QUALITY PAPER

# Supply chain management and quality management integration

## A conceptual model proposal

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### Abstract

**Purpose** – The purpose of this paper is to develop a theoretical basis for integration of quality management (QM) and supply chain management (SCM). For that purpose, some common practices of both approaches are identified as having impact on the four balanced scorecard perspectives.
**Design/methodology/approach** – The main concepts of SCM and QM were reviewed from the literature in order to develop key practices that are common to both approaches.
**Findings** – The findings suggest that the synergies of QM and SCM can promote the integration of the approaches which will promote a set of significant organizational benefits.
**Originality/value** – This study focuses on the integration of QM and SCM through their common practices. This issue has not been broadly explored and for that reason this paper contributes to the understanding of the critical factors for an effective integration of supply chain QM.

**Keywords** Integration, Quality management, Supply chain management
**Paper type** Research paper

### Introduction

The supply chain management (SCM) extends the concept of integrated management to all organizations involved in the process, from suppliers of raw materials to end customers.

The growing competition, globalization of economies and the need to increase the competitiveness of organizations through operational efficiency, promote new opportunities and challenges in the management and organization of the entire supply chain. Thus, SCM appears as an essential tool for competitive advantage in the market, since it allows the development of a link between the market, the distribution network, the production process and procurement activities, offering to customers a service of excellence at a low cost.

Likewise, quality management (QM) is another concept that promotes the competitiveness of organizations. Considering that customers are becoming more demanding, they are increasingly looking for companies that meet their needs in terms of products/ services, and companies that can indeed outweigh their expectations. Thus, QM influences the performance of companies and customer satisfaction, as well as other stakeholders.

The understanding of how QM and SCM are related in a particular organization and the impact that this integration has in the organizational performance is still very limited (Ramos *et al.*, 2007; Agus, 2011; Mahdiraji *et al.*, 2012; Zeng *et al.*, 2013; Huo *et al.*, 2014; Dellana and Kros, 2014).

Many empirical studies on QM and SCM have been conducted so far. However, most of them focus the two fields separately and just few the integration perspective.

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Forker *et al.* (1997) studied the importance of QM practices throughout the supply chain in the electronic components industry, and they found that some practices such as quality data and reporting, product/service design and training lead to better companies' performance.

Flynn and Flynn (2005) realized that organizations that pursue both quality and supply chain goals achieve a competitive advantage. Also, other researchers found mixed results of the effect of QM practice on supply chain performance. This suggests that more research is required in order to provide some guidance to both researchers and supply chain managers. New findings could help managers to understand how they can effectively distribute resources to issues that are critical for the QM integration in order to improve supply chain performance, and consequently, analyze the impact of this integration in companies' performance (Fynes *et al.*, 2005; Flynn and Flynn, 2005; Min and Mentzer, 2004; Forker *et al.*, 1997; Yeung, 2008).

Thereby, the main goals of this paper are to discuss the key topics related to the integration of these two crucial organizational areas and to develop a conceptual model that provides new insights about their impact on the organization.

In the next section, the literature concerning QM, SCM and the integration of both areas will be reviewed. Based on the literature review, a conceptual model is proposed and presented in third section. Fourth section contains final considerations about the work.

## Literature review

### *QM*

QM has been considered an important strategic management tool over the past two decades, involving the application of principles and practices of quality at all levels of an organization (Talib *et al.*, 2011).

There are several definitions concerning QM: many authors defined QM as a "management philosophy" (Perry and Sohal, 2001; Khan, 2014; Bon and Mustafa, 2013) that is related to the management of products production and processes in order to provide the adequate product design and features according with customers' expectation. Thus, QM should be focused in a broad set of issues, ranging from sourcing activities until the final product delivery and after sales service. Furthermore, QM is characterized by the constant search for continuous improvements in the processes and procedures, in order to achieve excellence and to attain efficiency, sustainability and competitiveness (Oakland, 1993; Terziovski, 2006). Under the QM framework, companies can improve their organizational performance and business, customer and employees' satisfaction, relationships with suppliers and positive attitudes, by improving organizational quality culture (Talib *et al.*, 2011; Reed *et al.*, 2000).

Since quality performance measurement is fundamental to effective manage an organization, it is necessary to determine how QM is implemented in order to measure the impact that their practices have on the organizational performance. Saraph *et al.* (1989) and Lu and Sohal (1993) were the first ones to try to measure how the QM practice affects organizations by identifying the factors of quality improvement which have a positive influence on quality improvement. Education and training, process management; QM (strategic and design), top management involvement and leadership were some of those QM practices which impacts on the organizational performance.

The research on QM has been progressing over the last two decades and empirical and theoretical studies have already defined and measured a set of key QM practices (Kaynak and Hartley, 2008). It is known that there is a strong relationship between those practices and organizational performance including non-financial performance (Sadikoglu and Olcay, 2014; Hassan *et al.*, 2012; Chung *et al.*, 2008; Demirbag *et al.*, 2006; Hendricks and Singhal, 2001). Hassan *et al.* (2012) demonstrated that QM philosophy improves the production performance and all the performance indicators related to customer. With the increasing of market's competitiveness, the importance of the QM practices will become increasingly crucial, in particular, those concerned with customer focus and product design (Chong and Rundus, 2004).

However, results from different studies addressing the relationship between QM practices and companies' performance have shown some ambiguous and inconsistent conclusions (Zeng *et al.*, 2014; Zehir *et al.*, 2012). Some of these inconclusive outputs can be explained by different research contexts and different analysis methods but, with no doubt, more research is required to further explore these relationships.

*SCM*

The globalization of the economy and also the fierce competition that exists between companies, leads to the need of increasing companies competitiveness. Some researchers stated that companies have to be focused on their products, production process and quality improvements, not just because of the market requirements, but especially to make their company more competitive than their competitors (Agus, 2011). In this context, companies' competitiveness can be achieved through operational efficiency and service quality that will promote challenges and managing opportunities all over the supply chain. In fact, products quality depends not only of the quality process of the manufacturer but also of the quality process of its suppliers'.

The scope of the logistics concept has been evolving over the last decades: the materials and information management process is now seen as a goal for all the supply chain members in an integrated effort to deliver sustainable products and processes (Vanichchinchai and Igel, 2009). According with the Council of Supply Chain Management Professionals (CSCMP), "logistics concerns to the part of the supply chain that plans, implements and controls the flow and storage of the raw materials, components, semi-finished and finished products, and also all the information related between the point of source and the point of consumption, in order to satisfy customer requirements." Customer satisfaction involves several dimensions: the right time, quantity, quality and cost, and only a balanced and integrated management can ensure a good performance of the organizations and of all logistics operations (Lin *et al.*, 2005).

Since the 1980s, the interest in SCM topic is increasing because companies realized that collaborative relationships within and beyond their organizations can bring benefits for all the interested parties (Lummus and Vokurka, 1999). Since then, different descriptions of SCM have been proposed. One of the definitions is that SCM "encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies" (CSCMP).

SCM help companies to find suppliers that can offer better services with lower prices, which allow them to become more specialized and competitive. Consequently, it is important for companies to manage all the network of suppliers' in order to optimize the performance of the whole system. Robinson and Malhotra (2005) also noted that each time a certain company deals with another one that will provide the next phase of the supply chain, both stand to benefit from the other's success, which means that the implementation of SCM has a huge importance for the companies. In fact, integration has emerged as a critical topic for managers, since the companies can benefit from cost and stock reductions and improvement of the service level (Guimenez and Ventura, 2003). Additionally, Cooper and Ellram (1993) suggested that the implementation of SCM has three major objectives that are: reduce inventory investment in the supply chain; increase customer service through increased stock availability and reduced order cycle time; and to help build competitive advantage for the network in order to create customer value.

*QM and SCM integration*

QM and SCM are management philosophies that play an important role in the strengthening of organizational competitiveness (Talib *et al.*, 2010). Some studies define the integration

between QM and SCM as the concept of supply chain quality management – SCQM (Lin and Gibson, 2011; Mahdiraji *et al.*, 2012). Robinson and Malhotra (2005) stated that SCQM "is the formal coordination and integration of business processes involving all partner organization in the supply channel to measure, analyze and continually improve products, services, and processes in order to create value and achieve satisfaction of intermediate and final customers in the marketplace." Based on the literature review carried out, it was identified that there is a lack of studies related to the integration of the three dimensions of the SCQM: internal process, upstream QM and downstream QM (Zeng *et al.*, 2013).

SCM assumes a methodical and integrative methodology to manage all the operations and relationships between all the stakeholders of a supply chain. In other words, it integrates all parties of a value chain into one whole entity and manages them as assets of a wide company (Simchi-Levi *et al.*, 2000, Mentzer *et al.*, 2001; Kannan and Tan, 2005; Wang *et al.*, 2004). From the perspective of QM, SCM could be recognized as providing quality products and services across every organization in the supply chain, to address client's expectations.

There are some studies that analyze how QM can be used to improve the performance of the entire supply chain. Some of them are related to troubleshooting concerning supply network (Lin and Gibson, 2011; Dowlatshahi, 2011; Flynn and Flynn, 2005; Fynes *et al.*, 2005) and other studies identify numerous theoretical and methodological features of the way in which knowledge management applications are proposed in the supply chain context (Robinson and Malhotra, 2005). As example, Wang *et al.* (2004) concluded that the improvement of quality in all supply chain processes leads to cost reductions, improves resource utilization, and improve process efficiency. Zeng *et al.* (2013) analyzed the relationship among the different dimensions of SCQM and their impact on the companies' performance, and they conclude that the internal implementation of quality in each supply member is mandatory. Additionally, the same authors concluded that managers should look beyond their own organization in order to benefit from the collaboration, the integration and the communication among the other partners of their supply chain.

Lin *et al.* (2005) stated that essential features that lead to achieving SCQM have not yet been fully explored. More recently, Zeng *et al.* (2013) also emphasized this research gap. Also, some other authors suggested that further research is still needed in order to provide a better understanding about quality practices along the supply chain and also the relationship between their practices and the overall performance. Therefore, some authors propose some directions for future research that could be very helpful for the companies (Marra *et al.*, 2012; Kim, 2007; Cao and Zhang, 2011; Craighead *et al.*, 2009; Bozarth *et al.*, 2009). For example, Terziovski and Hermel (2011) presented an exploratory study about the role of QM practice in the performance of integrated supply chain concluding, likewise Robinson and Malhotra (2005), that traditional QM programs should be transformed in a SCM perspective, so that quality initiatives cooperate and coordinate across all the network of companies in the supply chain. In their study, Terziovski and Hermel (2011) proposed that future research should focus in why quality practices are strong predictors of an integrated supply chain, and suggested that future models of quality and SCM integration need to empirically examine the aforementioned research question using different methods, as survey and case study approaches with multinational samples.

Lin *et al.* (2005) concluded that if key QM practices could be integrated in the supplier participation programs, that would provide collaboration between a company and its suppliers, which would have as a consequence an enhanced organizational performance. The organizational performance can also be optimized if a company considers its suppliers as member of its own firm. Also these authors consider that more research is needed to extend these conclusions to other countries or regions.

Kannan and Tan (2005) have empirically examined the level to which just in time, SCM and QM are correlated, and consequently their impact on business performance. Their study

validated that at both strategic and operational levels, there are relationships between how these areas are held by organizations. For example, both organizational areas are seen as a part of their operations strategy; and there is a commitment to quality and an understanding that supply chain dynamics have the greatest effect on performance. Their empirical study although interesting is like others studies, limited in scope both in terms of supply chain and quality practices.

According with the literature review it is possible to state that the integration between SCM and QM is a natural evolution of management practices, because, to the best of our knowledge, this integration is so far focused on specific features such as purchasing, manufacturing and distribution in order to support logistics processes. Although, due to the competitive environment, it is necessary to improve the performance by controlling some points such as: cost, efficiency, service levels, rapid response and quality of products and services (Lin *et al.*, 2005).

## Conceptual model proposal

In the recent past, a few number of contributions have been proposed to address the integration between SCM and QM (Talib *et al.*, 2010, 2011; Fish, 2011). As referred before, they focus on specific aspects of the logistics system leaving out key aspects of SCM. To further study the potentialities and hurdles of the integration of these two areas we propose a conceptual model to represent, in a comprehensive way, the key areas of both domains and the relationships between them.

The dimensions used in this research have been already analyzed and proposed by some researchers in an independent way. In Table I one can find a few examples of those dimensions.

Figure 1 presents the conceptual model that has been developed. The model proposes that SCM and QM have five major practices in common and includes areas mainly associated with QM and others associated with SCM, considered being of great importance for the integration of these two organizational areas.

Based on the literature review carried out, these practices have a significant impact on organizational performance. This conceptual model also suggests that although there are some specific areas of each domain (QM and SCM), there are also some that are crucial for both fields, namely, integration and sustainability.

Integration of QM and SCM has already been described as a process that will improve (Casadesús and Castro, 2005), for example, customer satisfaction and the performance of supply chain parties, and is also important for the improvement of the competitiveness of the companies (Kaynak and Hartley, 2008). Sila *et al.* (2006) have analyzed the state of SCQM in manufacturing companies and they concluded that quality is important within the relationships with customers and suppliers, although, in order to have a significant quality focus, the companies should improve supplier involvement in quality improvement. Despite the implementation of SCQM can improve the performance of the companies, that implementation is not yet comprehensive and, for that reason, more studies are necessary in order to better understand all the mechanisms involved. Also, Zeng *et al.* (2013) examined the relationships among different dimensions of SCQM and their impact on performance. The authors found that the integration, communication and collaboration within supply chain members with respect to quality, can improve companies performance.

Sustainability is related to the achievement of a sustainable performance in three dimensions: economic; social, and environmental. Supply chain sustainability is crucial and necessary to ensure long-term profitability, and is related to structural and organizational changes throughout the chain, promoting robust collaborations with suppliers and customers, reducing costs and environmental impacts (Seuring and Gold, 2013).

Chardine-Baumann and Botta-Genoulaz (2014) proposed a framework in order to assess the sustainable performance of SCM practices in the companies, in order to be able to verify

| Dimensions | SCM | QM |
|---|---|---|
| Leadership | Cooper and Ellram (1993), Andrews and Stalick (1994) and Zeng *et al.* (2013) | Bon and Mustafa (2013), Zeng *et al.* (2013) and Talib *et al.* (2014) |
| Management and strategic planning | Li *et al.* (2005), Talib *et al.* (2010) and Zeng *et al.* (2013) | Bon and Mustafa (2013), Talib *et al.* (2010) and Talib *et al.* (2014) |
| Stakeholders involvement and commitment | Li *et al.* (2005) and Yu *et al.* (2013) | Talib *et al.* (2010) and Bon and Mustafa (2013) |
| Information management | Li *et al.* (2005), Talib *et al.* (2010), Kushwaha and Barman (2010) and Shi and Yu (2013) | Li *et al.* (2005), Bon and Mustafa (2013) and Talib *et al.* (2014) |
| Continuous improvement and innovation | Soosay *et al.* (2008) | Talib *et al.* (2010) and Bon and Mustafa (2013) |
| Sustainability | Svensson (2007), Seuring and Müller (2008), Carter and Rogers (2008), Pagell and Wu (2009), Chardine-Baumann and Botta-Genoulaz (2014) and Leigh and Li (2014) | Ahmad and Schroeder (2002), McAdam and Leonard (2003), Isaksson (2006), Fotopoulos and Psomas (2009), Maletic *et al.* (2014) and Izvercian *et al.* (2014) |
| Product/service quality | | Saravanan and Rao (2004), Samat *et al.* (2006), Ueno (2008) and Baird *et al.* (2011) |
| Quality culture | | Black and Porter (1996), Kanji and Wong (1998), Irani *et al.* (2004) and Harvey and Stensaker (2008) |
| Procurement | Thomas and Griffin (1996), Spekman *et al.* (1998), Koh *et al.* (2007) and Shi and Yu (2013) | |
| Internal logistics | Stock *et al.* (2000), Ulusoy (2003) and Kim (2006) | |
| Distribution | Cooper and Ellram (1993), Vidal and Goetschalckx (1997) and Croom *et al.* (2000) | |

**Table I.**
SCM and QM dimensions

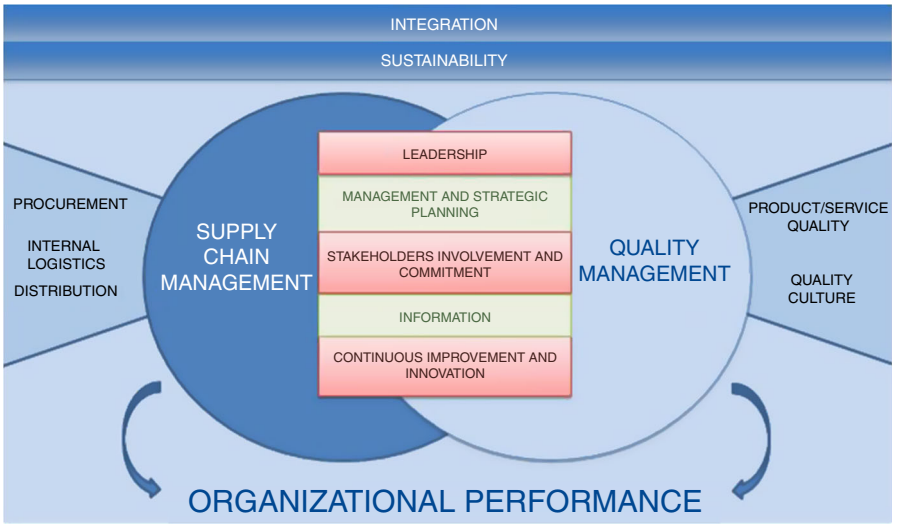


**Figure 1.**
Conceptual model developed

whether a best economic practice is also a best sustainable practice. Leigh and Li (2014) studied the importance of sustainability in the SCM, and they found that companies that consider sustainability issues can have more competitive advantages over their competitors.

In the quality perspective, sustainability research has addressed different areas such as integrated environmental management systems, the role of QM for the success of environmental management practices, among others (Gremyr *et al.*, 2014). Sustainability can help companies to develop their long-term success, and for that it is necessary to optimize procedures and systematize the structures that comprise an entity (Reed *et al.*, 2000). Thus, there is a commitment between all parties involved, which certifies that the sustainability criteria are respected. Reed *et al.* (2000) have studied the relation between QM and sustainable competitive advantages and they suggested that an empirical validation of the theory is needed.

Two major QM practices were identified: product/service quality, and quality culture. We believe that these two practices are well correlated with organizational performance. Product/service quality is what a customer expects in the product/service that he is acquiring. If a customer expects "excellence" in everything he purchases, then his expectations are very high (Murthy, 2007). Therefore, it is important that company financial policies, marketing strategies, and products are well designed and established. It is also imperative for the company to establish quality assurance steps and follow them.

The development of a quality culture is an approach that is related with sharing of values, beliefs, attitudes and patterns of behavior that characterize the members of an organization, and aims to improve the overall organizational performance (Woods, 1998). In a healthy corporate culture, all transactions are carried out correctly and the relationships between all the people involved (employees, suppliers and customers) are successful. Gambi *et al.* (2013) have studied the importance of organizational culture related with QM. The authors highlighted the need for more research within this dimension.

Regarding SCM, three main areas were proposed: procurement, internal logistics and distribution, since these are the specific dimensions of SCM. Procurement activity defines all the actions and processes in order to acquire goods and services. All inbound supply processes are executed by procurement (Stadtler and Kilger, 2000). This activity includes all the actions engaged in the establishment of fundamental requirements, such as, identification and featuring material requirements, receipt of orders, goods selection, and payments, among others. Koh *et al.* (2007) studied the relationship between SCM practices and organizational performance and they stated that procurement has an important role in SCM.

The internal logistics should be seen as a value-adding supply chain process (Stank *et al.*, 2001), since it ensures the movement and storage of product inventories throughout the company. Thus, logistics has a critical importance to organizational performance, since it is responsible for the reduction of stocks and tasks that do not add value to the final product.

The distribution includes a wide range of activities related to the effective and efficient movement of material from the source of supply to the point of use or consumption (Sanders, 2012). Those activities include, not only the choice of the most adequate distribution channel, but also a set of activities, such as the freight transportation, warehousing, material handling, packaging, inventory management systems and information systems management.

Considering the shared SCM and QM dimensions, some have been considered to conceptualize the integration of these approaches: leadership; management and strategic planning; stakeholder's involvement and commitment; information, and continuous improvement and innovation. The idea of integration arises from their similarities and synergies. When analyzed separately, different QM and SCM practices have a positive impact on organizational performance. Kaynak (2003) had stated that quality performance is related to higher organizational performance, considering different quality practices – management leadership, training, quality data and reporting, product/service design, etc. Concerning SCM, Ou *et al.* (2010) analyzed the relationships among SCM practices such as: customer focus;

management leadership; process management; among others, and their impact on the organizational performance. Similarly to Kaynak (2003), they also concluded that there is a positive relationship between those practices and the organizational performance.

Leadership is a practice that is common to these two areas. It is focused on creating and maintaining an environment within the organization, where people become fully involved and committed to achieve the quality objectives of the organization. Also in the context of SCM, leadership is responsible for maintaining stability in the supply chain that promotes the performance improvement (Sharif and Irani, 2012). Azar *et al.* (2009) examined direct and indirect relationships between SCQM and performance. They found that leadership is one dimension that has an important role in the implementation of QM in the supply chain, since it affects other dimensions such as: customer focus, human resource management, strategy planning, etc.

Management and strategic planning are important management tools for the competitiveness of the companies, aiming to design internal functions to reflect the organization's mission (Zeng *et al.*, 2013). In SCM includes a large set of complex issues, such as: network design, inventories location and management, suppliers' management, production planning, information management and quality. In QM involves: human resources; quality strategy; planning; responsibility; authority; communication, and commitment. As mentioned above, Zeng *et al.* (2013) examined the relationship among the different dimensions of SCQM and their impact on the performance, and they found that the implementation of different dimensions, such as strategic planning, in each supply chain member, enhances the global performance.

The stakeholders' involvement and commitment consider all the interested parts that could influence the success of a business: suppliers, employees; customers, shareholders, etc. Concerning the employees, their involvement and commitment at all the levels of an organization is crucial, since their complete involvement allows their capacities to be used for the benefit of the organization. Additionally, the involvement and commitment of the other members of the supply chain is critical to the internal and external integration and will have a significant impact on organizational performance.

Information systems allow the production of a well-timed information, which makes this a critical tool for managers struggling in highly competitive environments. In fact, it has been stated by some researchers that the performance of supply chain is influenced by managing and integrating key elements of information into the supply chain (Gunasekaran and Ngai, 2004). Thus, it is imperative that firms can have information technology system implemented, in order to plan, control and make adequate decision, balancing trade-offs between quality, costs, level of service, profit, among others aspects. Additionally, information and communication technologies are a key element for a fully integrated relationship between stakeholders and the drivers for the implementation of coordinated relationships.

As stated before, the main objective of QM and SCM is the continuous improvement and the innovation of the companies. This dimension enables companies' competitive advantage, since it helps them to create ideas and properly implement them (Bon and Mustafa, 2013). Thus, the innovation capacity is of great importance in terms of competitiveness and to promote a dynamic capability to respond to active markets and customer needs. This means that companies should be prepared to quick changes in the market by continuously innovating.

The measure of the organizational performance is related with the balance of the current results with its planned goals. In this study, organizational performance will be measured based on the balanced scorecard perspectives. The balanced scorecard is a performance measurement matrix designed to capture financial and non-financial metrics, such as market share, online delivery, cycle time, among others, that link the critical success factors

of an organization in a cause-and-effect manner, to organizational strategy (Houck *et al.*, 2012). The balanced scorecard covers four perspectives: customer; financial performance; internal processes; and the learning and growth environment. Each one of these areas contains multiple measures.

As a consequence of the stated above, we consider that this model is an adequate representation of SCQM, and with further research it is expected that it could contribute to understand how the internal and external integration of QM and SCM impacts on companies' performance. Additionally, with further research, it could be developed a framework to implement these integrated approaches.

## Final remarks

Much attention has been dedicated to SCM concepts in recent years. However, the analysis of the relationship between SCM and QM and their integration is still very limited (Robinson and Malhotra, 2005; Azar *et al.*, 2009). There are many similarities and differences between those areas and the understanding of those points can contribute for future operations management future research.

In order to go deeper in this topic, this paper presents the first result of a research project that is being conducted in order to analyze the integration of SCM and QM and its impact on the companies' performance. This is important since both areas are seen as management philosophies which can have an unlimited potential for scope and applications in organizational context. This work contributes to the literature by extending the examination of the practices of QM and SCM.

There are a high number of studies that suggest that more research is needed and so this conceptual model can help to fill some of the gaps stated in other works.

Therefore, the conceptual model proposed in this paper will be statistically validated using the structural equation model technique (Ullman, 2001; Lei and Wu, 2007; Kline, 2011), based on a survey that is being performed on an international basis.

## Future research

A comprehensive validation process of the model is required to get further insight on the subject allowing to understand how companies implement and integrate SCM and QM strategies and how that integration impacts on the overall organization performance. For that purpose, it is necessary to implement different investigation lines in multiple contexts.

Currently, a questionnaire has been developed and a large-scale survey is being conducted. Based on the results, the research model can be validated and the relationship between SCQM practices and organizational performance can be established.



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