

Goran Putnik¹
Paulo Ávila

Article info:
Editorial

MECHANISMS TO PROMOTE CONTINUOUS IMPROVEMENT IN QUALITY MANAGEMENT SYSTEMS

1. Introduction

The quality management systems (QMS) should be designed, operated and improved according with the eight quality management principles that are defined in ISO 9000:2005, Quality management systems – Fundamentals and vocabulary, and in ISO 9004:2009, Managing for the sustained success of an organization – A quality management approach. The title of this special Issue “Mechanisms to Promote Continuous Improvement in Quality Management Systems” is aligned with the sixth quality management principle (Continual improvement), from the eight principles on which the quality management system standards of the ISO 9000 series are based.

Because the main purpose of many companies is to be competitive in the global market and seeing in the continuous improvement a mechanism to promote it, on the third international conference Business Sustainability 2013 (BS’13) (held in November 2013), a set of papers were presented, addressing the theme of this Special Issue, and after that, a number of them, covering different approaches and research results about mechanisms to promote continuous improvement in QMS,

were selected, extended and improved, from which twelve papers were selected for publication.

The objective of this special issue is to communicate and to present the research, and corresponding research results, carried out in the area that came from the BS’13 communications. Firstly, in this Editorial, we will begin with a discussion on the relevance and the actuality of the theme as well as their implications for the organizations. After that, we follow with a global view on the special issue’s contents. The papers included in this Special Issue represent contributions in three main fields: the first field is related to the quality control; the second is related to appraisal activities for decision making; and the third one is related to the performance improvement of the processes. Within this framework, a short description of each paper included in this issue is given, and the each paper’s main contribution is highlighted. Finally, a brief summary and acknowledgments are presented.

2. Importance of the theme and its implications for the organizations

The relevance of this special issue theme is quite perceived by the most important international organizations, several CEO companies, principally in the multinational ones and for that that belongs to their

¹ Corresponding author: Goran Putnik
email: putnikgd@dps.uminho.pt

stakeholders, for the researchers, and of course for the organizations' collaborators that understand that their individual proactive contribution is very important for the whole organization improvement. ISO (2012) in the book of quality management principles, about the sixth principle already referred in the introduction, says even that continual improvement of the organization's overall performance should be a permanent objective of the organization. The same reference stresses as the key benefits the following: performance advantage through improved organizational capabilities; alignment of improvement activities at all levels to an organization's strategic intent; and flexibility to react quickly to opportunities.

Given what has been said, it is quite acceptable that organizations should follow the way of the continuous improvement of the QMS, but the well-known "Plan-Do-Check-Act" (PDCA) methodology, or Deming cycle, in honour of William Eduard Deming that disseminated its use, has to be applied to all organization's processes. The model of a process-based quality management system presented in ISO 2001: 2008, since the version of 2001, links the PDCA methodology with the process approach to express how continual improvement of the QMS should be applied in an organization. However, it is not an easy way, but we believe that for ISO 9001: 2008 certified organizations, with the necessity of improving all their processes, through quantitative performance measuring, see possible examples in Ávila et al. (2004), the effectiveness of continuous improvement can be much better.

This Special Issue intends to give a contribution in the fields of quality control, appraisal activities for decision making, and for the performance improvement of the processes, framed as mechanisms for continuous improvement, not merely academic, but applicable and useful for the organisations, as we will expose about the contents of the papers in the next section.

3. Volume's contribution

In this section we summarize the contribution of the eleven papers of this volume along the context in which they fall. The papers' contributions, with exception of Stadnicka and Antosz (2015), could be classified in three main fields: the first related to the quality control; the second related to appraisal activities for decision making; and third one related to the performance improvement.

The contribution of Dias *et al.* (2015), Sousa *et al.* (2015) and Costa *et al.* (2015), are classified within the first field (quality control), the papers of Morte *et al.* (2015), Subramaniam *et al.* (2015), Nicola *et al.* (2015) and Ávila *et al.* (2015) are classified within the second field (appraisal activities for decision making), and the remaining papers, Nogueira *et al.* (2015), Moutinho and Oliveira (2015), Putnik *et al.* (2015) and Fonseca. (2015) are classified within the third field (performance improvement of the processes).

The first field, quality control, is more directed to new studies that can bring and influence new forms to perform quality control in a manufacturing process. Of course that quality control should be an option if a process did not guarantee the conformity by itself. However, when a process did not guarantee the desired percentage of quality and/or there are still not means to update this processes and/or the cost/benefit is too much high, the solution is to integrate control activities into the production process as much as possible without additional costs. The three papers framed in this field show a contribution in continuous improvement in the quality control, a part of QMS.

The second field, appraisal activities for decision making, is associated with new contributions for three different assessment activities that should take place in a QMS. The papers of Morte *et al.* (2015) and Subramaniam *et al.* (2015) contributes for

the collaborators appraisal, the paper of Nicola *et al.* (2015) for the value for the customer, and the paper of Ávila *et al.* (2015) for the suppliers. It could be said that a significant part of the stakeholders is considered in the contribution of this special issue in order to improve the QMS.

The third field, processes performance improvement, as the name suggests, is more dedicated to the contribution to some processes improvement that normally belong to the enterprises QMS. The process improvement should be made and appraised through key performance indicators, normally defined by each enterprise, and through the values obtained new goals should be defined for the next assessment period. The papers of this field give us some ideas to promote such improvement. Moreover, the paper of Fonseca (2015), closing the list of the papers of this special issue, highlights for the new version of ISO 9001 that will bring new contributions in order to promote improvement of the whole of the processes in an enterprise.

As was sad before the paper's contribution of Stadnicka and Antosz (2015) was not directly framed with the three fields above defined. Purposely we left it out because this paper is considered as an interesting one to open the theme of this special issue. The paper presents the results of a study, conducted in large production enterprises in Poland, concerning the assessment of the implementation of continuous improvement. The study was conducted with the use of a questionnaire about employees' involvement in the problem identification and in reporting improvements, as well as the way of motivating employees to involve themselves. Several hypotheses were formulated and tested to justify the results according to the enterprise type. Several conclusions are quite important to be used by enterprises that pretend to improve the practice of continuous improvement.

3.1 Quality control

The paper of Dias *et al.* (2015) develops an artificial vision inspection application with the aim at performing the detection and the quality control of a dot on a tire. Two different techniques, namely Background Subtraction and Hough Transform, were tested to process the images acquired to implement the solution. The tests results demonstrate good performance of both methods: processing time was low and, simultaneous, the achieved accuracy was high. This application is a real life example as continuous improvement can be applied to repetitive inspection tasks, transforming them from manual to automatic inspection, which can be adapted for another kind of industries.

The paper of Sousa *et al.* (2015) applies the graph theory approach to quantify uncertainty of performance measures. To that end, the causes of uncertainty are identified and a quantitative methodology, based on graph theory, is used to calculate an uncertainty index to evaluate the level of uncertainty of a given performance measure or key performance indicator. The quantification of performance measures uncertainty could contribute to better represent the risk associated with a given decision, which means an improvement tool to be used by decision-makers. In spite of the methodology developed by the authors could be applied to any performance measure, i.e., besides of the quality control, this paper was framed in this field because presents an application example for a performance indicator (reflow soldering process: number of soldering defects per million opportunities) used in the final quality control test of printed circuit boards.

The paper of Costa *et al.* (2015) is one more contribution of this special issue in the area of automatic control. The authors establish an algorithm to automatically recognize basic functional geometries: planes, cylinders, spheres and cones without operator intervention. Shape and position

recognition of these geometries is essential for dimensional characterization of most components, which could be useful for many quality control tasks. An application of the algorithm on real parts is shown and the analysis of the results obtained validated the suitability and the potential of the algorithm and allowed concluding that the robustness of the model depends on the quality of the data acquisition.

3.2 Appraisal Activities for Decision Making

The paper of Morte *et al.* (2015) presents a performance appraisal model for truck drivers, based on multi-criteria decision aid methodologies: the PROMETHEE, and the MMASSI, with a case study in a Portuguese trucking company. From the more accurate knowledge that appraisals provides, now the company may plan their activities more appropriately and more accordingly to their strategic objectives. It can adjust its training programmes to different drivers' needs and profiles, and allocate drivers to the each haul service according with their ranking based on social and technical criteria. This paper is a good contribution in how multi-criteria decision aid methodologies can be applied by the enterprises in order to improve the collaborators assessment and induce the practice of continuous improvement.

The paper of Subramaniam *et al.* (2015) focuses on issue of clinical decision making in nursing care.

The research objective was to determine the nurses' knowledge, attitude, practice towards EBP and barriers to use EBP in four (4) Government Hospitals in Malaysia. The presented study covered about 600 nurses in selected hospitals. This survey has shown that nurses in selected government hospitals are not familiar with the term of Evidence Based Nursing Practice (EBNP). The research presented gaps in knowledge, attitude and practice and the barriers on one side and provides valuable basis for increasing EBP practice in selected hospitals

and other institutions as well.

The paper of Nicola *et al.* (2015) presents a new conceptual model decomposing value for the customer and its quantitative model of benefits and sacrifices, using the Fuzzy AHP method. The application of the model was done in a footwear industry case study, to ascertain the usefulness of this approach and as a part of its validation, because the authors pretend to develop a set of case studies. Value for the Customer is one of the most important factors of a success of an enterprise and should be the centre of any QMS. So, this model represents an important contribution tool to analyse how customers assess and perceived the actual product/service offer. Assessing the desires, needs of the customer, the companies would increase a competitive advantage, as well as new innovations on the quality of their products or services.

The paper of Ávila *et al.* (2015) focuses the problem of suppliers/partners selection, that normally is a time and resource-consuming task that involves data collection and a careful analysis of the criteria that can positively or negatively influence the choice. In order to contribute for the problem resolution, the authors purpose a model for the selection of suppliers, whose criteria were obtained from the literature review and their weights through the survey results from the companies. The model has a hierarchical structure and can be applied with the Analytic Hierarchy Process (AHP) method or with Simple Multi-Attribute Rating Technique (SMART), two of the most utilised and simple multi-attribute methods. Because each company follows its own method usually without benchmarking, the positive contribution of the paper is that now the decision-makers can make use of this new reference selection model for the suppliers, which can represent an orientation/pattern for a decision making on the suppliers/partners selection process.

3.3 Performance Improvement of the Processes

The paper of Nogueira *et al.* (2015) presents a case study related to the implementation of a work safety program in a Brazilian chemical industry, in order to decrease the number of accidents in spite of the company to be certified at OHSAS 18001. Based on the world best practices for the chemical industry, a safety program was designed and implemented, whose positive results demonstrate the effectiveness of the program inside the company. Because the labour accidents are a problem for the performance of the organization's processes and consequently for the competitiveness of the organizations, bringing financial and social damage, so the reader has in this study a guideline to implement a safety program with the target of controlling the accidents in a chemical industry.

The paper of Moutinho and Oliveira (2015) explores the improvement of a maintenance process service on customer site with a decentralized organization based on multi-site teams. The authors present a case study where were identified the principal barriers of their maintenance chain service and the respectively improvements. Results of the performance variation in the last 36 months show that it was possible to support an increase of 18% of customer's equipment market maintaining the equipment availability constant and reduce the total costs in 7%, while a significant cost reduction of the working and traveling time per maintenance action, took place. Once any organization has to perform maintenance and/or to supply maintenance service, this case study can contribute by validating effectiveness of some practical actions for improvement of the maintenance service.

The paper of Putnik *et al.* (2015) defines the set of smart objects embedded production and quality management functions for supporting production and quality management decision-making. According to Ruhanen *et al.* (2008) and referred by Putnik

et al. (2015), the smart object is the "final product" of the implementation of ICT in existing manufacturing physical resources, such as products or machines. The functions proposed by the authors pretend to contribute for different kind of problems solving in production and quality management, such as production planning and control, scheduling, factory supervision, real-time data acquisition and processing, and real-time decision making, were validated positively in a large manufacturing company. As referred by the authors, the topic of smart object is not quite new but the smart objects technology and implementations are still not in their mature phase and has been gaining strength in industrial environment. Therefore, the topic of this paper belongs to the applied research and contributes to the further performance improvement of the processes.

The paper of Fonseca (2015) reviews several quality paths including the Quality Gurus and Total Quality Management (TQM) approaches, the Business Excellence Models and the ISO 9000 International Standards series, ending with an analysis and considerations of the expected outcomes of the ISO 9001:2015 revision process. According to the author, major benefits are expected such as less emphasis on documentation and new/reinforced approaches: consideration of organizational context and (relevant) stakeholders, risk based thinking and knowledge management. This paper was purposely left to the end because the principal topic concerns what will be the structure of the next version (2015) of ISO 9001, which will surely contribute to promote continuous improvement in quality management systems of the 1.3 million certified organizations and for those for which the certification process will begin.

4. Summary

To summarize this Editorial, it is attempted to chart out briefly some developments in

related areas of mechanisms to promote continuous improvement in quality management systems. As this field looks for permanent improvement in order to achieve the goal of the total quality, i.e., a “never ending story”, novel questions and problems stem requiring equally novel solutions.

At the end, the Guest Editors hope, and would like, that this Special Issue will be useful, meeting the expectations of the authors and wider readership and serving for enhancing the individual and collective

learning, theoretical insight and practical applications, and to incentive further scientific development and creation of new research and technical papers.

Acknowledgments: We thank the papers authors for their positive contribution and the reviewers for their useful and timely comments on the papers submitted to this Special Issue. We would also like to express a sincere thank to the Editors-in-Chief of the Journal, for this kind opportunity.

References:

- Ávila, P., Putnik, G., Lopes, M., Afonso Fernandes, A., Cavaco, I. (2004) Contribuição da ISO 9001: 2000 na Criação e Implementação de Quantificadores de Desempenho para as Pequenas e Médias Empresas, Proceedings das 4as Jornadas Politécnicas de Engenharia, Porto, Portugal (in portuguese).
- Ávila, P., Mota, A., Putnik, G., Costa, L., Pires, A., Bastos, J., Cruz-Cunha, M. (2015) Proposal of an Empirical Model for Suppliers Selection, *International Journal for Quality Research*, 9(1), 107-122.
- Costa, C., Mendonça da Silva, J., Monteiro, A., Filipe, A. (2015) The Role of Automatic Shape and Position Recognition in Streamlining Manufacturing, *International Journal for Quality Research*, 9(1), 51-64.
- Dias, A., Silva, M., Lima, N., Guedes, R. (2015) Identification of Marks on Tires Using Artificial Vision for Quality Control, *International Journal for Quality Research*, 9(1), 27-36.
- Fonseca, L. (2015) From Quality Gurus and TQM to ISO 9001:2015: a Review of Several Quality Paths, *International Journal for Quality Research*, 9(1), 167-180.
- ISO 9000:2005, Quality management systems – Fundamentals and vocabulary.
- ISO 9004:2009, Managing for the sustained success of an organization – A quality management approach.
- ISO (2012) Quality Management Principles, ISBN 978-92-67-10573-4.
- Morte, R., Pereira, T., Fontes, D. (2015) MCDA Applied to Performance Appraisal of Short-haul Truck Drivers: A Case Study in a Portuguese Trucking Company, *International Journal for Quality Research*, 9(1), 65-76.
- Moutinho, J., Oliveira, F. (2015) Optimizing Maintenance Processes on Customer Site in a Decentralized Organization Based on Multi-site Teams, *International Journal for Quality Research*, 9(1), 141-150.
- Nicola, S., Pinto Ferreira, E., Pinto Ferreira, J. (2015) Assets Management - A conceptual Model Decomposing Value for the Customer and a Quantitative Model, *International Journal for Quality Research*, 9(1), 89-106.
- Nogueira, E., Quelhas, O., França, S., Meiriño, M., Cunha, L. (2015) Implementation of a Safety Program for the Work Accidents’ Control. A Case Study in the Chemical Industry, *International Journal for Quality Research*, 9(1), 123-140.

- Putnik, G., Varela, L., Carvalho, C., Alves, C., Shah, V., Castro, H., Ávila, P. (2015) Smart objects Embedded Production and Quality Management Functions, *International Journal for Quality Research*, 9(1), 151-166.
- Ruhanen, A., Hanhikorpi, M., Bertuccelli, F., Colonna, A., Malik, W., & López, T.S. (2008) Sensor-enabled RFID Tag Handbook. BRIDGE Project - Building Radio frequency IDentification for the Global Environment.
- Sousa, S., Lopes, I., Nunes, E. (2015) Graph Theory Approach to Quantify Uncertainty of Performance Measures, *International Journal for Quality Research*, 9(1), 37-50.
- Subramaniam, S., Krishinan, S., Thandapani, R., Rostenberghe, H., Berahim, A. (2015) Clinical Decision Making in Nursing Care: Evidence Based Practice and Seniority, *International Journal for Quality Research*, 9(1), 77-88.
- Stadnicka, D., Antosz, K. (2015) Continuous Improvement Practice in Large Enterprises: study results, *International Journal for Quality Research*, 9(1), 9-26.

Goran Putnik

University of Minho,
School of Engineering
Research Center Algoritmi
Portugal
putnikgd@dps.uminho.pt

Paulo Ávila

Polytechnic of Porto,
School of Engineering
Portugal
psa@isep.ipp.pt
