Supply Chain Quality Management SCQM: Understanding how it integrates into the service and manufacturing sectors. Case studies in a construction and a food companies

Andres Lopez Astudillo
Department of Industrial Engineering
Icesi University
Cali, Valle del cauca, COL
alopez@icesi.edu.co

Melenys Hinestroza Moreno
Departament of Quality Management
LATCO
Cali, Valle del cauca, COL
calidad@latcosa.com

Edilma Liliana Chacon Tabares
Departament of Quality Management
Harinera del Valle
Cali, Valle del cauca, COL
l.chacon@harineradelvalle.com

Francisco Balbastre Benavent
Juan José Renau Piqueras Department of Management
Valencia University
Valencia, Valencia, ESP
Francisco.balbastre@uv.es

Ana Redondo Cano
Juan José Renau Piqueras Department of Management
Valencia University
Valencia, Valencia, ESP
Ana.Redondo@uv.es

Abstract

Taking into account the need for companies to become increasingly competitive, the interest arises to carry out the present work, which aims to develop a proposal called Supply Chain Quality Management (SCQM), which consists of the integration of management of quality and the supply chain in a construction company and in a food company contributing to the orientation towards an improvement in the performance of each one of these.

On the other hand, the integration of quality management and the supply chain (SCQM) promotes permanent communication and teamwork through the interaction that it implies with internal and external clients and the relationship with both suppliers supplying goods and

services; It also promotes the focus of its activities efficiently by the dynamism in the quality requirements that are increasing.

Taking into account the importance of such integration (SCQM), it is important to implement policies and strategies whose purpose is the commitment of all participants and the areas involved to contribute to the ongoing dynamic operation of the aforementioned integration.

1. Problem Contextualization

The economies globalization and the competition increase in which our companies operate have caused a big revolution within them as well as motivated their managers to consider strategies or "distinguishing factors" that allow them to maintain a true competitive advantage in the market. In addition, companies must be able to adapt to the trends and demands of the clients achieving their satisfaction and creating value to the stakeholders.

The existing literature on "Total Quality Management in Supply Chain" shows us how the integration of two management fields such as "Supply Chain Management and Quality Management" can complement and improve the overall performance of Organizations (Fernandes et al., 2014), through the application of the philosophy of "quality management" in the operation and relationship of all actors in the "supply chain", aligning with business strategies focused on competitiveness and sustainability. The above with the aim of achieving competitiveness and respond to an increasingly demanding and dynamic market, through alliances that arise between suppliers and customers; suppliers and suppliers; suppliers and customers of customers; communications strengthen, permanently innovation and new products or services development. Construction and food industry sectors need to have sustainable competitive advantages in which supply chain quality management is considered as an option.

The aim of this article is to present the integration of the areas of quality management (QM) and supply chain management (SCM) in both, an industry (make-to-stock) and a construction company (make to order/project). The above, seeking to positively impact each of the companies in aspects such as management of more efficient operations, customers and post-consumer customers' integration, suppliers and suppliers of suppliers' integration, allies' integration, stakeholders' integration. Hence, companies can be more competitive, integrated areas to avoid waste, reprocessing, defaults to customers, as well as loss of flexibility, adaptability, and agility to innovate.

Kuei, Madu, & Lin, 2011 consider the SCQM as the design, linking, and management of strategic and tactical activities that allow optimizing the supply network. Therefore, it is necessary to identify factors both internal and external to the SCM. These authors propose a model that based on developing a structure and a government that integrates variables such as strategy, leadership, quality practices and internal processes aimed at developing aspects such as collaboration, interdependence and shared information, as well as long-term orientation:

- Strategic Planning as the systematic process of plans development and implementation in order to achieve the objectives and the organizational vision.

- Knowledge Management is focused on training, updating information with the purpose of strengthening human resources as the main asset having into account individual and collective knowledge and experiences.

- Supplier Relationship based on strategic alliances between client-providers that promote mutual benefit and collaborative work with feedback through audits of quality.

- Information Technology that provides a better reliability of data, in real time, considering the involvement and commitment of employees, which are responsible for the entire chain of ERP modules, platforms, etc.

- Process Management is one of the important elements for companies, especially those that base their management system on quality and are the structural basis of companies.

- Quality Management is required for the continued presence and good participation in the markets. The quality must be controlled and ensured due to its participation in meeting the needs and customer requirements.

- Support of the senior management is essential for the growth and development of the human resource through communication, motivation, and commitment.

On the other hand, Fernandes et al. (2014) propose a model which contains the key areas for supply chain management, quality management, and organizational impact integration. These areas summarize the conceptual framework of supply chain quality management proposed by Kushwaha & Barman, (2010) and Kuei et al., (2011), since it integrates two approaches: one at the internal level, where it relates the processes concerned with quality management, supply chain and organizational performance indicators; and another at an external level, which is oriented to establish relations with the other participants of the chain.

When quality management and supply chain management practices are analyzed, it is confirmed that the performance of these two disciplines is related to a higher organizational performance and positive impact on the organization. Therefore, quality management and supply chain management integration will improve customer satisfaction, supply chain areas performance, and the competitiveness of enterprises. These practices are described below:

- Sustainability: ensures long-term profitability and interrelates structural and organizational changes in the chain. It also promotes solid partnerships between suppliers and customers, minimizing costs and environmental impact.

- Stakeholders: participation and commitment involve all stakeholders, having into account that involvement at all level of the organization generates a synergy for a successful supply chain.

- Information: the information flow through the chain represents a strength in a competitive environment. With the aim of achieving the above, it is necessary to consider the four key elements of supply chain integration, as well as information systems technologies implemented for the purpose of planning, controlling, and making appropriate decisions.

- Strategic Planning: it is composed of a large number of complex elements from both quality management and supply chain management, due to it involves aspects such as network design, stocks location, supplier management, production planning, and information management.

- Continuous Improvement and Innovation: it promotes dynamic ability to actively respond to customer and market needs. It means that companies must be prepared for suddenly changes through a continuous innovation.

On the other hand, the measure of organizational performance is related to the results of the organization objectives, the authors Fernandes et al., propose to evaluate the SCQM integration through the balanced scorecard which considers the critical success factors of an organization in a way of cause and effect with the organizational strategy. The balanced scorecard includes four perspectives: Customer; Financial Performance; Internal Processes; and The Learning Environment and Growth.

In 2016 (Fernandes et al., 2014), affirms that quality management and supply chain management integration presents limitations. Hence, he proposes an innovative model that covers the dimensions of the supply chain quality management related to different aspects of the company performance. It must be implemented through an empirical analysis in different organizational contexts:

- Support of the high-level management: the support and involvement of the high-level management in the implementation of the supply chain quality management guarantees its effectiveness and success. The most relevant instructions related to this management must originate from this dependence:

- Customer satisfaction is a key point to the organizations' development, thus their needs must be addressed at all levels of the organization.

- In order to ensure the success of supply chain, it is necessary to allow the participation of customers in the activities of the company.

- New perspective adoption with suppliers; focused not only on quality providers but also on developing long-term relationships with them.

- Appropriate environment creation to employee development, through improving their skills and knowledge, as well as promoting motivation and preparation. So that they can make right decisions, around the tasks that they perform.

- Decision of the kind of information that can be shared between partners in order to get a smooth operation of the supply chain. The accuracy, timeliness, adequacy, and credibility of the information exchanged are also determined by the high-level management.

The elements described below contribute to the continuous improvement of communication, relationship, and cooperation among the actors in the chain.

- Customer focus: customer focus practices implementation, customer expectations and market opportunities understanding, adoption of systems such as supply chain quality management. The author proposes the following hypothesis: "Focus on the client has a positive impact on the internal process".

- Supplier management: a good supplier management ensures that resources meet the expected standards and quality requirements, in order to produce quality products and avoid wasted time by shutdowns or reprocesses. The author suggests the following hypothesis: "Supplier management has a positive impact on the internal process".

- Supply chain integration: commercial partners' integration in the activities of a Company can increase the efficiency of the internal process. Functional teams' participation can provide innovative ideas to obtain innovative products or services. The following hypothesis is proposed: "Supply chain integration positively impacts the internal process".

- Human resources management: training of the employees in an organization. Quality-related training programs ensure that employees have the knowledge and skills to design products or services as required. The author suggests the following hypothesis: "Human resources management has a positive impact on the internal process"

- Information: information systems play an important role in supply chain members integration. The chains where partners exchange information is able to work as a single entity. The author has proposed the following hypotheses: "Information has a positive impact on the integration of the supply chain" and "Information has a positive impact on the internal process".

- Internal process: It refers to all the activities of the company. It is possible to have a significant impact on the operational performance through the implementation of these practices. The above is defined in the following hypothesis: "Internal process has a positive impact on operational performance".

- Company performance: operational performance refers to the ability of a company to reduce costs, order time, delivery time, improve the efficiency of raw materials utilization and distribution capability. The high operational performance of a company allows producing quality products that increase customer satisfaction, revenue, and profit for companies. On the other hand, by reducing unnecessary costs, companies would be able to offer lower prices for their products.

The concept and alignment of the supply chain quality management have evolved from 2001 to 2016, switching over from an isolated process approach to a practical approach that interrelates each of the internal and external dimension. These last one has begun to recognize that supply chain management is the main factor of a sustainable competitiveness for Companies products and/or services in increasingly demanding markets. The above due to the importance of quality management when adopting a culture of improvement through the supply chain in terms of productivity, financial performance, customer satisfaction, etc. At the same time, soft factors such as people, organization and systems, working methods, and management styles are fundamental for their contribution to the achievement of competitiveness that seeks to integrate supply chain management with quality management.

Quality management and supply chain management integration involve several factors that strengthen the merger and development of the processes that include those areas. Following the review of the literature on Supply chain quality management, three variables were selected, which are aligned with this merger and are considered potential to achieve this objective. Supply chain management concept has switched over from competence to collaboration. It is leveraged by technology, which allows building long-term relationships, both vertically and horizontally, giving way to visibility in order to improve the operation, reduce stocks and increase demand.

Supply Chain seeks to remain a long-term in the market as well as achieve competitiveness advantages. It considers that variable "collaboration between partners" is indispensable to achieve the above (Simatupang & Sridharan, 2004). These authors propose three facilitators for the collaboration: **Shared information**, is the ability to view partner information and monitor the progress of their products, mainly monitoring, processing, data flow, stock status, and locations. **Synchronization** is the ability to

manage decisions at different management levels and time horizons, with the aim of pursuing the common goal of chain's profitability optimization. Finally, **Incentive alignment** is the process of sharing cost, risk, and benefits among participants. The above allows partners to act consistently with objectives and make appropriate decisions.

Considering the visibility, it is necessary to clarify that the actor of the supply chain cannot be considered as independent elements. Organizations must ensure an adequate coordination and integration within the supply chain, so the actors will be prepared and competent in demanding and dynamic markets (Ageron, Gunasekaran, & Spalanzani, 2013). Companies must collaborate strategically with partners within the supply chain, in order to achieve an effective and efficient flow of products and services, information, money, and decisions. The above with the objective of providing the maximum value to the customers at the lowest costs and to the greatest speed.

Another key aspect in the integration of quality management and supply chain is the human relations since individuals are in constant interaction in the chain (organizations, clients, and suppliers). And it is clear that relationships are not made between companies, are made between people and this connection is decisive for the success of any operation. The author (Gligor & Holcomb, 2013), states that the staff involved in the chain is exposed to several actions, which generate a greater confidence in people, better communication, better personal and business understanding, impacting on an increase in trading volumes.

2. Analysis Methodology

2.1. Integration model: the quality management and supply chain integration model proposal is shown in Figure 3.

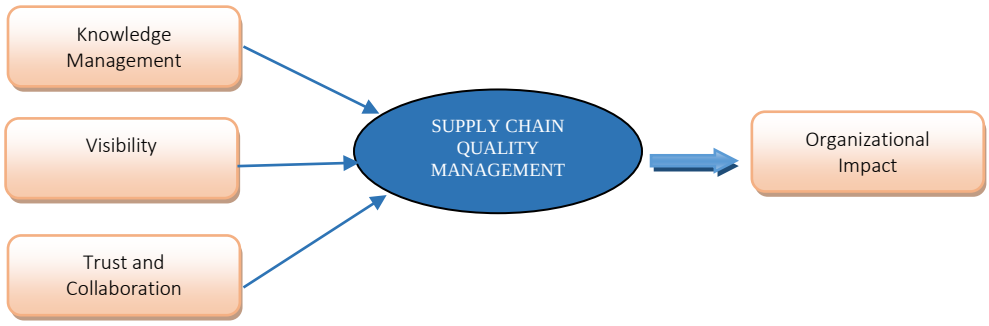

Figure 1. Proposed integration model

2.2. Methodology: this study presents an exploration of qualitative type since this methodology allows the collection, analysis, and interpretation of descriptive data, which are not objectively measurable. It also studies the reality of a situation in its natural context and/or interprets the phenomena according to the meanings for the people involved. This research is developed through case studies that create a bridge between research and practice, with the aim of developing a comprehensive knowledge of the nature of the phenomenon in those responsible. The reference method describes a narrative description, involves a group of observers, a given real-life situation, and the possibility of identifying several solutions options, assisting a divergent thinking. (Gill & Gill, 2014). They are conducted through in-depth interviews, a prepared dialogue in which one person assumes the role of interviewer and the other person is the interviewee. The subject of the interview is defined by the interviewer, while the interviewee expresses throughout the conversation their knowledge, that there is no more information about their experiences and/or personal experiences or own beliefs, desires (motivation to do things) or expectations.

For current type-of-interview research, it is necessary to apply the following questionnaire as a tool:

1. What is your view of quality and supply chain integration? (Considering that the logistics of an organization is integrated into the supply chain).
2. What do you think about quality management in organizations?
3. What do you think about supply chain management in organizations? (Considering that the logistics of an organization is integrated into the supply chain).
4. What is your opinion about the possibility of integrating quality and supply chain in organizations of Colombia? (goods or services).
5. In order to integrate quality and supply chain, it is necessary to have trust and collaboration between the areas of companies and companies that are part of the value chain (customers, suppliers, and allies), what opinion this variable deserves?
   - How do you consider that trust is given in collaboration with customers?
   - How do you consider that trust is given in collaboration with suppliers?
6. In order to integrate quality and supply chain, it is necessary to have the knowledge management between the areas of companies and companies that are part of the value chain (customers, suppliers, and allies), what opinion this variable deserves?
   - How do you consider that knowledge management is given in collaboration with customers?
   - How do you consider that knowledge management is given in collaboration with suppliers?
7. In order to integrate quality and supply chain, it is necessary to have visibility (real-time information) between the areas of companies and companies that are part of the value chain (customers, suppliers, and allies), what opinion this variable deserves?
   - How do you consider that visibility is given in collaboration with customers?
   - How do you consider that visibility is given in collaboration with suppliers?
8. How do you consider trust/collaboration, visibility, and knowledge management are integrated? Is there any order or sequence between these variables?
9. What kind of impact do you consider is generated in the integration of quality and supply chain in the organization?
10. What other variables do you consider are indispensable to integrate quality and supply chain in an organization?

2. **Research Development**

This research will be carried out in two large selected companies according to the context of the economy in Colombia. The first company is called FMG, which corresponds to the construction sector for architecture and civil works in the housing and infrastructure of the regions. The second company is denominated TMH S.A, which corresponds to the sector of the mass consumption food and raw materials for bakery areas with national coverage.

2.1. Construction sector organization

FMG is a company dedicated to the construction of buildings, industrial and institutional projects. It was constituted in 1998; its partners are a family group with experience in the construction and business administration sectors. The Company has been distinguished by the dedication and responsibility to assumes its commitments in the development of the projects. FMG has carried out important projects for the recognized institutions of southwestern Colombia.

The Company FMG has a defined and organized structure to ensure compliance with the quality, hygiene, safety and environment of the projects; as well as professionals, administrative and operative personnel competent in the budgets preparation, execution, and control of the projects. The above with the purpose of fulfilling the main objective: "to satisfy and to take care of our clients, workers, and environment". It also seeks to obtain a profitability that allows them to grow in the market with greater dynamism than the general industry, always governed by principles of professional ethics.

To conduct this exploratory study, it was required to interview eight professionals related to quality management and operations, three suppliers of raw materials, and two industrial clients. The results were as follows

2.1.1. Question No.1: 77% of the interviewees have a positive perception of SCQM integration

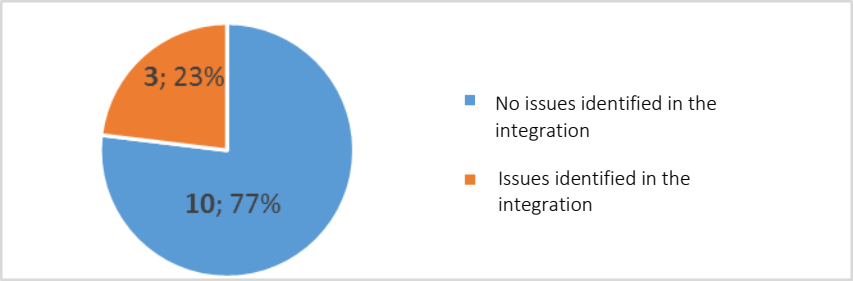

Figure 2. Perception of the interviewees regarding SCQM integration

2.1.2. Question No.2: Interviewees identified some benefits from Quality Management in organizations, as are shown in Figure 3.

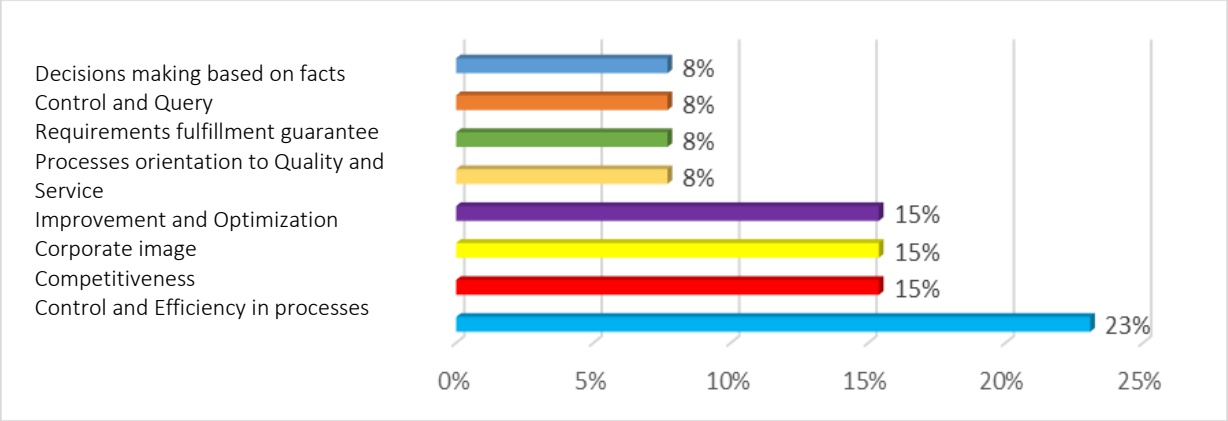

Figure 3. Quality Management Systems benefits in organizations

2.1.3. Question No.3: Perception contrast of supply chain management importance.

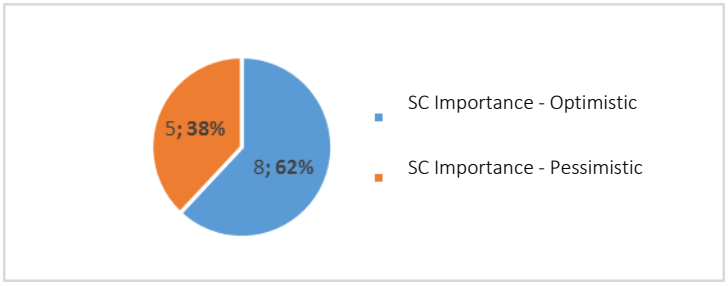

Figure 4. Opinion about Supply Chain Management in organizations

2.1.4. Question No.4: Interviewees perception about the possibility of Quality and Supply Chain integration in Colombian organizations.

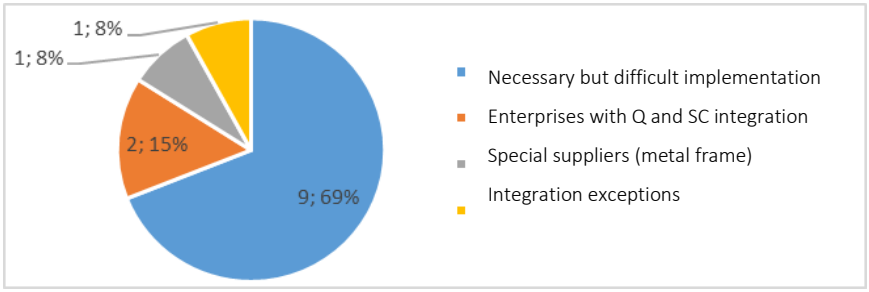

Figure 5. Opinion about Quality Management and Supply Chain Management in organizations

Of Colombia

69% of the interviewees believe that Quality and Supply Chain integration in Colombian organizations is necessary when the company desires to optimize and improve processes. However, they identify some issues that can make this integration difficult:

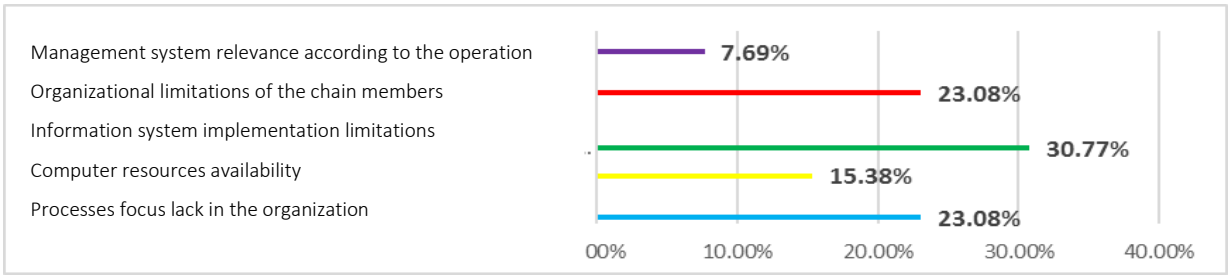

Figure 6: Issues identified for Colombian organizations integration

Three issues constitute approximately 80% of the situation described above, namely:

- The absence or limitations of organizations regarding costs, implementation times, and people competencies related to Information Systems.

- The absence of definitions regarding supplies or inputs, outputs or finished products, as well as the interactions of the organization processes.
- The size of the organization, economic activity, and organizational culture of suppliers and contractors close this characterization.

2.1.5. Question No.5: 92% of the interviewees consider that the variables "trust and collaboration" are important, necessary, fundamental, and vital in the integration of the areas of quality and supply chain. The reasons they expressed are the following:

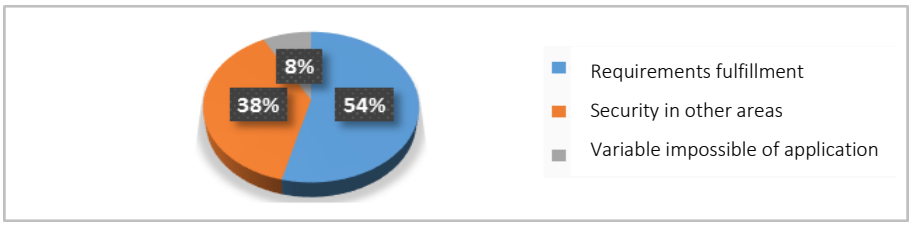

Figure 7. Opinions on the variable trust in the integration of the areas of quality and supply chain.

2.1.6. Question No.6: Knowledge management is considered by the interviewees as a fundamental and necessary variable for the areas of quality and supply chain integration, between the areas of the Company and the companies that are part of the value chain. They consider that the constant demand of the market and the dynamism of its environment requires all the companies have competitive advantages that allow them to be attractive and sustainable.

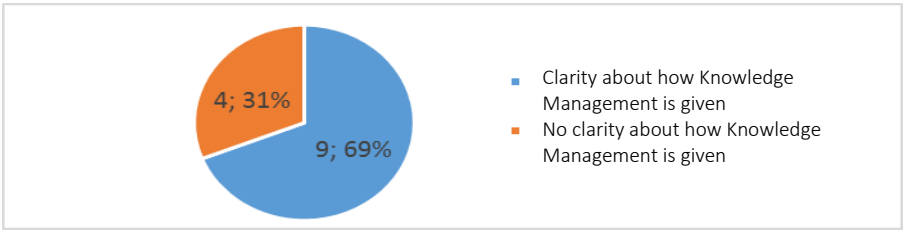

Figure 8. Opinion about Knowledge Management with Customers and Suppliers

2.1.7. Question No.7: 85% of the interviewees consider that the information is a strategic asset of organizations, not people or areas of the organization. This information should be available in real time, and it should be visible to the different actors of the chain and related interest groups; allowing the optimization of operational processes, the timely reaction to any deviation and the taking of appropriate actions.

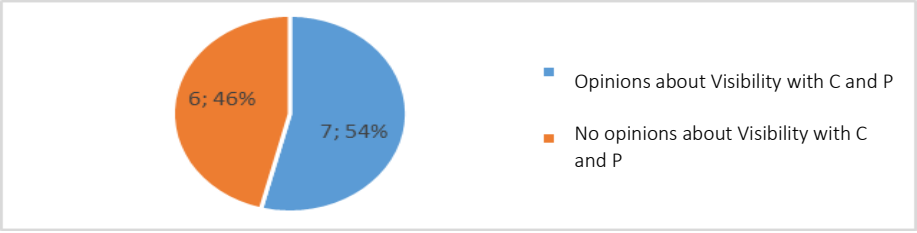

Figure 9. Opinion about Visibility variable with Customers and Suppliers

2.1.8. Question No.8: Trust is considered by the interviewees the main basis for any personal or labor relations. They say that "trust is measured by the degree of security that a person or an organization projects through its actions and the actions they take; behaviors with which organizations manage to generate and strengthen credibility as well as to maintain a climate and appropriate work environment".

Figure 10. Variables order proposed by the Quality Director of the FMG Company.

2.1.9. Question No.9: 100% of the interviewees consider that the impacts generated by the integration of quality and supply chain in organizations are **positive**. They are given for both the internal and the external customer.

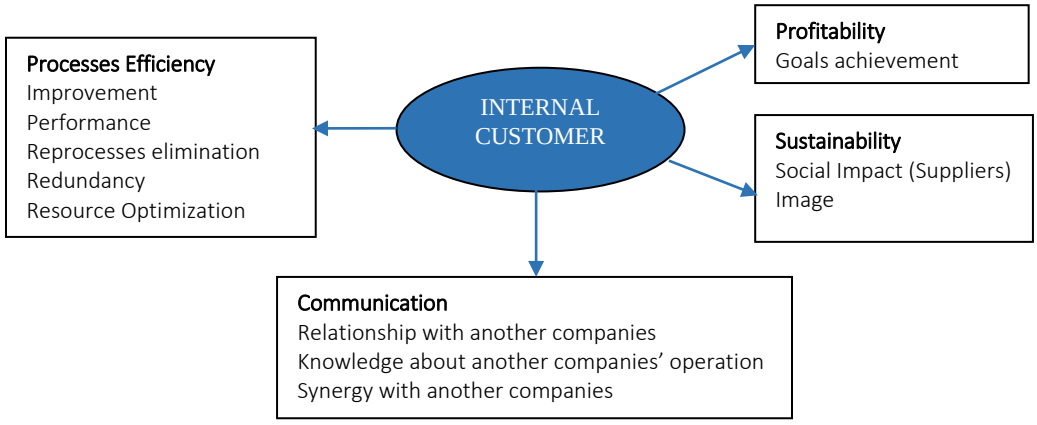

Figure 11. Impacts of the integration for the internal customer

Figure 12. Impacts of the integration for the external customer

2.1.10. Question No.10: The future of organizations is based on managing the integration of the key concepts of Quality Management such as process efficiency, continuous improvement, human factorization, innovation, technology and customer service approach, achieving a structure that covers the important areas of the organization, which are guided to organizational excellence. The last one described above is a managerial technique or a tool that helps organizations to improve administrative management and achieve business success.

2.2. Food manufacturing sector organization

The Colombian Company TMH S.A. has spent 67 years making food products, as one of the most innovative companies in this sector. It has grown steadily through effective strategies that have allowed it to expand the portfolio, which includes 40 brands of quality products belong to eight categories of the market, reaching thousands of consumers in Colombia. TMH S.A Organization sells and distributes products directly in 600 municipalities of the country in both the massive consumption line as the industrial line. It also exports its products to countries such as the United States, Spain, Ecuador, among others. Although the current dynamics of the market forces companies to have an international presence such as this Company, Colombian market still requires being explored and consolidated, due to It currently sells its products in the traditional channel to more than 9 thousand stores and bakeries.

In order to conduct this exploration, it was selected eight professionals from TMH S.A. in positions related to Quality Management and Suppliers Management, one customer, and one supplier.

2.2.1. Question No. 1: The total of the people interviewed agree that satisfaction is achieved considering the integration of the two areas. 82% of them say that it also achieves competitiveness and profitability by visualizing a positive outlook that companies should take into account as a strategy to be successful.

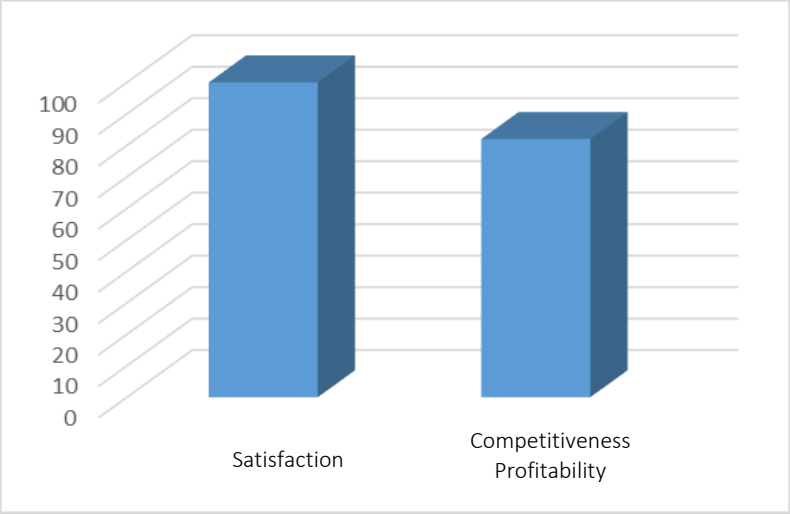

Figure 13. Opinion on Quality Management and Supply Chain Management integration

2.2.2. Question No. 2: Regarding the opinion on Quality Management, 45% of people relate it to continuous improvement, and 36% relate it to customer satisfaction. Although this area is an indispensable management in the companies, it is not guaranteed of profitability and sustainability.

Figure 14. Opinion about Quality Management in Organizations

2.2.3. Question No. 3: 64% of interviewees perceive supply chain as the key of efficiency achievement in companies, having an adequate use of the resources in order to reach the objectives. 45% of them believe that the SC encourages the harmonization of the processes involved in this management, due to it provides an appropriate correspondence between each of the chain processes to achieve a common goal.

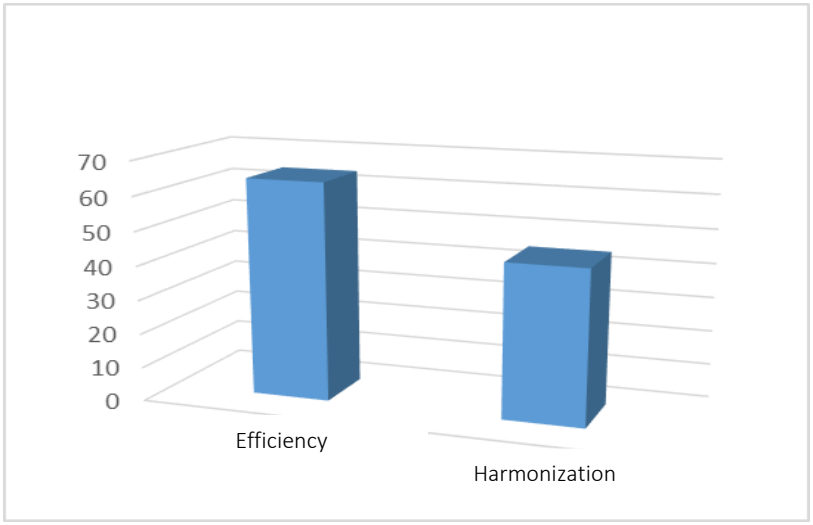

Figure 15. Opinion about Supply Chain in Organizations

2.2.4. Question No. 4: 91% of the people think that quality management and supply chain integration, organizations would be more competitive when referring to international markets. 36% of them agreed that globalization is another advantage offered by supply chain quality management. Finally, the opinion of 27% of the interviewees become a challenge for the country.

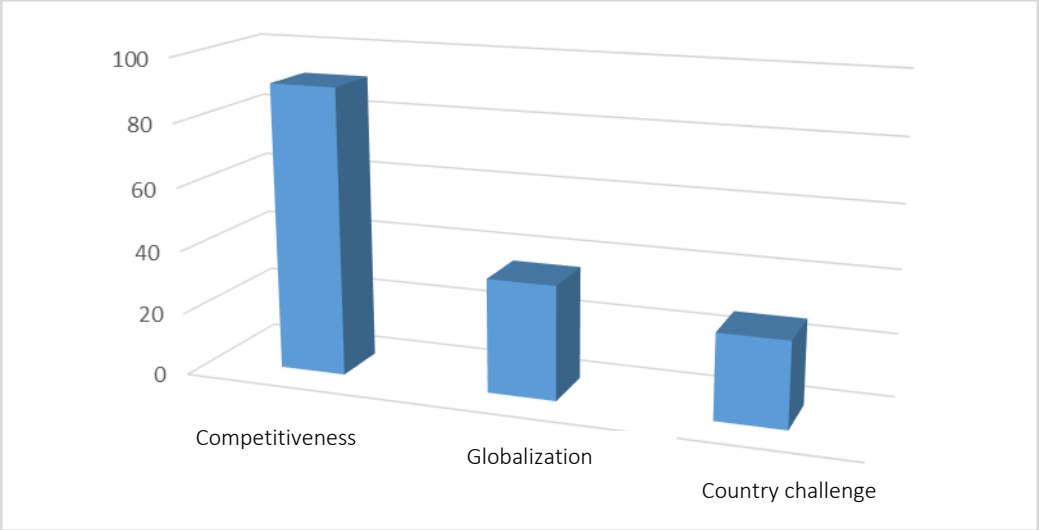

Figure 16. Opinion about Quality Management and Supply Chain integration in Colombia

2.2.5. Question No.5: most of the interviewees (82%) believe that the trust with the customer is given with the level of service and quality since these variables determine their satisfaction. However, today customers expect more than what is offered, thus there is another variable that yielded a considerable percentage. Finally, 64% of them think that trust is given when the product exceeds the expectations of customers.

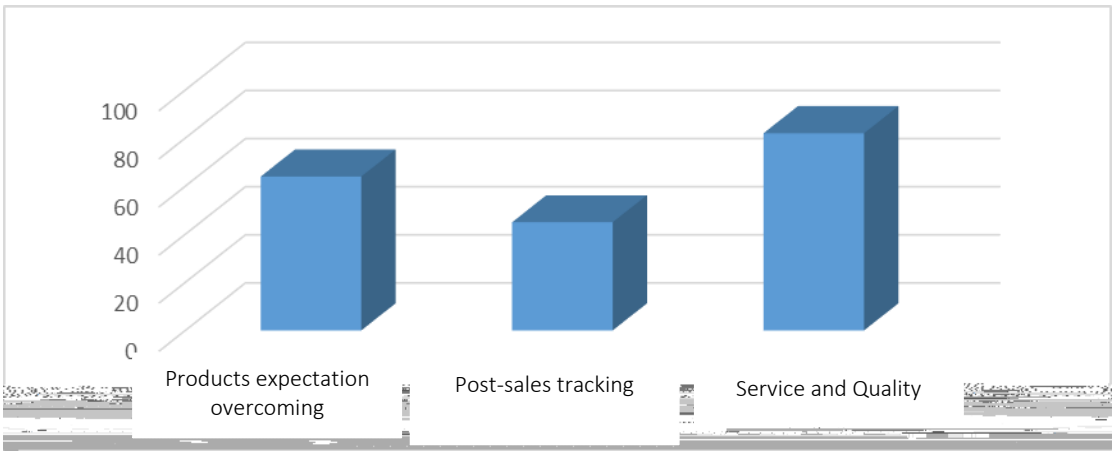

Figure 17. Opinion about how the trust and collaboration with customers are given by integrating Quality and Supply chain

2.2.6. Question No. 6: Opinion about knowledge management with customers. 27% of the interviewees think it is given through updated information. 18% of them consider it comes from feedback given to the customers regarding their needs. Hence, they might generate greater innovation in their processes.

Figure 18. Opinion about how knowledge management is delivered to customers when integrating Quality and Supply chain

2.2.7. Question No. 7: According to the opinion of 54% of interviewees, visibility with customers in quality and supply chain integration can be given through modern communication channels (internet, Facebook, cell phone, email, WhatsApp, etc.). On the other hand, according to 18% of the interviewees, technological developments also facilitate information transfer in a timely way.

Figure 19. Opinion about how visibility is delivered to customers when integrating Quality and Supply chain

2.2.8. Question No. 8: 36% of the interviewees believe that trust/collaboration integration, visibility and knowledge management is given through the implementation of improvements opportunities defined by stakeholders (suppliers-company-customers) in order to improve their processes. While 27% of them think that this integration is given through stakeholders' alliances, which seeks profit with satisfactory results for all.

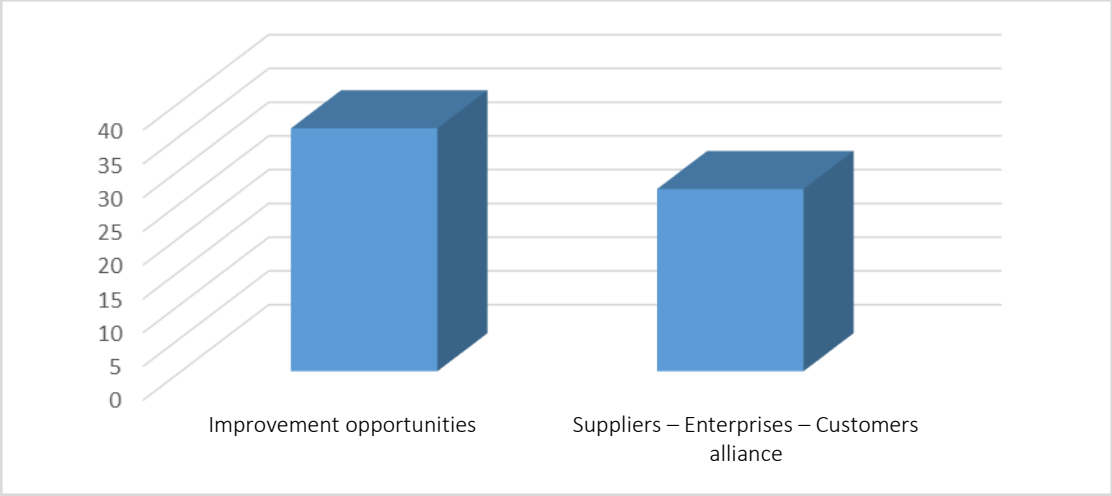

Figure 20. Opinion about how trust/collaboration, visibility and knowledge management are integrated.

2.2.9. Question No.9: interviewees agreed that it is generated a positive impact when integrating quality and supply chain. 45% of them say that it would obtain a better profitability and sustainability. Finally, 36% of them think it would be more efficient and effective.

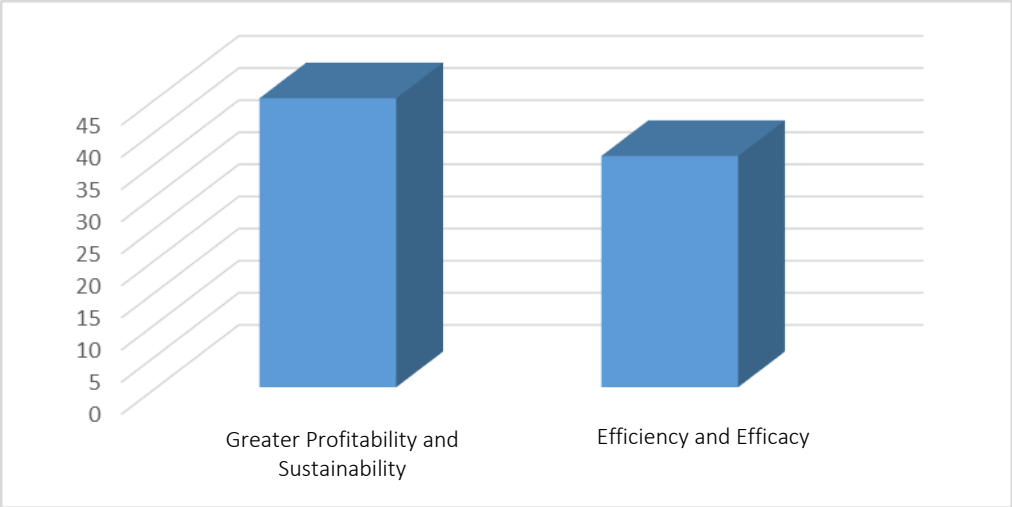

Figure 21. Opinion about the impact of Quality and Supply chain integration in organizations

2.2.10. Question No.10: aforementioned variables are enough to have knowledge of the customer, know their needs, priorities, scopes, and satisfaction levels. Nevertheless, the economic resource required to guarantee quality is fundamental to carry out the integration, the collaborators learning is necessary to harmonize within all the processes as well as to generate satisfactory results. In addition, the teamwork between Suppliers-Organization helps to continuous improvement.

It is important having into account human talent. The success of the implementation depends on how much each of the members of the company has been internalized, the importance of quality, and the philosophy adoption in all areas of organizational life.

3. Conclusions

3.1. Construction sector organization

FMG is certified under ISO 9001:2008, a tool that has given confidence to its customers (internal/external) about the accomplishment of product or service requirements. The evolution stage of the quality concept is "Assurance (QA)". At the same time, it performs Quality Control (QC) in several phases of the process to guarantee the conformity of the product or service, perform inspections (I) to the final product in order to validate compliance with specifications. However, there is a weakness in the quality control performed in the operation and development of daily activities (construction projects), since there are no professional staff neither expert in that area.

FMG has a low level in terms of supply chain. This concept is unknown inside the Company. Instead the above, it has logistics processes responsible for specifying, purchasing, receiving, storing and delivering products at the place and time agreed with the customer, reaching the agreed quantity and quality. However, it does not have a system that integrates distribution channels, suppliers, customers, and final consumers. Neither it has a tool that facilitates the relationship between customers and suppliers through proper stock management, timely delivery, and quality of their supplies. Nor an appropriate software that allows keeping the information centralized, synchronized, and accessible in real time to the actors of the chain.

The supply chain quality management integration level at FMG is considered low, which is based on the inequality of its areas. Because the supply chain term is unknown inside the Company, there are only independent logistics processes not related to each other, nor common objectives aimed at the organizational strategy. Although quality management is at an intermediate level of the evolution stages (quality assurance), there are improvement opportunities, which must be analyzed quickly by those responsible.

In supply chain, quality management integration at FMG, trust and collaboration variables are low too. From the management approach used by FMG: the activities and functions are distributed by areas or departments. They have individual objectives and not sided with the strategy of the organization. The management style is a little participatory, which implies that the processes of the organization are not related to each other, affecting collaboration and final results. On the other hand, collaboration is conceived by the collaborators as additional efforts to the work they perform or simply actions or optional decisions.

3.2. Food manufacturing sector organization

Quality management at TMH S.A is structured and certified in the quality management system ISO 9001: 2008. However, not all stakeholders are aware of the scope of this system. They consider it as the fulfillment of product and documentary requirements. There are found inefficiencies in the achievement of effectiveness about the quality management system. There is also found an improvement opportunity in strengthening leadership in all areas and having the total commitment of top management. Likewise, there is a lack of solid negotiations in relations with suppliers. They should have clear policies, quality agreements, and services related to supply to guarantee an appropriate delivery, as well as satisfaction according to needs and timely fashion.

Supply chain management at TMH S.A presents the required structure. However, from the management point of view, the supply chain is at an average level. Those people involved are not specifically aware of the benefits provided by the supply chain.

In order to achieve the quality and supply chain management integration at TMH S.A, there is necessary more knowledge and involvement of stakeholders, both quality management and supply chain. Therefore, the Company must implement actions to develop more culture. At the same time, it is important to determine the participation degree of CVC variables, trust, visibility, and knowledge management in the company.

The trust and collaboration in the Company TMH S.A are obtained at a low level according to the degree of client-supplier relationship, which must be based on negotiations and quality agreements. If TMH S.A decides to carry out the integration of quality management with supply chain, it should build up alliances between suppliers and customers as one of the main implementations. Regarding real-time information, this Company presents a medium level, due to the lack of exploration and better use of the SAP integrated information system. In addition, there is necessary to improve decision making in a timely way, according to the needs and deviations raised between order and delivery processes. These involve adjustments to the requirements from both suppliers and customers

In supply chain quality management is essential that the company moves from the low level in which it is currently at a high level, given the great impact that knowledge management has on companies like TMH SA, which invests in technology and information systems. They also seek permanent customer satisfaction, be competitive and sustainable.

Despite having considered two companies from productive sectors located in different areas, goods and services, construction and food, structural and organizational capital, defined quality management areas and supply chain through declared processes, such as having specific logistics functions; they present deficiencies in relation to quality and supply chain management, as well as deficiencies to consider the integration of SCQM, reflecting a long way to go.

4. Future research

The selection of two large companies belonging to two economic sectors encourages a continuous research of selected companies in order to setup a representative sample. Paradoxically, SCQM could facilitate actions, processes, and scope within the organization with the aim of having better management indicators. It would also strengthen relations with customers and suppliers, but there are great doubts about the possibility of integration, thus it would be interesting to evaluate this condition. In this exploration, three variables have been selected in order to promote the SCQM integration: collaboration management, visibility management, and human resource management. In addition, it is necessary to explore new perspectives on these selected variables as well as new variables.

5. Acknowledgments

The current exploration was carried out with the support of the I3 group of the Faculty of Engineering of Icesi University, Department of Industrial Engineering. This research was supported by Industrial Engineering Master, as well as Valencia University in the Department of Management, Juan José Renau Piqueras, through the tutors of the Management Organizations Doctorate.

6. Referencias

Srinivasan, G., Arcelus, F.J., and Pakkala, T.P.M., A retailer's decision process when anticipating a vendor's temporary discount offer, *Computers and Industrial Engineering*, vol. 57, pp. 253-260, 2009.

Ageron, B., Gunasekaran, A., & Spalanzani, A., IS/IT as Supplier Selection Criterion for Upstream Value Chain, *Industrial Management & Data Systems*, vol. 113, no. 3, pp. 443–460, 2013.

Belén Escrig-Tena, A., TQM as a competitive factor, *International Journal of Quality & Reliability Management*, vol. 21, no.6, pp. 612–637, 2004.

Chandra, C., & Kumar, S.. Supply chain management in theory and practice: a passing fad or a fundamental change?, *Industrial Management & Data Systems*, vol. 100, no.3, pp.100–114, 2000.

Fernandes, A. C., Truong, H., Sampaio, P., & Carvalho, M. Literature review of quality management and supply chain management: a perspective of integration. *Proceedings of the 1st International Conference on Quality Engineering and Management*, pp 103–114, 2014.

Flynn *, B. B., & Flynn, E. J. Synergies between supply chain management and quality management: emerging implications, *International Journal of Production Research*, vol. 43, no 16, pp. 3421–3436, 2005.

Foster, S. T., & Ogden, J., On differences in how operations and supply chain managers approach quality management, *International Journal of Production Research*, vol. *46*, no 24, pp. 6945–6961, 2008.

Foster, S. T., Wallin, C., & Ogden, J., Towards a better understanding of supply chain quality management practices, *NãoAbstract*, vol. 49, no 8, pp. 2285–2300, 2011.

Frohlich, M. T., & Westbrook, R., Arcs of integration: An international study of supply chain strategies, *Journal of Operations Management*, vol. *19, no* 2, pp. 185–200, 2001.

Gill, T. G., & Gill, T. G., The complexity and the case method, *Management Decision*, vol. 52, no 9, pp.1564-1590, 2014.

Gligor, D. M., & Holcomb, M., The role of personal relationships in supply chains: an exploration of buyers and suppliers of logistics services, *The International Journal of Logistics Management*, vol. *24*, no 3, pp . 328–355, 2013.

Harland, C. M., Lamming, R. C., & Cousins, P. D., Developing the concept of supply strategy, *International Journal of Operations & Production Management*, *19*(7), 650–674, 1999.

Kannan, V. R., & Tan, K. C., The impact of operational quality: a supply chain view, *Supply Chain Management: An International Journal*, *12*(1), 14–19, 2007.

Kaynak, H., & Hartley, J. L., A replication and extension of quality management into the supply chain, *Journal of Operations Management*, *26*(4), 468–489, 2008.

Kuei, C.-H., Madu, C. N., & Lin, C.,The relationship between supply chain quality management practices and organizational performance, *The International Journal of Quality Reliability Management*, *18*(8/9), 864–872,2001.

Kuei, C.-H., Madu, C. N., & Lin, C., Implementing supply chain quality management, *Total Quality Management & Business Excellence*, *19*(11), 1127–1141, 2008.

Kuei, C., Madu, C. N., & Lin, C., Developing global supply chain quality management systems, *International Journal of Production Research*, *49*(15), 4457–4481, 2011.

Martínez-Lorente, A. R., Dewhurst, F., & Dale, B. G., Total quality management: Origins and evolution of the term, *TQM Magazine*, *10*(5), 378–386, 1998.

Mellat-Parast, M., & Digman, L. , A framework for quality management practices in strategic alliances, *Management Decision*, *45*(3), 802–818, 2007.

Min, H., & Zhou, G., Supply chain modeling: past, present and future, *Computers & Industrial Engineering*, *43*(1–2), 231–249, 2002.

Pochampally, K. K., & Gupta, S. M., Total Quality Management in Supply Chain, *Environmentally Conscious Manufacturing VI*, *2*(2), 82–85, 2006.

Schonberger, R. J., Is Strategy Strategic? Impact of Total Quality Management on Strategy, *The Executive*, *6*(3), 80-92, 1992.

Simatupang, T. M., & Sridharan, R., A benchmarcking scheme for supply chain collaboration, *Benchmarking: An International Journal*, *11*(1), 9–30, 2004.

Stevens, G. C., & Johnson, M., Integrating the supply chain … 25 years on, *International Journal of Physical Distribution & Logistics Management*, *46*(1), 19–42, 2016.

Vanichchinchai, A., & Igel, B., The impact of total quality management on supply chain management and firm's supply performance, *International Journal of Production Research*, *49*(11), 3405–3424, 2010.

Biography

Andres Lopez Astudillo, is a full-time professor at Icesi University, in the Faculty of Industrial Engineering in the Department of Industrial Engineering, with 22 years in the academic sector, and 11 years in the industrial sector in positions related to operations management; With a degree in business administration from the Icesi University, with a postgraduate degree in production management, a postgraduate in marketing management, an MBA, a master's degree in knowledge management and a UOC information society, Phd (C) University of Valencia.

Melenys Hinestroza Moreno, is a Systems Engineer with a degree from the Universidad Autónoma de Occidente in 1999. Technologist in occupational health of the national service of learning "SENA". With studies of diploma in Systems of management and in Management of projects. Integral internal auditor HSEQ certificate. With extensive experience in the construction sector in areas of industrial engineering, human resources, quality assurance. With studies of Masters in Industrial Engineering at the Icesi University, 2017.

Edilma Liliana Chacón Tabares, is Director of quality management and certifications in systems of quality management. With experience as Technical Director in food analysis laboratory and Coordinator of microbiology and chemistry in food companies. 23 years of experience, manager of companies, with Diploma in Safety and food security HACCP (analysis of hazards and critical control points). Training as an internal auditor in ISO 900, HACCP, BASC (certification for companies that export). Management in the QM module in SAP (functional leader of the module). With studies of Masters in Industrial Engineering at the Icesi University, 2017.

Francisco Balbastre Benavent, is a professor and researcher, university holder, at the University of Valencia, in the Department of business management.

Ana Redondo Cano, is a professor and researcher, university holder, at the University of Valencia, in the Department of business management.