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Strategic Response to Industry 4.0; In the Perspective of Technology-Organization-Environment and Emotional Intelligence

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ABSTRACT

Technology-Organization-Environment (TOE) framework is the organizational level theory that suggests the acceptance and implementation of new and advanced technologies in the organization. In this study, the strategic response to industry 4.0 has been focused. This study will answer; how organizations can strategically respond to industry 4.0, which is the latest industrial revolution. Moreover, this study has considered the emotional intelligence individual-level factor to implement new technologies in the organization, which will enable organizations to strategically response the industry 4.0

The population of this study is the Chinese manufacturing industry. The sample size is 250, which was collected through a simple random sampling method. Data has been collected through the survey method. The advanced statistical software PLS-SEM has used for structural equation modelling for analysis.

Structural equation modelling consists of two modellings; measurement model and structural model. In the measurement model, reliability and validity through Cronbach alpha, composite reliability, average variance extract (AVE), and factor loadings of data have been measured. After the measurement model structural model based on the path coefficient through explanatory factor (R^2) with significant values has been mentioned. The results are in favour of the proposed model; only the moderating effect is contradicting, while emotional intelligence is playing its role as an independent variable instead of a moderating effect.

The advancement of IT technologies has evolved the industries into industry 3.0 to industry 4.0. Now a day's organizations are using advanced technologies in their production and manufacturing, which has integrated all the machines and processes through networking, or the internet. It will change the production concept to smart production. So, the manufacturing organizations can survive only, if they respond to the industrial revolution towards the industry 4.0. This study has contributed to the literature through emotional intelligence and highlighted the most important technological, organizational, and environmental factors to respond to industry 4.0; those are more practically implemented in the manufacturing companies.

Keywords:*Industry 4.0, TOE framework, Emotional intelligence, Industrial Revolution, and IT maturity*

INTRODUCTION

Industries have evolved through the passage of time and the implementation of new technologies in production. In the 18th century, steam energy used to run the mechanical production equipment had introduced industry 1.0(Corporation, 2020). After the one century, the industry moved toward mass production using electrical energy switched to industry 2.0 in the 19th century. In industry 3.0, the use of electronics and IT has automatic production, which has entered the manufacturing into the industrial 3.0 era in the 20th century(Corporation, 2020). Nowadays, the intelligent production has been started through the use of big data, internet of things and cloud computing has evolved into industry 4.0, which has changed the processes and production(i-SCOOP, 2020).

In industry 4.0, robotics has increased by 0.35% labour efficiency and productivity annually. Moreover, robotics performance is also higher as compared to the steam engine(Facts, 2020). So, the demand for robotics has

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increased. However, still, 80% of robots were only sold in five countries China, South Korea, German, Japan, and the U.S. In the manufacturing sector, robots can perform various functions. Robots are used for manufacturing automation by about 43%. In addition, it has estimated that 70% of human jobs would be replaced with robots until 2099(Facts, 2020).

Industry 4.0 can be integrated with the internet of things (IoT) and cloud computing for planned production. IoT can use to integrate other departments with the manufacturing department, and overall organizational department with each other through the use of modern enterprise resource planning (ERP)(Ostdick, 2018). Moreover, IoT and cloud computing will also be used for analytics, which will be used in production planning to customize the products according to customer demand. So, the evolution of industry 4.0 has reshaped the overall manufacturing process in a modernized way, which is more effective(Ostdick, 2018). However, the acceptance of industry 4.0 is not easy to implement. There areseveral technological, organizational, environmental, and individual factors that are effecting on the implementation of new technologies(Ostdick, 2018).

A comprehensive framework based on technological, organizational, environmental, and individual factors has to be considered for the implementation of industry 4.0. So, the TOE framework has provided the grounded for this study. In this competitive era, the strategic response to advanced information technologies became crucial for every organization. If organizations did not a response to the advancement in technologies before their competitors, then it will be difficult for organizations to survive in the competitive market.

This study has been distributed into five sections. In the first section, importance, and gap in the previous literature has been highlighted. In the second section, the in-depth literature review on study variables has been done. In the third section, sample, data collection method, the use of advanced software has been mentioned. In the fourth section, the results of structural equation modelling based on the measurement model, and the structural model has been focused on. In the end, in the fifth section, conclusion, discussion, future directions and limitations of the study have been elaborated.

LITERATURE REVIEW

Industry 4.0

Industry 4.0 is the integration of advanced technologiesinto manufacturing. In industry 4.0, customized manufacturing technologies make the process more smooth, integrated and convenient(Lin, Lee, Lau, & Yang, 2018). Industry 4.0 has defined by many scholars, but the primary purpose remains constant, which is the use of the internet in manufacturing to make the production process more flexible. In addition, industry 4.0 will enable organizations to virtualize operations through the use of the internet. So, the advent and use of the internet has revoluted the industry 3.0 to industry 4.0, which enable organizations to virtualize, and integrate their production processes(Lin et al., 2018).

In the previous literature, industry 4.0 has distributed in three main streams. In the first stream, industry 4.0 has focused on the requirement of industry 4.0 in manufacturing. Moreover, in this stream, the configuration and architecture(Theorin et al., 2017), information utilization, sharing and provision (Unger, Börner, & Müller, 2017), and system reconstruction and improvement through the use of technology has focused in industry 4.0(Poonpakdee, Koiwanit, & Yuangyai, 2017). So, this stream of industry 4.0 has mainly focused on system development, construction, and the requirement has been highlighted.

In the second stream of industry 4.0 literature, in this stream, the link of advanced information technologies have developed with social acceptance. The social acceptance of advance information technologies is very crucial. In this perspective, augmented reality (AR) has implemented to provide maintenance services in production from remote areas through the use of the internet. AR has attracted more attention and social acceptability in organizations, and overcome the limitations of advanced technologies, and motivate the employees to reuse the technologies in manufacturing(Masoni et al., 2017). Moreover, the wireless network is crucial for industry 4.0, because the unique architecture of the wireless network to improve the data quality, and service quality has increased the demand of wireless network in industry 4.0 for production and manufacturing(Li et al., 2017).

In the third stream of industry 4.0 literature, the impact of industry 4.0 has been used in different fields of life, primarily focused in qualification and education(Benešová & Tupa, 2017; Motyl, Baronio, Uberti, Speranza, &

Filippi, 2017), risk management(Tupa, Simota, & Steiner, 2017), and in supply chain management(Pfohl, Yahsi, &Kurnaz, 2015). So, the use of industry 4.0 has more generalization, which brings more demand to implement industry 4.0 in the organizations. Moreover, the strategic response of industry 4.0 has evaluated through the technology-organization-environment (TOE) framework was considered in the previous literature (Lin et al., 2018).

Technology-Organization-Environment (TOE) Framework

It is the organizational level theory, which has used to implement the new and innovative technologies in organizations from three (technological, organizational, and environmental) different contexts(Tornatzky, Fleischer, & Chakrabarti, 1990). Froma technological perspective, this theory suggeststhat the characteristics of technologies will motivate the adoption and implementation of new technologies. Moreover, the organizational context is based on organizational factors to adopt new technologies. In addition, environmental factors are the external factors that are effecting the surrounding factors that are effecting the adoption of new technologies(Henderson, Sheetz, & Trinkle, 2012).

TOE does not highlight the concrete factors of each dimension. The technological, organizational, and environmental factors will change according to the situation, and place, where the technology will be implemented. The previous literature on the TOE framework has highlighted the adoption of different technologies, like enterprise web technology 2.0 has focused(Saldanha & Krishnan, 2012), the generalization of enterprise 2.0 has focused in previous literature Jia et al. (2017). e-SCM through the radio frequency identification (RFID) tool (Reyes, Li, & Visich, 2016), ICT, EDI, and e-commerce. Furthermore, the TOE has used to adopt industry 4.0 as the strategic response (Lin et al., 2018).

Technological Perspective

Technology has changed the manufacturing processes from traditional to industry 4.0, which is the most significant evolution in the manufacturing industry. The industry 4.0 has unique and innovative technological characteristics which have integrated and convergence in the production processes, and existing technologies, which will bring the breakthrough outcomes in manufacturing(Kagermann, 2015; Schwab, 2017). Because industry 4.0 has shown more favourable outcomes.

In industrial 4.0, the industrial revolution has changed everything. Physical goods can embed into embedded systems like websites. Moreover, the cyber physical space changed towards the internet of things. In addition, the diffusion of big data has changed into cloud computing, and data can be accessed 24/7 at any place. Likewise, intelligent devices have switched towards the internet and become more efficient. So, with this revolutionary period, everything got interconnected with each other (Lin et al., 2018).

The cyber physical space has increased the demand forthe cyber world. The organizational operations can be tracked and monitored through the internet. In the previous literature of TOE, the technological characteristics can attract the attention to adopt new technologies. In addition, technologies got more matured rapidly. The advancement of technologies will facilitate more the users, and perform more effective and efficient tasks, which will automatically improve the overall performance and reduce the efforts (Lin et al., 2018).

IT maturity is the degree of the extent to which advanced technologies will be adopted and implemented to facilitate the production processes. In addition, IT maturity in manufacturing brings the innovative technologies in production like smart manufacturing, cyber physical space, and innovative packages, which enable users to customize and integrate all the production activities (Lin et al., 2018).

In previous literature, simulation technology has focused, which is the primary enabler towards the automotive and smart manufacturing(Weyer, Meyer, Ohmer, Gorecky, & Zühlke, 2016). In addition, security and dependency have enhanced through the wire application, which is the advanced architecture for scalable found in the previous literature(Poudel & Munir, 2018). On the other hand, the IT maturity will enable us to understand the production flexibility, forecast the demand, just in time manufacturing, enhance analytical capabilities, support in decision making, flexibility in planning, and optimize the supply chain. Moreover, in industry 4.0, big data, and cloud computing has played a vital role (Lin et al., 2018).

In China, IT infrastructure based on software, hardware, and network resources has been developed. Organizations and individuals have sufficient resources to perform automation activities. Moreover, individuals have the expertise to use information technologies, robots and other automatic machines. These machines make their life more convenient. In previous literature, the relationship between IT infrastructure and organizational performance has been developed(Foster & Kesselman, 1997; Star, 1999).

In this study, two significant constructs of technology, IT maturity and IT infrastructure has been considered. Both of these technological factors have a positive effect on the strategic response of implementing new technologies in industry 4.0

Organizational Perspective

In China, foreign direct investment was considered as "Trading market access for technology" as a strategic instrument in 1978(He & Mu, 2012). It has boosted the international automotive corporations to open their new branches in China, with the joint ventures between Chinese and international companies. Moreover, China has joined the World Trade Organization in 2001, which has motivated the internationally renowned companies like Volkswagen, General Motors, and Toyota has started its operations in China (Lin et al., 2018).

The joint venture in the automotive corporations in China has increased the competitive intensity, which will improve the quality and product design through the knowledge transfer process that will result from expanding the market share (Tang, 2012). In previous studies, the TOE framework for the adoption of new technologies has considered many organizational factors such as perceived benefits (Lin et al., 2018), top management support, employee's knowledge, absorptive capability, and business partner(Chiu, Chen, & Chen, 2017).

Top or senior managers support means devoting time and facilitating the doers in bringing newness, innovation, creativity and taking the risk in decision making, reviewing plans, follow up on results and facilitate workers and management in problem-solving. This support can also be in the form of the provision of financial, human, and material resources. Top management support has considered a crucial factor in motivating the employees towards the adoption and implementation of new technologies(Liu, Wang, & Chua, 2015; Yigitbasioglu, 2015).

Organizational operations can only be done if all the resources, human, financial, equipment and materials related things are available at and real time. Organizations need to acquire and provide suitable organizational resources to their employees which will enable them to perform better(Othman, Arshad, Aris, & Arif, 2015). Moreover, organizational resources can also develop a competitive advantage on other organizations; if they have unique resources, those are difficult to replicate. So, the successful competitive advantage can be obtained through the unique organizational resources(Ombaka, Machuki, & Mahasi, 2015).

Environmental Perspective

In China, government and environmental pressure effect on the adoption of new technologies(Aboelmaged, 2014; Azmi, Sapiei, Mustapha, & Abdullah, 2016; Chan, Chong, & Zhou, 2012; Henderson et al., 2012). In the manufacturing industry especially in automotive industry organizations use the advanced technologies to deal with their customers(Kamariah Kamaruddin & Mohamed Udin, 2009) and gain the competitive advantage(Huang, Janz, & Frolick, 2008). So, industry 4.0 will facilitate organizations to develop their strategies in-line with the advanced technologies to enhance their manufacturing and organizational performance(Chang, Lin, Wea, & Sheu, 2002).

The manufacturing industry in China and Germany huge number of organizations have implemented the industry 4.0 in their production. Industry 4.0 will enable organizations to respond to the rapid change in the market. Moreover, industry 4.0 will enable organizations to gain a competitive advantage. In the automotive industry, the implementation of industry 4.0 will enable organizations to bring the innovation in key components, introduce the innovative ideas form different markets, increase market share, and introduce foreign brands into local markets base paper(Lin et al., 2018).

Today, organizations have to face the competitive pressure from around the world. Because many international brands are performing their activities in the local markets, it is the struggle of winning the race of attracting, establishing, and maintaining the customers with the organization builds pressure on the shoulders of the organization(Sin et al., 2016). If organizations have more competitive pressure then they are more innovative and implementing the new technologies to perform their tasks. So, the competitive pressure is more fruitful to implement industry 4.0 in their manufacturing to enhance their organizational performance(Yigitbasioglu, 2015).

The survival of the organization is the survival of nations and countries. On one side, the industries and business organizations are the sources of revenue for the government and on the other side, these organizations can only be flourished if the government extends its support in facilitating them(Verhoest, Petersen, Scherrer, & Soecipto, 2015). This support could be financial incentives, procedural ease, helping in making collaborations outside the borders. Helping in import and export and providing logistic support. CPEC is one of the most considerable governmental support to the industries. So, governments support provide encouragement to the organizations(Lember, Kattel, & Kalvet, 2013).

Emotional Intelligence

Emotional intelligence is the understanding, utilization and control on the self and other emotions. Emotional intelligence will help organizations to understand their employees, customers and other stakeholders. Organizations prefer to hire those persons who are emotionally intelligent. Because they are more productive, efficient and intelligent people as compared to those who are emotionally weak. Emotional intelligence has focused on previous organizational and information technology literature(Peter, 2010; Wong & Law, 2002).

In the previous literature, emotional intelligence has measured through four different aspects. The first is the self-emotion appraisal, in this aspect. The person can understand his own emotions. The person can understand either he is happy or not; he knows his emotions in-depth. Moreover, the person can understand what he has certain type of feelings, and what is the reason for these feelings. In short, the person got awareness about his own emotions in self-emotion appraisal(Peter, 2010; Wong & Law, 2002).

Others' emotions appraisal is the second aspect to measure the emotional intelligence. In this aspect, a person can understand the emotions of others by observing them. Good observers can better judge the emotions of others. It also facilitates the persons to judge the emotions of their friends, family, colleagues or the other persons who are around him. Some people are more sensitive as compared to the emotions of others. On the other hand, some people are careless about the emotions of others. So, different people have a different attitude towards others' emotions appraisal(Peter, 2010; Wong & Law, 2002).

In the third aspect of the use of emotions. It starts when a person hasa good understanding of his own emotions. Moreover, he can find the reasons why they have these emotions. In this situation, people got more self-motivated and they set challenges for themselves; then they try to accomplish these challenges. In this situation, the person always says to himself that he is competent persons and he can achieve the target. So, self-motivation encourages them to do work hard. So, it is the practical implementation of the use of emotions in individuals, which will bring more fruitful results(Peter, 2010; Wong & Law, 2002).

In the fourth aspect of emotional intelligence. People can regulate their emotions. It means they can control their angry behaviour. Moreover, they can control their temper in difficult situations. They should do fewer complaints and blames to others. The people who have more control over their emotions can perform well as compared to the people who have less control over their emotions. Because they did wrong when they got more emotional, or other people can use them and their emotions maybe against them. So, the control and regulation of emotions played a crucial role in emotional intelligence(Peter, 2010; Wong & Law, 2002).

Conceptual Framework:

The theoretical framework has developed after the in-depth literature review. The conceptual framework has mentioned in Figure 1.

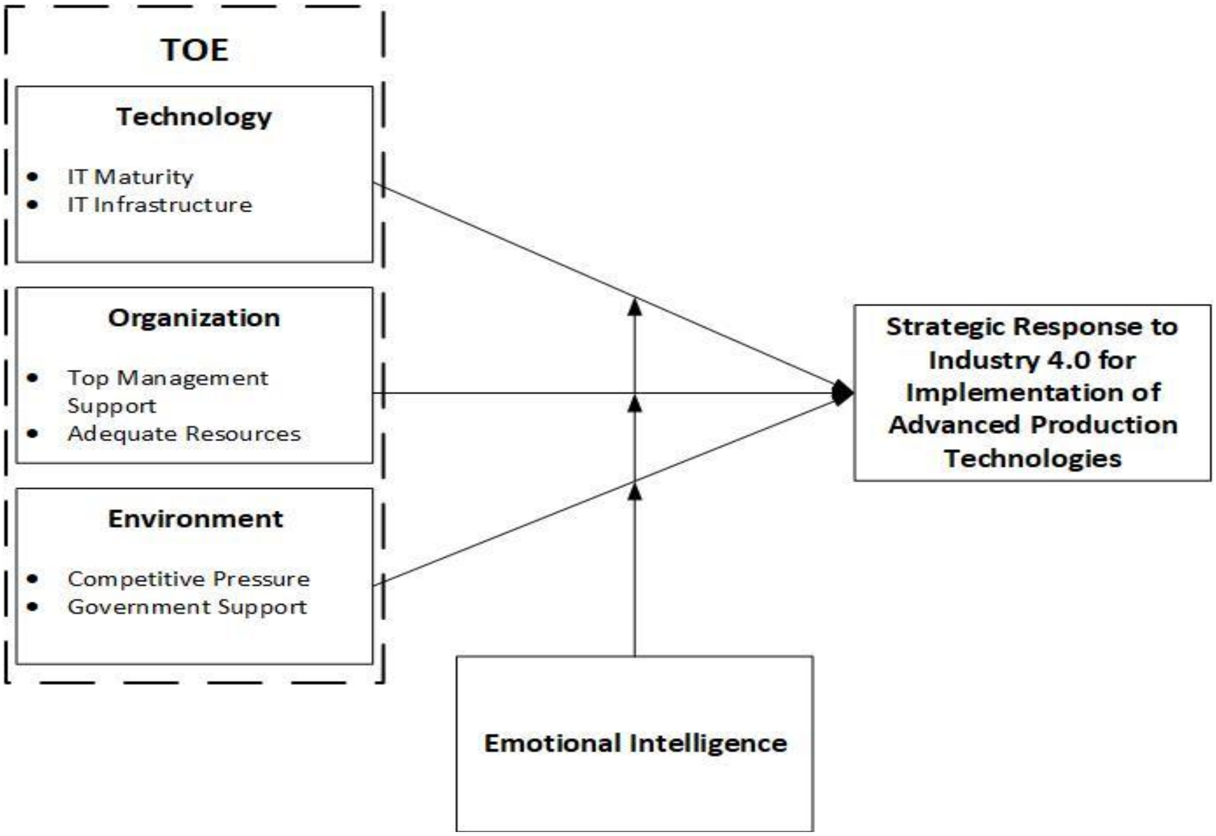

Figure 1: Schematic Diagram

METHODOLOGY

Sample and Data Collection Procedure

The Chinese manufacturing industry has switched from traditional manufacturing to smart manufacturing because of the use and implementation of advanced technologies in its manufacturing. In this study, the Chinese manufacturing industry has selected as the target population, which is consistent with previous literature (Lin et al., 2018).

Moreover, the sample has been selected through simple random sampling method. The sample size is 250. The characteristics of the sample have been described in Table 1.

TABLE 1

Profile of Respondents

Demographic Factor	Frequency	Percentage
Gender		
Male	152	60.8
Female	98	39.2
Education		
High School	24	9.6
Bachelor	169	67.6
Master	57	22.8
Age in Years		
18 – 23	42	16.8

24 – 29	73	29.2
30 – 34	80	32
Above 34	55	22
Experience in Years		
1 – 3	29	11.6
4 – 6	94	37.6
7 – 9	110	44
Above 9	17	6.8
Designation		
Lower level management	69	27.6
Middle level management	133	53.2
Upper management	48	19.2

Data has been collected through the survey method. Both online and offline survey methods have been used to collect the data. In an online survey, the questionnaire has been designed through the online questionnaire, which was distributed through the emails and wechat groups. It is a convenient, cheap, and rapid data collection method. When the respondent fills the questionnaire and submits it online, then responses have been collected automatically. These responses can be download into various formats. The comma-separated value (CSV) format has used for data analysis.

In the offline survey method, data has been collected from respondents to meet them physically. In this method, Chinese friends have helped in communication and data collection. The hard copy of the questionnaire was filled. After to fill the questionnaire, the responses have been coded into numbers and input in the excel file. At the end data from both soft and hard forms of questions have been merged into the same excel file and then convert into CSV file, which can be imported into SmartPLS for further statistical analysis.

Why Use PLS? Advance Research Tool

In this study, SmartPLS 3.2.8 has been used for data analysis. SmartPLS is an advanced tool to analyze the data through structural equation modelling. SmartPLS is a variance-based software.

Moreover, this software does not consider data normality assumptions. So, it can be work on small sample size(Hair, Ringle, & Sarstedt, 2011). So, this software can perform efficiently on a small sample size too. In addition, SmartPLS is an efficient tool for exploratory studies(Petter, Straub, & Rai, 2007). In this study, the relationship between TOE, emotional intelligence, and strategic response to industry 4.0 is at the exploratory stage. So, SmatPLS is an accurate statistical tool to analyze the data.

In this study, the research report has been written through the use of Microsoft Word 2019, which is the advance tool for report writing and formatting. References and citations have been provided through the use of Endnote X9, which has removed the chances for mistakes in citations and references. Moreover, an online questionnaire has been formulated through the use of the Lime survey web-based tool. Because Google is not providing their services in China. So, it is required another tool that can work in China. So, the lime survey is the best choice. It can make the online link for the survey, which can be pasted in wechat groups and can send in email. Moreover, the Grammarly premium account has used for proofreading and grammar checking to reduce significant mistakes from the manuscript.

Instrument Selection

In this study, the adapted instrument,except industry 4.0,has been to collect the data. The detail of instrument selection has been mentioned in Table 2.

TABLE 2

Instrument Selection

Construct	Code	Measurement Items	No.	Source
IT Maturity	ITM1	The prevalence of computer software and hardware use within the organization	4	(Premkumar & King, 1994; Yeh, Lee, & Pai, 2015)
	ITM2	The degree of computer software and hardware standardization within the organization		
	ITM3	The degree of employing information technology to support business functions within the organization		
	ITM4	How much the organization uses the contribution of information systems to organizational goals to assess their performance		
IT Infrastructure	ITI1	The IT infrastructure enables digital connections among each unit of the organization	4	(Ravichandran, Lertwongsatien, & Lertwongsatien, 2005; Yeh et al., 2015)
	ITI2	The IT infrastructure enables digital connections with corporate partners outside of the organization		
	ITI3	The IT infrastructure satisfies the current operational requirements of the enterprise.		
	ITI4	The IT infrastructure is flexible in design and easy to maintain.		
Top Management Support	TMS1	The owner or manager enthusiastically supports the adoption of these new technologies.	4	(Premkumar, Ramamurthy, & Nilakanta, 1994; Premkumar & Roberts, 1999)
	TMS2	The owner or manger has allocated adequate resources to adoption of these new technologies.		
	TMS3	Top management is aware of the benefits of these new technologies.		
	TMS4	Top management actively encourages employees to use the new technologies in their daily tasks.		
Adequate Resources	AR1	Our organization have adequate physical resources	4	(MWAZUMBO, 2016; Ombaka, Machuki, & Mahasi, 2015; Thompson, Peteraf, Gamble, Strickland III, & Jain, 2013; Wernerfelt, 1984)
	AR2	Our organization have adequate financial resources		
	AR3	Our organization have adequate technological resources		
	AR4	Our organization have adequate human resources		

Competitive Pressure	CP1	e-Business must be promoted to satisfy clients' demands	3	(Premkumar & Ramamurthy, 1995; Yeh et al., 2015)
	CP2	If e-business is not promoted in this industry, the competitive advantages will be lost		
	CP3	The promotion of e-business in this industry has become a trend.		
Government Support	GS1	We adopted industry 4.0 because of the incentives provided by the government	3	(Chiu, Chen, & Chen, 2017; El-Gohary, 2010)
	GS2	We adopted industry 4.0because of the protection provided by the government.		
	GS3	We adopted industry 4.0 because of government influences.		
Strategic Response to industry 4.0	SR1	We will use industrial technologies to improve quality	4	
	SR2	We will use industrial technologies to increase productivity		
	SR3	We will use industrial technologies to reduce wastages		
	SR4	We will use industrial technologies to integrate organizational activities		
Emotional Intelligence	EI1	I have a good sense of why I have certain feelings most of the time.	16	(Wong & Law, 2002)
	EI2	I have good understanding of my own emotions.		
	EI3	I really understand what I feel.		
	EI4	I always know whether or not I am happy.		
	EI5	I always know my friends' emotions from their behavior		
	EI6	I am a good observer of others' emotions.		
	EI7	I am sensitive to the feelings and emotions of others.		
	EI8	I have good understanding of the emotions of people around me.		
	EI9	I always set goals for myself and then try my best to achieve them.		
	EI10	I always tell myself I am a competent person.		
	EI11	I am a self-motivated person		
	EI12	I would always encourage myself to try my best.		
	EI13	I am able to control my temper and handle difficulties rationally.		
	EI14	I am quite capable of controlling my own emotions.		
	EI15	I can always calm down quickly when I am very angry.		
	EI16	I have good control of my own emotions.		

RESULTS

In this study, data has been analyzed through structural equation modelling. The structural equation modelling has distributed in the measurement model and the structural model. In the measurement model, data reliability and validity has been tested. While in the structural model, the path coefficient can be measured through the explanatory factor of (R^2) with their probability values.

Measurement Model

The measurement model is also called the outer model in structural equation modelling. In SmartPLS, the measurement model has analyzed through Cronbach alpha, composite reliability, average variance extract (AVE), and factor loading of each item.

Indicator Reliability

Reliability is the internal consistency of items. The reliability of data has been statistical tested through Cronbach alpha, using the algorithm, factor method in SmartPLS. The minimum acceptable Cronbach alpha value is 0.70, as suggested in previous literature(Henseler, Ringle, & Sinkovics, 2009; Nunnally, Bernstein, & Berge, 1967). The results of the Cronbach alpha values of each variable have been mentioned in Table 3. All the values are greater than 0.70. So, data is reliable and can be used for further analysis.

TABLE 3

Factor loadings, t – statistics,Reliability and Average Variance Extracted (AVE)

Construct	Item Loading	t-statistics	CronaBech Alpha	CR & AVE
IT Maturity				
ITM1	0.86	0.343	0.858	CR = 0.902 AVE = 0.699
ITM2	0.879	0.337		
ITM3	0.824	0.277		
ITM4	0.777	0.233		
IT Infrastructure				
ITI1	0.795	0.344	0.810	CR = 0.875 AVE = 0.641
ITI2	0.595	0.176		
ITI3	0.89	0.355		
ITI4	0.886	0.346		
Top Management Support				
TMS1	0.86	0.317	0.851	CR = 0.900 AVE = 0.693
TMS2	0.803	0.269		
TMS3	0.898	0.316		
TMS4	0.762	0.299		
Adequate Resources				
AR1	0.809	0.296	0.869	CR = 0.910 AVE = 0.718
AR2	0.851	0.29		
AR3	0.871	0.297		
AR4	0.856	0.298		
Competitive Pressure				
CP1	0.938	0.342	0.928	CR = 0.954

CP2	0.935	0.386		AVE = 0.874
CP3	0.932	0.342		
Government Support				
GS1	0.819	0.438	0.786	CR = 0.874 AVE = 0.699
GS2	0.827	0.33		
GS3	0.861	0.427		
Emotional Intelligence				
EI1	0.804	0.094	0.939	CR = 0.947 AVE = 0.561
EI2	0.805	0.098		
EI3	0.81	0.104		
EI4	0.8	0.11		
EI5	0.791	0.102		
EI6	0.611	0.083		
EI7	0.644	0.097		
EI8	0.727	0.092		
EI9	0.761	0.091		
EI10	0.737	0.092		
EI11	0.792	0.102		
EI12	0.728	0.091		
EI13	0.749	0.095		
EI14	0.691	0.084		
Strategic Response				
SR1	0.807	0.325	0.829	CR = 0.886 AVE = 0.661
SR2	0.805	0.322		
SR3	0.836	0.293		
SR4	0.802	0.292		

Internal Consistency Reliability

Composite reliability is the overall reliability of items. The composite reliability of data has been statistical tested through composite reliability test, using the algorithm, factor method in SmartPLS. The minimum acceptable value for composite reliability is 0.60, as suggested in previous literature. The results of the composite reliability values of each variable have been mentioned in Table 3. All the values are greater than 0.60. So, data is reliable and can be used for further analysis. If the items are formative, then composite reliability can measure through the variance inflation factor (VIF). However, in this study, all items are reflective, so, only composite reliability is a suitable measure for composite reliability.

Content Validity

Content validity is related to the content of the instrument. The content validity showed the overall look and grammatical correctness of items. If the items have content validity, then respondents can understand the questionnaire easily. The content validity can check through expert opinion. Moreover, content validity can statistically test through factor loading. If the items have factor loading more than 0.60. Then items have content validity. In this study, content validity has measured through the algorithm, factor method in SmartPLS. The factor loading results has mentioned in Table 3. All the factor loading values are higher than 0.60. So, all the items have content validity.

Convergent Validity

Convergent validity showed the theoretical relationship. If the items have convergent validity, then they can measure the same variable. On the other hand, the variables that have no relationship with each other can not consider the single framework. The convergent validity can check through the factor loading. If the items have factor loading more than 0.60. Then they have convergent validity. In this study, the factor loading has been checked, and the results have mentioned in Table 3. The factor loadings of each item have a value higher than 0.60. So, all the items have convergent validity.

Discriminant Validity

Discriminant validity showed the difference between items. It means the same variables are not repeated to measure the variable. Discriminant validity is the opposite of convergent validity. The discriminant validity can statistically test through average variance extracted (AVE). Then minimum acceptable value AVE is 0.5. In this study, discriminant validity has tested and results have mentioned in Table 3. All the AVE values are higher than 0.5. So, all the variables have discriminant validity.In partial least square – structure equation modelling (PLS-SEM) the discriminant validity tested through Formell and Larker Criterion Method. This method is based on the correlation and square root of AVE. The results showed that all the variables have discriminant validity.

Structural Model

The structural modelis also called the internal model. It is based on the explanatory factor (R^2) with their p values. In PLS-SEM structure model can analyze through the bootstrapping method. The minimum bootstrapping subsample size is 500, as suggested in the previous literature. The path coefficients of a strategic response to industry 4.0 have graphically mentioned in Figure 2.

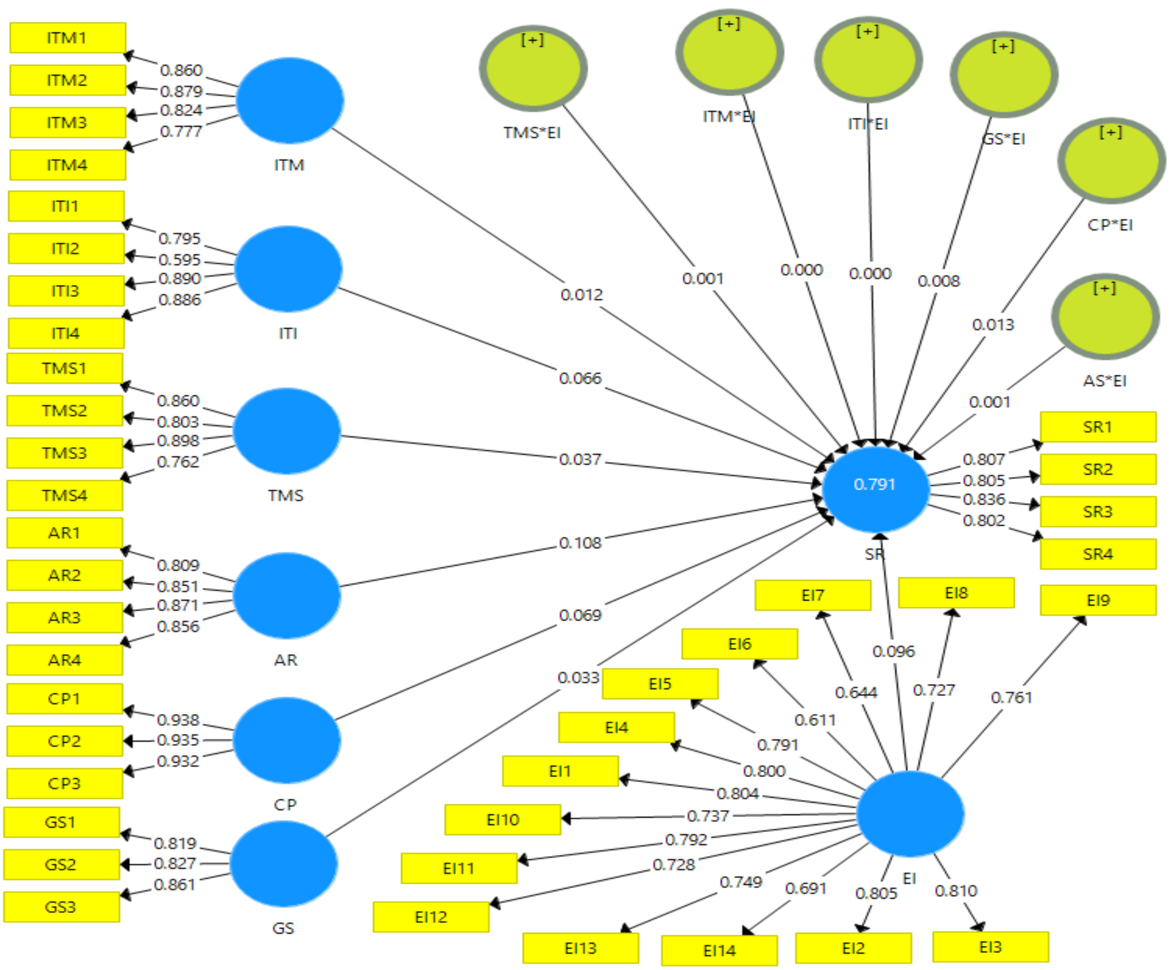

Figure 2:Path Coefficients of Strategic Response for Industry 4.0

In this study, all the variables have a direct effect on strategic response to industry 4.0; the statistical results of path coefficients with their p-values have mentioned in Table 4. The results showed that only IT maturity and moderators have a non-significant effect on strategic response to industry 4.0. However, the moderator's emotional intelligence hasa direct and significant impact on industry 4.0.

TABLE 4
Path Coefficients, t – statistics, and p values

	R^2	t-statistics	p values
AR -> SR	0.277	3.96	0.000
AS*EI -> SR	0.024	0.241	0.809
CP -> SR	0.209	2.701	0.007
CP*EI -> SR	-0.122	0.932	0.352
EI -> SR	0.304	3.326	0.001
GS -> SR	-0.124	2.341	0.020
GS*EI -> SR	0.057	0.883	0.378
ITI -> SR	0.24	3.456	0.001
ITI*EI -> SR	-0.011	0.145	0.885
ITM -> SR	-0.096	1.655	0.099
ITM*EI -> SR	0.018	0.252	0.801
TMS -> SR	0.155	2.237	0.026
TMS*EI -> SR	0.033	0.408	0.683

CONCLUSION AND DISCUSSION

Industry 4.0 has changed manufacturing toward smart manufacturing, which is more efficient and productive. The advancement of technologies like the internet of things, cloud computing, and robots have switched manufacturing methods towards automation. So, industry 4.0 has integrated manufacturing processes with each other. Industry 4.0 will enable organizations for effective manufacturing planning, customize production. In this competitive era, organizations can survive only, if they implement new technologies(Lin et al., 2018).

The implementation of new technologies is not so easy. There are many technological, organizational, and environmental factors are effecting on the adoption and implementation of new technologies in the organizations. In this study, the TOE framework has considered for strategic response to industry 4.0(Lin et al., 2018). Moreover, emotional intelligence has taken as individual factors, which is effecting the strategic response to industry 4.0.The conceptual model has been tested through the PLS-SEM method. The results showed that emotional intelligence could play the role ofan independent variable instead of a moderator.

This study has contributed to the TOE framework literature through emotional intelligence and has highlighted the cognitive factor in the adoption and implementation of new technologies, which was ignored. So, this study has opened the new horizon and dimension for the upcoming researchers to focus on cognitive factors. The framework of this study has tested in a developing country, which can be generalized in other developing countries.

This study has provided the guidelines for organizations to adapt and implement the new technologies in the organizations. This study will improve efficiency and productivity. So, the implementation of this study is beneficial for organizations to develop and implement production strategies to produce more customized products. It will be beneficial for organizations to gain a competitive advantage.

Limitation and Future Directions

In this study, only a few technological, organizational, and environmental factors have been considered. Many important factors like technological awareness, leadership styles, motivational factors, and institutional pressures have been ignored. These factors can bring different results. Moreover, the survey method has used in this study. While, in the future, a mixed methodology based on interviews with experts, and the survey method can be used to highlight the current and essential factors.

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