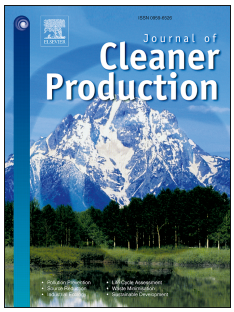
Journal Pre-proof



Impact of total quality management on corporate sustainability through the mediating effect of knowledge management

Jawad Abbas

PII: S0959-6526(19)33676-5

DOI: https://doi.org/10.1016/j.jclepro.2019.118806

Reference: JCLP 118806

To appear in: *Journal of Cleaner Production*

Received Date: 4 April 2019

Revised Date: 27 September 2019

Accepted Date: 8 October 2019

Please cite this article as: Abbas J, Impact of total quality management on corporate sustainability through the mediating effect of knowledge management, *Journal of Cleaner Production* (2019), doi: https://doi.org/10.1016/j.jclepro.2019.118806.

Impact of total quality management on corporate sustainability through the mediating effect of knowledge management

Jawad Abbas

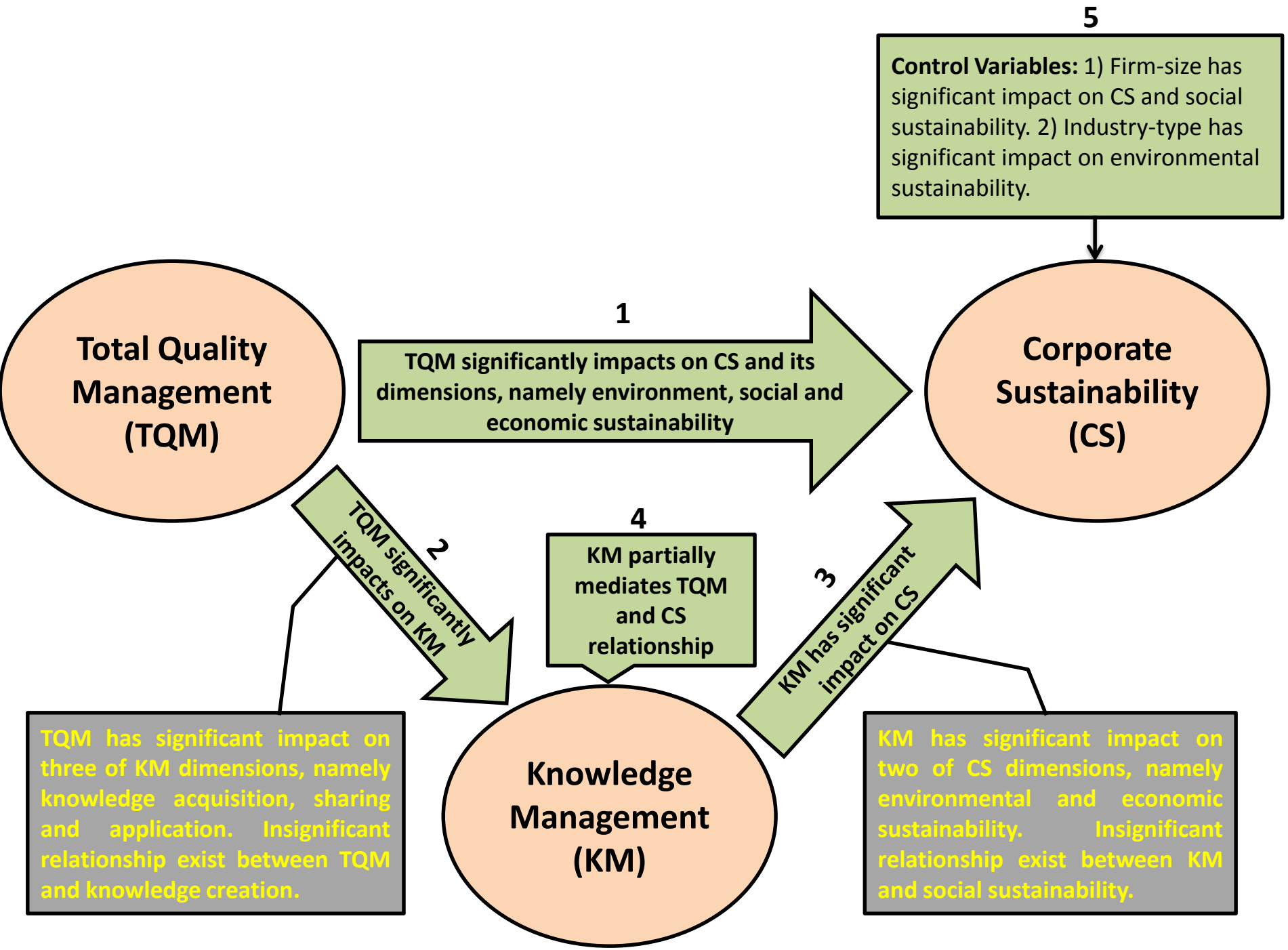
Department of Business Administration, Iqra University, Islamabad Campus, Pakistan

Corresponding author: Jawad Abbas, Department of Business Administration, Iqra University, Islamabad Campus, Pakistan. jawad.abbas@ymail.com

Compliance with Ethical Standards: There is no any conflict of interest to declare for this study. Moreover, all the respondents filled the questionnaire with their consent.

Declaration of funding: The present study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Wordcount: 10220 words including tables, figure and references.


5
Control Variables: 1) Firm-size has significant impact on CS and social sustainability. 2) Industry-type has significant impact on environmental sustainability.
Total Quality Management (TQM)
1
TQM significantly impacts on CS and its dimensions, namely environment, social and economic sustainability
Corporate Sustainability (CS)
2
TQM significantly impacts on KM
4
KM partially mediates TQM and CS relationship
3
KM has significant impact on CS
TQM has significant impact on three of KM dimensions, namely knowledge acquisition, sharing and application. Insignificant relationship exist between TQM and knowledge creation.
Knowledge Management (KM)
KM has significant impact on two of CS dimensions, namely environmental and economic sustainability. Insignificant relationship exist between KM and social sustainability.

Abstract: Considering the environmental deterioration and dwindling natural resources, the present study aims to investigate the structural relationship between total quality management (TQM) and corporate sustainability (CS), and examines how TQM practices can facilitate firms to achieve CS objectives. This study also analyses the important role of knowledge management (KM) in the relationship between TQM and CS and investigates how KM mediates the relationship between TQM and CS. Six TQM practices were taken from The Malcolm Baldrige National Quality Award (MBNQA) model; CS was comprised of environmental, social, and economic sustainability, and KM was measured through knowledge creation, acquisition, sharing, and application. The data was collected from medium and large-sized organizations from the manufacturing and services firms located in Pakistan. The theoretical model and hypotheses were tested through structural equation modelling (SEM). The results indicate that TQM has a significant and positive impact on CS, and KM partially mediates the relationship between them. The dimensional level analysis indicates that TQM has an insignificant relationship with knowledge creation and KM has an insignificant relationship with environmental sustainability. The findings provide valuable insights to the management of manufacturing and services industries and how they can ensure the sustainability in their organizations through TQM and KM.

Keywords: Total quality management; Sustainability; Knowledge management; Corporate social responsibility; Green performance; Cleaner environment

1- Introduction

Considering the technological, social, political, and environmental changes occurred during the last few decades, an organization's ability to acquire and sustain competitive advantage has become a real challenge (Cancino et al., 2018). These changes not only lead to more options for customers but have also altered their preferences and demands (Habib et al., 2019). Moreover, the increased customers' awareness about the dwindling natural resources, water, air and soil pollution (Li et al., 2018), and change in natural climate are forcing firms to adopt environment-friendly practices and minimise their reliance on fossil fuel resulting in ecological vulnerabilities (Yuan and Xiang, 2018). In the present era, dynamic organizations prefer to follow multiple strategies at the same time and support their prime strategy with subsequent strategies (Yusr et al., 2017) so that they can achieve the goal of sustainable development (SD) in an efficient and effective manner (Abbas, 2019).

According to United Nations' Brundtland Commission report, organizational development will be considered as SD if it fulfils the present generation's needs without compromising the future generation's ability to meet their needs (UN, 1987). This definition indicates the value of stakeholders and the environment, such as future generations and natural resources (particularly non-renewable ones), and symbolize that to achieve sustainability, organizations must behave ethically and value them. Corporate sustainability(CS) consists of three dimensions, namely social sustainability, which relates to people and society, environmental sustainability, which focuses on earth and natural resources, and economic sustainability, which concentrates on the financial aspects of firms (Shahzad et al., 2019). Some studies also used the term Triple Bottom Line (TBL) for these dimensions.

The prevailing competitive business market, strict global regulations for environment protection and increased customers' concerns about the quality and characteristics of the products are forcing firms to follow the strategies who effectiveness have already been established, such as total quality management (TQM) and knowledge management (KM) (Abbas and Sağsan, 2019). TQM has largely been recognized as a mechanism that has the ability to improve the organization as well as individual performance (Mahmood et al., 2014) and strengthen the competitive advantage (Li et al., 2018). It not only leads to increased businesses profitability but also enhances customers' and employees' satisfaction (Shafiq et al., 2017). Because of its focus on continuous improvement, TQM aims to follow environment-friendly practices by consuming the least amount of resources in the operations (Qasrawi et al., 2017). Moreover, the effective implementation of TQM significantly impacts on firms' green innovation (Li et al., 2018), which is a critical factor for sustainability (Yu and Huo, 2019). Xie et al. (2019) said that by focusing on processes (one of the key components of TQM), organizations can introduce environment-friendly products or services. Tseng *et al.*, (2017) said that through effective KM organizations can achieve sustainability in supply chain management.

In spite of the widely acknowledged value of these concepts, limited attention has been given by academic researchers in examining the relationship between the core constructs of TQM and CS. Siva et al., (2016) published a literature review study related to quality management and corporate sustainable development (CSD). However, the researcher was not able to find any empirical study that comprehensively investigates the role of TQM in enhancing CS, particularly in Pakistan, the place of the current study. The literature also fails to provide adequate evidence on the impact of KM on CS, the mediating variable in the present study. The author took KM as the mediating variable as its effectiveness has already been established in strengthening business operations, increasing customer loyalty, and boosting organizational profitability (Yusr et al., 2017). In addition to this, taking into account the complexity of external issues and differences which vary from industry to industry and from one firm to other, the author took industry type and firm size as control variables and investigated whether there are any significant differences in the impact of TQM on CS by considering them.

According to Prajogo (2005), two noteworthy differences exist in implementing TQM practices in the manufacturing and services industries: first, the output of manufacturing industry is tangible in comparison to the service industry output, which is intangible and heterogeneous. Secondly, these two industries operate in two different systems; for example, the delivery and consumption process in the service industry occurs at the same time, which contradicts the manufacturing sector. The second control variable of the study is the firm size. The firm size is taken as a control variable because, in comparison to medium-size firms, larger organizations have more resources. Similarly, larger firms may work differently to medium firms and this can explain the TQM, CS, and KM practices in a different manner. Therefore, the current research tries to answer the following questions;

1) What is the impact of TQM practices on CS?

2) Does KM mediate the relationship between TQM and CS?

3) Do the contextual factors significantly impact on the relationship between TQM and CS?

The researchers examined the significance of the TQM program with each dimension of CS and KM so that a detailed understanding about the role of TQM in enhancing KM and CS can be achieved and it can be investigated which of the KM and CS dimensions have a significant relationship with TQM. For this purpose, the inferential statistics technique, specifically the multivariate technique, followed by structural equation modelling (SEM) have been used to analyse the cause and effect relationship between TQM, KM and CS. The next sections of this article describe the theoretical foundation of the study including literature review and hypotheses development, followed by the methodology, results and discussion and conclusion.

2- Theoretical foundation and hypotheses development

The current study is grounded on the principles of the theory of knowledge management, the theory of sustainable development and principles of quality management. The last few decades have witnessed the important role of TQM in organizational policies. Being a holistic management philosophy, TQM aims to achieve continuous improvement in all areas of the firm (Abbas, 2019). This characteristic strongly relates to sustainability (Li et al., 2018). The spectrum of TQM can be expanded from the economic aspect of sustainability to social and environmental aspects (Singh et al., 2018). However, to do so, firms need to apply the quality concept from resources acquisition to customer service, even after the sale (Fernando et al., 2019). In this regard, the size of the firm has an important role, as larger firms have more resources than medium or smaller ones.

2.1- Brief description of TQM

The European Foundation for Quality Management (EFQM), Swedish Quality Award (SIQ), and Malcolm Baldrige National Quality Award (MBNQA) are the different quality models that describe the criteria for TQM implementation by considering its core values. The American MBNQA model incorporates soft as well as hard aspects of TQM and has been proven to be extremely valuable for many public and private organizations in terms of introducing reforms to their management and operational structures. This model contains six dimensions, namely leadership, strategic planning, customer focus, process management, human resource management, and information and analysis, and has been widely examined by different researchers, such as Yusr et al., (2017), Ooi (2014) and Sila (2007). Considering the comprehensiveness and validity of the model, the present research uses it to investigate the relationship between TQM, CS and KM. Table 1 presents a description of TQM, CS, and KM constructs and supporting literature.

2.2- Description of CS and its constructs

The theory of sustainable development is based on the report titled "our common future" prepared by the Brundtland Commission, presented at the United Nations in 1987 (UN, 1987). The aim of CS is to achieve environmental, social, and economic sustainability and linking them in the decision-making process. CS refers to the ability of an enterprise to cause minor or no damage to the society and environment with their operations by utilizing and wasting minimum to zero level of natural resources, particularly the non-renewable ones (Davenport et al., 2018). It motivates the businesses to consider the effects of their operations and decisions over a longer period of time (Cai and Li, 2018). There are a number of factors which motivate organizations to follow SD strategies, such as ethical, legal, and commercial aspects. Moreover, because of stakeholders' increasing pressure (Ji and Zhang, 2019), customers' needs and expectations, firms have to allocate a proportion of their resources to the social and environmental development programs (Shahzad et al., 2019)

Table 1: Description of variables and related literature

Constructs	Description	Supporting Literature
Leadership	Responsible for quality assurance and quality improvement efforts; include top management and focus on quality goals, efforts, and planning to achieve those goals in relation to time and cost.	(Kaynak, 2003; Ooi, 2014; Saraph et al., 1989; Sila, 2007; Yusr et al., 2017)
Strategic Planning	Vision and mission for quality, policy and strategy development and deployment to achieve organizational goals.	(Kaynak, 2003; Ooi, 2014; Saraph et al., 1989; Sila, 2007)
Customer Focus	Knowledge of customers' demand and market trends; developing and maintaining good relations with customers by ensuring their satisfaction.	(Kaynak, 2003; Ooi, 2014; Sila, 2007; Yusr et al., 2017)
Process Management	Clear division of process, ownership, and responsibility; ensuring the perfect product or service design, process control, continuous improvement by self-inspection and automation.	(Isaksson, 2006; Kaynak, 2003; Ooi, 2014; Sila, 2007; Yusr et al., 2017)
Human Resource Management (HRM)	Effective management of human resource through their active participation in operational issues, contact with top management, empowerment, training, performance recognition, and reward; quality responsibility and awareness.	(Kaynak, 2003; Ooi, 2014; Saraph et al., 1989; Sila, 2007; Yusr et al., 2017)
Information & Analysis	Evaluation and analysis of employees' and managers' performance using information technology and related tools. Giving feedback to them for solving the problems on a timely basis.	(Kaynak, 2003; Ooi, 2014; Saraph et al., 1989; Sila, 2007; Yusr et al., 2017; Abbas et al., 2015)
Environmental Sustainability	Promotion and protection of natural resources and natural environment, waste management, cleaner production, resources consumption.	(Hollingworth and Valentine, 2014; Kang et al., 2015; Robson and Mitchell, 2007; Turker, 2009; van der Heijden et al., 2010)
Social Sustainability	Participation in social development programs, public policy, financial and non-financial contribution to non-profit organizations, health and safety measures, work practices	(Hollingworth and Valentine, 2014; Kang et al., 2015; Robson and Mitchell, 2007; Turker, 2009)
Economic Sustainability	Financial performance of the organization, profitability, economic stability, market share.	(Isaksson, 2006; Jamali, 2006; Kang et al., 2015; Todorut, 2012)
Knowledge Creation	Using existing knowledge to create new knowledge, debate and discussion, innovation and improvement, research and development activities.	(Lee and Wong, 2015; Nonaka, 1994; Ooi, 2014; Yusr et al., 2017)
Knowledge Acquisition	Suppliers, customers, and employees' information. Aiming for continuous improvement in operations,	(Abbas et al., 2014b; Darroch, 2005; Ooi, 2014; Tang, 2015; Yusr

	products, and services; enhancement of skills, and experiences of employees.	et al., 2017)
Knowledge Sharing	Involvement of employees in decision making; quality assurance, sharing of experience and skills.	(Darroch, 2005; Nonaka and Takeuchi, 1995; Ooi, 2014; Tang, 2015; Yusr et al., 2017)
Knowledge Application	Application of obtained knowledge from customers, suppliers, and employees to improve company processes, products, and services.	(Darroch, 2005; Ooi, 2014; Tang, 2015; Yusr et al., 2017)

In order to maximize their profit, industrial organizations are rapidly consuming natural resources to manufacture different products and provide services to the customers. In contrast to the service industry, the manufacturing sector has consumed more natural resources and has caused more damage to the environment in the form of pollution, particularly water and air pollution (Yuan and Xiang, 2018). This continuous process has resulted in a steady increase in the planet's temperature and a decline in natural resource. Considering this issue, a number of people, such as environmentalists and international bodies started raising voices to create awareness about ecological issues and diminishing natural resources which resulted in significant pressure on firms to follow SD practices and become more socially responsible (Cai and Li, 2018). Along with the stakeholders' pressure, the highly competitive business markets also force organizations to direct their operations towards sustainability, differentiation, and reduction in cost (Lucas, 2019). In this situation, the resource-based view (RBV) of the organization highlights the firm's resources and competencies as an enabler to relate SD practices and its performance.

RBV offers a theoretical foundation to elucidate the relationship between TQM and organizational performance (Li, 2018). This argument is based on the concept that TQM has the tendency to improve the performance of the firm through encouraging the expansion of assets which are specific, steeped in the company's culture, generate a socially multifaceted relationship, and generate knowledge, especially tacit knowledge (Maravilhas and Martins, 2019). These characteristics relate to the conditions that, according to RBV, enable firms to achieve sustainable development and competitive advantage. These practices are equally important in manufacturing and services industries (Hussain et al., 2018). From the green organization perspective, addressing all three aspects of sustainability is crucial for an organization (Calza et al., 2017). Those organizations that invest in SD practices experience improved operational performance, have more loyal customers, and become more competitive in their operations (Singh et al., 2018).

The environmental dimension of sustainability focuses on the measures taken by organizations to protect the natural environment and natural resources for future generations (Lucas, 2019). It also investigates the impact of organizations' operational activities on the environment (Kenneth et al., 2019) and includes the actions taken to protect the natural environment from pollution, including water and air, efficient consumption of natural resources, cost savings related to natural resources utilization, and the preservation of natural heritage (Davenport et al., 2018). Environmental sustainability also aims to safeguard and administer resources and energy, particularly those that are not renewable and are also valuable to support life (Ji and Zhang, 2019). Organizations cannot ignore the ethical responsibility that they

have towards the community, society, and the environment. Hence, the stakeholders, especially the government, public, and customers, expect them to participate in social and environmental improvement programs to counter the negative impact of their business operations (Asrar-ul-Haq et al., 2017). Organizations that take measures to protect the natural environment positively influence the satisfaction of customers as well as employees.

In contrast to economic sustainability, which is more financial in nature, the environmental and social aspects of sustainability are more theoretical and conceptual. The social aspect of sustainability involves the ethical initiatives taken by organizations for the wellbeing of society, ahead of their economic and financial interests (Gorski, 2017). For example, the financial and non-financial contribution of organizations to societal development programs, such as donations to non-governmental organizations, participation in social awareness programs including product and service quality and responsibility etc. (Guerrero-Villegas et al., 2018). This dimension also considers the impact of an organization's social activities on social systems, like public policy, health and safety measures, work practices etc. (Ingenbleek and Dentoni, 2016).

As TQM focuses on continuous improvement and aims to achieve the efficient utilization of resources, it has a long-term orientation that perfectly relates to durability, one of the assumptions of CSD. TQM and CS are among the top priorities in a number of organizations and their practices are equally important for the manufacturing and services industries (Manatos, 2017). Therefore, many organizations are claiming to follow environment-friendly and SD practices in their operations (Cancino et al., 2018). As TQM is a management system, it can be expanded to include all the SD dimensions, as the aim of TQM is not only to enhance organizational performance but also the efficient utilization of resources (Shafiq et al., 2017). A poor-quality product or service can not only lead to poor economic sustainability (Abbas et al., 2014b) but can also result in wastage of natural resources, resulting in failure to achieve environmental sustainability. Therefore, the following hypotheses are proposed:

H1: Total quality management has a significant and positive impact on corporate sustainability

H1a: Total quality management has a significant and positive impact on corporate environmental sustainability

H1b: Total quality management has a significant and positive impact on corporate social sustainability

H1c: Total quality management has a significant and positive impact on corporate economic sustainability

2.3- Description of KM and its constructs

Knowledge is an intangible and inimitable asset and is used as a competitive instrument by organizations that use it in an efficient manner (Shahzad et al., 2019). KM is a process that ensures that *"people within the organization have the right information at the right time in the right format"* (Bolisani and Bratianu, 2018). Organizations that base their operations on the principles of KM exhibit superior efficiency, productivity, and quality of services (Johnson et al., 2019). The effective management of knowledge has a positive impact on the innovation capabilities of an organization (Attia and Salama, 2018). According to Mardani *et al.*, (2018), the ability of an organization to innovate and create a

new product, process and knowledge heavily depends on the KM system. Therefore, KM provides a foundation for firms to become more innovative and competitive in the industry.

[Insert here "Figure-1: Conceptual framework"]

Figure-1: Conceptual framework

Through KM firms transform tacit knowledge into explicit knowledge so that it can freely flow throughout the organization (Maravilhas and Martins, 2019). KM, with the help of a knowledge worker notion, can result in knowledge-based economies (Shahzad et al., 2019). Organizations can create and exchange knowledge and can maintain it as an asset via technologies (Abbas et al., 2014a) and can create new products and services. Leadership commitment and the reputation of the organization are the dominant factors in knowledge sharing activities (Jarrahi, 2018). Considering the commonality in the literature, the present study uses knowledge creation, knowledge acquisition, knowledge sharing, and knowledge application as constructs of KM. In the knowledge creation process, collaboration and brainstorming sessions have fundamental importance as these are among the top practices for generating new ideas and proposing viable solutions (Lee and Wong, 2015).

Knowledge acquisition involves taking knowledge from different channels, such as suppliers, customers, and employees' etc. for continuous improvement in operations, products, and services (Johnson et al., 2019). Knowledge sharing is the dissemination of experiences and expertise with others. It helps the organizations to maintain quality within their setup. The involvement of employees in the decision-making process has crucial importance for knowledge sharing (Habib et al., 2019). Organizations can only benefit from KM when they apply the knowledge acquired from different sources. Knowledge obtained from customers, employees, and other stakeholders should be used by the firm so that the overall performance of the company can be improved. Organizations that effectively implement TQM practices and incorporate KM into their operations enjoy enhanced profitability and market share (Kenneth et al., 2019). Therefore, the following hypotheses are proposed for this relationship;

H2: Total quality management has a significant and positive impact on knowledge management

H2a: Total quality management has a significant and positive impact on knowledge creation

H2b: Total quality management has a significant and positive impact on knowledge acquisition

H2c: Total quality management has a significant and positive impact on knowledge sharing

H2d: Total quality management has a significant and positive impact on knowledge application

2.4- TQM, KM and CS

In the knowledge-based society, integrating KM with SD has become particularly important as, according to Mardani *et al.*, (2018), knowledge is the main driving force for the individual, organizational, and national development. Mulhim (2017) stated that KM is an essential element for enhancing organizational economic sustainability. Organizations that base their operations on knowledge are not only more innovative (Imran and Abbas,

2020) but are also capable of exploring new directions of sustainability (Tseng et al., 2017). Organizations with effective KM systems consider knowledge sharing as their social responsibility (Barão et al., 2017). KM facilitates organizations for creating and using knowledge resources in a sustainable manner by taking into account the social, environmental, and economic aspects (Abbas and Sağsan, 2019). Organizations committed to KM activities promote knowledge sharing activities within and outside the firm. Dynamic organizations focus on combining KM strategies with overall organizational strategies so that sustainability can be achieved in all aspects (Yusr et al., 2017). To achieve SD goals, KM activities enable the organizations to answer the questions "what to do", "when to do", and "how to do" (Maravilhas and Martins, 2019). Therefore, we have the following hypotheses for KM;

H3: Knowledge management has a significant and positive impact on corporate sustainability

H3a: Knowledge management has a significant and positive impact on corporate environmental sustainability

H3b: Knowledge management has a significant and positive impact on corporate social sustainability

H3c: Knowledge management has a significant and positive impact on corporate economic sustainability

To investigate the mediating impact of KM in the relationship between TQM and organizational sustainability, the researchers proposed the following hypothesis;

H4: Knowledge management significantly mediates the relationship between total quality management and corporate sustainability

3- Research Methodology

This section provides information about the sample and sampling technique, the research instrument and the operationalization of the variables, as well as the statistical analyses conducted to investigate the relationship between TQM, CS, and KM.

3.1- Data collection

The present research focuses on collecting data from manufacturing and services firms. The researcher collected data from the lower, middle, and upper management, as they are the most suitable respondents for such studies and not only have information about the policies of their company, but are also familiar with the practices (Abbas, 2019). The Securities and Exchange Commission of Pakistan (SECP) is responsible for registering and maintaining the records of firms in Pakistan. Therefore, the author approached those firms which are registered with the SECP. The data was collected from only those firms which are having quality certification (such as ISO 9001) and have, have applied, or plan to apply for environment-friendly and social responsibility certification (such as ISO 14000 and 26000).

The researcher followed the survey method to test the formulated hypotheses. Using the non-probability convenience sampling technique, the survey instrument was distributed to manufacturing and services organizations through personal visit and e-mail. A total of 612 questionnaires were shared with companies located in the cities of

Lahore, Karachi, Islamabad, Sialkot and Faisal, as they are among the prominent business venues in Pakistan. The data was collected between April 2018 and July 2018, and a total of 331 usable responses were received. Following Hoang, Igel and Laosirihongthong (2006) recommendation, the data were collected from the medium (50-200 employees) and large (more than 200 employees) size organizations. A total of 202 (61.03%) responses were received from medium-sized firms and 129 (38.97%) were from large firms. Moreover, 194 (58.61%) responses came from manufacturing companies and 137 (41.39%) originated from services firms. Refer to Table-2 for detailed demographic information.

Table 2: Demographic of respondents

Particulars	Description	Values	%
Total received responses	Medium organization	202	61.03%
	Large organization	129	38.97%
Gender	Male	216	65.26%
	Female	115	34.74%
Industry type	Manufacturing	194	58.61%
	Services	137	41.39%
Job Position	Lower management	156	47.13%
	Middle management	112	33.84%
	Upper management	63	19.03%

3.2- Measurement Instrument

The instrument for this research is comprised of three sections. The first section contains 36 items related to the six dimensions of TQM taken from the MBNQA model. The items for this section were taken from Saraph et al., (1989), Kaynak (2003), Sila (2007) and Samson and Terziovski (1999). The second section contains 14 items related to CS and items were mainly taken from Kaynak (2003) and Turker (2009). Finally, the third section has 22 items related to KM dimensions. The items for this section were taken from Darroch (2003), Lee and Wong (2015) and Wang et al., (2008). All the items were evaluated on a 5-point Likert scale, where 1 represented strongly disagree and 5 represented strongly agree. To ensure the reliability and validity of the measurement instrument, the researcher conducted a pilot study by collecting 25 responses from the organizations located in Lahore. The initial results showed an internal consistency of the constructs ranging between 0.84 and 0.96, which fully complied with the 0.70 minimum requirement suggested by Hair et al., (2010). Considering the initial survey's results, the researchers initiated the comprehensive survey.

3.3- Data Analysis

SEM is believed to be the most effective technique for removing any biasing effect caused by measurement errors and building the hierarchy of the latent construct. It is also recognized as the most appropriate technique for investigating the relationship between observed and latent variables. The researcher used SPSS v.23 and AMOS v.23 to analyse the collected data. The researcher evaluated the feasibility of data for factor analysis and SEM by checking sample size, multicollinearity and common method variance (CMV). The sample adequacy was checked using the

Kaiser-Meyer-Olkin (KMO) test and showed a value of 0.912, which fully complies with Kaiser and Rice's (1974) minimum suggested sample size requirement of 0.6. Furthermore, the 0.941 R^2 value also indicated that the data is normal and appropriate for factor analysis. Using the variance inflation factor (VIF), the researcher analysed the element of multicollinearity. The result indicated a value of 2.958 which fully complied with Hair et al., (2010) maximum requirement of 4. According to Ooi (2014), CMV bias issue occurs when dependent and independent variables are analysed from the identical field of study. Podsakoff et al., (2012) said that CMV impacts the results if one factor represents more than 50% of the whole variance. Using the Harman's single-factor test, the author analysed CMV, and results for single factor influence indicated a value of 39.86% which is well below 50% threshold value, and signifies the non-existence of CMV in the data.

3.4- Model Assessment and Factor Analysis

Confirmatory factor analysis (CFA) is performed to ensure the unidimensionality and validity of the measurement model (Hinkin, 1998). The reliability of the measurement was checked through composite reliability and the Cronbach's alpha value of 0.914 fully meets Peterson's (1994) lowest requirement of 0.8 and Molina et al., (2007) requirement of 0.7. The reliability values of all thirteen constructs are given in Table 3. The validity of the model was examined through convergent and discriminant validity. For convergent validity, the indicators should have loaded more than 0.70 (Molina et al., 2007) and the average variance extracted (AVE) value of the construct should be higher than 0.5 (Hair et al., 2010). Table 3 indicates that the results of reliability and validity are within the allowable range.

The researchers performed a discriminant validity test to ensure that each construct is empirically discriminant from the others. As per Fornell and Larcker (1981), for discriminant validity, a construct must have a higher variance with its indicators than other constructs. Similarly, if the square roots of the AVE values have higher correlations among the indicators making each pair, it authenticates the discriminant validity (Fornell and Larcker, 1981). Additionally, Hair et al., (2010) proposed that in correlation, each pair of predictor variable should not possess a value higher than 0.9. As per the results in Table 4, it is clear that all constructs meet the discriminant validity requirements proposed by Fornell and Larcker (1981) and Hair et al., (2010). On the basis of the previously mentioned results, it can be said that the model fulfils the goodness requirements and the instrument has the required reliability and validity to test the hypotheses.

Table-3:
Reliability and Validity of the Instrument

Construct	Items	Factor Loading Ranges	Composite Reliability[1]	AVE
Leadership	5	0.761-0.934	0.911	0.637
Strategic Planning	6	0.712-0.899	0.842	0.612
Customer Focus	7	0.742-0.919	0.847	0.613
Process Management	5	0.701-0.896	0.891	0.629
Human Resource Management	8	0.699-0.952	0.912	0.633
Information & Analysis	5	0.701-0.922	0.842	0.684
Knowledge Creation	5	0.732-0.923	0.815	0.593
Knowledge Acquisition	5	0.706-0.914	0.899	0.621
Knowledge Sharing	6	0.698-0.942	0.913	0.636
Knowledge Application	6	0.724-0.895	0.879	0.661
Environmental Sustainability	5	0.711-0.883	0.823	0.712
Social Sustainability	5	0.719-0.921	0.819	0.642
Economic Sustainability	4	0.821-0.945	0.853	0.648

[1]Composite reliability value should be ≥0.7 (Molina *et al.*, 2007)
[2]Average variance extracted (AVE) value should be ≥0.5 (Molina *et al.*, 2007)

Table-4:
Constructs' Discriminant Validity

Construct	LD	SP	CF	PM	HRM	IA	KC	KA	KS	KAP	ENS	SS	ECS
LD	***0.798***												
SP	0.475	***0.782***											
CF	0.533	0.529	***0.783***										
PM	0.542	0.499	0.522	***0.793***									
HRM	0.462	0.520	0.483	0.511	***0.800***								
IA	0.465	0.498	0.542	0.531	0.553	***0.827***							
KC	0.495	0.586	0.593	0.455	0.518	0.524	***0.770***						
KA	0.483	0.557	0.498	0.534	0.486	0.435	0.583	***0.788***					
KS	0.513	0.607	0.510	0.481	0.543	0.469	0.524	0.489	***0.797***				
KAP	0.479	0.593	0.611	0.582	0.539	0.524	0.458	0.502	0.582	***0.813***			
ENS	0.593	0.488	0.483	0.527	0.472	0.485	0.621	0.531	0.452	0.442	***0.844***		
SS	0.603	0.612	0.532	0.614	0.495	0.468	0.485	0.456	0.485	0.492	0.532	***0.801***	
ECS	0.493	0.484	0.457	0.485	0.467	0.481	0.573	0.459	0.573	0.538	0.485	0.531	***0.805***

LD= Leadership, SP= Strategic Planning, CF= Customer Focus, PM= Process Management, HRM= Human Resource Management, IA= Information & Analysis, KC= Knowledge Creation, KA= Knowledge Acquisition, KS= Knowledge Sharing, KAP= Knowledge Application, ENS= Environmental Sustainability, SS= Social Sustainability, ECS= Economic Sustainability; Bold and italic values are AVE square root value for each construct

According to Kaynak, (2003) there are seven indicators that determine the goodness of fit of a measurement model, namely chi-square to degree of freedom (χ^2/df), comparative fit index (CFI), goodness of fit index (GFI), normative fit index (NFI), adjusted goodness of fit index (AGFI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA). The present research also includes the Tucker-Lewis index (TLI) to further determine the measurement and structural models' goodness of fit. The χ^2/DF value for the measurement model is 1.146, which is less than 2 as recommended by Byrne (1989) and also complies with Bagozzi and Yi (1988) requirement of less than 3. Additionally, the values for the other fit indices, such as NFI= 0.921, GFI=0.914, AGFI-0.911, CFI=0.959, and TLI=0.961, are also well above the recommended value of 0.9 suggested by Bagozzi and Yi, (1988), Bollen (1986) and Byrne (1989). Moreover, the values of SRMR of 0.0363 and RMSEA of 0.027 are also well below the cut-off limit of 0.080 proposed by Hu and Bentler (1998) and 0.08 by suggested by Browne and Cudeck (1992), respectively. The analysis of the structural model also indicated significant results (refer to Table 5 for further details). Considering these results, it can be confidently said that the model shows an excellent fit from the collected data.

Table 5:
Model Fit Measures

The goodness of fit measures	CMIN/DF	NFI	GFI	AGFI	CFI	TLI	RMSEA	SRMR
Recommended value	≤3[1]	≥0.9[2]	≥0.9[2]	≥0.9[2]	≥0.9[2]	≥0.9[2]	≤0.08[3]	≤0.08[4]
Measurement model	1.146	0.921	0.914	0.911	0.959	0.961	0.027	0.0363
Structural model	1.151	0.953	0.979	0.961	0.951	0.959	0.031	0.0331

[1] (Bagozzi and Yi, 1988)
[2] (Bagozzi and Yi, 1988; Bollen, 1986; Byrne, 1989)
[3] (Browne and Cudeck, 1992)
[4](Hu and Bentler, 1998)

3.5- Testing of hypotheses

The researcher analysed the formulated hypotheses through SEM. While testing the impact of TQM practices on CS, it has been found that TQM has a significant and positive impact on CS and all of its dimensions, namely environmental, social, and economic sustainability. Therefore, H1, H1a, H1b, and H1c are accepted. While investigating the impact of TQM practices on KM activities, the results indicated a significant and positive impact of TQM practices on KM and three out of four of its dimensions, namely knowledge acquisition, knowledge sharing, and knowledge application. An insignificant relationship was found between TQM and knowledge creation. Therefore, hypotheses H2, H2b, H2c, and H2d are accepted and H2a is rejected. While checking the impact of KM on CS, it has been determined that KM has a significant and positive impact on CS and two out of three of its dimensions, namely social sustainability and economic sustainability. The results indicate an insignificant relationship between KM and social sustainability, which leads to the conclusion that hypotheses H3, H3a, and H3c are accepted, while the hypothesis H3b is rejected.

According to Awang (2016), to check the mediation effect, the researchers should firstly check the direct effect of the independent variable on the dependent variable and the result should be significant. The indirect effect is checked by including the mediating variable. The researchers checked the direct effect of TQM on CS, which showed a coefficient value of 0.231 with a composite reliability value of 2.216 and a p-value of 0.019, indicating a significant impact of TQM on OS (see Table 6). To check the indirect effect, the researchers added KM as the mediating variable. The addition of KM as a mediating variable reduced the effect of TQM on CS from 0.231 to 0.159, and showed 2.119 composite reliability, and 0.028 p-values. The effect of TQM on CS is reduced because a portion of the effect has transferred through KM. As the results are still significant, it can be concluded that KM partially mediates the relationship between TQM and CS (Awang, 2016, 2012). To reconfirm the mediation result, particularly the indirect effect, the researchers performed bootstrapping. With 1,000 bootstrap sample and 95% bias correction, the standardized indirect effect of TQM on CS through KM showed a bootstrapping result of 0.029 with a p-value of 0.021. The direct effect of bootstrapping showed a value of 0.591 with a p-value of 0.031. According to Awang (2016), the significant value of the indirect effect confirms the existence of a mediation effect, while the significant value of the direct effect authenticates the partial mediation of KM between TQM and CS. Therefore, hypothesis H4 is also accepted.

Table 6:
Results of hypothesis testing

Hypothesis	Constructs	Coefficient	Critical	p-Value	Decision
H1	TQM → CS	0.231	2.216	0.019*	Supported
H1a	TQM → ENS	0.205	2.253	0.016*	Supported
H1b	TQM → SOS	0.189	2.215	0.030*	Supported
H1c	TQM → ECS	0.273	3.624	0.001**	Supported
H2	TQM → KM	0.202	2.194	0.031*	Supported
H2a	TQM → KC	-0.183	-0.112	0.132	Not supported
H2b	TQM → KAQ	0.231	2.204	0.007*	Supported
H2c	TQM → KS	0.263	2.523	0.004*	Supported
H2d	TQM → KAP	0.157	2.314	0.027*	Supported
H3	KM → CS	0.151	2.211	0.031*	Supported
H3a	KM → ENS	0.157	2.483	0.031*	Supported
H3b	KM → SOS	0.149	1.771	0.061	Not supported
H3c	KM → ECS	0.192	2.315	0.027*	Supported
Mediation					
H4	TQM → CS	0.159	2.119	0.028*	Supported
	TQM → KM	0.192	1.894	0.039*	Supported
	KM → CS	0.149	2.103	0.035*	Supported
Control Variables					
Firm size	FS → CS	0.048	2.011	0.046	Supported
	FS → ENS	0.139	1.545	0.128	Not supported
	FS → SOS	0.139	2.035	0.041	Supported
	FS → ECS	0.019	0.376	0.697	Not supported
Industry type	Ind-Typ → CS	0.031	0.291	0.683	Not supported
	Ind. Typ → ENS	0.041	1.973	0.042	Supported
	Ind. Typ → SOS	0.046	0.631	0.519	Not supported
	Ind. Typ → ECS	0.074	1.041	0.256	Not supported

*p≤0.05; ** p≤0.01; TQM= total quality management, CS= corporate sustainability, KM= knowledge management, ENS= environmental sustainability, SOS= social sustainability, ECS= economic sustainability, KC= knowledge creation, KAQ= knowledge acquisition, KS= knowledge sharing, KAP= knowledge application, FS= firm size, Ind. Typ= industry type.

4- Discussion, implications, and limitations

4.1- Discussion of results

The present research is conducted to investigate the impact of TQM on CS along with the mediating impact of KM in medium and large manufacturing and services companies located in Lahore, Karachi, Islamabad, Sialkot and Faisalabad cities in Pakistan. According to the results, TQM has a significant and positive impact on CS and its three dimensions, namely environmental, social, and economic sustainability. This means that the effective implementation of TQM practices within the organization leads to the enhanced SD. The finding confirms Abbas (2019) study that TQM practices significantly impact on corporate green performance. However, it contradicts to Li et al., (2018) research findings that TQM practices hinder Chinese manufacturing firms green management and innovation. It can be said that the basis of the current study's positive relationship is that TQM is a concept with a set of practices, which ultimately focus on continuous improvement. At the same time, TQM also reduces the resources used in the operational processes, which not only reduce the time and operating costs, but also save the environment and natural resources, leading to the environmental sustainability of the company. Improvements in customer satisfaction, reduction in errors and enhanced operational performance are some of the key benefits of the TQM practices, which directly impact on the economic sustainability of the firms.

Organizations that are cautious about the impact of their operations on the environment are the preferred choice of customers and therefore enjoy more loyalty (Yuan and Xiang, 2018). TQM and environmental management have striking parallels as the long-term goals of both concepts are similar, such as the minimum utilization of resources, minimizing waste, the satisfaction of customers. To achieve these long-term goals, organizations should place emphasis on integrating quality management practices with environmental management systems. By integrating quality and environment strategies, the organization's ability to focus on continuous improvement will be enhanced. As TQM enhances organizational environment management activities, it can strengthens the organization's image and market share. Moreover, by following TQM practices in comprehensive manners, organizations can ensure green operation processes, such as minimal emissions of dangerous gases and liquids and least consumption of natural resources, and can become an environmentally-friendly organization.

Similar to environmental sustainability, TQM demonstrated a significant and positive impact on social sustainability which relates to the findings of Kang et al., (2015) and Todorut (2012). However, in contrast to economic and environmental sustainability, most of the organizations have overlooked the social aspect of sustainability in their policies, as it is the least measurable aspect of sustainability in the TBL model (Shahzad et al., 2019). Social sustainable organizations focus on identifying the impact of their operations on society, both positive and negative, and take measures to develop quality relations with primary and secondary stakeholders. Although the organizational social sustainability actions are difficult to measure, it is easy to identify them. Some of the prominent organizational social development indicators are labour policies, customers' and employees' rights, work-life balance, volunteerism, living conditions, health and safety measures, social wellness, community engagement, donation for or participation in social development programs. Organizations that understand the significance of customers and relationships with them are aware of the importance of social sustainability and make it a part of their core business strategy.

The empirical results also demonstrated the positive relationship between TQM practices and organizational economic sustainability. This finding fully complies with various studies, such as Singh et al., (2018), Shafiq, Lasrado and Hafeez (2017), and Al-Qahtani et al., (2015). As per the results, TQM practices have a greater positive impact on the economic aspect of sustainability than environmental and social aspects. One of the key reasons of this result is that TQM practices improve the operational performance of firms, such as time management, efficient utilization of resources, training and development, which ultimately has an impact on employees' and customers' satisfaction as well as organizational financial performance (O'Neill et al., 2016). Another key reason for the improved economic performance of organizations through TQM is that TQM practices significantly reduce the operating costs and operational defects, leading to enhanced product/service quality of firms. As the quality of a product or service can creates a strategic and competitive advantage, the firms must ensure it in their productions' and services' processes. It is important to note that TQM practices are interdependent, and to attain maximum benefit from it, organizations must

implement the whole as a system. In this regard, leaders can play a critical role, as leaders are responsible for designing and implementing the strategies for the organizations.

The analysis of TQM, KM and CS indicated that TQM has a significant and positive impact on KM activities, which confirms the findings of Yusr *et al.*, (2017) and Ooi, (2014). While analysing the impact of TQM on the individual dimension of KM, with the exception of knowledge creation; TQM indicated a significant and positive impact on all the dimensions of KM, such as knowledge acquisition, knowledge sharing, and knowledge application. It indicates that the effective implementation of the TQM results in superior KM activities within the organization. Dynamic organizations take TQM and KM as inter-subjective constructs and highlight the importance of individual workers as knowledge and employees are the key sources of innovation. Analysing the relationship between KM and CS the result indicated that KM positive impacts on CS and two out of three of its dimensions, namely social and economic sustainability; however, an insignificant relationship was found between KM and corporate environmental sustainability. The analysis of the mediating role of KM between TQM and CS highlighted positive and significant results, indicating partial mediating, which leads to the conclusion that TQM practices can directly as well as indirectly (through KM) impact on CS.

Considering the contextual aspects, the present research contains two control variables, namely firm size and industry type. Considering Hoang et al's., (2006) criteria, the firm size was categorized into medium and large firms; organizations that have 50-200 employees were taken as medium firms and firms with more than 200 employees were taken as large firms. When the researchers included firm size as a control variable, the TQM practices showed a significant impact on CS, indicating that the strength of the relationship between TQM and CS varies from medium firms to large firms. The researchers further explored the path coefficient of TQM with each of the CS dimensions. The environmental and economic dimensions of sustainability showed an insignificant relationship between TQM and CS when firm size was included as the control variable; however, social sustainability indicated a significant relationship. This signifies that it is the TQM which explains the environmental and economic sustainability of the firms, and not the firm size. Therefore, it can be said that TQM practices do not differ by firm size in the context of environmental and economic sustainability. However, the size of the firm significantly controls the effect of overall CSD and social sustainability, indicating that large firms are more likely to implement TQM for overall SD and social sustainability than medium or small firms.

Industry type was another control variable used in this study and was grouped into the manufacturing and services industry. Analysing the effect of industry type on the relationship between TQM and CS showed an insignificant result, indicating that TQM practices are equally important for the manufacturing and services industries to achieve SD. The exploration of the relationship between TQM and each dimension of CS by considering industry type indicated an insignificant relationship between TQM and the social and economic dimensions of sustainability. This

indicates that the TQM practices are equally important for manufacturing and services firm in the context of social and economic sustainability. The result for industry type showed a significant relationship between TQM and environmental sustainability. This indicates that the degree of importance of implementing TQM for achieving environmental sustainability varies between the manufacturing and service industries and manufacturing firms have to make more efforts to achieve environmental sustainability in comparison to services firms.

4.2- Study implication

4.2.1- Practical implications

From the managerial perspective, the results highlight the significance of institutionalizing TQM practices in organizations and its important role in ensuring CS. Therefore, the management and leadership of organizations should enhance their commitments to implement TQM practices within the organization so that not only can economic sustainability be achieved, but also social and environmental sustainability, ensuring the TBL concept of sustainability. To achieve this, it is important to apply TQM practices in a holistic manner and organizations can follow one of the popular quality models, such as MBNQA, EFQM, and SQA etc. However, a number of organizations in the present study had other quality initiatives, such as lean manufacturing, Kaizen, Juran training, and even some without formal names. Here companies need to consider that in the absence of a comprehensive TQM program, which components of TQM are being implemented in an efficient manner and what level of efforts and resources are required to implement the core constructs of the TQM program so that the desired SD objectives can be achieved.

Another important finding of the present study is the identification of the mediating role of KM in the relationship between TQM and CS. This indicates that if organizations implement the TQM program in an efficient manner, it will enhance their KM activities, which also has a significant impact on the CS. The results also signify that the constructive effects of TQM are not only limited to the firms operating in the developed countries, but, if the organizations in the under-developed or developing countries apply its practices in an efficient manner; the similar results can be achieved there as well. The present study also supports the principles of the MBNQA model that the quality in the process leads to excellence in results. As the results indicate that TQM practices are equally important in manufacturing and service industries, the present study provides confidence to the manufacturing and service industries in Pakistan for implementing TQM philosophy in a holistic fashion. The results signify that the service industries can reap similar advantages from TQM to those being achieved by the manufacturing sectors around the world. Hence, the findings also provide confidence to the service firms' managers to concentrate on the effective implementation of TQM practices within their organizations and to obtain the maximum benefit accordingly.

4.2.2- Theoretical implications

The current study has a number of theoretical implications. Firstly, it enriches the inadequate literature on the relationship between TQM and CS, particularly in manufacturing and services firms situated in Pakistan. It also

supports the TQM advocates' stance that the effective implementation of TQM program can significantly enhance organizational performance. The present research also highlights the important role of KM in the relationship between TQM and CS and validates the theory of KM arguments that the effective management of knowledge not only positively impacts on individual and organizational performance, but also boosts their capabilities to innovate and achieve competitive advantage. This research also validates the CS model based on the MBNQA model and KM theory by analysing the robustness of the conceptual model through SEM, which is rare in previous researches.

4.3- Study limitations and future recommendations

The present study also has some limitations. Firstly, the data was only collected from lower, middle, and upper-level managers, and ignored the operational staff; however, their opinion can give further insights. For this reason, future studies should expand the scope of respondents. Moreover, the data was based on the perception of the respondents, not on the actual financial performance given in the institutional documents. Therefore, along with individual personal perception, the hard data of the organizations, for example, annual reports can also provide additional evidence regarding the impact of TQM practices on CS. The data is collected from firms located in five business cities in Pakistan; it is recommended to expand the study scope by including more cities or countries.

5- Conclusion

TQM has been taken as a management paradigm for the past three decades. As its effectiveness depends on a number of factors, different organizations have used it from different perspectives to improve their operational and financial performance. Using the American MBNQA model for TQM, the present study highlights the synergistic association between TQM and CS and indicates where and how the TQM practices can impact on CS. The empirical results indicate that TQM has a significant and positive impact on CS and all three of its dimensions. The current study also highlights the important mediating role of KM between TQM and CS and provides evidence showing that KM partially mediates the relationship between TQM and CS. Therefore, by investigating the direct and indirect effect of TQM on CS, the present study provides empirical evidence indicating that TQM practices can play a significant role in enhancing SD of small, medium and large-size manufacturing and services organizations.

Acknowledgement: I would like to thank Prof. Simon Thompson for his valuable suggestions for preparing this article. I would also like to thank the anonymous reviewers for their valuable notes to further improve this manuscript.

References

Abbas, J., 2019. Impact of total quality management on corporate green performance through the mediating role of corporate social responsibility. Journal of Cleaner Production 242, 118458. https://doi.org/10.1016/j.jclepro.2019.118458

Abbas, J., Mahmood, H.K., Hussain, F., 2015. Information security management for small and medium size enterprises. Science International-Lahore 27, 2393–2398.

Abbas, J., Muzaffar, A., Mahmood, H.K., Ramzan, M.A., Rizvi, S.S. ul H., 2014a. Impact of Technology on Performance of Employees (A Case Study on Allied Bank Ltd, Pakistan). World Applied Sciences Journal 29, 271–276.

Abbas, J., Muzaffar, A., Shoaib, M., Mahmood, H.K., 2014b. Do Business Schools Really Fulfill Industry Requirements? An Investigation of Industrial Performance of Business Graduates. World Applied Sciences Journal 31, 1378–1384.

Abbas, J., Sağsan, M., 2019. Impact of knowledge management practices on green innovation and corporate sustainable development: A structural analysis. Journal of Cleaner Production 229, 611–620. https://doi.org/10.1016/j.jclepro.2019.05.024

Al-Qahtani, N.D., Alshehri, S.S., Aziz, D.A.A., 2015. The impact of Total Quality Management on organizational performance. European Journal of Business and Management 17, 1–10.

Asrar-ul-Haq, M., Kuchinke, K.P., Iqbal, A., 2017. The relationship between corporate social responsibility, job satisfaction, and organizational commitment: Case of Pakistani higher education. Journal of Cleaner Production 142, 2352–2363.

Attia, A., Salama, I., 2018. Knowledge management capability and supply chain management practices in the Saudi food industry. Business Process Management Journal 24, 459–477.

Awang, Z., 2016. Analyzing the mediating variable in a model, in: SEM Made Simple: A Gentle Approach to Learning Structural Equation Modeling. MPWS Publisher, Bangi Selangor.

Awang, Z., 2012. A handbook on structural equation modeling using AMOS. Universiti Technologi MARA Press, Malaysia.

Bagozzi, R.R., Yi, Y., 1988. On the evaluation of structural equation models. Journal of the Academy of Marketing Science 16, 074–094.

Barão, A., de Vasconcelos, J.B., Rocha, Á., Pereira, R., 2017. A knowledge management approach to capture organizational learning networks. International Journal of Information Management 37, 735–740.

Bolisani, E., Bratianu, C., 2018. The elusive definition of knowledge, in: Emergent Knowledge Strategies: Strategic Thinking in Knowledge Management. Springer International Publishing, Cham, pp. 1–22.

Bollen, K.A., 1986. Sample Size and Bentler and Bonett's Nonnormed Fit Index. Psychometrika 51, 375–377.

Browne, M.W., Cudeck, R., 1992. Alternative ways of assessing model fit. Sociological Methods & Research 21, 230–258.

Byrne, B.M., 1989. A primer of LISREL: basic applications and programming for confirmatory factor analytic models. Springer-Verlag, New York.

Cai, W., Li, G., 2018. The drivers of eco-innovation and its impact on performance: evidence from China. Journal of Cleaner Production 176, 110–118.

Calza, F., Parmentola, A., Tutore, I., 2017. Types of Green Innovations: Ways of Implementation in a Non-Green Industry. Sustainability 9, 1301. https://doi.org/10.3390/su9081301

Cancino, C.A., La Paz, A.I., Ramaprasad, A., Syn, T., 2018. Technological innovation for sustainable growth: an ontological perspective. Journal of Cleaner Production 179, 31–41.

Darroch, J., 2005. Knowledge management, innovation and firm performance. Journal of Knowledge Management 9, 101–115.

Darroch, J., 2003. Developing a measure of knowledge management behaviors and practices. Journal of Knowledge Management 7, 41–54.

Davenport, M., Delport, M., Blignaut, J.N., Hichert, T., van der Burgh, G., 2018. Combining theory and wisdom in pragmatic, scenario-based decision support for sustainable development. Journal of Environmental Planning and Management. https://doi.org/10.1080/09640568.2018.1428185

Fernando, Y., Jabbour, C.J.C., Wah, W.X., 2019. Pursuing green growth in technology firms through the connections between environmental innovation and sustainable business performance: does service capability matter? Resources, Conservation and Recycling 141, 8–20.

Fornell, C., Larcker, D.F., 1981. Evaluating structural equation models with unobservable variables and measurement Error. Journal of Marketing Research 18, 39–50.

Gorski, H., 2017. Leadership and Corporate Social Responsibility. International conference Knowledge Based Organizations 23, 372–377. https://doi.org/10.1515/kbo-2017-0061

Guerrero-Villegas, J., Sierra-García, L., Palacios-Florencio, B., 2018. The role of sustainable development and innovation on firm performance. Corporate Social Responsibility and Environmental Management 25, 1350–1362.

Habib, M., Abbas, J., Noman, R., 2019. Are human capital, intellectual property rights, and research and development expenditures really important for total factor productivity? An empirical analysis. International Journal of Social Economics. https://doi.org/10.1108/IJSE-09-2018-0472

Hair, J.F., Anderson, R.E., Tatham, R.L., Black, W.C., 2010. Multivariate Data Analysis, 7th ed. Pearson, Upper Saddle River, NJ.

Hinkin, T.R., 1998. A Brief Tutorial on the Development of Measures for Use in Survey Questionnaires. Organizational Research Methods 1, 104–121.

Hoang, D.T., Igel, B., Laosirihongthong, T., 2006. The impact of total quality management on innovation, findings from a developing country. International Journal of Quality & Reliability Management 23, 1092–1117.

Hollingworth, D., Valentine, S., 2014. Corporate social responsibility, continuous process improvement orientation, organizational commitment and turnover intentions. International Journal of Quality & Reliability Management 31, 629–651. https://doi.org/10.1108/IJQRM-09-2012-0131

Hu, L., Bentler, P.M., 1998. Fit indices in covariance structure modeling: Sensitivity to under-parameterized model misspecification. Psychological Methods 3, 424–453.

Hussain, N., Rigoni, U., Orig, R.P., 2018. Corporate governance and sustainability performance: Analysis of triple bottom line performance. Journal of Business Ethics 149, 411–432.

Imran, M., Abbas, J., 2020. The Role Of Strategic Orientation In Export Performance Of China Automobile Industry, in: Handbook of Research on Managerial Practices and Disruptive Innovation in Asia. IGI Global, pp. 249–263.

Ingenbleek, P.T.M., Dentoni, D., 2016. Learning from stakeholder pressure and embeddedness: The roles of absorptive capacity in the corporate social responsibility of Dutch agribusinesses. Sustainability 8, 1–18.

Isaksson, R., 2006. Total quality management for sustainable development: Process based system models. Business Process Management Journal 12, 632–645.

Jamali, D., 2006. Insights into Triple Bottom Line Integration from a Learning Organization Perspective. Business Process Management 12, 809–821.

Jarrahi, M.H., 2018. Social Media, Social Capital, and Knowledge Sharing in Enterprise. IT Professional 20, 37–45.

Ji, Q., Zhang, H.Y., 2019. How much does financial development contribute to renewable energy growth and upgrading of energy structure in China? Energy Policy 128, 114–124.

Johnson, T.L., Fletcher, S.R., Baker, W., Charles, R.L., 2019. How and why we need to capture tacit knowledge in manufacturing: Case studies of visual inspection. Applied Ergonomics 74, 1–9.

Kaiser, H.F., Rice, J., 1974. Little Jiffy, Mark Iv. Educational and Psychological Measurement 34, 111–117.

Kang, J.-S., Chiang, C.-F., Huangthanapan, K., Downing, S., 2015. Corporate social responsibility and sustainability balanced scorecard: The case study of family-owned hotels. International Journal of Hospitality Management 48, 124–134.

Kaynak, H., 2003. The relationship between total quality management practices and their effects on firm performance. Journal of Operations Management 21, 405–435.

Kenneth, W.G., Inman, R.A., Sower, V.E., Zelbst, P.J., 2019. Impact of JIT, TQM and green supply chain practices on environmental sustainability. Journal of Manufacturing Technology Management 30, 26–47.

Lee, C.S., Wong, K.Y., 2015. Development and validation of knowledge management performance measurement constructs for small and medium enterprises. Journal of Knowledge Management 19, 711–734.

Li, D., Zhao, Y., Zhang, L., Chen, X., Cao, C., 2018. Impact of quality management on green innovation. Journal of Cleaner Production 170, 462–470.

Li, W., 2018. Research on the Innovative Development Mode of Quality Education of College Students Based on the Perspective of Human Resource Management. Educational Sciences: Theory & Practice 18, 2447–2454.

Lucas, M.T., 2019. Understanding environmental management practices: integrating views from strategic management and ecological economics. Business Strategy and Environment 19, 543–556.

Mahmood, H.K., Hashmi, M.S., Shoaib, D.M., Danish, R., Abbas, J., 2014. Impact of TQM Practices on Motivation of Teachers in Secondary Schools Empirical Evidence from Pakistan. Journal of basic and applied scientific research 4, 1–8.

Manatos, M.J.P., 2017. The integration of quality management in higher education (Thesis). Universidade De Lisboa, Lisbon.

Maravilhas, S., Martins, J., 2019. Strategic knowledge management a digital environment: Tacit and explicit knowledge in Fab Labs. Journal of Business Research. https://doi.org/10.1016/j.jbusres.2018.01.061

Mardani, A., Nikoosokhan, S., Moradi, M., Doustar, M., 2018. The Relationship Between Knowledge Management and Innovation Performance. The Journal of High Technology Management Research 29, 12–26.

Molina, L.M., Llorens-Montes, J., Ruiz-Moreno, A., 2007. Relationship between quality management practices and knowledge transfer. Journal of Operations Management 25, 682–701.

Mulhim, A.F., 2017. The Effects of Knowledge Creation Process on Organizational Performance: Evidence from Saudi Banking Sector. International Journal of Management Sciences and Business Research 6, 1–12.

Nonaka, I., 1994. A Dynamic Theory of Organizational Knowledge Creation. Organizational Science 5, 14–37.

Nonaka, I., Takeuchi, H., 1995. The knowledge-creating company: how Japanese companies create the dynamics of innovation. Oxford University, New York.

O'Neill, P., Sohal, A., Teng, C.W., 2016. Quality management approaches and their impact on firms? financial performance – An Australian study. International Journal of Production Economics 171, 381–393.

Ooi, K.B., 2014. TQM: A facilitator to enhance knowledge management? A structural analysis. Expert Systems with Applications 41, 5167–5179.

Peterson, R.A., 1994. Meta-analysis of Alpha Cronbach ' s Coefficient. Journal of Consumer Research 21, 381–391.

Podsakoff, P.M., MacKenzie, S.B., Podsakoff, N.P., 2012. Sources of method bias in social science research and recommendations on how to control it. Annual Review of Psychology 63, 539–569.

Prajogo, D.I., 2005. The comparative analysis of TQM practices and quality performance between manufacturing and service firms. International Journal of Service Industry Management 16, 217–228.

Qasrawi, B.T., Almahamid, S.M., Qasrawi, S.T., 2017. The impact of TQM practices and KM processes on organisational performance: An empirical investigation. International Journal of Quality & Reliability Management 34, 1034–1055.

Robson, A., Mitchell, E., 2007. CSR performance: driven by TQM implementation, size, sector? International Journal of Quality & Reliability Management 24, 722–737. https://doi.org/10.1108/02656710710774692

Samson, D., Terziovski, M., 1999. The relationship between total quality management practices and operational performance. Journal of Operations Management 17, 393–409. https://doi.org/10.1016/S0272-6963(98)00046-1

Saraph, J.V., Benson, P.G., Schroeder, R.G., 1989. An Instrument for Measuring the Critical Factors of Quality Management. Decision Sciences 20, 810–829. https://doi.org/10.1111/j.1540-5915.1989.tb01421.x

Shafiq, M., Lasrado, F., Hafeez, K., 2017. The effect of TQM on organizational performance: empirical evidence from the textile sector of a developing country using SEM. Total Quality Management & Business Excellence 1–22.

Shahzad, M., Ying, Q., Ur Rehman, S., Zafar, A., Ding, X., Abbas, J., 2019. Impact of knowledge Absorptive Capacity on Corporate Sustainability with Mediating Role of CSR: Analysis from the Asian Context. Journal of Environmental Planning and Management 1–27. https://doi.org/10.1080/09640568.2019.1575799

Sila, I., 2007. Examining the effects of contextual factors on TQM and performance through the lens of organizational theories: An empirical study. Journal of Operations Management 25, 83–109. https://doi.org/10.1016/j.jom.2006.02.003

Singh, V., Kumar, A., Singh, T., 2018. Impact of TQM on organizational performance: The case of Indian manufacturing and service industry. Operations Research Perspectives 5, 199–217.

Siva, V., Gremyr, I., Bergquist, B., Garvare, R., Zobel, T., Isaksson, R., 2016. The support of Quality Management to sustainable development: a literature review. Journal of Cleaner Production 138, 148–157.

Tang, H., 2015. How the corporate social responsibility affects the knowledge sharing among corporations: A simulation analysis base on social network. International Journal of Multimedia and Ubiquitous Engineering 10, 183–196.

Todorut, A.V., 2012. Sustainable Development of Organizations through Total Quality Management. Procedia - Social and Behavioral Sciences 62, 927–931. https://doi.org/10.1016/j.sbspro.2012.09.157

Tseng, M.L., Lim, M.K., Tan, K.H., Bui, T.D., 2017. Knowledge management in sustainable supply chain management: Improving performance through an interpretive structural modelling approach. Journal of Cleaner Production 162, 806–816.

Turker, D., 2009. Measuring Corporate Social Responsibility: A Scale Development Study. Journal of Business Ethics 85, 411–427.

UN, 1987. Report of the world commission on environment and development: Our common future. (Development and International Co-operation), Environment. Oslo, Norway.

van der Heijden, A., Driessen, P.P.J., Cramer, J.M., 2010. Making sense of Corporate Social Responsibility: Exploring organizational processes and strategies. Journal of Cleaner Production 18, 1787–1796. https://doi.org/10.1016/j.jclepro.2010.07.024

Wang, C.L., Ahmed, P.K., Rafiq, M., 2008. Knowledge management orientation: construct development and empirical validation. European Journal of Information Systems 17, 219–235.

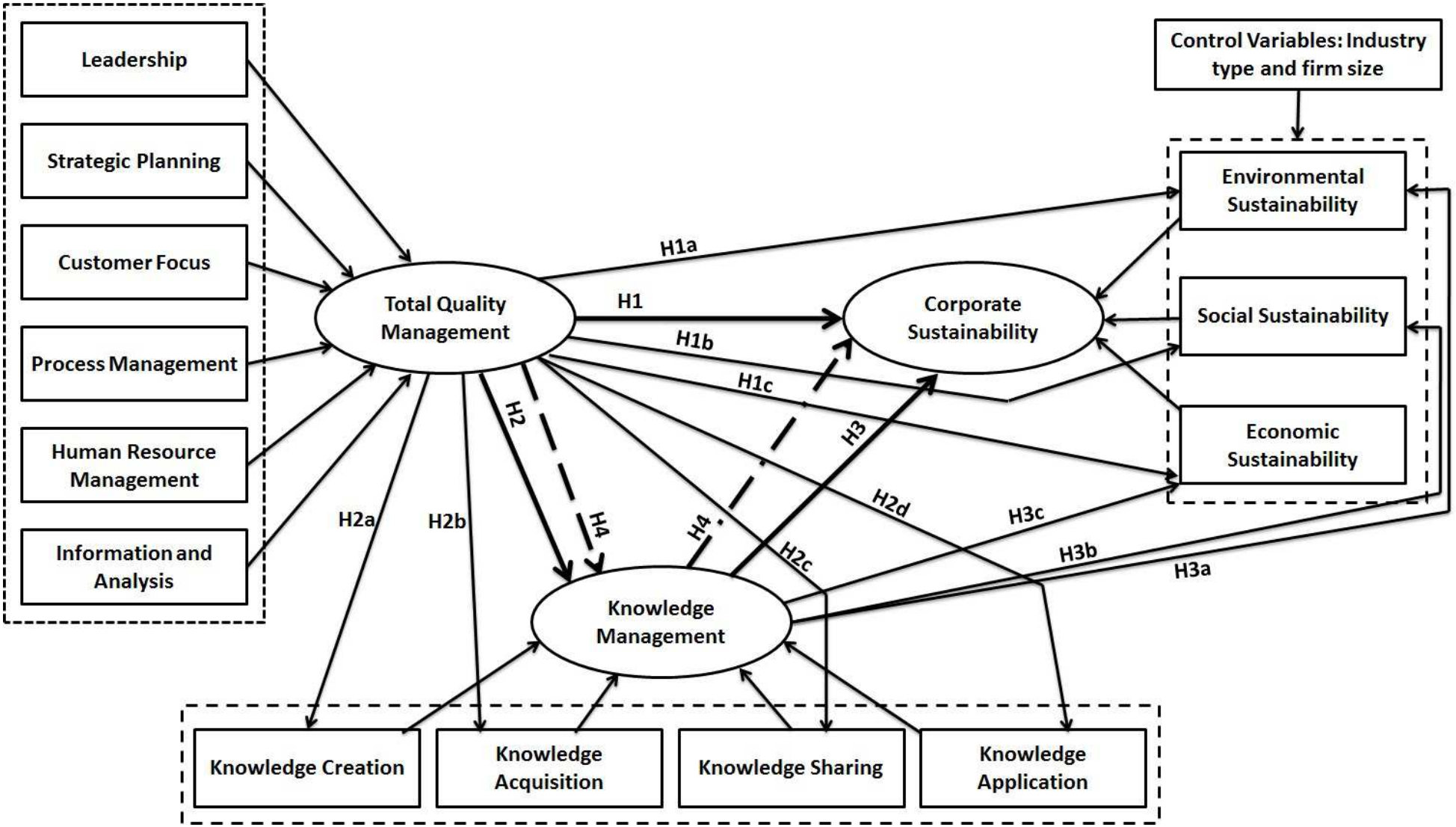
Xie, X., Huo, J., Zou, H., 2019. Green process innovation, green product innovation, and corporate financial performance: A content analysis method. Journal of Business Research. https://doi.org/10.1016/j.jbusres.2019.01.010

Yu, Y., Huo, B., 2019. The impact of environmental orientation on supplier green management and financial performance: The moderating role of relational capital. Journal of Cleaner Production 211, 628–639.

Yuan, B., Xiang, Q., 2018. Environmental regulation, industrial innovation and green development of Chinese manufacturing: based on an extended CDM model. Journal of Cleaner Production 176, 895–908.

Yusr, M.M., Mokhtar, S.S.M., Othman, A.R., Sulaiman, Y., 2017. Does interaction between TQM practices and knowledge management processes enhance the innovation performance? International Journal of Quality & Reliability Management 34, 955–974.

Figure-1: Conceptual framework



- Total quality management (TQM) significantly impacts on corporate sustainability (CS)
- Knowledge management (KM) partially mediates the relationship between TQM and CS
- TQM has insignificant relationship with knowledge creation
- KM has insignificant relationship with social sustainability
- Industry-type (manufacturing or services) has significant relationship with environmental sustainability
- Firm-size has significant relationship with CS and social sustainability