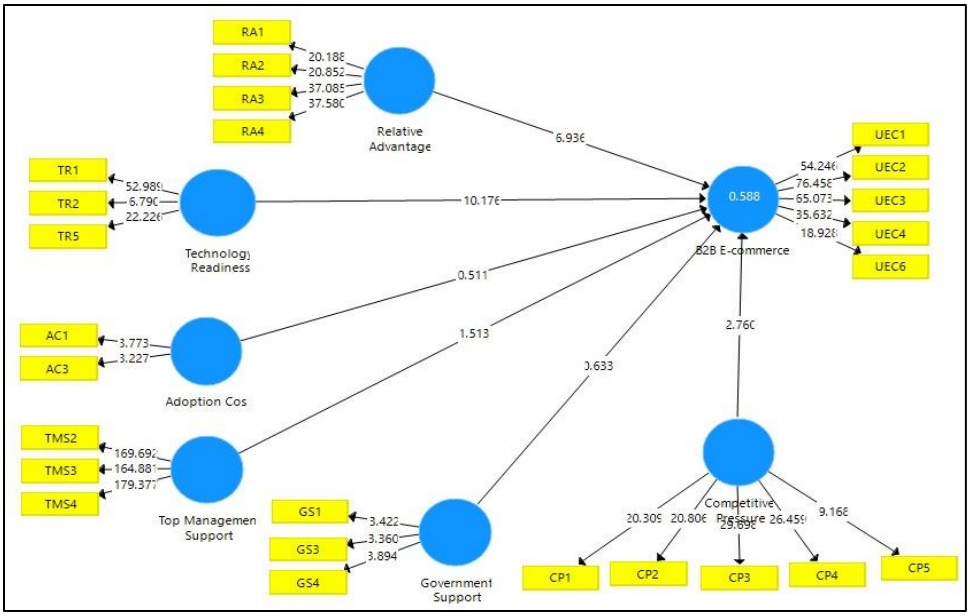

Figure 5: Full Structural Model

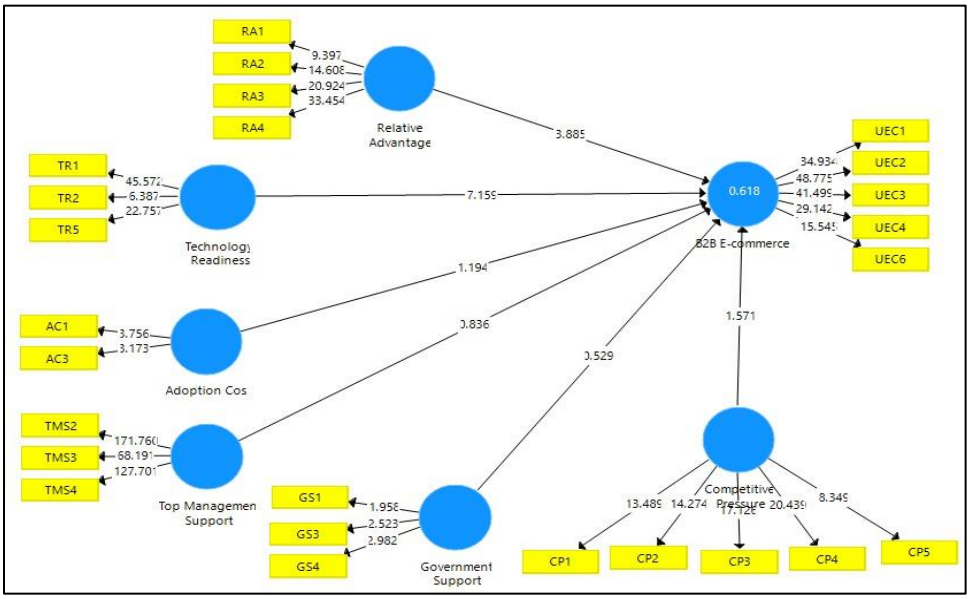

Figure 6: Sports Structural Model

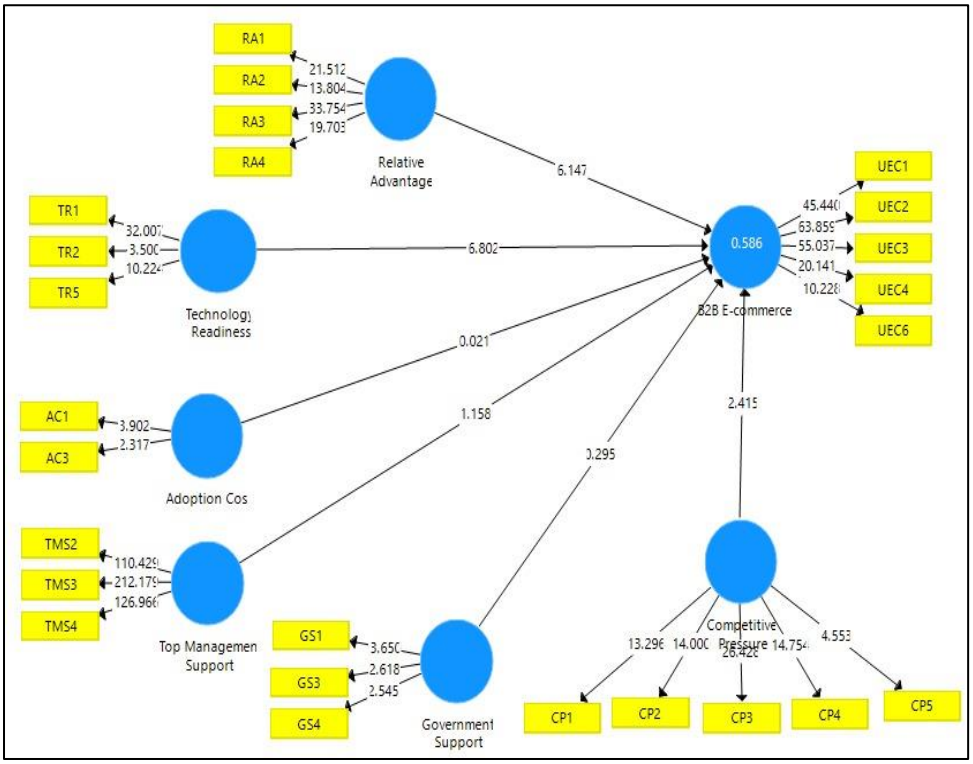

Figure 7: Surgical Structural Model

Table 4: Measurement Invariance Calculation Based on MICOM

Composite	C Value (= 1)	95% Confidence	Compositional Invariance
Adoption Cost	0.883	[0.990, 1.000]	yes
B2B E-commerce	0.999	[1.000,1.000]	yes
Competitive Pressure	0.995	[0.982,1.000]	yes
Government Support	0.690	[0.930,1.000]	yes
Relative Advantage	0.995	[0.999,1.000]	yes
Technology Readiness	0.996	[0.999,1.000]	yes
Top Management Support	1.000	[1.000,1.000]	yes

Composite	**Difference of the Composite's Mean Value (= 0)**	**95% Confidence**	**Equal Mean Values**
Adoption Cost	-0.057	[-0.260,0.254]	yes
B2B E-commerce	0.034	[-0254, 0.226]	yes
Competitive Pressure	0.326	[-0.244,0.240]	no
Government Support	0.073	[-0.230,0.244]	yes
Relative Advantage	0.015	[-0.254,0.240]	yes
Technology Readiness	0.005	[-0.260,0.259]	yes
Top Management Support	-0.155	[-0.237,0.256]	yes
Composite	**Difference of the composite's mean value (= 0)**	**95% confidence**	**Equal variances**
Adoption Cost	0.001	[-0.213,0.229]	yes
B2B E-commerce	0.234	[-0.378,0.360]	yes
Competitive Pressure	0.162	[-0.314,0.287]	yes
Government Support	-0.198	[-0.447,0.419]	yes
Relative Advantage	0.003	[-0.304,0.311]	yes
Technology Readiness	0.342	[-0.352,0.345]	yes
Top Management Support	-0.162	[-0.332,0.338]	yes

Table 5: Assessment of Group Differences

N0		Path Coefficients Original (Sport)	Path Coefficients Original (Surgical)	t-Value (Sport)	t-Value (Surgical)	p-value Henseler's MGA	p-value Permutation test	p-value Welch sattherhwait test	Supported
H_1	Relative Advantage → B2B E-commerce	0.256***	0.359***	3.978	6.111	0.115	0.120	0.121	no/no
H_2	Technology Readiness →B2B E-commerce	0.518***	0.456***	6.952	6.808	0.274	0.268	0.268	no/no
H_3	Adoption Cost → B2B E-commerce	-0.072	-0.001	1.248	0.021	0.231	0.226	0.221	no/no
H_4	Top Management Support → B2B E-commerce	0.055	0.067	0.819	1.130	0.450	0.446	0.446	no/no
H_5	Competitive Pressure →B2B E-commerce	0.105	0.176***	1.586	2.528	0.229	0.231	0.229	no/no
H_6	Government Support → B2B E-commerce	-0.037	-0.016	0.542	0.303	0.382	0.400	0.402	no/no

Note: p<0.1, * p<0.05, ** p<0.01***

Table 6: Comparison Analysis

Relationship	Full Model Result		Sports		Surgical	
Relative Advantage →B2B E-commerce	0.301***	Supported	0.256***	Supported	0.359***	Supported
Technology Readiness → B2B E-commerce	0.484***	Supported	0.518***	Supported	0.456***	Supported
Adoption Cost → B2B E-commerce	-0.022	Not Supported	-0.072	Not Supported	-0.001	Not Supported
Top Management Support→B2B E-commerce	0.065	Not Supported	0.055	Not Supported	0.067	Not Supported
Competitive Pressure → B2B E-commerce	0.139**	Supported	0.105	Not Supported	0.176**	Supported
Government Support→B2B E-commerce	-0.026	Not Supported	-0.037	Not Supported	-0.016	Not Supported

Note: p<0.1, * p<0.05, ** p<0.01***

5. Result Comparison and Discussion

The study has combined the TOE framework with the diffusion of innovation (DOI) theory to build a theoretical framework. A total of six (06) hypotheses have been identified and formulated based on each group, i.e., sports and surgical SMEs. To the model, the statistical analyses were performed by using SPSS v 25 and SmartPLS 3.3.2. The results are shown in Table 6. The Surgical SMEs of Pakistan do not significantly influence government support, adoption cost, and top management support on B2B e-commerce adoption. However, the competitive pressure (CP) from environmental factors has significantly influenced the B2B e-commerce of surgical SMEs. Further, the technological factors are also influencing positively on B2B e-commerce in Pakistani Surgical SMEs. On the other hand, for Sports SMEs of Pakistan, technology factors, i.e., relative advantage (RA) and technology readiness (TR), are significant and supported to B2B e-commerce usage in Pakistan. However, the organizational factors (AC and TMS) and environmental factors (CP and GS) have not significantly influenced the use of B2B e-commerce. In the full model, the only factor related to an environmental factor is competitive pressure (CP), and technological factors have a significant positive influence on B2B e-commerce. However, adoption cost (AC), top management support (TMS), and government support (GS) do not appear as significant factors in SMEs of Pakistan.

Besides past scholars used technology factors (i.e., relative advantage and technology readiness) to explore benefits and readiness to adopt the technology (Ramírez et al., 2020). However, the present study has found both technological context components positive significant in sports and surgical SMEs of Pakistan. According to DOI theory, innovativeness is consistent with internal organizational structural characteristics like organization infrastructure and resources to support technology usage. Thus, the above-mentioned technological resources are consistent with the underlying assumptions of DOI theory.

In developing countries, the governments are making specific policies and providing financial incentives to large industries to increase e-commerce usage (Mohtaramzadeh et al., 2018; Saprikis & Vlachopoulou, 2012). However, there is less government support for small and medium enterprises (SMEs), particularly in emerging economies. Similarly, the government of Pakistan also making policies and providing funding to establish large-scale industries. However, there is little focus on small and medium enterprises (SMEs). Therefore, the present study revealed that government support has not appeared as a significant factor for both sports and surgical SMEs in using B2B e-commerce for Pakistan's manufacturing SMEs.

Likewise, the cost of adopting new technology always remains an obstacle for developing countries manufacturing SMEs. This research found that the adoption cost of e-commerce usage, amount of money spent on training related to e-commerce usage, and maintenance and support fees for technology used do not significantly influence B2B e-commerce. At times, the high cost of broadband and access to the internet were the major barriers to adopt the technology (i.e., use of e-commerce), particularly for SMEs. In the present time, SMEs

are using cloud servers, and training cost is also reduced because of the rapid increase of e-training concept. Therefore, study findings conclude that adoption cost is no more a negative influencing factor that can affect the usage of e-commerce in both sports and surgical SMEs of Pakistan.

In addition, the relationship between top management support and B2B e-commerce illustrated as not supported. The result implies that top management support does not influence significantly because most top managers/CEO are owners of SMEs. There is a lack of entrepreneurial competencies in terms of technology adoption skills, knowledge, and attitude. Although, human competencies are considered an important and main challenge for small firms' survival due to limited skills (Al Mamun et al., 2016; Abd Wahid et al., 2017). Therefore, top management support does not influence B2B e-commerce in Pakistan's sports and surgical SMEs.

Lastly, the present study revealed that competitive pressure positively influences B2B e-commerce in sports SMEs of Pakistan. However, it does not appear as a significant factor in the surgical SMEs of Pakistan. The possible reason could be more competitive in sports goods SMEs than the surgical instrument of Pakistan. Further, competitive pressure encourages firms to compete with their rivals by improving operational processes to meet the changing environment's requirements. For this purpose, the adoption of new technology like e-commerce allows firms to integrate their business processes and establish a connection with upstream and downstream partners (Alsaad et al., 2019).

5.1 Implications of the Study

The significant direct and indirect relationship with the use of e-commerce also calls upon the SMEs managers' attention towards the availability of such resources (independent variables) before implementing e-commerce in their organizations. Hence, this study has tried to explain the essential underlying factors and capabilities to convert the firm from the traditional way of doing business to click and mortar using e-commerce.

From the compelling literature, prior scholars are focused on two streams. First, they make insights and determine information communication technology (ICT) adoption (Tutusaus et al., 2018). Second, innovative technology usage to the existing adoption context (Aremu et al., 2020). Based on literature findings, there is a lack of debate on the specific use of technology like B2B e-commerce usage, particularly in Pakistan's sports and surgical SMEs. Thus, the study has focused on all three aspects (technological, organizational, and environmental) of the TOE model. Henceforth, the study clearly states that three distinct factors of TOE model are essential to adopt technology adoption like B2B e-commerce.

5.2 Limitation and Future Recommendations

The current study is focused on organizational-level issues related to small and medium enterprises (SMEs). The study context is within the sphere of manufacturing-related firms rather than the whole industry approach. Further, to increase the generalizability, the study

population can be increased from manufacturing to service and retails and other sectors of the developing countries. The research may further increase its domain by analyzing the use of commerce from B2B to B2C context. As technology innovation researches increase every year, academicians and practitioners need to link technology usage with new areas such as digital design thinking and IR 4.0 adoption.

5.3 Policy Recommendations

During the pandemic, COVID-19, businesses were in fear of face-to-face operation and mostly affected badly worldwide. In this situation, the government should develop policies to promote Pakistan SMEs to reach the cross-border market through B2B e-commerce. Top management's role is to establish a conducive environment for the organization to adopt e-commerce to sustain growth in the future. The SMEs owners need to build competencies and focused on commission-based cloud platforms of e-commerce. The government's role should invest in the ICT infrastructure to robust internet connectivity in urban and rural areas. Moreover, to promote the e-commerce platforms for micro and large organizations, Pakistan's government should develop a fast and cost-effective data center such as the B2B portal to promote sports and surgical goods to boost cross-border e-commerce.

6. Conclusion

The research has predicted the direct effect on B2B use of e-commerce beginning with the TOE model's technological, organizational, and environmental factors by comparing surgical and sports SMEs of Pakistan. The theoretical study framework suggests that e-commerce implementation has an intuitive direction by having technological, organizational, and environmental factors. The result contributes to the existing knowledge in the following two ways. First, the study improves the understanding of technology adoption issues in manufacturing SMEs. Secondly, it helps to understand the comparison analysis of surgical and sports goods SMEs of Pakistan. Therefore, by analyzing the two distinct industries under the manufacturing head, the researcher can conclude a need to understand TOE factors and industry issues before implementing e-commerce in Pakistani manufacturing SMEs.

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