Scale development of critical success factors for quality management practices: evidence from Indian manufacturing SMEs

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Abstract: In developing countries like India, the level of awareness about quality management practices (QMP) in small and medium enterprises (SMEs) has increased recently. This study attempts to develop and validate a QMP scale for manufacturing SMEs. Using Pareto analysis vital QMP factors were identified and questionnaire was administered to 750 SMEs with 68.5% response rate. In order to extract and validate the latent factors, exploratory factor analysis coupled with confirmatory factor analysis was used. Further, structural equation modelling (SEM) was deployed for determining interrelationships of extracted factors. This resulted in seven-QMP factors with R = (0.50–0.81) and R-squared values ranged between 0.23–0.66 representing the variation in 35 items. The study contributes to QMP literature, by bestowing empirical data on QMP factors which are more appropriate for manufacturing SMEs. Though the study was conducted in Indian SMEs context, the research outcomes may be applicable for general manufacturing firms with slight modifications.

Keywords: small and medium enterprises; SMEs; scale development; confirmatory factor analysis; CFA; quality management practices; QMP; structural equation modelling; SEM.

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1 Introduction

In almost all the countries surveyed, small and medium enterprises (SMEs) are engines of economic growth of a country in terms of generating employment opportunities and contributing towards nations GDP. In developing economies like India, SMEs play a pivotal role by contributing 6.11% of the manufacturing GDP and 24.63% of the GDP from service activities (courtesy: 14th CII Global MSME Business Summit 2017). SMEs are useful partners and suppliers of parts and sub-assemblies (Dubey and Kumar, 2017) at relatively low cost to large-sized enterprises thereby becoming the integral part of their supply chain. As large-sized firms are increasingly depending on SMEs for supply of parts and services, the performance and competency level of SMEs become even more critical (Sun and Cheng, 2002) and they are expected to produce high quality products. The fear of losing business and pressure from large-sized firms to produce quality goods and services, have fuelled the interest on various quality tools and practices among SMEs (Kumar and Antony, 2008). However, the quality of products produced by SMEs still remains to be low (Majumdar et al., 2016) and Indian government has undertaken many initiatives to stimulate the quality awareness (Singh et al., 2018) among SMEs. The poor-quality parts supplied by SMEs can affect the quality of products produced and have an effect on the competitiveness of large-enterprises (Ghobadian and Gallear, 1996). After globalisation, SMEs are under constant pressure to produce quality products and satisfy their customers in order to compete and sustain in the dynamic market arena. The

quality of product can be improved in SMEs by adapting to various quality tools and techniques (Kusumah, 2013). This can help SMEs to raise their quality levels, thereby satisfying the needs of large-sized firms, customers and improving their business performance.

Today, organisations are under tremendous pressure to continuously improve and upgrade themselves to the changing needs of customers to produce high quality products/services at low cost. In this pursuit, quality management practices (QMP) is a management philosophy which will assist firms to fulfil customers' demands by delivering high quality products (Kapur et al., 2014). Some studies have focused on the theoretical aspects of QMP, while others emphasised on the practical and empirical issues, but less agreement on critical factors of QMP (Zhang et al., 2000). Further, many empirical studies have documented the success stories and failures of QMP implementation (Dubey et al., 2018). The studies (Goh, 2000; Hoang et al., 2010; Dubey and Kumar, 2017) reported that QMP is well adapted by large-enterprises and are more benefited when compared to SMEs. The QMP framework developed for large-sized firms are not suitable for SMEs (Yusof and Aspinwall, 2000a) and it cannot be adapted to SMEs (Quazi and Padibjo, 1997) as they operate in different business environments. However, the study by Ahire and Golhar (1996) reported that, irrespective of size of firm, small or large, there are no operational differences in QMP implementation and its payback. In Indian SMEs context, there is shortage of research on QMP and SMEs (Meshram et al., 2017), since mainstream have focused on large-sized firms (Parkin and Parkin, 1996; Walley, 2000; Kuratko et al., 2001; Rahman, 2001a; Petroni, 2002; Seth and Tripathi, 2005). This lack of empirical studies and inadequate information to support QMP implementation in SMEs context has resulted in slow implementation of QMP (Ghobadian and Gallear, 1996; Maria and Jones, 2003; Sahoo and Yadav, 2018). The studies (Abdullah, 2007; Malik et al., 2010; Sahoo and Yadav, 2018) reported that QMP implementation in SMEs seems to be limited and it is the same even in the case of Indian SMEs (Sinha et al., 2016; Sahoo and Yadav, 2018; Singh et al., 2018). Absence of QMP model suitable for Indian SMEs is the main barrier for unsuccessful and poor QMP implementation (Kalpande et al., 2010). Further, Kharub and Sharma (2016) expressed the need for testing reliability and validity of QMP factors in Indian SMEs to enjoy the full potential of QMP. Owing to bridge this gap, this study aims to contribute to QMP literature by developing a reliable and valid QMP scale for Indian manufacturing SMEs. The main focus was to identify the key QMP factors using Pareto analysis and empirically validating them with responses collected from Indian manufacturing SMEs. This study outcome would assist researchers to develop QMP theory, measure the status of QMP implementation and to identify the areas for further improvement. This is essential, since Indian SMEs are emerging as a major economic power; and such sophisticated quality framework will certainly be a great boon for sustainable development. In the following sections, a review of literature is presented followed by research methodology, identification of vital QMP factors using Pareto analysis, description of sample profile, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Further, the research findings are presented along with discussion and conclusions, and the research limitations are highlighted.

2 Literature review

This section examines the concept of QMP by identifying and comparing the literature revolving around QMP implementation. Then, a review of literature on important QMP factors considered by various researchers is discussed. In the last three decades, many researchers have done extensive empirical studies on QMP. Few have attempted to identify the critical factors of QMP, few have worked on finding the association between QMP and firms performance, while few others aimed at finding the reasons why QMP is important for firms. A systematic review of literature on QMP implementation in SMEs context was done by searching for articles in peer reviewed journals.

2.1 QMP in SMEs context

In developing economies like India, SMEs play a pivotal role by contributing 6.11% of the manufacturing GDP and 24.63% of the GDP from service activities (courtesy: 14th CII Global MSME Business Summit 2017). According to Micro, Small and Medium Enterprises (MSMEs) Act 2006, SMEs are defined based on investment made on plant and machinery. With respective to manufacturing enterprises, the investments up to INR2.5 million termed as micro-enterprises, between INR2.5–50 million are small enterprises while investment between INR50–100 million are termed medium-sized enterprises. SMEs are considered to be the backbone of Indian economy. Globalisation has provided SMEs many opportunities and challenges to improve their efficiencies. Today, the changes in both local and global competition inform SMEs of the need to improve on their business performances. QMP is considered to be better approach which helps to improve business performance, irrespective of size of the firm (Ahire and Golhar, 1996). Many firms operating at downstream were forced by large-sized firms to implement QMP (Majumdar, 2016) to stay competitive.

Many Indian SMEs have attempted to adopt QMP, but the level of implementation reported to be slow (Sahoo and Yadav, 2018) and not well adopted (Deshmukh and Lakhe, 2010). The study by Deshmukh and Lakhe (2010) revealed that 67.5% of Indian SMEs owners and managers are well informed about various quality practices but reported poor implementation of such practices in their own firms. Majority of SMEs are still reluctant to implement QMP (Singh, 2011) and they face many problems when attempting to implement (Sainis, 2018) due to following reasons: inadequate and timely financial assistances because of their size, lack of technical expertise which often leads to ad hoc implementation leading to poor results, low capacity of production, unskilled workforce with informal training, lack of funds to invest on upgradation and spreading out, inability to reach out to new marketplace (Sullivan-Taylor and Wilson, 1996; Majumdar, 2016). The nature of QMP implementation is a continuous improvement process and it is not an overnight solution (Mathur et al., 2012) for the solving the problems faced by SMEs. However, the small firm's owners would expect the early outcomes upon narrow implementation of QMP in short span of time. Probably, this might be the reason why QMP is well implemented in large-sized firms and SMEs consider it to be avoidable outlay (Samal et al., 2014).

2.2 QMP and SMEs performance

Many studies on QMP in SMEs context have been done by previous researchers. The reason for this is that, SMEs are vibrant and play a vital role in rising economic growth of any country. From literature, it is evident that successful implementation of QMP will improve customer satisfaction (Malik et al., 2018), productivity (Rahman and Bullock, 2005), involvement of employees (Yusuf et al., 2007) and competitive abilities of the firm (Zhang, 2000; Rahman and Attar, 2009; Mahmud and Hilmi, 2014; Venkateshwarlu et al., 2011; Nadarajah and Kadir, 2014). Further, research studies have empirically proved that QMP has significant and positive relationship with customer satisfaction (Sit et al., 2009; Mehra and Ranganathan, 2008; Ooi et al., 2011; Oakland, 2011; Valmohammadi and Roshanzamir, 2015) and firm performance (Hendricks and Singhal, 1996, 1997; Demirbag et al., 2006a; Idris, 2011; Sadikoglu and Olcay, 2014; Sahoo and Yadav, 2018) whereas, the following studies (Rahman, 2001a) reported contrary results that, there is no association between QMP and SMEs performance.

The SMEs must implement critical success factors (CSF) of QMP holistically (Chileshe, 2007) rather than on piecemeal basis (Salaheldin, 2009; Kharub and Sharma, 2016) to enjoy full potential of QMP. The study conducted by Pinho (2008) revealed that effective leadership initiatives, quality assurance systems, measuring results and top managers training programs have significant impact on SMEs performance and consumer orientation.

The QMP implementation has significant effect on operational and organisational performance (Salaheldin, 2009) and commitment from top management leadership (Motwani, 2001a; Kaynak, 2003; Murphy, 2016) is critical for successful implementation (Kumar and Antony, 2008) in SMEs. The study conducted by Herzallah et al. (2014) reported positive relationship with QMP and financial performance of SMEs and if operations are linked with business strategies then it will assist in achieving strategic goals (Singh et al., 2008; Tanninen et al., 2010) of the firm. Yunoh and Ali (2015) observed that implementation of quality practices will help SMEs to identify the target market and improves competitiveness.

There are many studies that (Eisen et al., 1992; Price and Chen, 1993; Harvey, 1995, 2004; Shea and Gobeli, 1995; Ahire and Golhar, 1996; Parkin and Parkin, 1996; Mo and Chan, 1997; Anderson and Sohal, 1999; Hendricks and Singhal, 1999; Rahman, 2001a; Beheshti and Lollar, 2003; Demirbag et al., 2006b; Pinho, 2008; Fening et al., 2008; Gadenne and Sharma, 2009; Salaheldin, 2009; Valmohammadi, 2011; Fening, 2012; Harris et al., 2013; Sinha et al., 2016; Abubakar and Mahmood, 2016; Sahoo and Yadav, 2018) revealed positive association between QMP implementation and SMEs performance, while following empirical studies (Goh and Ridgway, 1994; Chittenden et al., 1998; Rahman, 2001b; Sun and Cheng, 2002; Prajogo and Brown, 2006; Kober et al., 2012; Jabeen et al., 2015) refuted the association. As indicated above, many empirical studies support for QMP implementation in SMEs but it does not mean the process is simple or promise positive outcomes in short period (Bishop, 2018). The reasons might be that SMEs operate in unsupportive environment (Singh et al., 2005), inability to invest

on QMP (Sainis, 2018), trying QMP tools individually but not as a broader strategy, results in slow and unsuccessful implement (Mallur and Hiregoudar, 2010).

2.3 QMP factors

QMP factors or components are those which affect the successful implementation of QMP. Several studies on QMP have been undertaken by researchers and academician along with various institutions such as Deming's Prize, Malcolm Baldrige National Quality Award (MBNQA), and European Foundation for Quality Management (EFQM) to identify the CSF of QMP. These factors represent the key areas which organisation must emphasise on (Bishop, 2018) for effective implementation of QMP (Saraph et al., 1989). However, there is debate as to which CSF are applicable in SME context and if those factors should be related to tools and practices) or people related factors (Bishop, 2018). Ahire et al. (1996) defined the QMP factors or constructs to be as latent variables and critical areas of managerial planning (Saraph et al., 1989). The seven QMP factors or categories defined by MBNQA are leadership, customer and market focus, strategic planning, process management, human resource focus, and business results. The first empirical study on QMP was published by Gravin (1983) while the credit for validating the QMP instrument goes to Sarah et al. (1989). A review of literature was done to get more insights on CSF of QMP and its impact on SMEs performance.

Jamali et al. (2010) observed that top management commitment, process management, strategic quality planning and training are the key drivers for successful implementation of QMP in SMEs.

The study conducted by Idris (2011) reported that leadership exhibited by the management and supervisors are the most predominant factor for sustainable company performance. In Indian SMEs context, Singh (2011) reported that, for successful implementation of quality management, SMEs needs to focus on driving variables namely: top management commitment, employee training and empowerment, supplier development and coordination between departments.

Valmohammadi (2011) observed that leadership plays vital role in enhancing the organisational performance and by integrating all functions of quality will increase SMEs financial performance (Almansour, 2012).

Muturi et al. (2013) investigated the level of QMP implementation in the Kenyan small and medium manufacturing industries by considering the following factors: continuous support, customer focus, employee participation, employee training, information and analysis, organisation for quality, supplier quality management, quality system improvement, statistical quality technique and top management support.

Abdollahi et al. (2014) reported that, process management, training, supplier quality management, quality of data and reports, employee relationships and top management commitment influence positively on SMEs performance.

The study by Mahmud and Hilmi (2014) examined the mediating effect of organisation learning relationship between quality management and SMEs performance. The research concluded that quality management it will support both organisation learning and SMEs performance.

Table 1 List of QMP factors considered by researchers in SMEs context

Authors	*QMP factors considered by researchers*
Yusof and Aspinwall (2000b)	Advanced quality planning, benchmarking, communication, cost of quality, customer surveys, employee perceptions, employee recognition, human resource policy, kaizen, muri, muda, mura, 5S, pay and reward system, QA system, QCC, quality measurement, quality teams, self-assessment and others, SPC, supplier quality assurance, TPM
Rahman (2001b)	Workforce commitment, shared vision, customer focus, use of teams, personnel training, cooperative supplier relations, computer-base technologies, just-in-time principles, technology utilisation, and continuous improvement enablers
Temtime and Solomon (2002)	Managerial leadership and commitment, customer satisfaction, continuous improvement, employees empowerment and involvement, supplier partnership, quality culture and philosophy, and measurement and feedback
Sohail and Hoong (2003)	Employee training and development, process management, quality measurement and benchmarking, top management commitment, customer involvement and satisfaction, strategy and planning
Temtime (2003)	Customer satisfaction, managerial leadership, employee empowerment, continuous improvement, supplier partnership, quality culture, working environment, measurement and feedback
Erginel (2005)	Customer focus, leadership, employee involvement, process approach, systemic approach, continuous improvement, decisions based on facts, relationship with suppliers mutually beneficiary
Hong and Phitayawejwiwat (2005)	Customer orientation, HRD, information and analysis, leadership, quality assurance, quality results, strategic quality planning, supplier relationship
Rahman and Tannock (2005)	Genuine top management commitment, policy and planning aimed at customer satisfaction, an effective steering committee, good communication within the organisation, employee involvement and teamwork development, reward and recognition systems, employee training and development, appropriate problem-solving tools and techniques
Rad (2006)	Process management, focus on customer, leadership and management, focus on employees, focus on material resources, strategic planning performance results, focus on suppliers
Demirbag et al. (2006a)	Role of top management, quality data and reporting, employee relations, process management, supplier quality management, commitment, training, quality policy
Chileshe (2007)	Customer-oriented, supplier-oriented, HRM-oriented, process-oriented
Salaheldin (2009)	Assessment of performance of suppliers, benchmarking, continuous improvement, customer and market knowledge, customer orientation, employee empowerment, employee involvement, employee training, enterprise performance metrics for TQM process control, leadership, management of customer relationships, organisational culture, product and service design, quality goals and policy, realistic TQM implementation schedule, resources conservation and utilisation, resources value addition process, supplier quality, supplier relationships, team building and problem solving, top management support, use of IT
Kumar and Anthony (2009)	Management involvement and commitment, communication, link QI to employee, cultural change, education and training, link QI to customer, project selection, link QI to business, link QI to supplier , project mgmt. skill, organisational infrastructure, vision and plan, IT and innovation
Malik et al. (2010)	Top management commitment, customer focus, supplier relationships, employee involvement and empowerment, work environment and benchmarking

Table 1 List of QMP factors considered by researchers in SMEs context (continued)

Authors	*QMP factors considered by researchers*
Mallur and Hiregoudar (2010)	Leadership and top management commitment, vision and plan statement, supplier quality management, system process quality improvement, total employee involvement, education and training, performance appraisal and recognition, customer focus satisfaction, evaluation, work environment and culture, continuous improvement, communication
Valmohammadi (2011)	Communication, customer focus, employee management, leadership, process management, quality information system, supplier quality management
Fard et al. (2011)	Benchmarking, balanced score card, process management, information usage, quality strategy, employee involvement, training and education, communication
Fening (2012)	Leadership, strategic planning, customer and market focus, measurement, analysis and knowledge management, workforce focus, process management and results
Kalpande et al. (2013)	Team processes, internal customer focus, use of data, common understanding of quality, understanding customer need, supplier partnership, understanding organisation processes, quality improvements techniques
Srinivas (2013)	Management commitment and leadership, education and training, employee participation, quality assurance, strategic planning process, customer focus and satisfaction, total quality management, benchmarking
Agbola and Ankrah (2013)	Awareness of quality management, availability of quality management policy, leadership commitment, use of new technology and continuous improvement, enforce of quality standards, customers needs
Herzallah et al. (2014)	Management leadership, customer focus, training, employee relations, quality data and reporting, supplier management, product and service design, process management
Kaur and Sharma (2014)	Top management policy, human resources management, corporate planning, monitoring and execution, customer focus, leadership, quality and process, information and analysis
Manhas et al. (2015)	Continuous improvement, customer focus, employee participation, process management, supplier quality management, teamwork, top management commitment, training
Yunoh and Ali (2015)	Management commitment, strategic planning, customer focus, benchmarking, relationship with suppliers, continuous improvement
Sinha et al. (2016)	Involvement of people, customer focus and leadership, process approach, mutually beneficial supplier relationship, factual approach to decision-making
Ahmad et al. (2017)	Training, top management commitment, customer focus, continuous improvement, employee involvement, process management
Oliveira et al. (2019)	Leadership, customer focus, strategic planning, HRM, process management, supplier management
Imran et al. (2018)	Leadership, strategy, people, resources, process
Aich et al. (2018)	Top management commitment to quality, improved production planning and control, employee involvement, and supplier quality management employee involvement, supplier quality management information technology, management mission and vision, recognition system and customer focus
Sahoo and Yadav (2018)	Cross-functional product design, process quality management, quality empowerment, organisation-wide employee training, quality information usage

QMP assist SMEs to gain competitive advantage over foreign products and improves the growth and performance (Kwamega et al., 2015). The study in Malaysian SMEs (Yunoh and Ali, 2015) proposed innovation to be the intervening variable which influences relationship between quality management and organisational performance.

The study in 20 auto component SMEs in India (Sinha et al., 2016) observed positive influence between following QMP factors namely: process approach, mutually beneficial supplier relationship, factual approach to decision-making and SMEs performance.

Oliveira et al. (2019) investigated quality management implementation in Brazilian SMEs and reported that the lack of awareness on quality management and commitment to continuous improvement philosophy. The study (Sahoo and Yadav, 2018) in 127 Indian SMEs reported the need for awareness about QMP among SMEs owners/managers, since success of any quality initiative depends on leadership style exhibited by them.

Many studies have investigated the QMP factors by developing QMP models or frameworks. In connection with this, the authors have done extensive literature review for the purpose of identifying the QMP factors considered by researchers in SMEs context by reviewing the studies published between 2000 to 2018. The reason for this that, SMEs are different from large-sized firms (Falle et al., 2016) and they operate in different way. The peer-reviewed research papers from various database references were searched using following key words: QMP, TQM, CSF, QMP in SMEs, etc. The list of QMP factors recommended by various researchers is mentioned in Table 1.

From the exhaustive literature, it can be concluded that QMP is a multidimensional concept since it consists of various factors addressing quality concepts. Thorough literature analysis on QMP reveals that relatively large number of studies across the globe have used the survey instrument and critical factors proposed by Saraph et al. (1989), Flynn et al. (1994), Anderson et al. (1994), Black and Porter (1996), Ahire and Golhar (1996), Sila and Ebrahimpour (2002) and others. Many studies in literature reported varying outcomes, but Sila and Ebrahimpour (2002) claimed that QMP implementation significantly varies from firm to firm, region to region and with respect to demography. Thus, it is necessary to reassess QMP implementation (Mosadeghrad, 2015) based on demography or region. Owing to bridge this research gap, the present study attempts to develop a reliable and valid QMP scale suitable for Indian manufacturing SMEs.

3 Research methodology

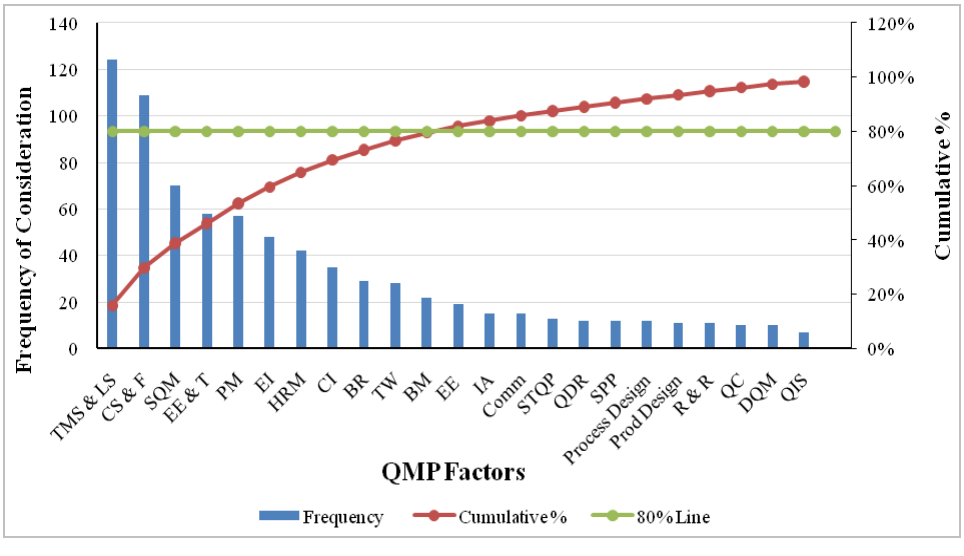
To realise the study objective, a comprehensive literature review on QMP was carried out using keyword search such as TQM, QMP, QMP implementation, QMP in SMEs, and QMP in manufacturing SMEs. The research papers were reviewed from various database references and 45 critical factors of QMP with supporting literature studies have been tabulated. The research study is empirical one and data was collected through structured QMP scale and it was subjected to EFA using SPSS 21. Further for the purpose of validating the factors, CFA was performed using Analysis of Moment Structures (AMOS) 22 software to fit structural equation modelling (SEM).

4 Identification of vital QMP factors using Pareto analysis

Many statisticians use Pareto analysis for making decision about critical factors and to limit number of factors. Using Pareto analysis, critical QMP factors were identified by considering those factors which are frequently considered by researchers. For this purpose, research papers were searched from various database references such as Google Scholar, Emerald, IEEE, Taylor Francis, Scopus indexed journals, Springer, Inderscience, American Society of Quality and various others by using the keywords such as: TQM, QMP, TQM implementation, QMP implementation, etc. and this resulted in 45 CSF of QMP considered by various researchers as mentioned in Table 2.

Based on frequency of consideration by researchers, 25 QMP factors were identified for further study by discarding the others. The selected 25 QMP factors are listed based on frequency of consideration, cumulative frequency and percentage of cumulative frequency are calculated and it is mentioned in Table 3. The research studies claim that vital few factors occupy 80% of cumulative percentage while useful many occupy 20% of occurrences (Talib et al., 2010; Oza and Shiroya, 2015; Azizaman et al., 2015; Fonseca, 2015).

Figure 1 Pareto diagram of QMP CSFs (see online version for colours)



For the 25 QMP factors, the overall frequency of consideration was 782 and first 11-factors accounted for cumulative percentage of 80%. Hence, it can be concluded that the first 11-factors are vital accounting to 80% of occurrences and were termed as useful many (Talib et al., 2010; Karuppusami and Gandhinathan, 2006). The outcome of Pareto analysis was 11 frequently used QMP factors and these were considered for scale development and 11-QMP factors are: top management commitment and leadership styles, customer focus and satisfaction, supplier quality management, employee education and training, process management, employee involvement, human resource management, continuous improvement, business results, teamwork and benchmarking.

Table 2 List of CSF of QMP with supporting literature

Sl. no.	*CSF of QMP*	*Supporting literature*
1	Top management support/top management commitment and leadership styles	Juran (1974), Ishikawa (1976), Crosby (1979), Feigenbaum (1983), Shewhart and Deming (1986), Garvin (1987), Saraph et al. (1989), Porter and Parker (1993), Lu and Sohal (1993), Dale and Cooper (1994), Flynn et al. (1994), Powell (1995), Black and Porter (1996), Ahire et al. (1996), Motwani et al. (1996), Motwani and Kumar (1997), Zeitz et al. (1997), Quazi and Padibjo (1998), Grandzol and Gershon (1998), Joseph et al. (1999), Anderson and Sohal (1999), Rao et al. (1999), Yusof and Aspinwall (2000a, 2000b), Sureshchandar et al. (2001), Chapman and Al-Khawaldeh (2002), Antony et al. (2002), Beer (2003), Li et al. (2003), Kaynak (2003), Baidoun and Zairi (2003), Yong and Wilkinson (2003), Conca et al. (2004), Evans and Jack (2003), Baidoun (2004), Al-Nofal et al. (2004), Arawati (2005), Prajogo (2005), Al-Nofal et al. (2005), Zadry (2005), Sila and Ebrahimpour (2005), Demirbag et al. (2006b), Brah and Lim (2006), Nair (2006), Karuppusami and Gandhinathan (2006), Samat et al. (2006), Tarí (2006), Mahapatra and Khan (2006), Rad (2006), Das et al. (2007), Ou et al. (2007), Sila (2007), Fryer et al. (2007), Kozak et al. (2007), Abdullah and Uli (2007), Abdullah et al. (2008), Khamalah and Lingaraj (2007), Bergman and Klefsjö (2007), Macinati (2008), Yaacob (2008), Awan et al. (2008), Bou-Llusar et al. (2009), Fotopoulos and Psomas (2009), Salaheldin (2009), Kumar et al. (2009), Pettersen (2009), Jung et al. (2009), Jimenez-Jimenez and Martinez-Costa (2009), Sadikoglu and Zehir (2010), Jamali et al. (2010), Talib and Rahman (2010), Arumugam et al. (2011), Valmohammadi (2011), Brun (2011), Kumar et al. (2011), Shahin and Dabestani (2011), Bahri et al. (2012), Koilakuntla et al. (2012), Arshida and Agil (2012), Zehir et al. (2012), Jha and Kumar (2012), Talib et al. (2012), Fening et al. (2013), Alolayyan et al. (2013), Noruzy et al. (2013), Moghadam et al. (2013), Mardani et al. (2013), Kalra and Pant (2013), Hietschold et al. (2014), Al-Refaie and Hanayneh (2014), Singh and Singh (2014), Oruma (2014), Sadikoglu and Olcay (2014), Irfan et al. (2014), Wanderi et al. (2015), Jabeen et al. (2015), Manhas et al. (2015), Long et al. (2015), Abuzaid (2015), Chepkoech (2015), Mehralian et al. (2016, 2017), Dedy et al. (2016), Sinha et al. (2016), Obeidat et al. (2016), Muketha (2016), Haile and Raju (2016), Fatemi et al. (2016), Kholopane (2016), Anil and Satish (2016), Al-Dhaafri et al. (2016), Basu and Bhola (2016), Vasantharayalu and Surjit (2016), Aquilani et al. (2017), Ebrahimi and Rad (2017), Panuwatwanich and Nguyen (2017), Shafiq et al. (2019), Farish et al. (2017), Xiong et al. (2017), Pradhan (2017), Qasrawi et al. (2017), Keinan and Karugu (2018), Arshad et al. (2018)
2	Quality information availability/quality data reporting	Saraph et al. (1989), Flynn et al. (1994), Rao et al. (1999), Black and Porter (1996), Joseph et al. (1999), Antony et al. (2002), Talib and Rahman (2010), Rad (2006), Valmohammadi (2011), Baird et al. (2011), Noruzy et al. (2013), Irfan et al. (2014)
3	Information and analysis	Lu and Sohal (1993), Porter and Parker (1993), Powell (1995), Black and Porter (1996), Saraph et al. (1989), Ahire et al. (1996), Zeitz et al. (1997), Rao et al. (1999), Anderson and Sohal (1999), Prajogo (2005), Samat et al. (2006), Jamali et al. (2010), Moghadam et al. (2013), Mehralian et al. (2016), Kholopane (2016)
4	Benchmarking	Lu and Sohal (1993), Dale and Cooper (1994), Flynn et al. (1994), Powell (1995), Black and Porter (1996), Ahire et al. (1996), Ruggieri and Merli (1998), Rao et al. (1999), Zhang et al. (2000), Sila and Ebrahimpour (2003), Mahapatra and Khan (2006), Rad (2006), Khamalah and Lingaraj (2007), Jitpaiboon and Rao (2007), Salaheldin (2009), Talib and Rahman (2010), Talib et al. (2013), Nitin et al. (2011), Brkic et al. (2013), Long et al. (2015), Mehralian et al. (2016), Jehangiri (2017)
5	Strategic quality planning	Anderson and Sohal (1999), Prajogo (2005), Mahapatra and Khan (2006), Jha and Kumar (2012), Al-Dhaafri et al. (2016), Basu and Bhola (2016), Parvadavardini et al. (2016), Anil and Satish (2016), Vasantharayalu and Surjit (2016), Aquilani et al. (2017), Mehralian et al. (2017), Pradhan (2017), Qasrawi et al. (2017), Arshad et al. (2018)
6	Team work	Anschutz (1995), Oakland and Aldridge (1995), Motwani et al. (1996), Black and Porter (1996), Sureshchandar et al. (2001), Sila and Ebrahimpour (2002), Yong and Wilkinson (2003), Mahapatra and Khan (2006), Lewis et al. (2006), Guimaraes (1997), Ooi et al. (2007), Khamalah and Lingaraj (2007), Arumugam et al. (2008), Oluwatoyin and Oluseun (2008), Ueno (2009): Rahman et al. (2009), Prajogo and Cooper (2010), Jamali et al. (2010), Brun (2011), Kumar et al. (2011), Jha and Kumar (2012), Talib et al. (2013), Al-Refaie and Hanayneh (2014), Abuzaid (2015), Manhas et al. (2015), Long et al. (2015), Obeidat et al. (2016), Muketha (2016)

Table 2 List of CSF of QMP with supporting literature (continued)

Sl. no.	*CSF of QMP*	*Supporting literature*
7	Continuous improvement/continual improvement	Bessant et al. (1994), Stahl (1995), Motwani et al. (1996), Evans and Dean (2000), Corbett and Rastrick (2000), Juergensen (2000), Sureshchandar et al. (2001), Sila and Ebrahimpour (2002), Antony et al. (2002), Yong and Wilkinson (2003), Conca et al. (2004), Samat et al. (2006), Rad (2006), Mahapatra and Khan (2006), Bergman and Klefsjö (2007), Oluwatoyin and Oluseun (2008), Fotopoulos and Psomas (2009), Sadikoglu and Zehir (2010), Talib and Rahman (2010), Valmohammadi (2011), Kumar et al. (2011), Talib et al. (2012, 2013), Jha and Kumar (2012), Alolayyan et al. (2013), Oruma (2014), Irfan et al. (2014), Abuzaid (2015), Jabeen et al. (2015), Manhas et al. (2015), Obeidat et al. (2016), Muketha (2016), Haile and Raju (2016), Kholopane (2016)
8	Employee education and training	Juran (1974), Ishikawa (1976), Crosby (1979), Feigenbaum (1983), Shewhart and Deming (1986), Saraph et al. (1989), Porter and Parker (1993), Lu and Sohal (1993), Dale and Cooper (1994), Cherrington (1995), Motwani and Kumar (1997), Powell (1995), Ahire et al. (1996), Joseph et al. (1999), Rao et al. (1999), Vermeulen and Crous (2000), Yusof and Aspinwall (2000a, 2000b), Chapman and Al-Khawaldeh (2002), Sila and Ebrahimpour (2002), Antony et al. (2002), Baidoun and Zairi (2003), Baidoun (2004), Al-Nofal et al. (2004), Samat et al. (2006), Karia and Asaari (2006), Mahapatra and Khan (2006), Khamalah and Lingaraj (2007), Boon et al. (2007), Guimaraes (2007), Ueno (2009), Claver-Cortés et al. (2008), Lewis et al. (2006), Rahman et al. (2009), Fotopoulos and Psomas (2009), Jimenez-Jimenez and Martinez-Costa (2009), Sadikoglu and Zehir (2010), Prajogo and Cooper (2010), Talib and Rahman (2010), Jamali et al. (2010), Brun (2011), Kumar et al. (2011), Arumugam et al. (2011), Zehir et al. (2012), Bahri et al. (2012), Arshida and Agil (2012), Talib et al. (2012, 2013), Noruzy et al. (2013), Kalra and Pant (2013), Singh and Singh (2014), Al-Refaie and Hanayneh (2014), Wanderi et al. (2015), Manhas et al. (2015), Dedy et al. (2016), Long et al. (2015), Fatemi et al. (2016), Obeidat et al. (2016), Sinha et al. (2016)
9	Product design	Saraph et al. (1989), Flynn et al. (1994), Ahire et al. (1996), Joseph et al. (1999), Rao et al. (1999), Mahapatra and Khan (2006), Lewis et al. (2006), Jamali et al. (2010), Zehir et al. (2012), Bahri et al. (2012), Noruzy et al. (2013), Kalra and Pant (2013)
10	Quality culture of organisation	Black and Porter (1996), Sila and Ebrahimpour (2003), Ueno (2009), Jha and Kumar (2012), Oruma (2014), Wanderi et al. (2015), Chepkoech (2015), Fatemi et al. (2016), Sinha et al. (2016), Mehralian et al. (2016)
11	Strategic quality management	Juran (1974), Crosby (1979), Feigenbaum (1983), Shewhart and Deming (1986), Saraph et al. (1989), Porter and Parker (1993), Lu and Sohal (1993), Powell (1995), Black and Porter (1996), Motwani and Kumar (1997), Fotopoulos and Psomas (2009), Irfan et al. (2014)
12	Supplier quality management	Juran (1974), Ishikawa (1976), Crosby (1979), Shewhart and Deming (1986), Garvin (1987), Saraph et al. (1989), Porter and Parker (1993), Dale and Cooper (1994), Powell (1995), Juran and Gryna (1993), Ahire et al. (1996), Flynn et al. (1994), Black and Porter (1996), Motwani and Kumar (1997), Zeitz et al. (1997), Rao et al. (1999), Joseph et al. (1999), Yusof and Aspinwall (2000a, 2000b), Chapman and Al-Khawaldeh (2002), Kaynak (2003), Baidoun and Zairi (2003), Sánchez-Rodríguez and Martínez-Lorente (2004), Baidoun (2004), Zadry (2005), Sila and Ebrahimpour (2005), Arawati (2005), Karuppusami and Gandhinathan (2006), Tarí (2006), Demirbag et al. (2006a), Ou et al. (2007), Sila (2007), Abdullah and Uli (2007), Khamalah and Lingaraj (2007), Yaacob (2008), Macinati (2008), Salaheldin (2009), Jimenez-Jimenez and Martinez-Costa (2009), Zakuan et al. (2010), Talib and Rahman (2010), Jamali et al. (2010), Arumugam et al. (2011), Shahin and Dabestani (2011), Bahri et al. (2012), Arshida and Agil (2012), Baird et al. (2011), Talib et al. (2013), Kalra and Pant (2013), Fening et al. (2013), Hietschold et al. (2014), Singh and Singh (2014), Sadikoglu and Olcay (2014), Irfan et al. (2014), Manhas et al. (2015), Long et al. (2015), Mehralian et al. (2016, 2017), Haile and Raju (2016), Kholopane (2016), Nhlabathi and Kholopane (2013), Sadikoglu and Olcay (2014), Sinha et al. (2016), Parvadavardini et al. (2016), Ebrahimi and Rad (2017), Panuwatwanich and Nguyen (2017), Samson (2017), Xiong et al. (2017), Farish et al. (2017), Pradhan (2017), Arshad et al. (2018)

Table 2 List of CSF of QMP with supporting literature (continued)

Sl. no.	*CSF of QMP*	*Supporting literature*
13	Employee involvement	Juran (1974), Crosby (1979), Feigenbaum (1983), Garvin (1987), Saraph et al. (1989), Dean and Evans (1994), Flynn et al. (1994), Dale and Cooper (1994), Motwani et al. (1996), Motwani and Kumar (1997), Ahire et al. (1996), Black and Porter (1996), Zeitz et al. (1997), Cassar (1999), Joseph et al. (1999), Rao et al. (1999), Yusof and Aspinwall (2000a, 2000b), Zineldin and Fonsson (2000), Sureshchandar et al. (2001), Harvey and Brown (2001), Antony et al. (2002), Chapman and Al-Khawaldeh (2002), Yong (2003), Baidoun and Zairi (2003), Baidoun (2004), Bou and Beltrán (2005), Samat et al. (2006), Mahapatra and Khan (2006), Boon et al. (2007), Guimaraes (2007), Jimenez-Jimenez and Martinez-Costa (2009), Fotopoulos and Psomas (2009), Sadikoglu and Zehir (2010), Talib and Rahman (2010), Rad (2006), Parast et al. (2011), Valmohammadi (2011), Arshida and Agil (2012), Bahri et al. (2012), Alolayyan et al. (2013), Al-Refaie and Hanayneh (2014), Oruma (2014), Abuzaid (2015), Manhas et al. (2015), Long et al. (2015), Dedy et al. (2016), Muketha (2016), Haile and Raju (2016), Fatemi et al. (2016)
14	Quality improvement system	Black and Porter (1996), Zeitz et al. (1997), Mahapatra and Khan (2006), Khamalah and Lingaraj (2007), Bahri et al. (2012), Talib et al. (2013), Mehralian et al. (2016)
15	Role of quality department	Saraph et al. (1989), Joseph et al. (1999), Antony et al. (2002), Mehralian et al. (2016)
16	Int. quality results	Rao et al. (1999)
17	Ext. quality results	Rao et al. (1999)
18	SPC usage	Lu and Sohal (1993), Dale and Cooper (1994), Powell (1995), Ahire et al. (1996)
19	Employee empowerment	Juran (1974), Crosby (1979), Feigenbaum (1983), Garvin (1987), Dale and Cooper (1994), Motwani et al. (1996), Motwani and Kumar (1997), Black and Porter (1996), Ahire et al. (1996), Sureshchandar et al. (2001), Yong (2003), Samat et al. (2006), Ueno (2009), Talib and Rahman (2010), Rad (2006), Al-Refaie and Hanayneh (2014), Singh and Singh (2014), Abuzaid (2015), Chepkoech (2015)
20	Product quality	Ahire et al. (1996), Anderson and Sohal (1999), Antony et al. (2002), Prajogo (2005)
21	Supplier performance	Ahire et al. (1996), Antony et al. (2002), Jha and Kumar (2012)
22	Operational quality planning	Motwani et al. (1996), Black and Porter (1996), Joseph et al. (1999), Sureshchandar et al. (2001), Yong (2003), Abuzaid (2015)
23	Supervision	Zeitz et al. (1997)
24	External interface management	Black and Porter (1996)
25	Quality citizenship	Rao et al. (1999)
26	Quality policy	Joseph et al. (1999), Antony et al. (2002), Mahapatra and Khan (2006), Noruzy et al. (2013)
27	Technology utilisation	Joseph et al. (1999)
28	Systems approach to management	Alolayyan et al. (2013)

Table 2 List of CSF of QMP with supporting literature (continued)

Sl. no.	*CSF of QMP*	*Supporting literature*
29	Process management	Juran (1974), Crosby (1979), Feigenbaum (1983), Shewhart and Deming (1986), Garvin (1987), Saraph et al. (1989), Porter and Parker (1993), Lu and Sohal (1993), Flynn et al. (1994), Powell (1995), Black and Porter (1996), Motwani and Kumar (1997), Anderson and Sohal (1999), Zhang (2000), Kaynak (2003), Evans et al. (2004), Conca et al. (2004), Sila and Ebrahimpour (2005), Al-Nofal et al. (2004), Prajogo (2005), Nair (2006), Demirbag et al. (2006a), Karuppusami and Gandhinathan (2006), Brah and Lim (2006), Mahapatra and Khan (2006), Tarí (2006), Sila (2007), Bergman and Klefsjö (2007), Ou et al. (2007), Fryer et al. (2007), Abdullah and Uli (2007), Abdullah et al. (2008), Khalifa and Aspinwall (2008), Macinati (2008), Jimenez-Jimenez and Martinez-Costa (2009), Fotopoulos and Psomas (2009), Sit et al. (2009), Jung et al. (2009), Sadikoglu and Zehir (2010), Arumugam et al. (2011), Valmohammadi (2011), Brun (2011), Nitin et al. (2011), Jha and Kumar (2012), Bahri et al. (2012), Talib et al. (2013), Fening et al. (2013), Alolayyan et al. (2013), Moghadam et al. (2013), Kalra and Pant (2013), Irfan et al. (2014), Manhas et al. (2015), Mehralian et al. (2016), Sinha et al. (2016), Haile and Raju (2016), Kholopane (2016)
30	Factual approach to decision making	Bergman and Klefsjö (2007), Alolayyan et al. (2013), Sinha et al. (2016)
31	Mutual beneficial suppliers relationship	Alolayyan et al. (2013), Sinha et al. (2016)
32	Service design	Antony et al. (2002), Kaynak (2003), Li et al. (2003), Zadry (2005), Arawati (2005), Karuppusami and Gandhinathan (2006), Mahapatra and Khan (2006), Salaheldin (2009), Ya'acob (2008), Arumugam et al. (2011), Irfan et al. (2014)
33	Vision and plan statement	Yusof and Aspinwall (2000a, 2000b), Baidoun and Zairi (2003), Baidoun (2004), Chapman and Al-Khawaldeh (2002), Bahri et al. (2012), Arshida and Agil (2012), Long et al. (2015)
34	Performance management	Jamali et al. (2010), Talib and Rahman (2010), Hietschold et al. (2014)
35	Employee satisfaction	Jamali et al. (2010), Talib and Rahman (2010), Valmohammadi (2011), Al-Refaie and Hanayneh (2014)
36	Feedback	Kumar et al. (2011)
37	Process design	Saraph et al. (1989), Ahire et al. (1996), Flynn et al. (1994), Rao et al. (1999), Joseph et al. (1999), Mahapatra and Khan (2006), Lewis et al. (2006), Jamali et al. (2010), Zehir et al. (2012), Bahri et al. (2012), Noruzy et al. (2013), Kalra and Pant (2013)
38	Values and ethics	Jha and Kumar (2012)
39	Rewards and recognition	Yusof and Aspinwall (2000a, 2000b), Chapman and Al-Khawaldeh (2002), Baidoun and Zairi (2003), Baidoun (2004), Mahapatra and Khan (2006), Khamalah and Lingaraj (2007), Ueno (2009), Jha and Kumar (2012), Bahri et al. (2012), Arshida and Agil (2012), Long et al. (2015)
40	Delegations	Jha and Kumar (2012)
41	Design quality management	Juran (1974), Ishikawa (1976), Crosby (1979), Shewhart and Deming (1986), Garvin (1987), Lu and Sohal (1993), Dale and Cooper (1994), Powell (1995), Black and Porter (1996), Motwani and Kumar (1997).
42	Communication	Black and Porter (1996), Antony et al. (2002), Dean and Evans (2004), Mahapatra and Khan (2006), Samat et al. (2006), Zineldin and Fonsson (2000), Ueno (2009), Lewis et al. (2006), Valmohammadi (2011), Brun (2011), Garg and Garg (2011), Jha and Kumar (2012), Wanderi et al. (2015), Chepkoech (2015), Sinha et al. (2016)

Table 2 List of CSF of QMP with supporting literature (continued)

Sl. no.	*CSF of QMP*	*Supporting literature*
43	Customer orientation/customer focus/customer satisfaction	Juran (1974), Shewhart and Deming (1986), Garvin (1987), Stalk et al. (1992), Lu and Sohal (1993), Flynn et al. (1994), Dale and Cooper (1994), Philips Quality (1995), Powell (1995), Muffato and Panizzolo (1995), Black and Porter (1996), Ahire et al. (1996), Motwani et al. (1996), Motwani and Kumar (1997), Zeitz et al. (1997), Quazi and Padibjo (1998), Grandzol and Gershon (1998), Rao et al. (1999), Anderson and Sohal (1999), Yusof and Aspinwall (2000b), Sureshchandar et al. (2001), Chapman and Al-Khawaldeh (2002), Sila and Ebrahimpour (2002), Antony et al. (2002), Li et al. (2003), Yong (2003), Baidoun and Zairi (2003), Sousa (2003), Evans et al. (2004), Conca et al. (2004), Baidoun (2004), Agus (2005), Zadry (2005), Al-Nofal et al. (2004), Sila and Ebrahimpour (2005), Karuppusami and Gandhinathan (2006), Brah and Lim (2006), Lewis et al. (2006), Tarí (2006), Samat et al. (2006), Mahapatra and Khan (2006), Nair (2006), Ou et al. (2007), Sila (2007), Abdullah and Uli (2007), Guimaraes (1997), Bergman and Klefsjö (2007), Yusof et al. (2008), Ya'acob (2008), Awan et al. (2008), Oluwatoyin and Oluseun (2008), Fotopoulos and Psomas (2009), Mady (2009), Zehir et al. (2010), Talib and Rahman (2010), Sadikoglu and Zehir (2010), Jamali et al. (2010), Talib and Rahman (2010), Talib et al. (2012), Arumugam et al. (2011), Oghojafor et al. (2011), Brun (2011), Garg and Garg (2014), Nitin et al. (2011), Shahin and Dabestani (2011), Jha and Kumar (2012), Zehir et al. (2012), Bahri et al. (2012), Arshida and Agil (2012), Patrick (2012), Moghadam et al. (2013), Noruzy et al. (2013), Kalra and Pant (2013), Alolayyan et al. (2013), Oruma (2014), Sadikoglu and Olcay (2014), Irfan et al. (2014), Abuzaid (2015), Jabeen et al. (2015), Manhas et al. (2015), Long et al. (2015), Obeidat et al. (2016), Mukheta (2016), Haile and Raju (2016), Fatemi et al. (2016), Dedy et al. (2016), Kholopane (2016), Anil and Satish (2016), Sinha et al. (2016), Kafetzopoulos et al. (2015), Jaca and Psomas (2015), Psomas and Jaca (2016), Basu and Bhola (2016), Sweis et al. (2016), Vasantharayalu and Surjit (2016), Aquilani et al. (2017), Ebrahimi and Rad (2017), Qasrawi et al. (2017), Patyal and Koilakuntla (2017), Xiong et al. (2017), Farish et al. (2017), Mehralian et al. (2017), Pradhan (2017), Keinan and Karugu (2018), Arshad et al. (2018)
44	Business results	Juran (1974), Ishikawa (1976), Crosby (1979), Shewhart and Deming (1986), Garvin, (1987), Powell (1995), Motwani and Kumar (1997), Yeung et al. (2003), Lakhal et al. (2006), Fuentes et al. (2006), Demirbag et al. (2006b), Shrivastava et al. (2006), Tarí et al. (2007), Sila (2007), Yusuf et al. (2007), Sadikoglu and Olcay (2014), Sabella et al. (2014), Al-Ettayyem and Zu'bi (2015), Cetindere et al. (2015), del Alonso-Almeida et al. (2015), Kafetzopoulos et al. (2015), Jaca and Psomas (2015), Al-Dhaafri et al. (2016), Parvadavardini et al. (2016), Psomas and Jaca (2016), Shafiq et al. (2019), Xiong et al. (2017), Farish et al. (2017), Qasrawi et al. (2017)
45	Human resource management	Zhang et al. (1999), Kanji and Wallace (2000), Conca et al. (2004), Lewis et al. (2006), Sila and Ebrahimpour (2005), Prajogo (2005), Mahapatra and Khan (2006), Karuppusami and Gandhinathan (2006), Tarí e (2006) Tarí et al. (2007), Brah and Lim (2006), Jitpaiboon and Rao (2007), Sila (2007), Fryer et al. (2007), Ou et al. (2007), Ueno (2009), Awan et al. (2008), Al-Khalifa and Aspinwall (2008), Ya'acob (2008), Macinati (2008), Pinho (2008), Zu et al. (2008), Fotopoulos and Psomas (2009), Khanna et al. (2011), Sadikoglu and Zehir (2010), Mittal et al. (2011), Munizu (2011), Lam et al. (2012), Chen and Tsou (2012), Moghadam et al. (2013), Hietschold et al. (2014), Irfan et al. (2014), Mehralian et al. (2016, 2017), Kholopane (2016), Al-Dhaafri et al. (2016), Basu and Bhola (2016), Aquilani et al. (2017), Ebrahimi and Rad (2017), Farish et al. (2017), Pradhan (2017), Arshad et al. (2018)

Table 3 List of QMP factors with frequency of consideration by various researchers

Sl. no.	*Critical success factors*	*Acronym*	*Frequency of consideration*	*% frequency of consideration*	*Cumulative frequency*	*Cumulative %*	*Ranking*
1	Top management support/top management commitment and leadership styles	TMS&LS	124	16	124	16%	1
2	Customer orientation/customer focus/customer satisfaction	CS&F	109	14	233	30%	2
3	Supplier quality management	SQM	70	9	303	39%	3
4	Employee education and training	EE&T	58	7	361	46%	4
5	Process management	PM	57	7	418	53%	5
6	Employee involvement	EI	48	6	466	60%	6
7	Human resource management	HRM	42	5	508	65%	7
8	Continuous improvement	CI	35	4	543	69%	8
9	Business results	BR	29	4	572	73%	9
10	Team work	TW	28	4	600	77%	10
11	Benchmarking	BM	22	3	622	80%	11
12	Employee empowerment	EE	19	2	641	82%	12
13	Information and analysis	IA	15	2	656	84%	13
14	Communication	Comm	15	2	671	86%	14
15	Strategic quality planning	STQP	13	2	684	87%	15
16	Quality data reporting	QDR	12	2	696	89%	16
17	Strategic planning process	SPP	12	2	708	91%	17
18	Process design	Proc. design	12	2	720	92%	18
19	Product and service design	Prod. design	11	1	731	93%	19
20	Rewards and recognition	R&R	11	1	742	95%	20
21	Quality culture	QC	10	1	752	96%	21
22	Design quality management	DQM	10	1	762	97%	22
23	Quality improvement system	QIS	7	1	769	98%	23
24	Vision and plan statement	VPS	7	1	776	99%	24
25	Operational quality planning	OPS	6	1	782	100%	25

5 Sample data

The data was collected from manufacturing SMEs. Initially, for pilot-study, data was collected from 50 SMEs using 11-QMP factors scale to get feedback about factors, its items, its correctness and to fine-tune the QMP scale. The respondents were managers/supervisors or entrepreneur and employees of manufacturing SMEs. Based on pilot-study feedback and discussions with quality experts, academicians and SMEs owners, the draft scale was modified. The final scale designed was administered to 750 SMEs of which only 514 responded to the survey with response rate of 68.5%. Table 4 indicate the demographic profile of SMEs and respondents.

Table 4 Demographic characteristics of SMEs and respondents

Characteristics of SMEs and respondents			*Number*	*%*
Profile of SMEs	Age of firm	Less than 10 years	298	58
		Between 10–20	210	41
		More than 20 years	06	0
	Cost of the projects	INR1–10 lakhs	220	43
		INR11–25 lakhs	96	19
		INR26–50 lakhs	96	19
		INR51 lakhs–1 crore	102	20
	Size of firm	Less than 10	214	42
		Between 11–25	282	55
		Between 26–50	18	4
	Status of QMP in SMEs	High	226	44
		Low	288	56
Profile of respondents	Gender	Male	487	95
		Female	27	5
	Average monthly salary	Less than INR5,000	00	0
		INR5,000–10,000	132	26
		INR10,000–20,000	268	52
		More than INR20,000	114	22
	Experience	Between 0–10 years	423	82
		Between 11–25 years	82	16
		Between 26–50 years	08	2
		More than 50 years	01	0
	Qualification	ITI	00	0
		Diploma	105	20
		Undergraduate	139	27
		Graduate	157	31
		Postgraduation	114	22
	Age of the employee	Between 20–30 years	272	53
		Between 30–40 years	202	39
		Between 40–50 years	37	7
		Between 50– 60 years	03	1
	Type of job	Technical	400	78
		Non-technical	114	22

5.1 Profile of SMEs

Out of 750 SMEs, only 514 SMEs responded to the survey and majority (at 58%) of SMEs took part in the survey were less than ten years old and most (at 43%) of them involved were handling projects ranging between the INR1 to 10 lakhs; most of the firms (at 55%) participated in the survey were having employees in the range of 11 to 25 numbers. Further, with regard to status of QMP implementation, only 44% of SMEs had high level of QMP and 32% of SMEs had moderate level of implementation and 24% of SMEs represented low level of implementation.

5.2 Profile of respondents

The male respondents constituted the majority (at 95%) of the sample and majority (at 52%) of SMEs paid average salary ranging between Rs.10,000 to Rs.20,000. The respondents having experience up to ten years constituted the single largest category (at 82%) of the sample. The graduates constituted single largest category of respondents (at 31%) followed by undergraduates (at 27%). The respondents from age group of 20 to 30 years constituted single largest category (at 53%) of sample while those aged between 30–40 years was 39%. The technical staff constituted vast majority (at 78%) of sample and 22% of sample were non-technical staff.

6 Scale development and validation

By considering 11-QMP factors (critical/vital factors frequently considered as mentioned in Pareto analysis, Table 2) with 112 items, the initial draft scale was developed by avoiding use of compound or double-barrelled items and complex vocabulary. Further, these items were revised based on opinions collected from subject experts of Quality Circle Forum of India (QCFI) and entrepreneurs of various firms. This assisted in improving and checking content validity of QMP scale. Acknowledging the feedback, draft scale was modified and final measuring scale was designed consisting of 11-QMP factors with 81 items. The QMP scale consisted of two parts namely:

1 general information (firm and respondent

2 81 QMP items corresponding to 11-QMP factors.

The items were all on five-point Likert scale, with phrases of strongly agree and strongly disagree on point 5 and 1, respectively. The finalised QMP scale was administered to 750 manufacturing SMEs and 514 valid responses returned back and 19 responses were discarded due to partial and missing values. This resulted in responses rate of 68.5% for further analysis.

Table 5 KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling adequacy		.874
Bartlett's test of sphericity	Approx. chi-square	7,275.176
	df	946
	Sig.	.000

For the purpose of checking adequacy of collected data sample, Kaiser-Meyer-Olkin (KMO) statistic was performed. The test statistic yielded value 0.874 which is considered to be adequate (Kaiser and Rice, 1974) for conducting factor analysis. The KMO statistics along with the Barlett's test of sphericity, a measure of multivariate normality of data sample (DoF. 946, Sig. 0.00) is mentioned in Table 5. This indicated that values are significant and there exist non-zero correlation.

6.1 Exploratory factor analysis

EFA was performed on 11-QMP factors to ascertain the hidden dimensions by logically grouping variables or attributes. EFA with varimax rotation was employed to extract the items essential for factors. The EFA yielded nine-QMP factors explaining 69.82% of the total variance. The factors with eigenvalues > 1 (Kaiser criterion) and by considering the factor loadings above 0.5 and based on the items loading on each factor, they were labelled as follows:

Factor 1 top management commitment and leadership

Factor 2 employee education and training

Factor 3 supplier quality management

Factor 4 employee involvement

Factor 5 customer focus and satisfaction

Factor 6 process management

Factor 7 human resource management

Factor 8 continuous improvement

Factor 9 benchmarking.

These items with loadings are shown in Table 6. The reliability coefficient of items in the questionnaire was 0.875 Cronbach's alpha value, which indicated that all nine-QMP factors had acceptable reliabilities (Kline, 1998).

6.2 Confirmatory factor analysis

Before performing CFA, data was tested for any missing items or entries, since it often problematic for the estimation of SEM. To assess the validity of nine-QMP factors with 51 items, CFA using AMOS 22 software was performed with maximum likelihood method. This process will eliminate those items with loading coefficients less than 0.5. The CFA assess factor validity (Zakuan et al., 2009) through proper testing and validation. It is based on comparison of variance-covariance matrix obtained from collected data to the one obtained from the model (Van Prooijen and Van Der Kloot, 2001). The model fit is usually analysed through set of fit indices namely: goodness fit index (GFI), adjusted goodness of fit index (AGFI), comparative fit index (CFI), incremental fit index (IFI) and Tucker-Lewis coefficient (TLI) all these indices must be close to 1.0 for perfect fit (Bentler, 1992; Byrne, 2016). While, error approximation in data is represented by root mean square error of approximation (RMSEA) must be less than 0.08 (Browne and Cudeck, 1993). The CFA was performed confirmed seven-QMP

factors model with adequate model fit as shown in Figure 2. The model fit indices of the test yielded values above acceptable criterion range as mentioned in Table 7.

Figure 2 Path diagram for seven-factors QMP measurement model (see online version for colours)

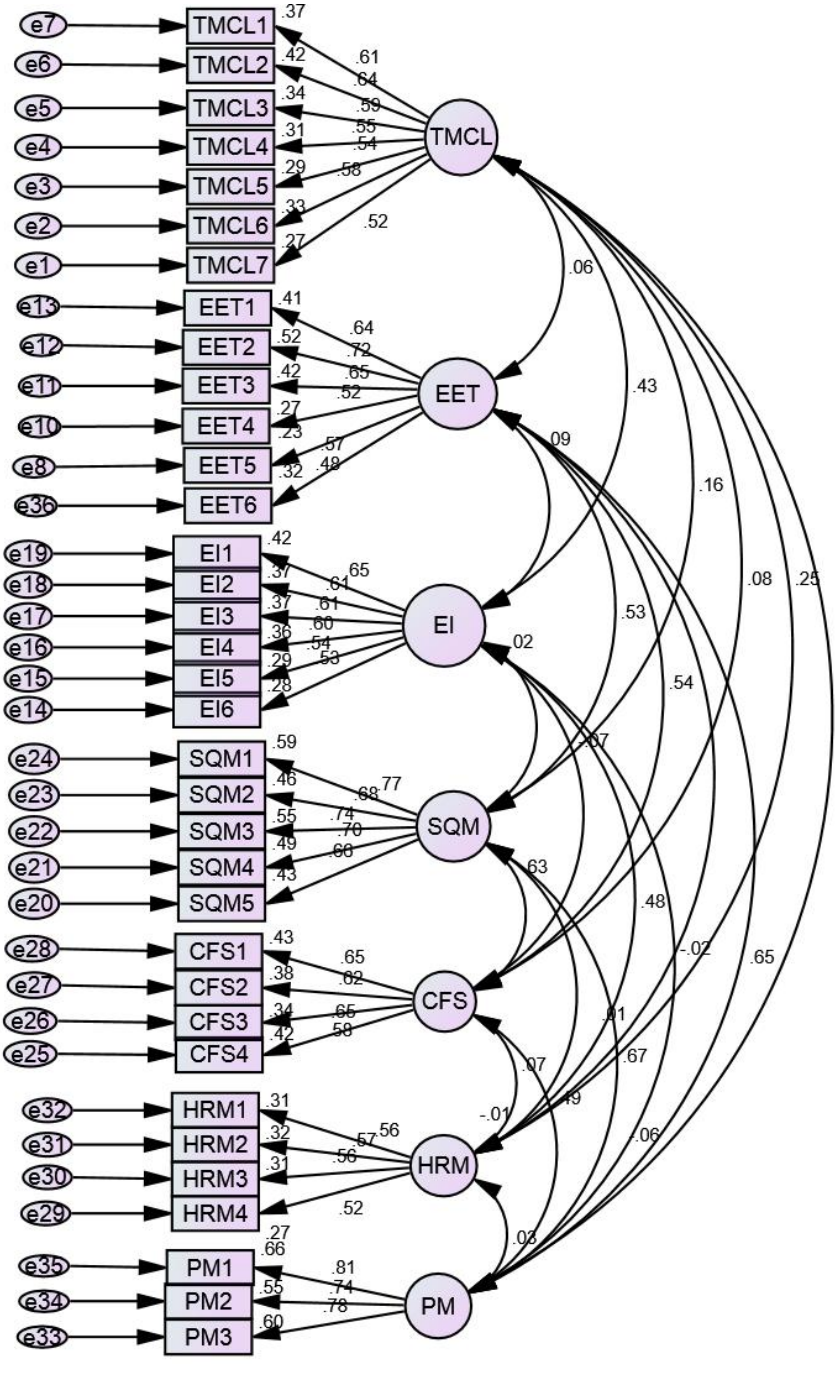


Table 6 Factor loadings of QMP factors by EFA

QMP factors	*Measurable values/items*	*Weights*	*Eigenvalues*	*Variance*	*Accumulated*
Top management commitment and leadership (TMCL)	Identification of areas of improvement	0.878	9.029	27.361	23.086
	Quality improvement steering committee	0.860			
	Leadership commitment	0.837			
	Organisation quality mission and policies	0.810			
	Management reviews	0.794			
	Continuous improvement of processes	0.749			
	Monitoring quality management activities	0.719			
	Periodic customer satisfaction survey	0.687			
Employee education and training (EET)	Quality related responsibility	0.861	3.926	11.897	32.317
	Training on quality principles	0.809			
	Identification of training needs	0.791			
	Training on job related skills	0.754			
	Continuous learning programs	0.729			
	Top management always updates their knowledge	0.678			
	Training to identify and act on quality improvement opportunities	0.534			
Supplier quality management	Long-term relationship	0.769	2.291	6.941	40.068
	Quality audits	0.681			
	Few suppliers	0.655			
	Supplier involvement in quality improvement	0.630			
	Suppliers are selected based on quality aspects	0.620			
	Suppliers provide relevant quality records	0.576			
Employee involvement (EI)	Employee commitment	0.818	1.595	4.834	46.893
	Participation in quality decisions	0.806			
	Quality awareness to employees	0.711			
	On-job training	0.709			
	Co-workers value other employees' contribution	0.603			
	Teamwork and participation	0.593			
	Consideration of employee's thought to make quality decision	0.533			

Table 6 Factor loadings of QMP factors by EFA (continued)

QMP factors	*Measurable values/items*	*Weights*	*Eigenvalues*	*Variance*	*Accumulated*
Customer focus and satisfaction (CFS)	Delivery of quality products	0.715	1.453	4.402	52.277
	Product reliability	0.626			
	Focus on product quality	0.591			
	Resolving customers complaints	0.542			
	Customers' requirements addressed in the product design procedures	0.513			
	Assessing of current customers' needs and expectations	0.509			
Process management (PM)	Reduction of cycle time	0.781	1.354	4.102	57.247
	Standard operating procedure	0.731			
	Inspections, review or checking of work	0.641			
	Measure to ensure process yields quality outputs	0.597			
	The employees are involved in different processes and know how to evaluate them	0.582			
Human resource management (HRM)	Roles, responsibilities and authorities	0.852	1.188	3.601	61.800
	Leadership role in QM	0.774			
	Employee well-being	0.721			
	Reward and recognition	0.599			
	Adequate and fair compensation	0.520			
Continuous improvement (CI)	Reinforce continuous study	0.782	1.111	3.366	65.870
	Active improvement teams	0.736			
	Product quality design	0.754			
	Feedback on performances	0.681			
Benchmarking (BM)	Reducing product cost	0.754	1.096	3.322	69.825
	Periodical revision of the performance measures	0.689			
	Commitment to change expressed in strategic plans	0.512			

Table 7 Model fit indices for seven-QMP factors

Model fit indices	*QMP factors*							*Acceptable criterion range*
	TMCL	*EET*	*EI*	*SQM*	*CFS*	*HRM*	*PM*	
χ^2/df	1.834	2.235	2.010	1.999	0.360	1.531	0.981	Less than 3
GFI	0.981	0.962	0.990	0.901	0.925	0.943	0.969	Greater than 0.9 or close to 1
AGFI	0.968	0.971	0.977	0.992	0.965	0.911	0.952	
CFI	0.988	0.979	0.985	0.995	1.000	0.998	0.986	
IFI	0.988	0.979	0.985	0.995	1.002	0.988	0.986	
TLI	0.980	0.680	0.975	0.990	1.006	0.993	0.972	
RMSEA	0.042	0.058	0.047	0.033	0.000	0.024	0.049	Less than 0.08

The standardised regression weights for all factors are shown in Table 8 and are significant at the 0.05 level. The CFA model of seven-QMP factors with 35 items indicated factor loadings or estimates in the range of 0.50 to 0.81 which is above the acceptance criterion of 0.3, indicating convergent validity. The R-squared loadings are in the range of 0.23–0.66 and it represents the percentage variation in the 35 items. The path diagram of seven-QMP factors is shown in Figure 2. The chi-square statistics was 734.625 (df = 536 and p = 0.000), χ^2 / df ratio = 1.371, GFI = .928, AGFI = .915, IFI = .959, TLI = .954, CFI = .959 (indices > 9 indicates good model fit) and RMSEA = 0.027 (errors of approximation, smaller is better). All the major fit indices of the CFA model indicated good fit and model proposed for QMP consisting of seven factors with 35 items has construct validity, i.e., all the seven factors and their respective items can effectively measure the QMP in manufacturing SMEs.

Table 8 Standardised coefficient estimates and square loadings values of seven QMP factors

Parameters	*QMP factors*							*Acceptable criterion range*
	TMCL	*EET*	*EI*	*SQM*	*CFS*	*HRM*	*PM*	
Factor loading or standardised coefficient estimates	.62	.72	.65	.77	.65	.57	.81	Greater than 0.30 shows convergent validity
	.60	.65	.61	.74	.65	.56	.74	
	.59	.64	.61	.70	.62	.56	.78	
	.59	.57	.60	.68	58	.52		
	.56	.52	.54	.66				
	.53	.48	.53					
	.50							
Squared loadings (percentage of variation)	.39	.41	.42	.59	.43	.31	.66	
	.36	.52	.37	.46	.38	.32	.55	
	.34	.42	.37	.55	.34	.32	.60	
	.32	.27	.36	.49	.42	.27		
	.35	.23	.29	.43				
	.25	.32	.28					
	.28							

7 Discussion and conclusions

In highly dynamic and competitive environment, QMP help firms to survive and gain competitive advantage. Out of 514 surveyed manufacturing SMEs, around 226 SMEs (44%) reported to have high level of QMP implementation. Probably, it is safe to assume that Indian manufacturing SMEs are aware about QMP and its benefits. Further, the responses obtained are expected to be reliable since all the surveyed SMEs have high level of awareness about QMP.

From literature, it is evident that very few studies have developed QMP model suitable for SMEs context (Kalpande et al., 2013; Sahoo and Yadav, 2018). QMP implementation is country dependent (Sila and Ebrahimpour, 2002) and it is firm specific (Dean and Bowen, 1994). Over the late few decades, many studies on QMP in Indian SMEs have exploded and researchers have expressed need for more systematic studies in depth. Indian SMEs are in need of easy, pragmatic and appropriate QMP approach which can guide them for the way forward to success. From the published literature in Indian context, many studies have been attempted, but it is limited and seems to be rigid and not apt for SMEs. The ones which have been developed have randomly identified factors using limited responses from quality managers/owners/CEOs/top managers on the basis of their subjective evaluations (Sahoo and Yadav, 2018; Kharub and Sharma, 2016) and validated the factors through sample mean comparison (Mallur et al., 2012). It is essential to systematically identify the factors that are to be evaluated, as they verify what the scale will measure with reference to context of study. Further, identified factors must be validated to ensure that, selected factors can clearly measure the concepts or area of interest. The validation of scale will determine the degree to which the identified factors will satisfactorily represent the underlying construct/factors that it is supposed to measure. This presents the research gap on systematic identification and validation of QMP factors in Indian manufacturing SMEs. Thus, the present study has systematically reviewed and analysed literature in SMEs context and 11 vital QMP factors were identified using Pareto analysis and validated using SEM which is often used by researchers in recent times (Henriksen and Pedersen, 2007) by considering specific attributes of Indian manufacturing SMEs. The scale was validated using 514 responses and respondents were managers, owners and employees and factors validity was explored using EFA and CFA and internal consistency was examined using Cronbach's alpha. To the authors' knowledge, there has not been a study which systematically developed QMP scale by considering responses from employees working in the firm. The validation of factors using SEM includes the assessment based on factors loadings, GOF indices and squared loadings. The developed seven-QMP factors measurement model has satisfied all the assessment criteria and hence the scale developed is considered valid to measure QMP. The validated QMP scale includes following factors: top management commitment and leadership styles, employee education and training, employee involvement, supplier quality management, customer focus and satisfaction, human resource management and process management. The research findings are consistent with the Malcolm Baldrige Award Criteria and Rajiv Gandhi National Quality Award in India. Similar research findings have been reported by then subject experts (Saraph et al., 1989; Ahire and Golhar, 1996; Samson and Terziovski, 1999) and as well in Indian manufacturing SMEs context (Kharub and Sharma, 2016). Thereby, the results of this study confirm to be reliable for successful QMP implementation in Indian manufacturing SMEs.

QMP is quality oriented management philosophy having its roots in manufacturing sector. To stay competitive, manufacturing SMEs are making modest attempt by embracing various quality practice. The successful implementation of QMP solely depends on top management commitments towards quality inventiveness. The quality managers and owner/entrepreneur of SMEs must take necessary measures to integrate quality practices with organisational goals so they can reap the benefits of QMP like the large-sized firms. Many researchers have identified various QMP factors and framework, but all are not similar (Majumdar, 2016), since it is context dependent (Bishop, 2018) and this would baffle QMP implementation (Nitin et al., 2011). This way, the present study fills research gap by validating the identified seven-QMP factors. The QMP factors identified and validated are based on the actual QMP factors practiced in manufacturing SMEs. Further, the identified factors are validated using empirical data and employee's perceptions on QMP in manufacturing SMEs with acceptable reliability value of 0.875. This would assist SMEs managers and owners to identify the key areas to focus upon and address them on priority basis by choosing right tools/practices at the right time in the right way to improve product quality and performance-levels. Further, the factors considered for the study are those, that are currently practiced by SMEs, thus by effective and careful implementation of seven-QMP factors, firms can realise high quality product and long-term sustainable growth.

The QMP scale developed has high validity for Indian manufacturing SMEs, as the data was collected from 514 respondents of Indian manufacturing SMEs. For the present study, data came from managers, owners and employees working in Indian manufacturing SMEs, however, previous studies [162 general managers and 89 quality managers of 20 companies (Saraph et al., 1989), 371 manufacturing firms (Ahire et al., 1996), 62 quality managers/CEOs (Motwani, 2001b), and 139 production managers or quality managers (Salaheldin, 2009)] used the data collected from managers or quality analysts or CEOs/owners with limited sample size. The collection of data from more than one respondent from each firm will reduce the tendency of getting over-assertive responses.

In summary, the scale appears to be valid and reliable to evaluate and measure QMP implementation in Indian manufacturing SMEs. The factor top management commitment and leadership, is a predominant factor and QMP implementation is mainly dependent on management support and initiatives (Ugboro and Obeng, 2000) and it influences other QMP factors (Anderson, 1995; Kaynak, 2003). The other six factors are supporting blocks to strengthen the base of QMP implementation. SMEs can implement the seven-QMP factors model and begin their quality journey with improved business performance.

In developing countries, SMEs play a very crucial role by contributing to the economic growth and generating employment. Likewise, in India, around 95% of industrial units (3.4 million) are in SMEs sector with 40% in manufacturing sector and 40% of industrial production. In view of this, the growth and success of SMEs will have direct influence on economic growth of the country. This paper presents a reliable and valid QMP scale for Indian manufacturing SMEs with empirical insights. This can support Indian policy-makers, enterprises owners and business associations like Confederation of Indian Industry (CII) to make informed decision regarding quality improvement initiatives in SMEs context.

In India, 95% of industrial units (3.4 million) are in small-scale sector with a 40% value addition in the manufacturing sector. Enterprises of this type provide the second

highest employment level after agriculture and account for the 40% of industrial production. These units contribute 35% to India's exports. In this setting, Indian SMEs are fundamentally important to the Indian economic system. Their potential to generate employment, bolster exports and bring flexibility into India's business environment deserves close attention and support form India's policy-makers.

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