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An adaptive management system for hazardous technology organizations

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Abstract

This paper introduces a management system suitable for hazardous technology organizations which has been developed based on the assumptions that in these organizations safety is a critical strategic factor, the existence of an enhanced safety culture is a crucial condition for safety and that safety culture enhancement implies in organizational changes. The management system was theoretically developed and then implemented at a Brazilian nuclear research and development installation, as a case study, in order to validate the theoretical propositions assumed in the system development. The developed management system comprises a day-to-day based organizational framework which treats safety as one of the organization strategic perspectives and provides a continuous adaptation of the complex causal inter-relationships which occur between the implementation of new management practices – designed and implemented according to the requirements of the criteria of excellence of the Brazilian quality award management assessment model – and the organization safety culture. The results achieved in the case study permitted to demonstrate the validness of all the system theoretical propositions and to conclude that the continuous and systematic operation of the management system makes an effective safety culture enhancement possible and simultaneously facilitates that the new management practices be effectively implemented, thus making continuous organizational improvement possible.

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1. Introduction

The complex environment that involves organizations nowadays, where changing of scenarios occur under a dynamic, unpredictable and accelerated fashion, increases the diversity of internal and external factors that may influence organizational performance, while simultaneously maximizes their inter-dependence, thus submitting organizations to a set of conditions that represent threats or opportunities regarding their survival, competitiveness and success. The existence of a management system within the organization in order to identify, treat and check these conditions in a continuous and systematic way has, therefore become a strategic need for organizational performance improvement towards market competitiveness. In order to cope with this context, many organizations worldwide have implemented total quality management (TQM). However, most of them did not succeed in obtaining an effective TQM implementation, mainly due to the lack of adequacy of their organizational culture regarding the changes required by TQM to occur within the organization (Sousa-Poza et al., 2001; Vermeulen, 1997).

Within the context of hazardous technology organizations – where safety is a critical strategic factor – such as those of the nuclear, oil and aviation sectors, there is a possibility of accident occurrence whose consequences may reach organization's people and assets, the environment, and the society in general. Therefore, safety management must necessarily be part of the strategic policy of these organizations, besides quality management. Analyses of hazardous technology industrial accidents have demonstrated that safety depends not only on the technical factors related to the operation of the industrial processes, but on issues related to human and organizational factors as well, giving rise to the need for the development of new safety management approaches (Perrow, 1984; INSAG-1, 1986; Reason, 1999; Llory, 1999).

Within the nuclear sector, since the accidents of Three Mile Island (TMI), occurred in 1979 in the USA, and Chernobyl, occurred in 1986 in the Ukraine, safety became a paramount concern for the nuclear organizations worldwide. Since that time, due to the possible catastrophic consequences of a nuclear reactor accident, non-governmental organizations of environmental protection, as well as green political parties from many countries, started to adopt a strong stand against the use of nuclear energy to electrical power production, giving rise to serious public acceptance problems concerning the use of nuclear energy worldwide. This context has caused a nuclear energy use discontinuity in several countries, highlighting therefore, the critical strategic condition of safety regarding the sustainability of nuclear energy use to electrical generation, and therefore to the search of improved competitiveness of these organizations.

The analyses of the Chernobyl accident accomplished by the International Atomic Energy Agency (IAEA) through the international nuclear safety advisory group, led to the development of the safety culture approach, understood as a reinforcement process to all other necessary safety measures, which must be constructed, maintained and continuously enhanced within nuclear organizations worldwide (INSAG-1, 1986). "Safety culture is a necessary characteristic to reach safety in nuclear installations and therefore it must be possible to assess its status in order to improve it and maintain it in optimal levels"