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Relationship between the maturity of continuous improvement and the certification of quality management system in automotive sector in Brazil

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Abstract

The present paper aims to identify the relationship between the maturity of continuous improvement and the certification of the quality management system within a company in the Auto parts industry located in the South of Minas Gerais State. Continuous improvement has become the element of greatest importance for the development of all kinds of organizations, whether in production operations or when providing services, with the ends of reaching the objective of the present paper, where the following propositions shall be verified. The time necessary to implement the Quality Management System in certified companies brings forth implications with regards to the maturity of continuous improvement. The continuous improvement process is a gradual organization learning process. With the purpose of dealing with this issue, the explanatory qualitative Case Study method was chosen, through the use of the triangulation method where interviews with representatives were used, with direct observation and survey and analysis of historical facts. The approach taken is primarily descriptive/qualitative, where it was sought to analyze, classify, and interpret facts without research interference. As a result, it was observed that within the research unit the certification time did not show to be the principal factor for the advance in continuous improvement maturity levels. Organizational learning significantly contributes to the maturation of the continuous improvement system, especially when found deeply taking root in the company's culture.

Keywords: continuous improvement, company's culture and maturity levels.

1 Introduction

In the pursuit of excellence in their processes and competitive advantage, continuous improvement has contributed to ensure that everything be done within a short term with top quality, by avoiding reworks whether in management, cost reductions, flexibility within the process or timely attention to customer expectations.

Continuous improvement is a fundamentally important item in the certification process in the maintenance of organization certificates.

The considerations cited within this paper have as an objective the identification of two propositions:

P1: The implantation time for the Quality Management System in certified companies brings forth implications in terms of continuous improvement maturity.

P2: The continuous improvement process is a gradual organizational learning process.

In order to verify these propositions within the research unit the case study method based on the triangulation including an exchange within various data sources.

2 ISO 9001 System

The standard for the ISO 9000 series have a guide for the implementation of a Quality Management System, where an organization requires a demonstration of its capacity to coherently supply products that attend to the client´s requirements. These regulatory requirements are applicable to a quality management system where the organization is in need of demonstrating is ability to supply the market with quality products as well as when it intends on increasing client satisfaction by using an effective application of the system, including processes for continuous improvement and can guarantee compliance with client requirements (ABNT,2005).

Standard ISO 9001 was specifically designed to be used in the following situations:

- Contractually between client and supplier;
- For approval or registration of the client for the supplier´s quality system;
- For the certification or registration of the supplier´s quality systems by a credited certifying organ or as guideline for quality management (GODOY *et al*., 2009).

The revision of Standard ISO 9001 version 2000 (ISO 9001:2000) focused on commonly structuring the management system based on the process, connected to the PDCA improvement method (Plan, Do, Check, Act) with necessary demonstrations of continuous improvement occurrences.

Table 1: Structuring of ISO 9000

Series	Fundamentals
ISO 9000:2005 Quality Management System	Fundamentals and Vocabulary
ISO 9001:2008 Quality Management System	Requirements
ISO 9004:2010 Quality Management System	Guidelines for performance improvement

Source: Elaborated by Author

The number of companies certified in ISO 9001 in 2009 surpassed the 1,000,000 mark of companies in the world.

3 ISO TS 16949

The technical specification of ISO/TS 16949 is a document that was prepared by the International Automotive Task Force (IATF) and by the Japan Automobile Manufacturers Association, Inc. (JAMA) having the objective of attending to the normative requirements of the key American, German, French, Italian and Eastern manufactures.

The specification grew out of the need for the existence of a single document within the standards of the International Organization for Standardization (ISO). So, in 1999, ISO TS/ 16949 was first published, enduring revision in 2002 based on standard ISO 9000 (2000).

The main objective of ISO TS/16949 is the development of a global managerial system, with an emphasis in reducing scrap within the supply chain by specifying requirements for the quality system (KATHA, 2004).

The technical specification ISO TS/ 16949 is not applicable alone and should be applied in conjunction with the specific requirements of each client. Each manufacturer has its particular demands, which should be attended to by its suppliers.

The major differential of the ISO TS/ 16949 in relation to ISO 9001 is the focus not only on efficacy but also the efficiency of the processes, where upper administration should evaluate such processes with ends of guaranteeing the efficacy and efficiency of the processes (ISO TS/ 16949, 2004).

The specification has ISO 9001 (2004) standards as a base, where the objective is to develop quality management systems that conduct continuous improvement, with an emphasis on the prevention of

defects and reductions of variations and scraps within the supply chain. This specification also avoids multiple certification audits, providing a common approach to the quality management system for the automotive sector, focused on management by process as seen in Figure 1 (MIGUEL et al., 2008).

Figure 1: Model of quality and process-based management system. Source: Ferreira 2005

The ISO TS/ 16949 is a very complex standard since it includes ISO 9001 standards and has specific demands from manufacturers in terms of various operational issues, and is only adopted in cases involving demands from a very important client (GIOVANNI, 2008).

ISO TS/ 16949 is found in a 2009 version and more than 40,000 have been certified and do not contain any requirements which are additional or different from the ISO TS/ 16949 edition and exclusively describes the considered modification of Standard ISO 9001:2008.

4 Continuous Improvement

According to Mello et al., (2009), continuous improvement after the revision of the ISO 9001:2008 standard has been considered a formal requirement, and it is up to organizations to continuously seek efficacy and efficiency improvements to their processes, without the expectation of problems occurring so that an improvement opportunity could then be demonstrated.

The evolution of the continuous improvement concept follows the quality evolution. "The client's needs are not static. There is nothing like a permanent list of the client's needs." (JURAN, 1989, p.104).

Inconsistently, new technologies, new markets, social insurgencies, international conflicts create new client needs or alter the existing data (JURAN, 1989).

According to Bessant et al., (1994), continuous improvement can be defined as an incremental innovation process, focused and continuous, involving the entire organization. Small steps, high frequency and small change cycles seen separately have small impacts but, added up can bring a significant contribution to the company's performance. However, improvement activities are not only restricted to the process control, much on the contrary according to the authors, they are actions that aim to create beneficial changes in an organized fashion; obtaining unprecedented levels of performance, close to perfection never seen before, being the synonym of innovation (GONZALES et al., 2007).

According to Sampaio et al., (2009) there are two key motives for companies to be certified with ISO 9001: internal motives and external motives. The internal motives are related to the objective of reaching organizational improvement, whereas external motives are primarily related to issues of marketing, client pressure and the increase of clients in the market, etc.

4.1 Continuous Improvement Maturity

What can set a company apart is its level of practice (how to develop continuous improvements), which is something that cannot be copied. Such levels of maturity are also important for guiding companies. By these means, it is possible to know the current status and where it can, would like to reach. In the development of continuous improvement the important thing is to act consciously in relation to each step taken or to be given. So, continuous improvement will normally take root within the company routine, become part of its culture. This is the point where the biggest problem is found within companies; after all, breaking cultural paradigms can take a long time (MESQUITA and ALLIPRANDINI, 2003).

Bessant (2000) identified, after some studies, some of the organizational skills and incorporative behaviors, which were considered to be indispensable for a good development and support with successful continuous improvement (SILVA, 2003).

- Understanding Continuous Improvement: ability to articulate the basic values of continuous improvement;
- Acquiring the habit of Continuous Improvement: ability to generate sustainable involvement for continuous improvement;
- Focusing on Continuous Improvement: ability to bring together CI activities with strategic organization objectives;
- Conducting Continuous Improvement: ability to manage, conduct and sustain the creation and maintenance of CI behaviors;
- Aligning Continuous Improvement: ability to create consistency among the values and behaviors for CI and organizational context (structures, procedures, etc.);
- Sharing Continuous Improvement: ability to shift CI activities by means of organizational barriers;
- Continuous Improvement for Continuous Improvement System: ability to strategically administer CI development;
- Constructing learning organization: ability to learn by means of continuous improvement activities.

Bessant (2002) highlights that not every organization has equal abilities for continuous improvement, some of them being competent in identifying problems or efficient in working with multifunctional groups while others do not consider any of these important issues (SILVA, 2003).

Based on this gradual learning process, Bessant, Caffyn and Gallagher (2001), pointed out that there are different development stages for continuous improvement.

The structure maturity phases for continuous improvement are presented in Table 2.

Bessant and Caffyn (1997) argue that the organizations that advance in this model present the following characteristics: a common objective, adequate management model, habit of practicing continuous improvement, communication and development of an environment that favors the learning process.

The stages should work as organizational guidelines so that they can be defined as strategies with the objective that the organizations increment their capacity of reaching superior levels of maturity (ATTADIA; MARTINS, 2003). It is about a strategic process that needs to be administered with a long-term focus (BESSANT et al., 1994).

Table 2: Stages in the Evolution of CI

CI Level	Concept	Characteristic behaviour patterns
Level 1 - (Pre-CI)	Interest in the concept has been triggered - by a crisis, by attendance at a seminar, by a visit to another organisation, etc. - but implementation is on an ad hoc basis	Problems are solved randomly; No formal efforts or structure for improving the organisation; Occasional bursts of improvement punctuared by inactivity and non-participation; Solutions tend to realise short-term benefits; No strategic impact on human resources, finance or other measurable targets; Staff and management are unaware of CI as a process.
Level 2 (Structured CI)	There is formal commitment to building a system which will develop CI across the organisations	CI or an equivalent organisation improvement initiative has been introduced; Staff use structured problem solving processes; A high proportion of staff participate in Ci activities; Staff has been trained in basic CI tools; Recognition system has been introduced; Structured idea-management system is in place; CI activities have not been integrated into day-to-day operations.
Level 3 (Goal Oriented CI)	There is a commitment to linking CI behaviour, established at 'local' level to the wider strategic concerns of the organisation	All the above plus: Formal deployment of Strategic Goals; Monitoring and measuring of CI against these goals; CI activities are part of main business activities; Focus includes cross-boundary and even cross-enterprise problem-solving.
Level 4 (Proactive CI)	There is na attempt to devolve autonomy and to empower individuals and groups to manage and direct their own processes	All the above plus: CI responsabilities devolved to problem solving unit; High levels of experimentation.
Level 5 (Full CI Capability)	Full CI Capability Approximates to a model 'learning organisation'	All the above plus: Extensive and widely distributed learning behaviour Systematic finding and solving problems and capture and sharing of learning; Widespread, autonomous but controlled experimentation.

Source: Bessant, Caffyn and Gallagher (2001)

5 Methodological Procedures

So that the study's objective be met, research was performed in a qualitative nature, strategically using a case study based on the technique of data triangulation including the interaction between various evidence sources (Figure 2), aiming at analyzing the convergence of the sources.

The criteria of the chosen company was based on having the prerogative of being an organization that practices within the automotive industry, due to its importance for the generation of knowledge and technology, has already gone through an implantation process of quality requirements like the ISO 9000 and TS 16949 since it is believed that it has structured a minimal systematic for the conduction and coordination of continuous improvement activities.

Three instruments were applied to the company in questionnaire form. The first is an instrument called "The guide for verifying continuous improvement in the organization" (Ferraz, 2007), which aims to characterize the organization as well as the quality management system and describe the organizational abilities for continuous improvement.

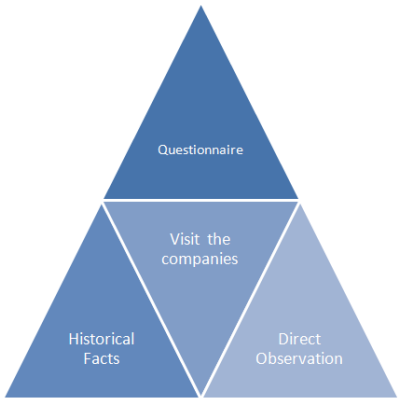

Figure 2: Triangulation Method. Source: Elaborated by the author

The second instrument called "Diagnostic of continuous improvement organizational excellence level" (Ferraz, 2007) has as an objective the evaluation of organization competences for continuous improvement and from this evaluation, point out the maturity level of the continuous improvements of the organization according to the maturity levels proposed by Bessant, Caffyn and Gallagher (2001) in Table 2.

The third and final instrument is called "Basic Construct of Quality Management" has as its intention to measure the organizational practices of quality management.

The questionnaires were sent via email, along with an explanatory text about the objectives of the research, ensuring the respondents confidentiality along with contact information of the researcher in case there were any doubts.

The questionnaires were given to the Quality Manager, Heads of Quality, Heads of Production, Quality Analysts, the Process Engineering Department and the Manufacturing Engineering Department.

The results were obtained according to the perception of the informants who responded to the instruments, through facts and data from file sources taken from the interviews made with the participants and from direct observation by the research unit.

6 Result Descriptions and Analysis

The company that was studied is a multinational with headquarters in Germany who was transformed into a business model that was able to distinguish itself in a highly competitive market, concentrating efforts in technology, quality and human resources. With more than 12,000 collaborators in Brazil and Argentina, the company has sought solutions and aggregated technologies in order to satisfy its clients more and more, and is certified by standards ISO/TS 16949, ISO 9001, ISO 14001 e OHSAS 18000 .

It manufactures piston rings and bushings and is part of a complex of manufacturing companies of various motor components, supplying the most reputable manufacturers such as Volkswagen, Audi, BMW, John Deere, Porsche, Opel, Ford, General Motors, Mercedes Benz, Fiat, Volvo, Caterpillar, Peugeot among others and currently employs more than 3,100 employees.

The company was certified in ISO 9001 in 1994 and ISO TS 16949 in 2002.

When classifying the responses of the "Diagnostic of continuous improvement organizational excellence level" instrument (Table 6.1) Level 4 (Pro-Active Continuous Improvement) classification was encountered, which according to Bessant, Caffyn and Gallagher (2001) is characterized by a concern for empowering and motivating individuals and groups to administer their processes and promote incremented improvements. There is a high level of experience in problem solving.

Table 3: Identification of maturity level by organizational abilities and incorporative behaviors.

Diagnostic of organizational excellence level in continuous improvement		Level 1 Pre Continuous Improvement	Level 2 Structured Continuous Improvement	Level 3 Objective Oriented Continuous Improvement	Level 4 Pro Active Continuous Improvement	Level 5 Total Capacity Continuous Improvement
Comprehension of Continuous Improvement	Continuous Improvement Concept				X	
Development of Continuous Improvement Habits	Solutions to Problems				X	
	Quality Tools			X		
	Audits					X
	Auto-Evaluation					X
Creation of a Continuous Improvement System	Improvement Cycles					X
	Work Groups					X
Participation in Problem-Solving	Meetings					X
	Client Concept			X		
	Client Relations				X	
	Decision Making					X
Focus on Continuous Improvement	Flow of Communication				X	
	Communication Channels				X	
	Organizational Strategy				X	
Conduction of Continuous Improvement	Motivation				X	
	Participation				X	
	Upper Management Role			X		
Alignment of Continuous Improvement	Improvement Projects		X			
Learning Organization	Values			X		
	Employee Contribution			X		

Source: Elaborated by Author

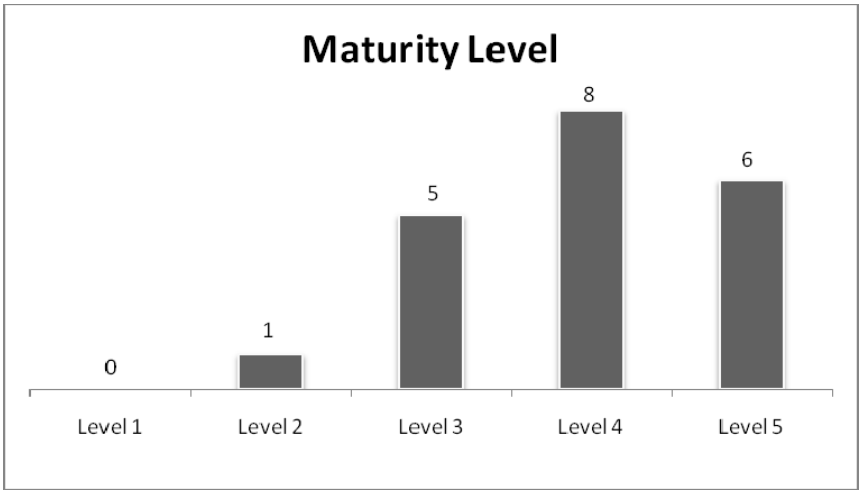

Figure 3: Totals of the responses by maturity level of continuous improvement Source: Elaborated by Author.

Of the analyzed items, lower levels of maturity for continuous maturity were identified during the analysis performed (Table 4).

Table 4: Items classified as having lower maturity levels of continuous improvement.

Continuous Improvement Concept	Maturity Level	Details	Evidence
Improvement Projects	Level 2	The improvement projects are not adjusted to the structure of the organization.	Although the organization relies on a tool for strategic frameworks, not all of the employees have access nor are they familiar with the tool, so some projects related to continuous improvement are administered by departments, but are not necessarily connected to strategy.
Quality Tools	Level 3	There is a formal performance indicator system to model continuous improvement along with strategic objectives.	There are performance indicators in the company, however it is much more focused on productivity than on continuous improvement (Ex: On-time delivery, Scraps and Client Complaints)
Client Concept	Level 3	There is an entire client concept, but work organization does not make this conception feasible.	The company is divided into Mini Factories where each if them is independent in terms of some processes and support departments.
Upper Management Role	Level 3	The value for continuous improvement by means of allocation of resources and formal acknowledgement of employee contribution.	For continuous improvement projects, the company relies on constant support from the Manager and Head of Quality and with other managers only during master plan revision meetings.

Source: Elaborated by Author

The company relies on a continuous improvement item within its quality policies described in Item 8 "We continuously improve – We seek a distinguished position within the global competition, reached through continuous improvement, planned and measurable in our work, processes and products" – which comes to reinforce the real intention of applying continuous improvement in the company.

One of the founders' phrases available online on the company's website is: "good quality is of crucial importance, there is always room for continuous improvement".

During the interviews done and through direct observation, it was identified that managers have a clearer and objective vision of the continuous improvement projects that are aligned with company strategy, what the direct actions related to continuous improvement are, and what investments are and will be done for reaching a higher level of continuous improvement maturity. However, the others who were interviewed, even participating directly with some projects and performing daily tasks for continuous improvement could not clearly define that their activities are aimed at this end and are not aligned with company strategy.

The company utilizes tools such as the Kaizen, Suggestion Programs and Six Sigma, which helps define the continuous improvement structure within the organization, and they take place in projects and direct actions daily with the participation of all of the levels in the company.

Aside from the characteristics of workplace organization, continuous improvement projects have the increase in productivity as its focus.

The participation of individuals in the continuous improvement process is still average and because of that it has been attempting to implement this culture through the application of the tools previously cited with the participation of multifunctional teams.

Company employees suffer through a performance evaluation where for operational positions the evaluation is performed every two years and one of the items evaluated is about how much the collaborator knows and is integrated in the quality management system. However, since is still only a recent company tool, it has suffered through various modifications throughout three years of

implementation and the aim that should be given to the knowledge of the quality management system is still being spread throughout the company.

In the company, there is also a very strong culture among the production managers that quality is actually very important within the organization and be ensured by all. However, when the organization provides training on recycling standard, the participation of collaborators is lower than expected and there is a need for a certain amount of demand from quality managers so that the participation index improves, even because some training is client requirements.

7 Conclusion

This study showed that the propositions discussed here obtained the following results:

P1: The implementation time of the Quality Management System in certified companies brings forth implications related to continuous improvement maturity.

The time factor should be linked to factors such as involvement from upper management, provision of resources, structuring and organization of the company be linked to strategy and the participation of employees in the process of continuous improvement for the increase in maturity for continuous improvement in the studied company.

It was possible to notice that organization comes from a culture where continuous improvement only came to mind when cost reduction was necessary. Although cost reduction is significantly present in the company, a culture of continuous improvement development has been trying to be implemented in all of the organization's levels with a strengthening of the participation of everyone in programs such as 5S and Kaizen as well as the restructuring of the Suggestions Program within the company.

Companies that emphasize employee autonomy in different hierarchical levels and support offered by management have maturity increases in practicing continuous improvement. (BESSANT, CAFFYN and GALLAGHER, 2001).

Good development of the company in incorporative behaviors makes maturation in organization skills propel the company to higher levels of maturity.

P2: Continuous improvement process is a gradual organizational learning process.

It can be stated that the knowledge and development of continuous improvement are reached by means of a gradual organizational learning process, which can be summarized in the following stages (BESSANT, CAFFYN and GALLAGHER, 2001):

- Companies that have developed a "habit" of continuous improvement, by means of the involvement of individuals and the use of adequate tools and techniques are in a gradual organizational learning process.
- Companies that emphasize employee autonomy of various hierarchical levels and the support given by management increase the maturity of practicing continuous improvement.
- Companies that create a workplace favorable to the organizational learning process favors continuous improvement.

In the studied company, it was verified that the manufacturing process is a scenario that facilitates the learning process once the employees are invited to participate in the implementation of tools such as 5S, Kaizen and the Suggestion Program, which are being stimulated by the company with the creation of a specific group in the quality area with the purpose of spreading and maintaining these tools.

According to Gonzalez and Martins (2007) performing the systematic Kaizen promotes the integration of employees from different areas within the company promoting discussions, an exchange of information,

critical thinking and a learning process for each individual toward a common objective: process improvement.

The stimulation of participating in the company's suggestions program is fundamental since it has as immediate base the simple and direct continuous improvement in the manufacturing process, be it improvements in machinery or in workflow.

To consider that continuous improvement is a learning process that allows for the verification of the idiosyncratic way of doing and reaching the level of strategic capacity in CI used by each company (PEREIRA and SOUZA, 2005).

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