Knowledge and Quality for Continuous Improvement of Production Processes

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Abstract. This work aims to show the scale of the use of tools and concepts for quality management and knowledge. In addition, it seeks the improvement of industrial processes and products, which we also need the conscious and motivated employee participation. Moreover, it seeking their commitment with the changes to be implemented. An illustrative case of application is performed on company of aluminum smelter, with significant results.

Keywords: Organizational change · Process improvement · Knowledge · Quality

1 Introduction

The organizations need to prepare people for the challenges of daily life are far beyond numbers and manage conflicts. It is necessary to rethink, learn and lead forms of sharing among the various types and levels of employees within organization.

Knowledge is created by individuals, and the organization must support employees with creativity and interest, providing them with contexts for knowledge creation, making it concrete. For an organization to remain competitive in the market, knowledge is a key strategic resource [1].

The knowledge management is the collection of processes that govern the creation, dissemination and use of knowledge. Thus, to fully achieve the companies' goals, a new confluence of information technology and administration, a new link between strategy, culture and the organization's information systems are necessary [2]. Figure 1 shows the integration between departments.

The changes that are occurring and those that occur are not seen as mere trend, but permanent changes and favorable to all segments, as organizations have extremely important role also in the professional growth of its employees.

The purpose of this paper is analyze how the kind of knowledge (tacit and explicit) is related to use of tools of quality to continuous improvement in production process.

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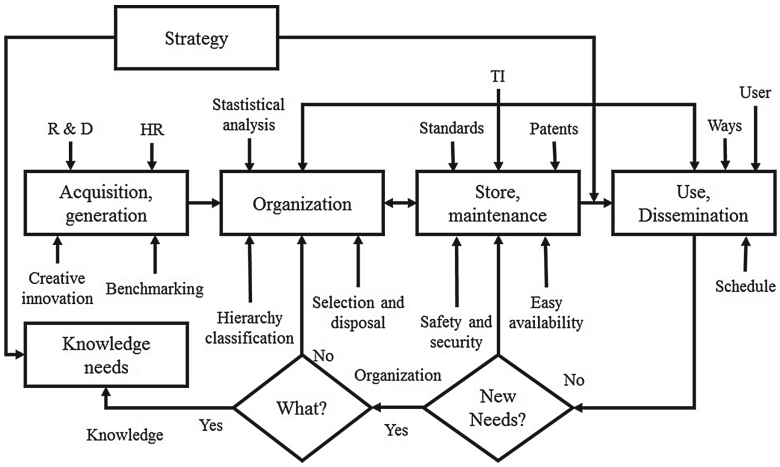

Fig. 1. Model for knowledge management. Source: Adapted [3]

2 Organizational Change

It is configured as organizational change the modification of existing resources patterns, whether is structural, human, strategic or technological, reflecting an a systematic way or parts of the organization [4]. A process of change, to be successful, must be well planned, well publicized, well justified and well executed. It is necessary to take on consideration the climate and the culture of the organization [3].

Everyone in the organization should be aware and willing to carry out these changes, from the lowest organizational level to senior management. Therefore, for change to happen occur, it is necessary that the organizational values and attitudes change at all levels [5]. Actions such as hiring consultants and/or internal and external training help improve and speed the results, starting to promote awareness of the team. Emphasizes that the leader's role is necessary for the implementation of any change [6].

Every change generates mistrust and resistance, since the comfort zones are affected. This resistance is inherent in any process of organizational change. The shift in paradigm becomes one of the points decisive in the success of the change. The cultural issue is a factor that should be treated with due importance by organizations in breaking paradigms, aiming to promote a culture of excellence that should be pursued and developed [6].

3 Process Improvement

The improvement process within organizations becomes very important because it affects all sectors and levels. Improvement is always the order, because perfection, although it should always be purse, is unattainable [3].

The improvement can be classified as continuous or incremental, where the first is accomplished through the analysis of how processes are operating. Incremental improvements are obtained by more drastic changes, offering deeper transformations and having a timely and more intense effect.

Continuous improvements are softer, but use simpler tools for analysis; already incremental improvements are more emphatic and use more advanced statistical tools or innovations to a stronger improvement of the shares.

4 Integrated Management: Quality and Knowledge

Quality tools are a first step to improving the profitability of the process and productivity through optimization of operations [7]. Figure 2 shows the interaction between the stages of the continuous improvement of the Quality Management System process.

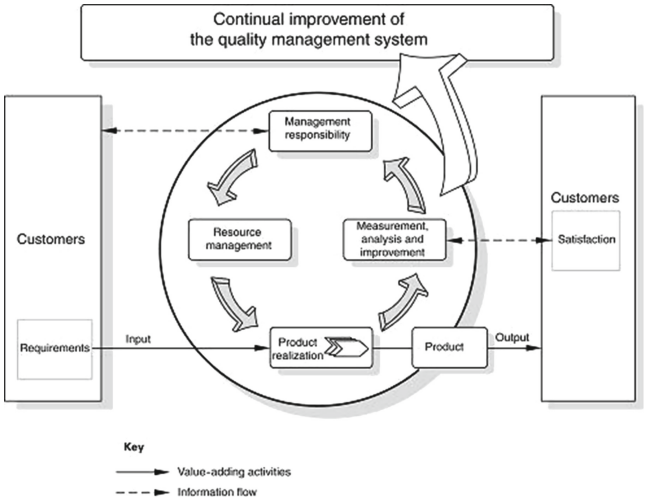

Fig. 2. Continuous improvement of the Quality Management System. Source: [8,9]

The methodology of integrated management was proposed by [10], in order to achieve better organizational results, and is represented by strategic actions, structural, behavioral and operational. The main purpose is the focus of eliminating flaw in the processes to maximize and provide service and products closer to perfection. In support of continuous quality improvements are listed the basic quality tools [3].

5 Quality Tools

For continuous quality improvement are listed the basic quality tools [3]:

- **Check Sheet:** important to ensure that nothing that should be done or checked is forgotten.
- **Histogram:** basic statistical tool of graphic sample description of variables, useful to understand their behavior.
- **Pareto Chart:** as it is represented the items under analysis in descending order of importance (value, frequency, etc.) to prioritize analysis of the most important.
- **Ishikawa Diagram:** or cause and effect, or herringbone, used to identify causes of problems according to their nature.
- **Process Control Chart:** main statistical tool of control processes.
- **Stratification:** used when there is suspected values for different origins of elements.
- **Scatter Diagram:** appropriate to set behavior analysis of two quantitative variables considered simultaneously and evaluate their correlation.
- **Flow Chart:** provides a graphical representation of the interrelationship of all its activities, allowing a better visualization and understanding.

The following tools are also complementary in assisting quality management [11].

- **Brainstorming:** is a group process in which individuals send free form of ideas, in large quantities, without criticism and in the shortest possible time.
- **5W1H or 5W2H:** it is a tool to help structuring action plans from key issues (What ?; Who ?; When ?; Where ?; Why ?; How ?). Although 5W2H adds the issue How much ?, emphasizing the cost of action.
- **5S:** a set of concepts and practices that are the main goals of the organization and rationalization of the work environment. The program refers to five Japanese words beginning with the letter S: seire, seiton, Seiso, Seiketsu and Shitsuke.

6 Knowledge

There are several levels of interaction that can arise within an organization for the development of knowledge that may be relevant in continuous improvement. The knowledge conversion model should be based on the interaction between the tactical knowledge and explicit [11]. Tacit knowledge has a personal quality, subjective, the result of processing information, insights and technical abilities also that integrate the acquired knowledge, or know-how. Explicit knowledge refers to that transmitted into a formal language, systemic, onto a objectively from. Proposes a conversion model of knowledge where the integration of explicit knowledge and tacit knowledge complement each other, as shown in Fig. 3 [12].

Fig. 3. Knowledge Spiral. Source: Adapted [12]

The knowledge spiral contemplates a successive process covering: (a) Socialization: is the process which experiences are shared and tacit knowledge is socialized among individuals; (b) Outsourcing: is the most important conversion model, because it allows the creation of new and explicit concepts through the tacit knowledge that normally are difficult to verbalize; (c) Combination: This process is based on the exchange of explicit information and use paradigms of information technology; (d) Internalization: is the mental absorption of the results of combinations checked in practice, or "learning by doing", returning to the beginning of tacit knowledge and the new working process at an advanced level of knowledge. While most share new mental models, tacit knowledge becomes part of the organizational culture, and by every successful internalisation, the cycle starts again, leading to improvement or innovation. Table 1 combines the main tools of quality and levels of knowledge, as well as its goals and objectives.

Existing tools and techniques in the management of knowledge and quality help define, analysis and measurement to solve problems.

Knowledge management is becoming an important integrator in organizations. Therefore, the implementation and use of systems such as ERP are the focus of studies that aim to address the effects on organizations under the technical and functional perspective [13].

7 Illustrative Case

An application of various ideas outlined in this work was done in an aluminum smelter company during the period of a year. This sets the presence of the action research methodology.

Action research is a type of social research with empirical basis that is designed and carried out in close association with an action or resolution

Table 1. Quality tools and levels of knowledge

Quality tools	Homes	Level
Cause and effect diagram	Identify the relationship between the result and all causes of a problem	Tacit
Pareto chart	Encourage the identification, measurement and the priority of the most important problems of a process	Explicit
Flowchart	Provides the sequences of process steps on easy veining	Explicit
Letter control	Monitor the variability and the problem of a process through charts explicit	Explicit
Check sheet	Enumerate the constant occurrences of a production process at a given time	Tacit
Histogram	Monitoring identification the monitoring of variables of a process	Explicit
Diagram of dispersion	Provide statistics of dependent and independent variables of a process	Explicit
Brainstorming	Detail the perceptions of a particular subject, looking for different opinions from the collective creativity	Tacit
5W2H	Represent and unify the processes, on organizing action plans and statement of Assistant methods to indicators, to a management	Tacit
Stratification	Identify variables from different sources in order to avoid inconsistent analyzes	Tacit
5S	Collaborate in the behavioral modification of employees in order to have a sense of organization keeping the pleasant atmosphere and abolishing waste	Tacit

of a collective problem, which researchers and representative participants of the situation or problem are involved in cooperative mode or participatory [14].

This work was carried out in an aluminum die casting company on the surroundings of São Paulo, which currently has 109 employees over three shifts. It was established by senior management should be prepared a medium-term action plan for the organization to become competitive stand out compared to its competitors. For this, to happen quality management methodologies and knowledge management were used in solving the problems. The main problem listed by managers was the high rate of noncompliance, Fig. 4, caused by not having appropriate method on dealing some of the appointed internally problems and by the clients.

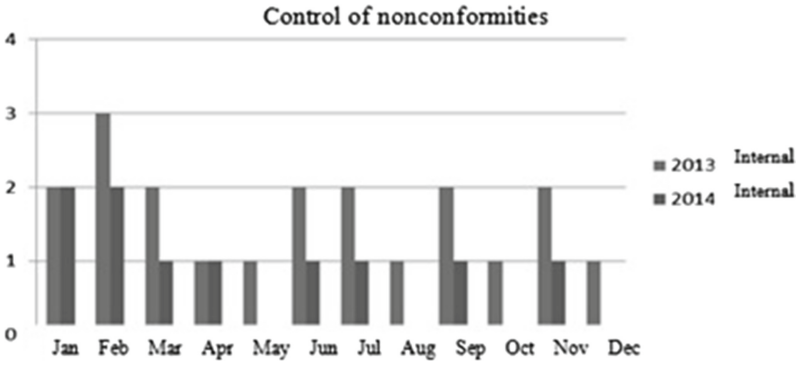

Fig. 4. Control of non-conformities internal

As can be seen in Fig. 4, the comparison between the 2013, with a total of twenty non-conformities and 2014, with a total of ten internal non-compliance where it is possible to see a fifty percent improvement after the implementations suggested by the tools of quality and knowledge management. Figure 5 shows the comparison between 2013 and 2014 for external nonconformities.

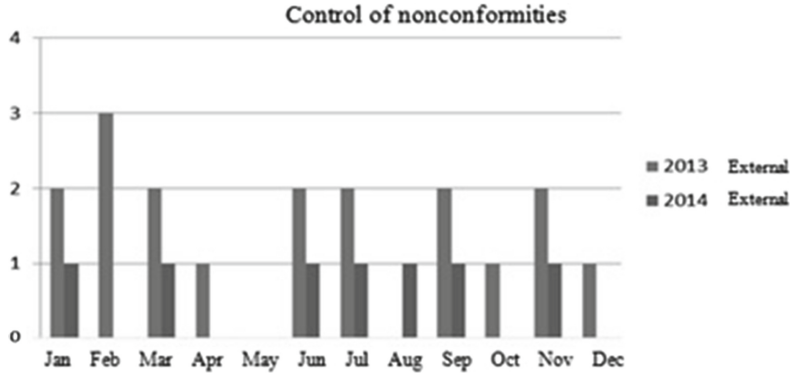

Fig. 5. Control of no external compliance

As can be seen in Fig. 5, 2013 presented a total of eighteen nonconformities, and 2014, showed a total of seven external nonconformities cohere it is possible to see an improvement of sixty-one percent after the suggested tools implementations suggested by the tools of quality management and knowledge management.

8 Conclusion

Over the past few years organizations seek to develop methods to become increasingly competitive and stand out in the market in which they operate, but what is the gain that the implementation of knowledge and quality management tools can generate?

The research carried out in the company in question presented quantitative results and a substantial improvement in the quality, demonstrated by reducing the number of non-internal and external compliance.

The positive results were only possible after the interaction and the commitment of everyone in the organization, shared together the integration of management systems.

With this work we seek to offer a small contribution to organizations and emphasize the relationship of open tools for managing problems and improvements to the organization.

References

1. Choi, B., Poon, S.K., Davis, J.G.: Effects of knowledge management strategy on organizational performance: a complementarity theory-based approach. Omega **36**(2), 235–251 (2008)
2. Texeira Filho, J.: Gerenciando conhecimento: como a empresa pode usar a memória organizacional e a inteligência competitiva no desenvolvimento dos negócios. SENAC, São Paulo (2000)
3. Costa Neto, P.L.d.O., Canuto, S.A.: Administração com qualidade: conhecimentos necessários para a gestão moderna. Bluncher, São Paulo (2010)
4. Wood Junior, T.: Mudança organizacional: aprofundando temas atuais em administração de empresas. Atlas, São Paulo (1995)
5. Duck, J.D.: The Change Monster: The Human Forces that Fuel or Foil Corporate Transformation and Change. Crown Business, New York (2002)
6. Falconi, V.: O verdadeiro poder. INDG, Belo Horizonte (2009)
7. Lobo, R.N.: Gestão da qualidade. Erica, São Paulo (2010)
8. Associação Brasileira de Normas Técnicas: NBR ISO 9001:2008. Sistema de Gestão da Qualidade Requisitos (2008)
9. Eurocontrol: ISO 9001 Certification (2009). https://www.eurocontrol.int
10. Rodrigues, M.V.: Ações para a qualidade: gestão estratégica e integrada para a melhoria dos processos na busca da qualidade e competitividade - planejamento e estratégia. Campus, Rio de janeiro, 4th edn. (2012)
11. Carpinetti, L.C.R.: Gestão da qualidade: conceitos e técnicas. Atlas, São Paulo (2010)
12. Nonaka, I., Takeuchi, H.: The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation. Oxford University Press, Oxford (1995)
13. Baskerville, R., Pawslowsky, S., McLean, E.: Enterprise resource planning and organizational knowledge: patterns of convergence and divergence. In: International Conference on Information Systems, vol. 20, pp. 396–406. Association for Information Systems, Atlanta (2000)
14. Thiollent, M.: Metodologia da pesquisa-ação. Cortez, São Paulo (2011)