

Integrated management systems – quality, environment and health and safety: motivations, benefits, difficulties and critical success factors

Almeida, João^a; Sampaio, Paulo^b; Santos, Gilberto^c

^aCollege of Health Technology of Coimbra, Rua 5 de Outubro, Apartado 7006, 3040-854 Coimbra. Portugal almeida.joaonuno@gmail.com; ^bUniversity of Minho, Campus de Gualtar, 4710-057 Braga. Portugal paulosampaio@dps.uminho.pt; ^cCollege of Technology of Polytechnic Institute of Cávado e Ave, Campus do IPCA, Lugar do Aldão, 4750-810 Vila Frescainha S. Martinho, Barcelos. Portugal; gsantos@ipca.pt

ABSTRACT

Following the process of economic globalization and increasingly competitive markets, many organizations have implemented wider management systems, as distinctive factor against competition. However, with the increasing standards organizations found themselves needing to integrate management systems aiming the expertise and resources optimization. As a result of that integration a maximum performance of the management system can be achieved. It was defined as this study aim the assessment of critical success factors for implementing an integrated management system, and what were the difficulties felt by organizations during the integration process. The type of sampling was non-probabilistic by convenience. The sample was composed with four organizations with certified management system of quality, environment and occupational health and safety. The type of study was descriptive and exploratory level I. To collect data semi-structured interviews were conducted with management system managers, where the entire integration process was examined. It can be concluded that the integrated management system contributes positively to the studied organizations, leading to benefits at the organizational processes, cost reduction, efficiency gains, among others. It can also be concluded that the involvement of top management, the existence of human and financial resources, training, as well as the employee motivation involvement, clear goals and meeting deadlines, are factors that can lead to successful systems integration. The change on both organization structure and behavior of employees was the most outline difficulty felt by organizations.

Keywords: Management system; integration; success factors; integrated management systems

1. INTRODUCTION

With technological advancement, rampant global growth and the growing prospects of human life, the concept of industrial development has changed. This change, along with the economic globalization process and increasingly competitive markets, has led many organizations to extend their business area, making it more comprehensive and differentiated in comparison with their competition (Billig and Camilato, 2008 and Ferreira, 2009). The "quality assurance" led to international efforts in order to develop quality management systems that must work as a guarantee regarding the performance, methods and control procedures, materials, technical specifications and guidelines for production and inspection (Michael and Dias, 2009). According to Sampaio and Saraiva (2010), management systems can be defined as a set of interrelated business processes, which use different resources to achieve the established organizational goals. Additionally, they allow the organization to recognize the effort to assure compliance of its products and/or services, customer satisfaction and continuous improvement (Pojasek, 2007).

With the industrial revolution, the idea of progress becomes imperative, being the natural resources seen as raw material for generating new products, resulting in the degradation of the natural environment (Smith, 2006). The integration of environmental issues (including environmental protection and pollution prevention in the management of organizations through the implementation of an environmental management system) allow acquiring a deep insight of the most important environmental aspects associated with its activity, and identifying the processes that need to be improved through the implementation of effective environmental measures (Fresno and Engelhardt, 2004).

Also the issues of health and safety at work have been increasingly recognized as an important factor, not only for employees, but also for the organizations, assuming themselves the occupational health and safety management system as a guarantee to reducing risks and costs associated with repairing accidents. This management system proves to be just a tool that, when properly implemented, allows the organization to obtain data, objectively, on its performance in health and safety in all its aspects, allowing improvements based on facts (Ramos and Almeida, 2008).

As a result of this framework, the implementation of management systems and the increase of their certification led to the need to integrate them into a holistic system (Asif *et al.*, 2010). The idea arising from this concept, which involves the integration of various management systems is, as far as possible, that organizations can manage their operations through a single management system, instead of several management systems (Rasmussen and Jørgensen, 2007). This holistic management avoids wasting resources and increasing organizational efficiency and profitability (Abrahamsson *et al.*, 2010).

2. MATERIALS AND METHOD

The data collection for this study was based on case studies, since the results of case studies can have a significant impact in terms of research, leading to new discoveries and development of new valid and useful theories for professionals

(Voss *et al.*, 2002). Meredith (1998) adds that, this method of study helps the understanding why certain characteristics are met in target-cases.

The case studies were based on semi-structured interviews (based on guidelines adapted from Sampaio and Saraiva, 2010) for managers of integrated management systems of each of the organizations targeted. The aim of this interview was to know how the integrated system was implemented and what were their contribution to the organization, as well as knowing what were the critical success factors for implementation.

- Q 1. Which year did the organization decided to integrate the management system?
- Q 2. What was the sequence of implementation/integration of the management system?
- Q 3. Why your organization decided to integrate the management systems? What were the real motivations?
- Q 4. The organization adopted a specific strategy to the integration of management systems? If yes, which and why?
- Q 5. Which were the main obstacles that the organization faced during the integration process?
- Q 6. On a scale of 1 to 5 (1 - lowest level of integration ... 5 – highest level of integration), how would you classify the integrated management system in your organization? Why?
- Q 7. The integrated management system in the organization is recognized as an asset? Why?
- Q 8. Which are the main benefits that resulted from the integration of management system?
- Q 9. If the organization had not implemented an integrated management system, what would be the level of performance compared to the current reality (1 - lower than the current time | 2 - equal to the current time | 3 - higher than at current time)? Why?
- Q 10. How would you classify the integration of the existing standards - quality, environment and occupational health and safety (1 - very difficult integration...5 - easy integration)? Why?
- Q 11. How many levels of integration of management systems do you consider to exist, and what distinguishes each one of these levels?
- Q 12. What factors do you consider relevant to the successful integration of management systems?

For the case studies were selected four organizations with integrated management systems (environment, quality and occupational health and safety). As a reference, in this selection was used the number of target organizations in other studies with similar research methodology (Fresno and Engelhardt, 2004, Rasmussen and Jørgensen, 2007; Karapetrovic and Casadesus, 2009; Grae and Oliveira, 2010), as well as theories presented in scientific articles on research of case studies (Voss *et al.*, 2002; Meredith, 1998). The selected organizations had management systems with different levels of integration. The selection and classification of organizations has taken in account the information gathered from certification entities, auditors and consultants who audit or assist in the organizations under study. Thus, organizations were classified as high level of integration and low level of integration depending on, whether they showed, respectively, an "all-in-one" system or a system with a document integration only (Karapetrovic, 2002; Bernardo *et al.*, 2009).

After data collection, the steps suggested by Eisenhardt (1989) and Voss *et al.* (2002) were followed. Initially the collected information was analyzed and, at a later stage, tried to identify possible patterns in different case studies, comparing the features of organizations with high and low levels of integration.

3. RESULTS AND DISCUSSION

The chosen organizations belong to the following economic sectors: mining, wholesale trade and construction. Only one of the organizations belonged to NUT II of Norte, and the other ones from the Centro. The average number of organizations employees is 78, ranging from 15 to 150. With regard to the system manager, responsible for the integration, it was found that in organizations with high level of integration, average age tends to be lower ($\bar{x} = 31$ years), a higher level of academic skills and a professional experience time lower when compared to organizations with a lower level of integration (Table 1). By performing an analysis of the socio-biographical data, can be verified, despite the small number of case studies, these factors may be influential for a better integration of management systems.

Table 1 - Comparison of system managers and the level of integration

n = 4	High level of integration	Low level of integration
Qualifications	Graduation	High school
Age (years)	$\bar{x} = 31$	$x = 48,5$
Time of service in the organization (years)	$\bar{x} = 6$	$\bar{x} = 18$

When asked upon which year the organization decided to integrate the management system and the sequence of that implementation/integration, three organizations reported having gone to the implementation and integration of the occupational health and safety management system simultaneously with the environmental management system, based on the quality management system. However, two of the four organizations only integrated some procedures and documentation. In terms of duration of the integration process, organizations with high level of integration decided to integrate the systems five years after the implementation of quality management system. In organizations with a lower

level of integration, one of them implemented the three systems simultaneously, to certify during the following year, thus revealing little maturity of the systems. Organizations have resorted to consult companies and the recruitment of more resources and staff training, in order to proceed with the integration of systems. One of the organizations (with a low level of integration) chose to check the documentation for common systems and compile it into single documents. Given the motivation that led the organization to integrate the management systems, like Karapetrovic *et al.* (2006) and Santos *et al.* (2011), managers claimed image improvement as a marketing tool and improved relations with stakeholders, as well as the optimization of processes, reduction of documents and improving internal organization, as the main motivations for integrating management systems (Table 2). It is noticeable the difference between the two groups of organizations. The group that presents a higher level of integration, points out as main motivations the system optimization and efficiency improvement. Despite the other group of organizations indicating the improvement of internal organization, the motivations were very limited, turning more outward than for the system itself. The reduction of documents, similar to that referred by Sampaio and Saraiva (2010) and Santos *et al.* (2011), seems to be the major motivation for these organizations, which is reflected in difficulties at the operational field.

Table 2 - Motivations for the integration of management systems.

	High level of integration		Low level of integration	
Marketing tool / image improvement	X	X	X	X
Internal process optimization	X	X		
Marketing differentiation	X			
Give response to customers with specific demands	X			
Improve effectiveness and control of systems	X			
Top management decision		X		
Economic support for investment projects		X		
Cost reduction associated to resources involved		X		
Customers and suppliers relationship improvement			X	
Internal organization improvement			X	
Documents reduction			X	X

During the integration of management systems, organizations have faced difficulties, especially those organizations with high level of integration (Table 3). These difficulties, also identified by authors such as Santos *et al.* (2011) and Sampaio *et al.* (2008), occurred mainly at the level of internal restructuring and employee's behavior change. Organizations with low level of integration have not identified obstacles so far, due to the fact that only integrated documentation, continuing the subsystems operating in parallel.

Table 3 – Obstacles during the integration of management system

High level of integration	Low level of integration
<ul style="list-style-type: none"> ▪ Behaviour and procedures change by some employee's, mostly those who were in the organization for more time. ▪ Organization restructuring. 	<ul style="list-style-type: none"> ▪ Did not experience significant obstacles until this moment, since they only integrated documentation, keeping the subsystems separated.
<ul style="list-style-type: none"> ▪ Lack of experience of the consulting organization in management systems integration. ▪ Changes in the organization structure. 	<ul style="list-style-type: none"> ▪ Lack of local consultants. ▪ Lack of partners with integrated management system for benchmarking effects. ▪ Financial investment.

When asked about the level of integration of management systems (Table 4), organizations with high level of integration believed that their systems are well integrated, meeting "all in one" system, referred by Karapetrovic (2002). These organizations can distinguish four levels of integration, beginning with the policy, from the integration of documentation, the definition of objectives and goals and finally, the alignment of management tools. Other organizations felt that their level of integration was reduced because it only reflected at a documentation level, remaining separate processes, i.e., an integration classified as partial, according to Bernardo *et al.* (2009). It was notorious the difference between organizations with high and low levels of integration, in that the first ones had already referred to different levels identified by Karapetrovic (2002), and the other ones had failed to identify these levels, reflecting the low level of integration existing in them.

Table 4 – Integration levels (1 - lowest level of integration ... 5 – highest level of integration)

High level of integration	Low level of integration
<ul style="list-style-type: none"> ▪ [4] Systems find themselves well integrated. However, there are improvements to be done. ▪ Identified levels: <ul style="list-style-type: none"> 1 – Policy 2 – Documentation support 3 – Objectives and goals 4 – Operational control / management tools 	<ul style="list-style-type: none"> ▪ [2] Integration only at the documentation level. As far as operational control concern, there is still an independent approach, at the quality, environment and safety level. ▪ Identified levels: <ul style="list-style-type: none"> 1 - Documentation 2 – Policy and objectives
<ul style="list-style-type: none"> ▪ [5] Even having the notion that it can be improved, a maximum level of integration was considered. It was also considered that it was still in a growing stage where the integration with other management systems will be easier. ▪ Identified levels: <ul style="list-style-type: none"> 1 - Policy 2 – Documentation support 3 - Objectives and goals 4 - Operational control / management tools 	<ul style="list-style-type: none"> ▪ [1] Only integrated at documentation level. ▪ Identified levels: <ul style="list-style-type: none"> 1 – Documents integration

It was noted that the integration of management systems is an asset for organizations with high level of integration, since it provides an improvement of indicators and better control procedures. These gains have a positive effect of the motivations cited by organizations, particularly in terms of improving the efficiency and control systems and the response to some customers with specific requirements. Organizations with a lower level of integration do not see the management systems integration as a positive gain, especially in operational terms. In fact, the motivations indicated do not correspond to internal motivations in its true sense, since they are merely aspects of marketing, improving the relationship with customers and suppliers, leaving missing a whole host of reasons that reflect improvements and add value to the system and consequently the organization.

The main perceived benefits for organizations with high level of integration were at the level of organization of processes, improving the functioning of the organization due to behavior change and a better definition of responsibilities. Organizations with a lower level of integration essentially felt benefits in the reduction documentation (Table 5).

Table 5 – Benefits of the integration.

	High level of integration		Low level of integration	
Interested parties relationship improvement	X	X		
Procedures organization	X			
Behavior changes at environmental and safety levels	X			
Responsibilities definition improvement	X			
Documentation reduction	X		X	X
Indirect cost reduction	X			
The integrated systems allow the global vision of the organization		X		
Better work and organization		X		
Employee's communication improvements		X		
Effectiveness and efficiency gains		X		
Systematization and procedure speed increase			X	

With these benefits, organizations with high level of integration said that if the organization had not implemented/integrated management systems, the level of performance would be lower than the current one. In organizations with high level of integration this process was undoubtedly a way to improve their performance. Both organizations are found in possession of a level of superior performance compared to the situation preceding the integration. On the other hand, organizations with low levels of integration had recognized improvements in documentation, but not enough to consider being a higher level of performance. These results suggest that, in fact, only with a fully integrated management system, they can have gains and the benefits that this integration entails, and which are mentioned in the literature. This way, organizations see their performance improve, thereby increasing the effectiveness and efficiency of the system and consequently the organization.

Regarding the easiness of standards integration, organizations with high level of integration consider them of being quite easy to integrate, particularly ISO 14001 and OHSAS 18001, by the fact that they are more similar. On the other hand, organizations with low level of integration experience some difficulty in integration, not by the lack of standards compatibility, but especially for the current organizational structure. The organization that felt more difficulties in the integration of standards was precisely the one who choose to implement the three management systems simultaneously in an integrated manner.

Salaheldin (2009) defines critical success factors as critical areas that the organization should consider for successful integration. When asked about the success factors associated with the integration of management systems, organizations have identified the set of factors described in Table 6.

Table 6 - Critical success factors to the integration of management systems.

	High level of integration		Low level of integration	
Top management involvement (makes every employee involved in it)	X	X	X	X
Financial resources	X		X	X
Human resources	X		X	
Training	X		X	
Employees motivation	X			
Well defined objectives	X			
Persistency	X			
Employees involvement (they are the ones who more contribute to the audit process)		X		X
Consultants with integration experience		X	X	
Compliance with deadlines set for the project (indicators monitoring)		X		
Learning spirit of the teams		X		
Objectivity		X		

Based on the critical success factors identified by the organizations, the following should be highlighted as being most important:

- Top management involvement;
- Financial resources;
- Human resources;
- Training.

In fact, it is clear the importance of the involvement of top management for the success expected to arise during the integration of management systems. This commitment, besides being able to influence the alignment of management systems with the organization's business plan (Teo and Ang, 1999), can lead the rest of the organization also to commit themselves, as well as allow top management to demonstrate their commitment to the strategy (Salaheldin, 2009). According to Teo and Ang (1999), this commitment may even raise the status of the organization's management and consequently lead to an approach between the management and the various departments which, in a phase of implementation and maintenance of integrated management systems, can be very positive.

The commitment of top management is a major factor in the initial phase of management systems implementation (Nah *et al.*, 2001), facilitating the allocation of human resources and financial resources necessary to implement/integration of management systems (Teo and Ang, 1999). Without this commitment, the successful integration of management systems is compromised. Awan *et al.* (2008) reported the importance of creating synergies between the functional areas of business, including human resources, finance, marketing, among others, and the remaining functional areas of the organization, to be assigned responsibilities in the implementation of practices relevant to the system.

Training, particularly in areas where scientific and technical progress is constant, is a key factor for the system to operate without any nonconformities. The standards of quality, environment and occupational health and safety, report that training is important to assign responsibilities to employees, stressing the need to evaluate their effectiveness.

Yusof and Aspinwall (2000) and Salaheldin (2009) also identified human and financial resources, as well as education and training as critical success factors to systems implementation. Salaheldin (2009) also notes that these factors have a strong impact on the operational control.

The organizations under study also identified other factors that are considered as secondary:

- Motivation;
- Persistency;
- Clear objectives;

- Employees involvement;
- Compliance with deadlines in the project.

The motivation and employee involvement are essential to achieve certification and maintain effective management systems (Cheng and Tummala, 1998). These authors described the employees as managers, supervisors and operators and emphasize that the attitude and behavior of people working in organizations are critical to achieving the systems certification and its maintenance, since they are those that most contribute to the results of audits.

Among the strategic factors responsible for successful implementation/integration of management systems, a clear definition of objectives is, according to Salaheldin (2009), one of the most important. Harry and Schroeder (2006) and Trad and Maximiano (2009) point out that the successful implementation does not happen without an active leadership with clearly outlined and communicated objectives to employees. Pande *et al.* (2000) also points to the need of the projects are based on the needs and objectives and strategy of the organization.

The resources allocated to the system for the development of strategies and operational components, are important and necessary for meeting deadlines previously set for the project. This factor is critical and can be compromised if the top management is not compromised as well (Teo and Ang, 1999). The development of a monitoring plan of indicators is very important to meet the deadlines.

It is also worth mentioning that other factors, not being the most important ones, allow to take some relations:

- Spirit of learning of the teams;
- Objectivity;
- Consultants with integration experience.

Salaheldin (2009), about the spirit of learning of the employees, states that the higher this is, the greater its influence on the operational performance and, consequently, the greater the probability of a successful implementation/integration of the management systems.

For the other factor, it is important that organizations be objective in the projects that they propose to develop, particularly in terms of systems integration. This is a feature by which organizations must adhere to not stray from the main objective.

Another factor identified as critical, to the success of management systems integration, was the existence of consultants with experience in the integration of management systems. In fact, this factor relates to the difficulties experienced by the organizations that have adopted a strategy of integration hiring an outside consultant and that this one proved to be inexperienced in management systems integration. Again, the training factor being highlighted as critical to the success of systems integration. Although not being an employee of the organization is a service provider and as such, an employee of the organization, so this one also needs to be equipped with specific skills to the functions it performs.

4. CONCLUSIONS

The adoption of an integrated management system is, nowadays, a strategic decision of great importance for the competitiveness and sustainability of organizations. The successful integration of the management system is significantly related to the true motivations that lead to integration organizations. To achieve this efficiency level of integration and an "all-in-one," organizations need to comply with a number of factors that will lead to successful integration and better control systems.

With the integration of the management systems, and according to the organizations that collaborated on this study, it is possible to identify a set of benefits and gains associated. These reflect the initial motivations and, in practical terms, brought positive changes, including restructuring the organization in general and the system in particular, especially in terms of processes, documentation, communication and employees responsibility. Despite the benefits that integration earned to the organization, some difficulties were identified by them in this process, namely the level of behavioral changes and procedures, as well as the organizational structure and the initial financial investment required.

The observed level of integration can be influenced by the order of implementation and integration of standards, pointing out the conclusions of this study that the order of implementation follows, in most situations, the order of publication of the standards. This can be a key factor to the extent that organizations implement OHSAS 18001 and ISO 14001 after the quality management system implemented and embedded.

Can also be concluded that there are several factors indicated as critical to the success of the integration of management systems. Since not everyone is put on the same level of importance, based on the literature and in this study, were considered to be more important the involvement of top management, financial and human resources and training.

6. REFERENCES

- Abrahamsson, S.; Hansson, J.; Isaksson, R. (2010), Integrated management systems – Advantages, problems and possibilities. Gotland University, Visby.
- Asif, M.; Fisscher, O.; Bruijn, E.; Pagell, M. (2010) Integration of management systems: A methodology for operational excellence and strategic flexibility. *Oper Manag Res*, Vol.3, pp. 146-160.
- Awan, H.; Bjatti, M.; Bukhari, K.; Qureshi, M. (2008), Critical success factors of TQM: Impact on business performance of manufacturing sector in Pakistan. *International Journal of Business and Management Science*, Vol. 1, pp. 197-203.
- Bernardo, M.; Casadesus, M.; Karapetrovic, S.; Heras, I. (2009), How integrated are environmental, quality and other standardized management systems? An empirical study. *Journal of Cleaner Production*, Vol. 17, pp. 742-750.

- Billig, O.; Camilato, S. (2008), Sistema de gestão integrada de qualidade, segurança, meio ambiente e saúde. Unisinos. São Leopoldo.
- Cheng, S.; Tummala, V. (1998), An employee involvement strategy for ISO 9000 registration and maintenance: a case study for Hong Kong and China companies. *The International Journal of Quality & Reliability Management*, Vol. 15 No. 8/9, pp. 860-891.
- Eisenhardt, K. (1989), Building theories from case study research. *The Academy of Management Review*, Vol. 14, No. 4, pp. 532-550.
- Ferreira, M. (2009), Capacidade de inovação empresarial e políticas públicas de incentivos. Universidade de Aveiro.
- Fresner, J.; Engelhardt, G. (2004), Experiences with integrated management systems for two small companies in Austria. *Journal of Cleaner Production*, Vol. 12, pp. 623-631.
- Grael, P.; Oliveira, O. (2009) Sistemas certificáveis de gestão ambiental e da qualidade: Práticas para integração em empresas do sector moveleiro. *Produção*, Vol. 10 No. 1, pp.30-41.
- Harry, M.; Schroeder, R. (2006), Six sigma: the breakthrough management strategy revolutionizing the world's top corporations. Doubleday. New York.
- Kanji, G.; Chopra, P. (2010), Corporate social responsibility in a global economy. *Total Quality Management*, Vol. 21 No. 2, pp. 119-143.
- Karapetrovic, S. (2002), Strategies for the integration of management system and standards. *The TQM Magazine*, Vol. 14 No. 1, pp. 61-67.
- Karapetrovic, S.; Casadesús, M.; Heras I. (2006), Dynamics and integration of standardized management systems – an empirical study. Universitat de Girona.
- Karapetrovic, S.; Casadesús, M. (2009), Implementing environmental with other standardized management systems: Scope, sequence, time and integration. *Journal of Cleaner Production*, Vol. 17, pp. 533-540.
- Miguel, P.; Dias, J. (2009), A proposed framework for combining ISO 9001 quality system and quality function deployment. *The TQM Journal*, Vol. 21 No. 6, pp. 589-606.
- Nah, F.; Lau, J.; Kuang, J. (2001), Critical factors for successful implementation of enterprise systems. *Business Process Management Journal*, Vol. 7 No. 3, pp. 285- 296.
- Pande, P.; Neuman, R.; Cavanagh, R. (2000), The Six Sigma way: how GE, Motorola, and other top companies are honing their performance. McGraw-Hill. New York.
- Pojasek, R. (2007), A Framework for Business Sustainability. *Environmental Quality Management*, Vol. 17 Issue 2, pp. 81-88.
- Ramos, D.; Almeida, L. (2008), Implementação do sistema de gestão da segurança e saúde no trabalho (SST). In: Santos, G., Implementação de sistemas integrados de gestão - Qualidade, ambiente e segurança. Publindústria. Porto. Ed. 1.
- Rasmussen, J.; Jørgensen, T. (2007), Integrated Management Systems: An analysis of best practice in Danish Companies. Aalborg University.
- Salaheldin, S. (2009), Critical success factors for TQM implementation and their impact on performance of SMEs. *International Journal of Productivity and Performance Management*, Vol. 58 No. 3, pp. 215-237.
- Sampaio, P.; Saraiva, P. (2010), Integração ou adição de sistemas de gestão? Associação Portuguesa para a Qualidade - *Revista Qualidade*, Vol. Primavera-Verão, pp. 36-40.
- Sampaio, P.; Saraiva, P.; Rodrigues, A. G. (2008), Sistemas de gestão: Da qualidade para outros sistemas. *Proceedings do Colóquio Internacional de Segurança e Higiene Ocupacionais*, Guimarães.
- Santos, G.; Mendes, F.; Barbosa, J. (2011), Certification and integration of management systems - The experience of Portuguese small and medium enterprises. *Journal of Cleaner Production*, Issue 19, pp. 1965-1974.
- Silva, O. (2006), Sistemas produtivos, desenvolvimento económico e degradação ambiental. *Revista Científica Eletrônica Turismo*. Ano III, No. 5.
- Teo, T.; Ang, J. (1999), Critical success factors in the alignment of IS plans with business plans. *International Journal of Information Management*, Vol. 19, pp. 173-185.
- Trad, S; Maximiano, A. (2009), Seis Sigma: Fatores críticos de sucesso para sua implantação. *Revista de Administração Contemporânea*, Vol. 13 No. 4, pp.647-662.
- Voss, C.; Tsikriktsis, N.; Frohlich, M. (2002), Case research in operations management. *International Journal of Operations & Production Management*, Vol. 22 Issue 2, pp. 195-219.
- Yusof, S.; Aspinwall, E. (2000), Critical success factors in small and medium enterprises: Survey results. *Total Quality Management*, Vol. 11 No. 4, pp. 448-462.