INDEPENDENT JOURNAL OF MANAGEMENT & PRODUCTION (IJM&P)
http://www.ijmp.jor.br v. 4, n. 2, July – September 2013.
ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

APPLICATION OF A QUALITY MANAGEMENT TOOL (8D) FOR SOLVING INDUSTRIAL PROBLEMS

Evandro Eduardo Broday
Federal Technological University of Paraná – UTFPR, Brazil
E-mail: evandrobroday@ibest.com.br

Pedro Paulo Andrade Júnior
Federal Technological University of Paraná – UTFPR, Brazil
E-mail: pedropaulo@utfpr.edu.br

Submission: 22/04/2013
Revision: 05/05/2013
Accept: 16/06/2013

ABSTRACT

The proposed article aims to develop and implement a management tool using the 8D quality for solve problems. In methodological terms, the research was developed in a European multinational accomplished through a case study presents the steps used by the company to adapt the tool 8D, as required by the same. In terms of results it was found that, through the transfer of knowledge from senior management to employees, showing the correct application of the tool 8D, time to resolution of the problems can be 30% lower.

Keywords: 8D; Quality Management; Quality Tools; Knowledge Transfer.

http://www.ijmp.jor.br v. 4, n. 2, July – September 2013.
ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

1. INTRODUCTION

The currently existing global competition makes companies seek more and more alternatives to remain alive in the market. For this, many companies seek to reduce the number of failures in its products, seeking an increasing of reliability.

To have a good reliability, it is necessary for the departments of Production, Maintenance and Quality work together into the company, because they are dependent of each other. Through maintenance practices, it's possible to provide availability for the machines operate. A decrease in availability of machinery reflects the company's productivity immediately. Quality management provides quality tools for the two sectors work in harmony.

For Coutinho et al. (2010), the main objective of the application of quality tools is to identify the major problems of companies, always seeking the best solution of the same.

Quality tools help to improve the quality of products, services and processes. Quality tool is a tool designed to perform a specific task, according to a defined procedure. It enables direct and support the activities of improvement and change. Quality tools can be divided in two groups: traditional tools and additional tools. Traditional tools are the tools that were developed in Japan, including the Pareto chart and the Ishikawa diagram. The complementary tools are less used or are used only to solve a specific problem (SLACK, 2009).

This research was developed in an European multinational, active in the agricultural market. The main problem observed was the breaking of some tractors when they were already in operation by the customer. In order to decrease the number of breaks, which result in a negative image for the company and annoying to the customer, it was used the tool 8D (Eight Disciplines) to minimize the damage.

The 8D is a quality approach to dealing with a problem in a company or organization. This is a method of analysis and fast response for a problem. It applies the double objective of ensuring the continuity of flows and at the same time finding ways to eradicate the roots causes of the problem. Solutions to specific problems are continuously improved and kept as a model. In this study, specifically, the need to deploy the tool 8D to solve the machinery breaks in a multinational company. As it is necessary a monitoring of employees for the method has effectively, in this work was

ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

discussed a knowledge transfer from senior management to employees, teaching a working method, contributes to the growth of the organization.

This manuscript is justified by the fact that present the tool and its context 8D inserted into a multinational European agriculture. Being a case study, it'll provide to the production engineer the interaction of the theme, developing their knowledge and searching for concepts and techniques to play the best possible understanding and analysis of this study, and thus replicating and generalizing knowledge to another number of samples.

2. LITERATURE REVIEW

2.1 Quality Evolution

The art of getting Quality experienced a great evolution in the twentieth century, from the mere inspection of finished products to the strategic vision of business. According to Heras et al. (2009), quality evolution is divided in four steps: quality inspection, statistical quality control, quality assurance and total quality management (TQM).

Until the mid-twentieth century it was rare for a company present in your chart a department directed to quality. This function was performed by special inspectors (CARVALHO and PALADINI, 2012).

The Taylorist system generated some undesirable effects due to the emphasis given by senior management to productivity. Supervisors and workers prioritized productivity and quality have relegated to the background. At this time, the inspection was focused on the product

In 1922, the inspection activity is formally incorporated into the Quality Control. The activity of the inspectors was restricted to the identification and quantification of defective products, which often resulted in punitive measures. Manufacturers were removing defective parts without being made a preliminary study on the causes (CARVALHO and PALADINI, 2012).

With the growth in production, the model based on the 100% inspection becomes expensive and ineffective. In 1924, Shewhart, applying statistical knowledge, develops a powerful technique in order to troubleshoot quality control of Bell Telephone Laboratories: the control charts, currently used in the industry.

ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

The statistical control was evolved and came to the era of Quality Assurance, which consists of four main movements: quantification of quality costs, Reliability, Total Quality Control and Zero Defects Program.

The era of Total Quality Management (TQM) is a natural evolution of the three ages that preceded it and is ongoing today. According to Slack et al. (2009), TQM is a management philosophy that focuses on continuous client, relying on management tools and working within a cooperative organizational culture.

Firms implement TQM to raise the competitive advantage, increase the profits, and become innovative (BON and MUSTAFA, 2012). Experience has shown that some firms fail when they implement TQM because its implementation cannot be successful without the use of suitable quality management methods (TARÍ and SABATER, 2004).

TQM is positively related to innovation performance because it establishes a system and culture that will provide a fertile environment for organizations to innovate (PRAGOJO and SOHAL, 2006).

2.2 Quality Tools

Before speak about quality tools, it should define what quality is. According to Carpinetti (2012), quality has different settings due to generic allocation to which the term is used to represent things are quite different. Garvin (1992) rated the quality in five distinct approaches:

- Quality transcendent: the quality is not an idea or a concrete thing, although we cannot define quality, we know what it is;
- Quality based on the product: quality is a precise and measurable variable;
- Quality based on the costumer: quality is to meet consumer desires;
- Quality based on production: quality is the degree to which a specific product is in accordance with a design or specification;
- Quality based on value: quality is the degree of excellence at an acceptable price.

http://www.ijmp.jor.br v. 4, n. 2, July – September 2013.
ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

Quality works to achieve continuous improvement in the productive system, in an approach that is characterized as a process of continuous improvement in products and processes to achieve improvements in overall performance.

According Carpinetti (2012) and Silva et al. (2013), to assist in the development of continuous improvement, it is used the tools of Quality, which are:

- Pareto Chart: is used to divide a large problem into several smaller problems, with the goal of viewing the problem. It shows, in order of importance, the contribution of each item to the total effect. Typically, it is represented by a bar graph;
- Cause and Effect Diagram (Ishikawa Diagram): is used to represent the relationship between the effect and all possible causes that are contributing to this effect. Causes are usually grouped in these categories: method, measurement, machine, raw material, labor, and work environment.
- Check sheet: is a very simple tool which aims to group data so that they are easily further processed;
- Stratification: It separates data collected from different sources so that patterns can be seen.
- Histogram: is a bar graph showing the frequency at which the values occur in the measurements. In the graph, the thickness is variable, and the range of the height of the bar shows the number of times it occurs;
- Control Chart: widely used in SPC (Statistical Process Control), is a graph done to identify how a process can be changed to point to modify the product quality;
- Scatter Diagram: relates two variables by studying the possible relationships that may exist between them.

A single tool is a device with a clear function, and is usually applied on its own, whereas a technique has a wider application and is understood as a set of tools. Companies that know how to use correctly the quality tools to solve a problem, are able to achieve goals, leading to a true competitive position (TARÍ and SABATER, 2004). According to Heras et al. (2009), the use of quality tools enhances the

ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

competitiveness of those organizations that support your quality system based on ISO 9000.

2.3 8D (Eight Disciplines)

The tool 8D (Eight Disciplines), corresponds to their readiness to solve complex problems for continuous improvement of a product or a process. The tool is processed in eight disciplines and emphasizes the synergy of the people involved. It was originally developed by Ford Motor Company, where it combined various elements of other techniques for problem solving to shape the eight disciplines, which it was introduced in Ford manual titled: Team Oriented Problem Solving (TOPS) (MARCHINI, sd). According to Marchini [sd], the tool 8D ranks according to table 1:

Table 1 – 8D

D1. Inicial Data	Establish a small group of people with knowledge, time availability, authority and competence to solve the problem and implement corrective actions. The group must select a team leader.
D2. Description of the problem	Describe the problem in measurable terms. Specify clearly and objectively the problems that occurred both internal and outside the company.
D3. Immediate countermeasures	Define and implement actions that will provide protection for the customer to faulty, not causing a significant loss of the same, until permanent corrective action is implemented. Check with the data of the effectiveness of those actions.
D4. Root causes	Identify all potential causes that could explain why the problem occurred. Apply and test each potential cause against the problem description and data. Identify alternative corrective actions to eliminate the root cause.
D5. Corrective and preventive actions	Confirm that the corrective actions implemented will solve the problem for the customer or supplier and will not cause undesirable side effects. Define other actions, if necessary, based on the potential severity of the problem.
D6. Effectiveness of actions	Define and implement the necessary corrective actions for the permanent elimination of the root cause of the problem. Choice controls to ensure that the cause is eliminated. Monitor the long-term effects and implement additional controls, if

ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

	necessary.
D7. Updating of standards	Modify the specifications, training of employees, work flow, improve practices and procedures to prevent recurrence of this and all similar problems
D8. Closing	Recognize the collective efforts of the staff. Promote your accomplishment and share knowledge and learning with the whole team, to assist in possible failures or similar errors that may occur.

3. METHODOLOGICAL PROCEDURES IN THE IMPLEMENTATION OF THE 8D METHOD

The company in question is a manufacturer of agricultural machinery. The machines vary in size; each size is to meet a different specification. Each one of the machines has a person responsible for their design, being the Chief of the project.

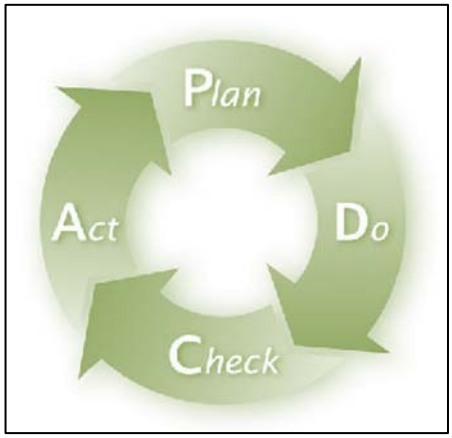
Seeking to know what was the situation regarding the use of quality tools; a questionnaire was prepared to see the actual state of the each tool use. The main objective of the questionnaire was to take all information about the use of the tools, in verifying that the tools were known or not, if the tools are used properly, if there are difficulties for the use of the tools and what are the frequently used tools. The questionnaire was sent to the project leader for each segment and contained all quality tools, and the Chief of the project indicates the most used, and describe the facilities and difficulties in working with a quality tool.

After getting the answer of each leader of the project, it was found that there are tools which are not known or used. The large number of tools and the difficulty of working with more than two at the same time were appointed as the main difficulty in implanting a quality management tool.

By the questionnaire survey, it was found that the most appropriate tool to accomplish the deployment in the enterprise was the 8D. To put into practice this tool, a technician document has been created. This technician document was designed to collect all the information about the problem. In fact, this technician document is based on the PDCA cycle, as shown in Figure 1 below (DEMING, 1990):

Figure 1 – PDCA Cycle

INDEPENDENT JOURNAL OF MANAGEMENT & PRODUCTION (IJM&P)
http://www.ijmp.jor.br v. 4, n. 2, July – September 2013.
ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74



Source: Deming (1990)

The quality approach presents a basic management method - PDCA (Plan, Do, Check, Action) cycle - as well as several sets of tools that can be applied to operationalize each cycle phase and employed depending on the company's quality management maturity, and also on the complexity of the problem (SILVA et al., 2013)

The phase P (Plan) is to find the problem and establish the goals, i.e. what is the plan of action adopted to solve the problem. The phase D (Do) is to monitor the implementation of the plan, to see if the action plan is being implemented properly. The phase C (Check) is to verify that the result of the goal was met. Finally there is the stage A (Action), which should provide a corrective action in case of failure or standardize and retrain if there is success.

As the failures occur, it is necessary to block their root causes. This can only be achieved through the operation of the PDCA cycle. Each spin of the PDCA cycle represents an increase of knowledge that maintenance teams acquire about the equipment.

From the knowledge of the problem, security is the formalization and implementation of immediate actions for the protection of the client. It includes the search for evidence on the ground, the sorting actions, blocks production and its communication to the client. There are three phases:

- D1 (Initial data - Locating the problem);
- D2 (Description of the problem);
- D3 (Lock Stock): collecting the facts and the evidence, the problem is described in a structured way using 5W2H (Why, Where, When, What, Who,

ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

How, How much) by setting up so lock stock application to avoid this problem keep happening.

During the phase Plan/Do the root causes of the problem are identified, by setting up an action plan and corrective actions. There are two steps:

- D4 (Identification of potential causes);
- D5 (Corrective and Preventive actions): based on evidences and data, it can be identified potential factors. By using the “5 Whys”, it’s confirmed the root causes of the problem.

During the Check/Act, the effectiveness of the corrective measures are evaluated, the standards are updated to prevent any recurrence and action plans are determined. There are three phases:

- D6 (Efficiency of actions);
- D7 (Update of standards);
- D8 (Closing): here, the effectiveness of the actions with the data and welcomes the success of 8D team. After that, the customer is invited to show the evidences of change. The problem was solved and probably will not return.

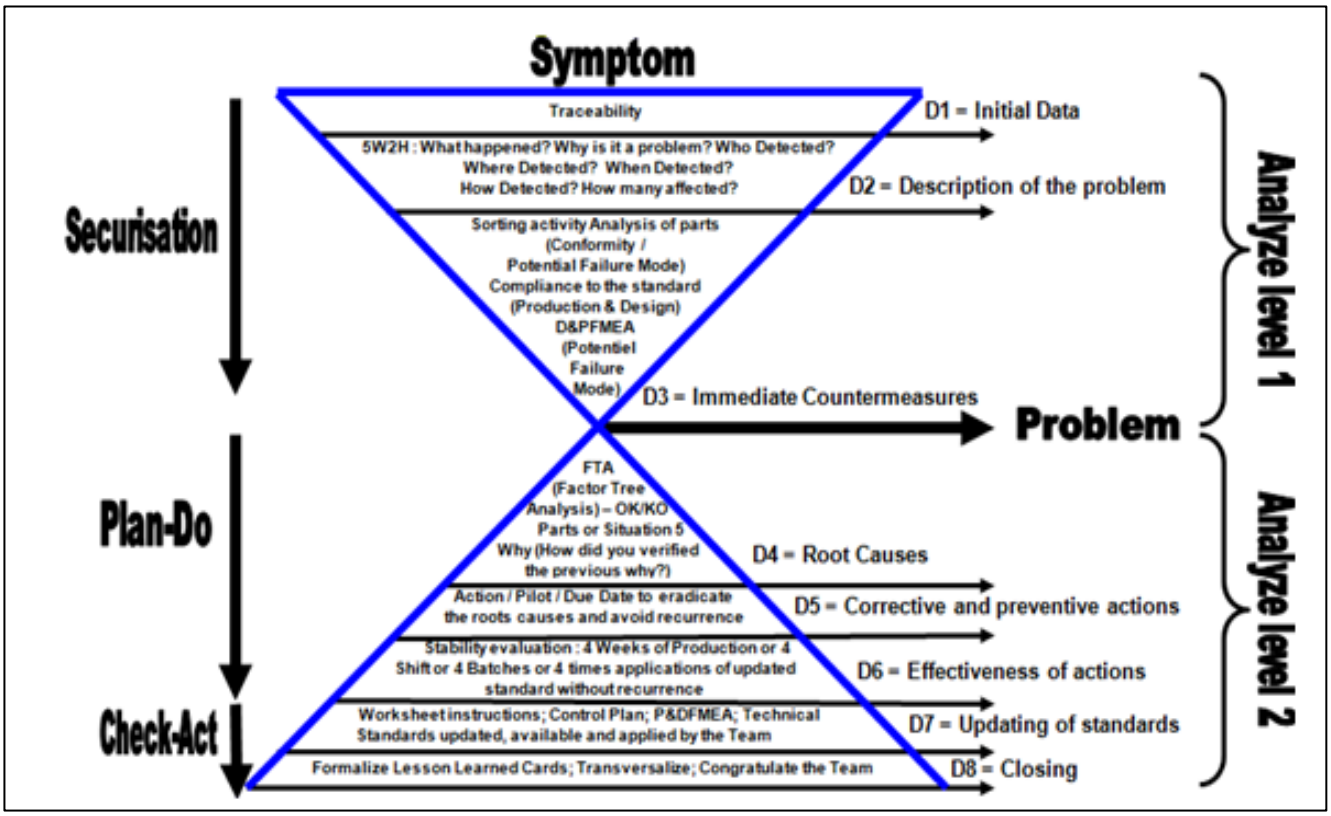
The 5W2H, used during D2, is a technique for finding information about a problem and its causes, asking questions to find the root causes of the problem. What, who, where, when, how, how much and why are conducted and an action plan is proposed.

The development of 8D Method is proposed in two levels: analyze level one and two. Analyze level 1 will determine the problem that must be dealt with from the symptom, using the 5W2H. An analysis of the actual parts and checking the correct implementation of the rules are made. It is important not to confuse the symptoms with the problem. Symptom is what is annoying the customer, and the no resolution of the symptom becomes the problem.

Analyze level 2 is made to find the root causes of the problem, the implementation of plans of action for its eradication and the formalization of the lessons learned. The 8D Method can be viewed in figure 2 above:

INDEPENDENT JOURNAL OF MANAGEMENT & PRODUCTION (IJM&P)
http://www.ijmp.jor.br v. 4, n. 2, July – September 2013.
ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

Figure 2 – 8D Method



Source: The Author

Lessons Learned cards are complete files to avoid the same problem more than once. It documents all the steps and methods used to solve the problem. Here, one can identify the factors that could create the problem and the 5 Whys identify root causes. After that, the corrective actions are implemented, eradicating the problem.

4. RESULTS AND DISCUSSIONS

To achieve success in implementing the tools, the monitoring of the users is necessary. For this, it is important to undertake training courses for users, showing and teaching how the method works and/or it applies.

The training was made by using the 8D Method. One of the objectives was to integrate the method as a daily routine. Through the use of this tool, all company progresses on the path for continuous improvement, where all people learn continuously.

In the studied company, one month after the implementation of the 8D method, the time spent to solve a problem decreased about 30%, on average, before

http://www.ijmp.jor.br v. 4, n. 2, July – September 2013.
ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

the deployment of 8D. This is due because the 8D integrate all departments of the company immediately and effectively in search of the root cause of the problems.

The essential role of an "integrated learning" is to support the long-term success of a company's in innovation programs. One of these innovative programs can cite a quality tool. The basis of learning is synonymous with the acquisition of new technologies and human experiences in the application of these technologies (SMITH and SHARIF, 2007).

Any new technology that the company experience generates a competitive advantage for the company front of yours competitors. Having achieved an advantage, technology assets are an essential ingredient to defend that position. It is very important for a company to adopt and apply new technologies early enough so that the financial benefits are available to pay the initial costs that can be extremely high. If a company waits too long to apply a new technology, so it can find a position where the available profits cannot overcome the initial costs. In this way, the production of knowledge is essential for the company to maintain a competitive position.

The production of knowledge is analyzed as an interactive and collective learning process in which a variety of authors are involved, such as companies, universities, research and development centers and laboratories. This process is affected by the characteristics of the system in terms of appropriability of knowledge, availability of external knowledge and accessibility to external knowledge. Each participant has to invest in communication process and transmit additional pieces of knowledge (Kang Rhee and Kang, 2010).

Having knowledge ready to be transferred, the broadcast must be agile and in an effective way. The process of knowledge transfer is defined by Szulanski (1996) as: "replication internal practice that is made of a higher form in any part of the Organization and is considered higher than alternative practices known outside the company."

In the process of transferring knowledge, interpersonal skills relating to employees are extremely important; this includes leadership, oral communication skills, strong impact and friendly staff. Intellectual capacity is also critical, and research has shown that verbal and quantitative skills are related to success. Finally,

ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

the motivation for the breakthrough is a strong determinant of progress later, since those who want to succeed are much more likely to do so (PATRUCCO, 2008).

Creative organizations consist of creative employees and their performance is based on the continuous development of knowledge and implementation. Thus, the purpose of creative organizations is to spread valuable knowledge (GIRDAUSKIENĖ and SAVANEVIČIENĖ, 2012).

Nonaka (2000) classifies the knowledge according to its origin and type. The author suggests four types of knowledge: Tacitus (skills of the individual), conceptual (product concept, the design of the product name, average), explicit (routine knowledge, organizational culture), and systemic (documents, patents and licenses). Thus, the knowledge, the main tool of a creative organization is mainly about making more accessible the tacit knowledge.

Knowledge transfer is based on openness, trust and cooperation, providing opportunities for the team to develop actively new ideas and share knowledge, especially to encourage managers to experiment and take risks (PETRONI and COLACINO, 2008).

After the deployment of 8D Method there was training with the employees, to learn the correct way how the method worked. Initially there was resistance to its adoption, but it was proved that this method is the most effective and quick to seek answers to the problems, came to be regarded as a priority tool for the solution of problems of breakdown of machinery.

5. CONCLUSIONS

The need for quality and innovation in services organizations became vital for their business excellence and to compete through strengthen their competitive advantage (BON and MUSTAFA, 2012).

Having knowledge about the correct use of the tool, it is possible to use it correctly and effectively to non-compliance of a product of his line, so the application of the tool is made by employees who worked directly with the process presented problem. Thea appropriate use brings the following benefits:

a) Customer satisfaction: the goal of 8D is to seek accurate information about the defects found on the customer. With this, it can improve responsiveness by

ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

giving priority to complaints from customers, developing an effective approach to problem solving, with which one can meet all requirements of the customers;

b) Development of a quality system: the objective is that the procedures meet the aspect of Quality at the source, that is, the concern with the blockage of faults begins already in the production process. Deploy the quality as a daily basis tends to increase the reliability of the products.

Knowledge is a critical resource for competitive advantage. Companies must create new knowledge continuously, to maintain its competitiveness in rapidly changing environments. However, the creation of knowledge is not a process that necessarily creates new knowledge, but an operation that recombines and rearranges the existing knowledge.

The 8D Method presents considerable advantages to attack the root cause of the problem. The basic principle for the final disposal of any equipment failure is the precise identification of its causes. The identification of root causes allows you to take all necessary countermeasures to block these causes and prevent the recurrence of the failure. If this principle is not applied, the same failures they appear so commonplace. With the proper training of employees, the method works properly, ensuring a higher speed for the search and resolution of problems.

REFERENCES

BON, A. T.; MUSTAFA, E. M. A. (2013) Impact of Total Quality Management on Innovation in Service Organizations: Literature Review and New Conceptual Framework. **Procedia Engineering,** v. 53, p. 516-529.

CARPINETTI, L. C. R. **(**2012) **Gestão da Qualidade**: Conceitos e Técnicas. 2.ed. São Paulo: Atlas.

CARVALHO, M. M.; PALADINI, E. P. (2012) **Gestão da Qualidade**: Teoria e Casos. 2. ed. Rio de Janeiro: Elsevier: ABEPRO.

COUTINHO, M. et al. (2010) **Contribuição associadas à aplicação integrada das ferramentas da qualidade: o ciclo PDCA como base para resolução de problemas nos processos de produção.** In: Simpósio de Engenharia de Produção, 17., 2010, Bauru (SP) SIMPEP.

DEMING, W. E. (1990) **Qualidade**: a revolução da administração*.* Rio de Janeiro: Marques-Saraiva.

GARVIN, D. A. (1992) **Gerenciando a Qualidade***.* Rio de Janeiro: Qualitymark.

ISSN: 2236-269X
DOI: 10.14807/ijmp.v4i2.74

GIRDAUSKIENĖ, L.; SAVANEVIČIENĖ, A. (2012) Leadership role implementing knowledge transfer in creative organization: how does it work? **Procedia - Social and Behavioral Sciences**, v.41, p. 15-22.

HERAS, I.; MARIMON, F.; CASADESÚS, M. (2009) Impacto competitivo de lãs herramientas para la gestión de la calidad. **Cuadernos de Economía y Dirección de la Empresa,** v.12, p. 7-35.

KANG, J.; RHEE, M.; KANG, K. (2010) Revisiting knowledge transfer: Effects of knowledge characteristics on organizational effort for knowledge transfer. **Expert Systems with Applications**, v. 37, p. 8155-8160.

MARCHINI, L. R. (2013) **Disciplina 8D**. Disponível em: <http://http://lodineimarchini.no.comunidades.net/index.php?pagina=1365191325 >. Acesso em: 20. abr. 2013.

NONAKA, I., TOYAMA, R., NAGATA,A.(2000) A Firm as a Knowledge creating Entity: A New Perspective on the Theory of the firm. **Industrial and corporate change**, v.9, n.1, Oxford University Press.

PATRUCCO, P. P. (2008) The economics of collective knowledge and technological communication. **The Journal of Technology Transfer**, v.33, p. 579-599.

PRAGOJO, D.; SOHAL, A. S. (2006) The relationship between organization strategy, total quality management (TQM) and organization performance - the mediating role of TQM. **European Journal of Operational Research,** v. 168, p. 35-50.

PETRONI, A.; COLACINO, P. (2008) Motivation strategies for knowledge workers: evidences and challenges. **Journal of Technology Management & Innovation**, v.3, p. 21-32.

SILVA, D. A. L.; DELAI, I.; CASTRO, M. A. S; OMETTO, A. R. (2013) Quality tools applied do Cleaner Production programs: a first approach toward a new methodology. **Journal of Cleaner Production,** v. 47, p. 174-187.
SMITH, R.; SHARIF, N. Understanding and acquiring technology assets for global competition. **Technovation**, v.27, p. 643-649, 2007.

SLACK, Nigel. (2009) **Operations Management**. 6th ed. England: Printice Hall.

SZULANSKI, G. (1996) Exploring internal stickiness: Impediments to the transfer of best practice with in the firm. **Strategic Management Journal**, v.17, p. 27−43.

TARÍ, J. J.; SABATER, V. (2004) Quality tools and techniques: Are they necessary for quality management? **International Journal of Production Economics**, v. 92, p. 267-280.