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## Investigation of TQM implementation: empirical study in Brazilian ISO 9001-registered SMEs

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This paper presents an investigation of TQM implementation in the context of small and medium enterprises (SMEs) ISO 9001:2008 registered Brazilian companies. The applied research method was a survey with 200 firms, and the structural equation modelling technique applied to analyse the empirical data. The results reveal significant issues about the context considered. The findings point out that ISO 9001:2008 practices may not necessarily drive performance improvements, i.e. the Brazilian SMEs are not moving towards TQM because of the lack of awareness of TQM and commitment to continuous improvement philosophy. The companies appear to be more concerned with TQM practice implementation, which guarantees the ISO certificate than with quality improvement, which leads to a better performance. Finally, the results of the study have come into question if the TQM model is robust enough to be implemented on SMEs. The search of an answer to this question requires more investigation by scholars.

**Keywords:** total quality management; ISO 9001; SME; structural equation modelling

### 1. Introduction

Over the decades since Saraph, Benson, and Schroeder (1989), researchers have altered and improved the concept of TQM. Besides there being many TQM definitions, its focus and objective have remained relatively unchanged: to improve business performance (Ahmad, Zakuan, Jusoh, Ariff, & Takala, 2012). Indeed, the TQM role, argued by Powell (1995) and Flynn, Schroeder, and Kibara (1995), is to improve business performance. Afterwards, other authors have broadly agreed (Ahire & Dreyfus, 2000; Agus & Hassan, 2014; Yunis, Jung, & Chen, 2013; Lam, Lee, & Ooi, 2012; Burli, Bagodi, & Kot-turshettar, 2012). Ahire, Golhar, and Waller (1996) pointed out the performance gap between TQM and non-TQM firms and reaffirmed the importance of TQM in a firm's performance.

The small and medium enterprises (SMEs) are an interesting context for the study of TQM. They play a significant role in supply chains because they are often suppliers of goods and services to large organisations. In general, the lack of product quality would adversely affect their competitive ability (Ghobadian & Galear, 1996). Moreover, SMEs represent a critical and challenging context for TQM because they lack the resources and infrastructure of large organisations. Thus, some quality practices that would improve SMEs' performance are blocked by their either limited or non-investment capability in many aspects of quality management, e.g. training. Finally, SMEs have cultural and management awareness barriers that may compromise TQM implementation (Ruang-permpool, 2002).

Although many SMEs' managers agree with the TQM principles, they are not willing or capable of implementing it effectively (Parking & Parking, 1996). Any SME without

any formal quality system can be greatly benefited when they apply the discipline and proper procedures as prescribed in ISO 9001 requirements. The ISO 9001 certification process, as the first step to TQM journey, contributes to ensuring employees training, commitment, and responsibility on quality issues (Prajogo & Brown, 2006). Indeed, the ISO 9001 certification provides the building blocks for a successful TQM implementation (Quazi and Padibjo, 1998; Rahman, 2001).

Some SMEs are progressing towards TQM, but it does not come fast and should not be expected in a short term. Since the 1990s, many Brazilian companies have implemented ISO 9001 model and succeeded to comply with the requirements. Therefore, it is supposed that such quality systems present some degree of maturity. Following that, we come up with two research questions: Are the Brazilian SMEs evolving towards TQM? Is TQM such a robust model for SMEs as well as for the large companies?

Therefore, this paper aims to investigate TQM model implementation in the context of Brazilian SMEs ISO 9001:2008-registered companies. This article formulates causal hypotheses based on existing literature and tests it with an empirical study using the survey research method. The data analysis applies the structural equation modelling technique.

This paper is structured as follows: Section 2 provides a theoretical background on TQM and SMEs. Section 3 explains validation procedures and details the research method used. Section 4 presents the empirical findings and analysis. Finally, Section 5 offers our conclusions.

## **2. Theoretical background**

This section discusses the TQM model. In the first part of it, we address the TQM model already consolidated in large companies. In the second part, some aspects of TQM in SMEs are discussed with the focus on the barriers and enablers for TQM implementation in such critical setting. In the following section, the hypotheses are formulated from the theoretical background. The objective is to find a robust and broadly supported base of constructs to represent TQM. The section defines a set of performance construct and formulates hypotheses about the relationship between the constructs.

### **2.1. The TQM model**

The TQM model was addressed early on by Saraph et al. (1989), who proposed seven constructs: management leadership, training, employee relations, quality data and reporting, supplier quality management, product/service design, and process management (PM). Several other authors also addressed the same model, offering minor construct modifications (Flynn et al., 1995; Ahire et al., 1996; Black & Porter, 1996; Forza & Filippini, 1998). Some authors replaced training and employee relations with workforce management, people management, or human resource management (Tari, Molina, & Castej, 2007 and Zu, 2009). Similarly, the quality data construct proposed by Saraph et al. (1989) have since been replaced with PM, by Brah, Wong, and Rao (2000) and Sharma and Kodali (2008), and with process control, by Singh and Sushil (2013). The main reasons for such substitutions are the use of data and statistical tools to analyse and control processes.

Authors such as Anderson, Rungtusanatham, Schroeder, and Devaraj (1995) and Ahire and O'Shaughnessy (1998) addressed the same issue with some sensitive modifications on previous constructs. As possible TQM constructs, Anderson et al. (1995) proposed

learning and continuous improvement. Ahire and O'Shaughnessy (1998) introduced the customer focus (CF) construct. Ahire et al. (1996) and Brah et al. (2000) proposed benchmarking and Das, Paul, and Swierczek (2008) proposed product innovation.

Continuous improvement is always an important issue; no one can oppose improvement (Ackoff, 1991). Most articles declined to address continuous improvement as a separate construct (Sit, Ooi, Lin, & Chong, 2009; Prajogo, 2005; Ooi, Lin, Tan, & Chong, 2011), although they recognise that it is intrinsically embedded in other TQM constructs (e.g. PM).

Many studies have, nonetheless, supported the addition of the CF construct to Saraph's original seven (Rahman & Bullock, 2005; Sila & Ebrahimpour, 2005; Feng, Prajogo, Tan, & Sohal, 2006; Talib, Rahman, & Qureshi, 2013).

The supplier quality construct, frequently mentioned as supplier management (SM), is a construct that several papers have supported (Macinati, 2008; Tarí et al., 2007; Zu, 2009).

Both constructs are considered core constructs in the TQM model along with leadership, PM, and human resources management (HRM, Saraph et al., 1989). They are an integral part of the excellence criteria of the most significant national quality awards and accepted perspectives of TQM (Powell, 1995; Sharma & Kodali, 2008; Bou-Llusar, Escrig-Tena, Roca-Puig, & Beltran-Martín, 2009; EFQM Criteria, 2003; MBNQA Criteria, 2007).

Moreover, Wilson and Collier (2000) support the strategic planning (SP) as part of the TQM model. In most recent works, many authors used such a construct (Brah, Lee, & Rao, 2002; Lam et al., 2012; Talib et al., 2014). The use of SP as a core construct is a consequence of the quality concept evolution. Nowadays, quality is a strategic issue for the majority of companies around the world.

The literature review shows that the TQM model has been investigated extensively. That allows to identifying some core constructs: leadership, SP, CF, SM, PM, and human resource management (Sila & Ebrahimpour, 2005; Escrig-Tena, Bou-Llusar, Beltrán-Martín, & Roca-Puig, 2011; Lam et al., 2012; Arumugam, Chang, Ooi, & Teh, 2009; Brah et al., 2002). The present study also uses those six constructs as a TQM foundation. They are defined as follows:

- (1) *Leadership* (LD) deals with the importance of effective support and involvement of the top management on quality issues. It measures the degree to which top management accepts and supports quality principles, prioritises quality indicators rather than costs and schedule indicators, participates and encourages employee's participation in quality affairs, defines clear goals and performance evaluation indicators, and allocates the proper resources towards the quality improvement correctly.
- (2) *CF* deals with the importance of the customer within an organisation's priorities. It measures the degree to which the organisation recognises customer needs and takes appropriate action, measures and assures its customer satisfaction, handles customer complaints, and offers any kind of recovery or after-sales service.
- (3) *SP* reveals the degree to which the quality vision is clear, so as to be able to establish a future plan according to quality parameters. It measures the degree to which all members of the board are cognisant of SP with the involvement of customers, shareholders, and suppliers. It also measures how effectively the plan cascades into achievable operational goals.

- (4) *SM* consists of measuring the degree to which top management establishes and maintains good relationships with suppliers, and measures the suppliers' capacity to comply with quality requirements. It also measures the degree to which a supplier is committed to process improvement and willing to solve possible quality problems that involve them.
- (5) *PM* deals with the practice of quality management as a means to achieving high performance in company activities and processes. It also includes the use of tools and techniques to improve quality, the presence of statistical analysis and control, and the documentation of critical standard processes.
- (6) *HRM* measures the involvement, motivation, and satisfaction of the employees as well as the maintenance of a peaceful and pleasant work environment that encourages quality improvement. It also considers how employees are evaluated and if their performance is recognised using quality standards.

It is important to note that TQM is a multivariate model and not a multidimensional construct. Therefore, it is not a high order factor, but the relationship among the six core constructs represents it.

Table 1 shows all the essential constructs and their respective indicators which were picked up from literature by a frequency citation considering the most cited papers. The same criterion was used for performance constructs as well.

## **2.2. The performance construct**

There are plenty of performance definitions. Hung, Lien, Yang, Wu, and Kuo (2011) and Sadikoglu and Zehir (2010) used innovation performance. Lam et al. (2012) measured employee performance. As the output of their model, Escrig-Tena et al. (2011) measured strategic flexibility. Therefore, it is necessary to define what type of performance is to be measured in this study.

The focus of this study is on performance from internal point view. It does not consider external performance indicators such as customer satisfaction or market participation. Even excluding all the external performance indicators, the internal performance is still a complex construct; it involves issues such as employee satisfaction, operational performance, and financial performance, among others.

Many attempts to measure internal performance have used a broad performance measure as quality performance (Baird, Hu, & Reeve, 2011; Kaynak, 2003; Tarí et al., 2007) or company performance (Sadikoglu and Zehir, 2010; Arumugam et al., 2009). The indicators measure more than one type of performance (employee, operational, and financial) in a single performance construct. The problem with these broad constructs is that they restrict the study contribution, not allowing more accurate conclusions. For instance, some empirical evidence supports the idea that leadership affects performance, but researchers would be unable to postulate whether it affects only the product performance or only the process performance.

This paper is interested in measuring the effect of TQM on, ultimately, financial performance. Some authors have considered financial performance in their structural model (Demirbag, Tatoglu, Tekinkus, & Zaim, 2006; Kaynak, 2003; Laosirihongthong, Teh, & Adebajo, 2013) and it is frequently used as the output (dependent variable).

Despite such considerations, the direct relationship between some constructs of TQM model and financial performance may not be supported by a short-term view (Sila, 2007). Kaynak (2003) stated that it would be interesting to measure this relationship with non-

Table 1. TQM constructs and their indicators.

Latent constructs and observed indicators	Authors
<i>(1) Leadership (LD)</i>	
LD1 – We have clear quality goals defined by the top-level managers and our performance evaluation depends heavily on quality	Ahire et al. (1996), Brah et al. (2002), Hung et al. (2011) and Kaynak (2003)
LD2 – Top-level managers allocate adequate resources towards efforts to improve quality	Ahire et al. (1996), Hung et al. (2011), Kumar, Garg, and Garg (2011) and Macinati (2008)
LD3 – Top-level managers view quality as more important than costs and schedules objectives	Ahire et al. (1996), Brah et al. (2002), Kaynak (2003) and Kumar et al. (2011)
LD4 – Managers encourage, support and participate in continuous improvement process	Escrig-Tena et al. (2011), Zu (2009), Kaynak (2003) and Talib et al. (2014)
<i>(2) CF</i>	
CF1 – Customer needs and expectations are known and understood by all staff members	Ahire et al. (1996), Talib et al. (2014), Brah et al. (2002) and Rahman and Bullock (2005)
CF2 – Our company conducts a customer satisfaction evaluation and take action to improve the results	Escrig-Tena et al. (2011), Zu (2009) and Talib et al. (2014)
CF3 – Our organisation collects complaints data from clients and threat them with priority	Lam et al. (2012), Brah et al. (2002) and Kumar et al. (2011)
CF4 – Our organisation provides warranty on sold products or a good after sale service	Lam et al. (2012), Brah et al. (2002) and Sharma and Kodali (2008)
<i>(3) SP</i>	
SP1 – Planning are known by all staff members and involves the employers, stakeholders, customers and suppliers in setting objectives	Brah et al. (2002), Talib et al. (2014) and Bou-Llugar et al. (2009)
SP2 – Strategic plans and linked with quality values (CF, quality commitment), and not only with profit expectations	Lam et al. (2012), Brah et al. (2002) and Macinati (2008)
SP3 – Strategic plans are translated into a set of specific and measurable objectives	Escrig-Tena et al. (2011) and Bou-Llugar et al. (2009)
SP4 – Results are compared to the previous planned results in order to improve the planning process	Tarí et al. (2007)
<i>(4) Suppliers Management (SM)</i>	
SM1 – The suppliers are required to meet the quality specifications	Demirbag et al. (2006), Talib et al. (2014), Ahire et al. (1996) and Kaynak (2003)
SM2 – Quality is the main criterion for selecting suppliers instead of prices or delivery schedules	Talib et al. (2014), Kaynak (2003) and Ahire et al. (1996)
SM3 – There are cooperation from our supplier to improve process, solve quality problems and to discuss new product development	Brah et al. (2002), Kaynak (2003) and Escrig-Tena et al. (2011)

*(Continued)*

Table 1. Continued.

Latent constructs and observed indicators	Authors
SM4 – The company conducts supplier inspections frequently and take action from the results	Demirbag et al. (2006) and Sharma and Kodali (2008)
(5) <i>PM</i>	
PM1 – Our company uses techniques or tools for improvement in the manufacturing process	Talib et al. (2014), Bou-Llusar et al. (2009) and Tari et al. (2007)
PM2 – Process are systematically measured, controlled and managed	Bou-Llusar et al. (2009) and Tari et al. (2007)
PM3 – Process are controlled using statistical tools and the process control do not rely on inspection only	Demirbag et al. (2006), Macinati (2008) and Lakhali et al. (2006)
PM4 – Work methods are explicitly defined	Escrig-Tena et al. (2011) and Kaynak (2003)
(6) <i>Human Resource Management (HRM)</i>	
HRM1 – Employee satisfaction are formally and regularly measured	Lam et al. (2012) and Sharma and Kodali (2008)
HRM2 – The company has a training programme to all employees and the programme is followed.	Brah et al. (2002), Bou-Llusar et al. (2009) and Escrig-Tena et al. (2011)
HRM3 – Employees are allowed and encouraged to participate in quality assurance programmes	Ahire et al. (1996), Kaynak (2003), Demirbag et al. (2006) and Escrig-Tena et al. (2011)
HRM4 – Our employees are evaluated and recognised for superior quality performance	Demirbag et al. (2006), Kaynak (2003) and Zu (2009)

financial performances. Demirbag et al. (2006) found that mediating this relationship with non-financial performance leads to a better model.

In this paper, we decided to use neither a broad operational performance nor a quality performance. Instead, the study uses both product performance (Jayaram, Ahire, Nicolae, & Ataseven, 2012; Laosirihongthong et al., 2013) and process performance (Salaheldin, 2009) to mediate the relationship between TQM and financial performance. Nevertheless, the direct relationship between those constructs and financial performance is still being tested by Lakhali, Pasin, and Limam (2006). Those authors applied the same differentiation, breaking down company performance into financial, product, and operational (focused on the process) performances. Table 2 shows all performance constructs and the respective indicators.

### 2.3. *TQM in SMEs*

SMEs still represent a critical and challenging context for TQM due to the lack of resources, structure, technical competence and management commitment required to TQM implementation (Majumdar & Manohar, 2016).

Those characteristics should not discourage scholars to investigate TQM in SMEs' context because that setting should act as a critical situation for testing TQM model. Imre Lakatos argues that a research programme should be tested on critical settings to expand its validity (Chalmers, 1999).

Table 2. Performance constructs and their indicators.

Latent Constructs and observed indicators	Authors
<i>Product Performance (PDP)</i>	
PDP1 – Product Overall Performance	Ahire et al. (1996) and Ahire and Ravichandran (2001)
PDP2 – Product Reliability	Ahire et al. (1996) and Ahire and Ravichandran (2001)
PDP3 – Product Conformance with specifications	Ahire et al. (1996) and Ahire and Ravichandran (2001)
<i>Process Performance (PCP)</i>	
PCP1 – Productivity improvement	Kaynak (2003), Bou-Llusar et al. (2009) and Sila and Ebrahimpour (2005)
PCP2 – Lead time improvement	Kaynak (2003), Bou-Llusar et al. (2009) and Sila and Ebrahimpour (2005)
PCP3 – Quality cost improvement	Kaynak (2003), Brah et al. (2002) and Sila and Ebrahimpour (2005)
<i>Financial Performance (FNP)</i>	
FNP1 – Market share growth	Kaynak (2003), Bou-Llusar et al. (2009), Laosirihongthong et al. (2013) and Sila and Ebrahimpour (2005)
FNP2 – Sales growth	Kaynak (2003), Demirbag et al. (2006), Laosirihongthong et al. (2013), Bou-Llusar et al. (2009) and Sila and Ebrahimpour (2005)
FNP3 – Profit growth	Kaynak (2003), Demirbag et al. (2006), Laosirihongthong et al. (2013), Bou-Llusar et al. (2009) and Sila and Ebrahimpour (2005)

As already presented, TQM has a robust core of elements. However, it is important to investigate empirically how TQM model is strong to move to more complicated contexts. SMEs offer the critical context for testing TQM research programme.

SMEs present barriers for successful TQM implementation. Among them, we can identify cultural barriers, management awareness and lack of commitment, lack of technical competence and knowledge of TQM, financial constraints, and lack of resources for investments (Ghobadian & Galar, 1996; Ruangpermpool, 2002).

On the other hand, SMEs present enablers for successful TQM implementation. The quicker decision-making ability, the faster customer feedback, the close contact with suppliers and employees, and a small amount of money and time required to train the employees can facilitate the TQM implementation (Majumdar & Manohar, 2016). Furthermore, the better employees' involvement and participation, and the trust and empowerment of employees can contribute to the development of a work environment that favours TQM.

Considering both barriers and enablers, SMEs can apply TQM model with considerable success (Ghobadian & Galar, 1996).

We propose a set of hypotheses to investigate TQM in SMEs' context empirically. Figure 1 shows all the proposed hypotheses in this section.

According to Majumdar and Manohar (2016), the essential framework needed for successful TQM implementation includes the following elements:

- management commitment,
- quality awareness at all levels of the organisation,
- involvement of customers and good relations with suppliers,
- statistical quality control,



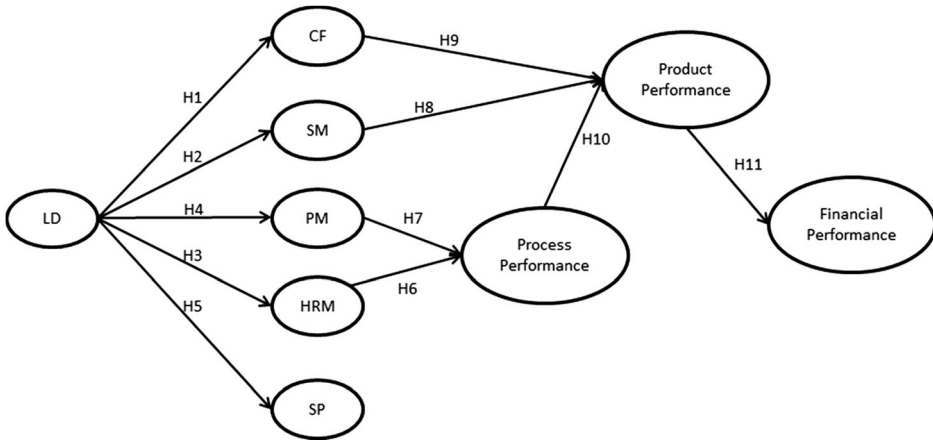


Figure 1. Structural model.

- teamwork, training, and employee participation,
- quality culture, and
- continuous improvement.

In these elements, we can identify the three major aspects of TQM: the cultural, the technical, and the managerial.

The managerial perspective represents the leadership's commitment and enough knowledge of TQM to support quality practices and, as a consequence, attain quality results.

Specifically in SMEs' context, the close contact between owners and customers, suppliers, and employees are a reality that promotes TQM implementation.

Hypotheses *H1–H5* test the managerial aspect of TQM. A committed leadership should encourage TQM practices implementation related to CF, SM, PM, HRM, and SP. We intend to analyse the results of hypotheses *H1–H5* to empirically test the 'lack of management commitment' and the 'lack of management awareness of TQM' pointed out by Majumdar and Manohar (2016).

*H1*: Leadership is positively related to CF.

*H2*: Leadership is positively related to SM.

*H3*: Leadership is positively related to human resource management.

*H4*: Leadership is positively related to PM.

*H5*: Leadership is positively related to SP.

The rejection of hypotheses *H3* and *H4* could provide empirical evidence to corroborate to 'the lack of resources', an SME's characteristic, to properly train employees and provide tools and technologies for effective PM.

The technical aspect is related to the 'lack of technical skill, education, and expertise' and to 'the lack of tools and technology' as Majumdar and Manohar (2016) reaffirm as obstacles in SMEs. Hypotheses *H3* and *H6* test the technical skill and the ability to enable process performance. Hypotheses *H4* and *H7* verify the lack of tools and technologies and their impact on process performance in SMEs.

*H6*: Human resource management is positively related to process performance.

*H7*: PM is positively related to process performance.

The cultural aspect of TQM is associated with the development of a quality culture that should disseminate at least the continuous improvement philosophy at all organisational levels.

Internally, manager's involvement and the employees' participation are essential to developing a quality culture. Externally, customer and suppliers participation in solving quality problems helps to ensure quality performance. Hypotheses *H6* and *H7* are deeply connected with the presence of continuous improvement element of organisation's culture.

Hypotheses *H8* and *H9* also consider the external contribution to the firm's performance. Close contact with customers will enable the better understanding of their needs and respond effectively, generating more customised products to attend the customer expectations. Close contact with suppliers will allow long and reliable relationship which should affect product quality positively.

*H8*: SM is positively related to product performance.

*H9*: CF is positively related to product performance.

The hypotheses *H6*, *H8*, and *H9* examine the impact of 'close contact with customer, suppliers, and employees', a typical characteristic of Brazilian SMEs, on firm performance.

In addition to the formulated hypotheses, a better process performance, fuelled by continuous improvement, is a natural consequence of TQM implementation like the improvement on product performance and financial performance as well. Consequently, we formulate the following hypotheses:

*H10*: Process performance is positively related to product performance.

*H11*: Product performance is positively related to financial performance.

### 3. Research method and construct validation

This section explains the research design and reports the tests carried out for construct reliability and validity.

#### 3.1. Research method

The small- and medium-sized ISO 9001:2008-registered Brazilian companies were the population of the survey. There is no accurate information about the population size. According to the ISO Survey 2015 available online (<http://www.iso.org/>), there are 17,529 ISO 9001 certificates in Brazil.

The questionnaire was sent to a random sample of 200 SMEs' ISO 9001:2008-registered Brazilian companies located in São Paulo State, where there are 10,261 ISO 9001 certificates, more than 58% of the total in Brazil (<http://certifiq.inmetro.gov.br/>). Therefore, although Sao Paulo State was the sampled population, it is our belief that the results can be extrapolated to the country. Before this, five academic quality experts and two quality managers from different companies had validated the questionnaire without making any changes. The return tax was 100%.

All organisations had 300 employees or fewer and mandatory active registration on ISO 9001. The ISO 9001 registration time ranges from 9 months to 8 years and the average registration time is three-and-a-half years.

The sample analysis shows that 29% of companies are from the automotive sector, 21% from machinery, and 8% from the construction industry. The other companies are from other industries such as metallurgy, glass, and automation.

### 3.2. Construct validation

A crucial step during the development of any research effort is validation. First, an extensive literature review ensured the content validity or internal validity (Forza, 2002; Bryman, 2001). Second, the experts' evaluation was carried out (Forza, 2002. Hair, Black, Babin, Anderson, & Tatham, 2014).

We validate the constructs following the steps proposed by Hair et al. (2014) and use the Smart partial least-square method (PLS) software to make all calculations. We applied Cronbach's  $\alpha$  and a composite reliability measure to estimate the reliability of each TQM and performance construct (Nunnally & Berstein, 1994; Raykov, 1997). Moreover, for each construct, we estimate the average variance extracted (Fornell & Larcker, 1981). Tables 3 and 4 offer the results for performance and TQM constructs, respectively. All construct fit the established criteria with a composite reliability above 0.7, an average variance extracted above 0.5, and a Cronbach's  $\alpha$  above 0.7 (Hair et al., 2014, p. 665).

We also computed the convergent validity that refers to the agreement of items representing the same construct. The factor loading for each construct was calculated and, to reach construct convergent validity, each must be 0.5 or higher and ideally, 0.7 or higher (Hair et al., 2014, p. 665). Tables 3 and 4 provide the factor loading values for performance and TQM constructs. Except one indicator in SP construct, all loadings are above 0.7, but we maintained all because their value is higher than 0.5. It is worth to note that the value of such indicator is 0.68 that is close to 0.7.

Following Kaynak (2003) procedure, a discriminant validity procedure was performed as well to investigate whether the constructs were different from one another. For each construct, all correlations were compared with their composite reliability. Table 5 shows the results for the TQM constructs. The TQM constructs were valid because all correlations were lower than their respective composite reliability.

The same applies to the performance constructs. Table 6 offers the results. Again, the performance constructs were valid as all correlations were lower than their respective composite reliability.

Table 3: Performance constructs convergent validity.

Latent Constructs and observed indicators	Loadings
<i>Product Performance</i> ( $\alpha = 0.856$ , c.r. = 0.912, AVE = 0.776)	
PDP1 – Product Overall Performance (Ahire et al., 1996)	0.900
PDP2 – Product Reliability (Ahire et al., 1996)	0.932
PDP3 – Product Conformance with specifications (Ahire et al., 1996)	0.838
<i>Process Performance</i> ( $\alpha = 0.934$ , c.r. = 0.958, AVE = 0.883)	
PCP1 – Productivity improvement (Kaynak, 2003)	0.725
PCP2 – Lead time improvement (Kaynak, 2003)	0.933
PCP3 – Quality cost improvement (Kaynak, 2003)	0.823
<i>Financial Performance</i> ( $\alpha = 0.906$ , c.r. = 0.941, AVE = 0.842)	
FNP1 – Market share growth (Kaynak, 2003)	0.837
FNP2 – Sales growth (Kaynak, 2003)	0.872
FNP3 – Profit growth (Kaynak, 2003)	0.745

Note:  $\alpha$  = Cronbach's  $\alpha$ , c.r. = Composite Reliability, and AVE = Average Variance Extracted.

Table 4. TQM constructs convergent validity.

Latent Constructs and observed indicators	Loadings
(1) <i>Leadership</i> ( $\alpha = 0.927$ , c.r. = 0.948, AVE = 0.821)	
LD1 – We have clear quality goals defined by the top-level managers and our performance evaluation depends heavily on quality	0.900
LD2 – Top-level managers allocate adequate resources towards efforts to improve quality	0.932
LD3 – Top-level managers view quality as more important than costs and schedules objectives	0.950
LD4 – Managers encourage, support and participate in continuous improvement process	0.838
(2) <i>CF</i> ( $\alpha = 0.878$ , c.r. = 0.917, AVE = 0.821)	
CF1 – Customer needs and expectations are known and understood by all staff members	0.725
CF2 – Our company conducts a customer satisfaction evaluation and take action to improve the results	0.933
CF3 – Our organisation collects complaints data from clients and threat them with priority	0.936
CF4 – Our organisation provides warranty on sold products or a good after sale service	0.823
(3) <i>SP</i> ( $\alpha = 0.787$ , c.r. = 0.859, AVE = 0.606)	
SP1 – Planning are known by all staff members and involves the employers, stakeholders, customers and suppliers in setting objectives	0.837
SP2 – Strategic plans and linked with quality values (CF, quality commitment), and not only with profit expectations	0.872
SP3 – Strategic plans are translated into a set of specific and measurable objectives	0.683
SP4 – Results are compared to the previous planned results in order to improve the planning process	0.745
(4) <i>Suppliers Management</i> ( $\alpha = 0.934$ , c.r. = 0.953, AVE = 0.834)	
SM1 – The suppliers are required to meet the quality specifications	0.881
SM2 – Quality is the main criterion for selecting suppliers instead of prices or delivery schedules	0.924
SM3 – There are cooperation from our supplier to improve process, solve quality problems and to discuss new product development	0.939
SM4 – The company conducts supplier inspections frequently and take action from the results	0.908
(5) <i>Process Management</i> ( $\alpha = 0.937$ , c.r. = 0.955, AVE = 0.841)	
PM1 – Our company uses techniques or tools for improvement in the manufacturing process	0.865
PM2 – Process are systematically measured, controlled and managed	0.933
PM3 – Process are controlled using statistical tools and the process control do not rely on inspection only	0.966
PM4 – Work methods are explicitly defined	0.902
(6) <i>Human Resource Management</i> ( $\alpha = 0.942$ , c.r. = 0.959, AVE = 0.852)	
HRM1 – Employee satisfaction are formally and regularly measured	0.910
HRM2 – The company has a training programme to all employees and the programme is followed.	0.942
HRM3 – Employees are allowed and encouraged to participate in quality assurance programmes	0.939
HRM4 – Our employees are evaluated and recognised for superior quality performance	0.901

$\alpha$  = Cronbach's  $\alpha$ , c.r. = Composite Reliability, and AVE = Average Variance Extracted.

### 3.3. Structural model specification and estimation method

We applied the PLS method to estimate the structural model using the Smart PLS software to generate all results. We also calculated the Standardised Root-Mean-Square Residual (SRMR) to avoid erroneous conclusions due to model misspecification. The result of 0.07 for SRMR suggests a well-fitted model according to the standard threshold.

Table 5. TQM constructs discriminant validity.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	Composite Reliability
(1) Leadership	1.000	–	–	–	–	–	0.948
(2) CF	0.659	1.000	–	–	–	–	0.917
(3) SP	0.478	0.688	1.000	–	–	–	0.859
(4) SM	0.408	0.460	0.691	1.000	–	–	0.953
(5) Process Management	0.465	0.497	0.554	0.627	1.000	–	0.955
(6) Human Resource Management	0.529	0.636	0.552	0.428	0.750	1.000	0.959

Table 6. Performance constructs discriminant validity.

Variables	(1)	(2)	(3)	Composite Reliability
(1) Product Performance	1.000	–	–	0.912
(2) Process Performance	0.424	1.000	–	0.958
(3) Financial Performance	0.768	0.494	1.000	0.941

#### 4. Results and discussion

Table 7 shows all  $p$ -values of research hypotheses tests. Most of the hypotheses (7) were supported with a 0.05 significance level. One hypothesis was supported with a 0.1 significance level, and three hypotheses were not supported at all. In this section, we discuss the impact of those results.

##### 4.1. Results among constructs of TQM model

The empirical evidence supports the relationships between leadership and CF, SP, SM, and human resource management. We proposed the Hypotheses  $H1-H5$  to evaluate the managerial aspect of TQM empirically, i.e. how leadership either encourages or is involved in TQM practices.

Table 7. SEM results?.

Direct Effect	Hypothesis	$P$ -value	Remarks
Leadership → CF	$H1$	0.000	Supported
Leadership → SM	$H2$	0.000	Supported
Leadership → Human Resource Management	$H3$	0.000	Supported
Leadership → Process Management	$H4$	0.234	Not Supported
Leadership → SP	$H5$	0.000	Supported
Human Resource Management → Process Performance	$H6$	0.051	Supported*
Process Management → Process Performance	$H7$	0.448	Not Supported
Supplier Management → Product Performance	$H8$	0.902	Not Supported
CF → Product Performance	$H9$	0.013	Supported
Process Performance → Product Performance	$H10$	0.000	Supported
Product Performance → Financial Performance	$H11$	0.000	Supported

\*Supported with  $p$ -value = 10%.

According to the results, we cannot affirm that leadership is not committed. The leadership has a prominent influence on the majority of TQM elements which means that, in the sample, the leadership has played a crucial role in enabling quality practices. The leadership is also actually involved with common TQM practices related to the customers, suppliers, and human resources. Therefore, we corroborate with Majumdar and Manohar (2016) statement, ‘close contact with customers, suppliers, and employees’. On the other hand, ‘the lack of management commitment’, suggested by the same authors, is not confirmed in the Brazilian SMEs’ context.

In a departure from the literature, however, no support is found for a relationship between leadership and PM. Although ISO 9001 prescribes the need for data collection and analysis, quite often, the certificate is granted without checking for the use of statistical tools, as recommended by the standard. The results suggest that leadership may emphasise TQM practices (to succeed in quality audits) more than it does PM improvement.

The main reasons to obtain an ISO 9001 certificate are often external, such as marketing advantages, customer expectations, and competitive pressure. Hence, the companies that face external pressures to register in ISO 9001 focus their efforts on mandatory requisites; their leadership is concerned less with improving quality than complying with the ISO 9001 requirements. Usually, the SMEs are not major players in their supply chains and they are encouraged to register in ISO 9001 only as a guarantee for their customers that their product will have the required quality level.

They spend their resources and time only to maintain the certificate and stay on business. Indeed, it is not supposed to be the real purpose of certification. It should be the quality improvement, customer satisfaction, organisation by process and a risk-based management. The evidence supports the existence of all other relationships involving leadership and other TQM constructs.

Perhaps the most significant relationship, regarding quality improvement, is the relationship between leadership and PM. Many authors in the literature argue that PM as one of the key enablers to quality improvement. As the results do not support such relationship, there is evidence that leadership, in studied context, is not quite focused on process improvement.

The unsupported relation shows us an opportunity for improvement in the studied context. The studied SMEs should be more concerned with quality improvement than with complying with the ISO 9001 requirements. Such result provides us an insight into Brazilian SMEs. The managers or owners likely think that TQM model and ISO 9001 requirements are the same. It leads them to believe that the ISO 9001 implementation is not the first step in the quality management journey, but the final destination.

We can confirm, based on this, the ‘lack of management awareness of TQM’ suggested in the literature. In fact, there is a technical aspect even in the managerial perspective, once it is known that there exists a body of scientifically validated knowledge which is applied by managers in different settings (Grey, 1997). The lack of this knowledge (e.g. TQM) can actually generate negative managerial implications.

#### **4.2. Results between TQM and performance constructs**

Figure 2 offers the direct paths between TQM constructs and performance constructs, along with the others. In this section, we analyse the hypotheses *H6–H9*, which test the technical and cultural aspects of TQM.

The results show that hypotheses *H7* and *H8* are rejected, and *H6* is only marginally supported. That leads us to conclude that besides the TQM practices being implemented,

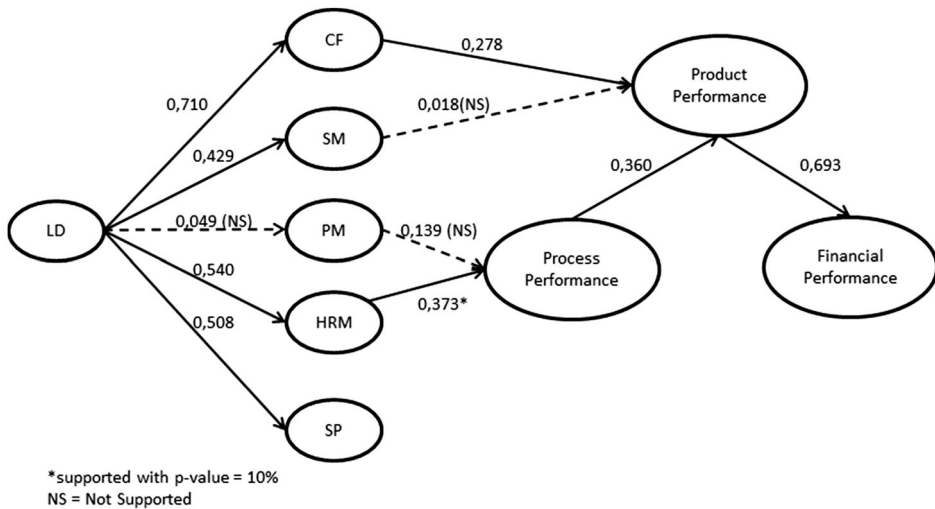


Figure 2. Significant paths.

they fail to affect the company performance positively in the studied context. Such evidence corroborates the discussion provided in Section 4.1, which pointed out that not emphasising the improvement of process quality would negatively influence a firm's performance.

The lack of evidence to reject hypothesis *H9* shows us that the close contact with the customer is relevant to improve performance and SMEs should invest more in this practice. On the other hand, the close relationship with the suppliers does not affect performance significantly.

The rejection of hypothesis *H7* and the marginal support of *H6* provide insight to the discussion. First, the marginal acceptance of *H6* puts doubt on the study of the impact of human resource management on process performance. Theoretically, well-trained and motivated employees should affect the process performance positively. As the hypothesis is not supported, what is going wrong in this matter? Have the employees not been trained appropriately? Or they are not receiving proper motivation?

Saridakis, Torres, and Johnstone (2013) argue that the context of informality of the SMEs generates employee satisfaction and motivation. That is particularly true to Brazilian SMEs' context where employees are motivated mainly due to the close contact with the owner. That generates the moral commitment. That leads us to conclude that there is a 'lack of technical skill or expertise' in Brazilian SMEs (especially about TQM), probably because of the 'lack of resource' to properly train the workforce and to provide adequate methods and tools to PM.

The rejection of *H7* suggests the confirmation of the 'lack of tools and technologies' because of PM practices not driving into process performance. The use of proper techniques in the process and the use of data analysis tools should have a significant influence on process performance. The rejection of *H7* (combined with the rejection of *H4*) also leads us to question the presence of continuous improvement element in the studied SMEs.

A possible explanation for company performance being only weakly affected is that it is forced to register with ISO 9001 by the big players of the supply chain. The SMEs tend to focus on complying with ISO 9001 requirements rather than devoting proper attention to

quality improvement activities. Hence, the emphasis on SM practices, CF practices or human resource management practices will not necessarily improve performance.

Figure 2 shows that the leadership is concerned with quality practices, in the context of SMEs' ISO 9001-registered Brazilian companies, confirmed by non-rejection of *H1*, *H2*, *H4*, and *H5*. However, these practices do not lead to an improvement in the firm's results (confirmed by the rejection of hypothesis *H7* and *H8* and the marginal acceptance of *H6*).

#### 4.3. Results among performance constructs

The literature points out that the best way to achieve financial performance is through product and process improvement. The results show that process improvement is crucial for the companies to attain product quality. Furthermore, product quality is an important driver of financial performance.

The non-rejection of *H10* and *H11* suggests that the three types of performance are intrinsically correlated. Thus, the TQM enablers must generate process improvement to enable financial performance.

### 5. Conclusion and future research

The objective of this paper was to investigate TQM model implementation in the context of SMEs' ISO 9001-registered Brazilian companies, a critical setting to TQM. Thus, the research question was: are the Brazilian SMEs evolving towards TQM? Consequently, we tested if TQM is a robust model for SMEs as well as for large companies.

In Section 4, we argue that, in the particular context, the leadership is concerned more with TQM practices than with quality results. Although the company must carry out quality improvement activity to maintain its certificate, it seems that most of such activities consist of ineffective corrective actions.

Those results corroborate the findings of Feng, Terziovski, and Samson (2007), which argued that an ISO 9001 certificate by itself does not necessarily lead to improvement in performance. The organisation's commitment to quality is a critical factor in achieving performance improvement.

The commitment to quality means to implement the appropriate quality practices to materialise the quality principles. However, the choice of right quality practice is not enough. It is also necessary to use the quality practices adequately to improve the performance. The result from the empirical study raises the following question: are the companies of studied context implementing the quality practices just to maintain their ISO certificates instead of doing that to improve their performance?

Biazzo (2005) stated that an audit that focuses on evaluating conformity aims to check that documented procedures are being respected. This is not the objective of a TQM system. The same author also argued that this kind of audit does not include any judgement regarding the adequacy of the rules or their ability to generate performance improvement. Otherwise, an audit that focuses on performance goes beyond mere compliance and starts to evaluating suitability. The role of the audits is even more critical among SMEs, and auditors play a fundamental role in guiding SMEs in the right direction. The success of a TQM system then, according to Biazzo (2005), depends on the evolution of an audit system from compliance to adequacy evaluation. While the audit system does not change, the role of ISO 9001 in achieving performance improvement will be constrained.

In this context, it is possible to conclude that Brazilian SMEs are not evolving towards TQM. The main reason for that is the lack of awareness of TQM at all organisational



levels; one organisation cannot move towards something that it does not know. In addition to, the role played by both internal and external audits is not pushing the companies of studied context towards TQM.

Prajogo and Brown (2006) suggested that the worldwide implementation of ISO 9001 as a quality system has led to a situation where firms tend to equate ISO 9001 to TQM and sometimes confuse the two models. Such conclusion fits well in the Brazilian SMEs' context. The lack of knowledge about TQM generates a series of problems that undermine company's ability to implement TQM successfully.

As suggested by Majumdar and Manohar (2016) and empirically confirmed in the survey presented in this paper, the lack of resources and TQM awareness are the causes of the lack of technical skill and proper tools and technologies. If the organisation's top management is not aware of TQM model and thinks it is equal ISO 9001, they will not invest adequately in training or tools to improve the process. They will implement quality practices only to comply with the requirements and external audits rather than to pursue the continuous improvement, an essential element in TQM.

This study suggests that Brazilian SMEs lack the continuous improvement element and because of that, they are constrained to evolve towards TQM. Actions should be taken to mitigate the lack of TQM awareness and move towards its full implementation.

Future research should consider the investigation of the rejection of hypotheses *H4* (Leadership is positively related to PM) and *H7* (PM is positively related to Process Performance) and the role played by audits in pushing towards TQM. Moreover, we do not corroborate Prajogo and Brown's (2006) statement that ISO 9001 certification is the first step to TQM journey.

With relation to TQM robustness for SMEs, future research should also consider the application of the same model in different populations, with higher maturity degrees, which do not implement quality systems based on the ISO 9001 model. That will allow a result comparison. A longitudinal comparison may also be considered to study whether companies improve their system over time and whether a system that once did not drive results would, a few years later, enable performance to be carried out in a more proper and efficient way.

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