ANALYSIS AND DEFINITION OF COMPETENCIES FOR A WORKING GROUP OF PRODUCT ENGINEERING

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Abstract. This paper is regards the question of competence in a working group to review the development and product engineering, marked by new demands on workers. In recent years, the subject competence, its development, management, came to the forefront of academic discussions and business associated with different levels of understanding: on the person level (one's competence), organizations (the core competences) and countries (school systems). The objective is to contextualize the perceptions of the concepts of competence, explaining the conceptual visions for understanding of these different instances of daily individual and inquire about the purpose of this training school, aiming to develop competencies for obtaining the results plotted in the development of and group activities. To this end, the connection between the academic literature in the field of education and literature in the areas of administration and engineering support research in theoretical understanding of the issue and presents the analysis of planned objectives and results of product engineering group. You could say that research and analysis applied to this group of engineering it is intended to prompt a debate about the development of competence in the context of current demand in the world of contemporary work.

Keywords: Competence, Engineering Education, Industrial Organization

1. INTRODUCTION

The capitalist transformations, especially in the economy, the end of this century, have marked the history with the birth of a new way of thinking. Intellectual activity is currently experiencing a turnaround, there was a shift in the economics of labor-intensive to knowledge-intensive economy, knowledge is now recognized as a distinguishing factor in the labor market, as a result, organizations and people have sought to adapt to this demanding market through training. Amid this avalanche of change and professional requirements, appears with much pomp the discourse of competence.

Enter the labor market sets, besides the assurance of a salary, joining a social identity by which recognition arises, allowing the individual to belong to a community, a cultural world. Before anything else, the individual must be recognized for its production, so that adds value to the organization to which it belongs. Keeping employee demand and productive efforts to constantly upgrade the knowledge and align with the demands for new competencies that emerges every day according to the contemporary who, day after day, charges and demands of workers.

Talking about competency requires returning to the past to see how this requirement has evolved into the information age. Fontenelle (2004) argues that since the first primitive communities, the man needed to ensure survival to develop knowledge, competencies, and tools. However, in a certain time organizations require employees to use only their muscle strength, as exemplified in the film "Modern Times" which is the main actor Charles Chaplin, who portrays a creative and comical in the lived reality of most companies in the 30s and a critique of industrialization excessive, inhumane conditions and relations of production lines and complete disregard for the feelings and needs of workers. Over time, new needs arose and forcing the changes that led humans to act as the medium was amended, was what happened with the advent of productive organization, which now require either individually or collectively to preserve, adaptation and development of their competencies capital.

In recent years, the competence issue came to the forefront of academic research and business associated with different levels of understanding: on the person level (one's competence), organizations (the core competences) and countries (school systems).

In this article, the claim is well defined: to present for discussion a way to understand the responsibility of these various bodies and inquire about what the function of this training school, from the theoretical research based on scholarly literature in the field of education and the literature business administration and a case study of an engineering group, the need to define competencies, group formation, difficulties and development of analysis methodology and results.

2. REVIEW

According to Fleury & Fleury (2001) the debate on competencies began in 1973 when David McClelland published an article Testing for competence rather than intelligence, to the American Psychologist published in the magazine, which states that educational qualifications, academic knowledge and intellectual capacity not guarantee a good performance at work. To ensure excellence in the performance he suggests looking at the competencies that professionals demonstrate in the workplace. McClelland was based on the findings of a survey commissioned by the U.S. State Department in the early 70s.

The powers, according to this author, is an underlying characteristic of a person who is causally related to superior performance in carrying out a task or particular situation. Well differentiated competency competencies, natural talent of the person, which may come to be enhanced, competencies, demonstrating a particular talent in practice and knowledge: what people need to know to perform a task (Mirabile, 1997), quoted by Fleury & Fleury (2001).

2.1. Concept of Competence Statement

It is noted that currently, the age of technology, changes take place in a very aggressive and fast, causing organizations to be concerned with the development and management of individual and collective competencies under the exigencies of adaptation to a new reality, which are essential to follow the technological advances that require knowledge, speed and versatility.

In discussions about the meaning of competence, it is observed that the concept is on the question of qualifications, defined by factors related to the position or office. However, this way of thinking does not pay attention to all types of organizations that live in a globalized world full of changing situations that require adjustments in record time according to events (Nunes, 2008).

According to Manfredi (1998), the concepts of "qualification" and "competence" have different origins, although employees with similar meanings. While the concept of "qualification" is associated with the insertion of the worker inside the world of production and work, the "competence" is based on the concepts of competencies and abilities, inherited from the psychology, education and linguistics. Therefore, reflects on these different connotations, and there is much they are mutually intertwined.

For the author, can be seen that this is a trend to replace the notion of qualification by calling competency model, which tends to be defined less as a store of knowledge and competencies, but rather as the capacity to act, intervene, decide in situations not always planned or predictable.

Zarifian (2000) supports the above scenario when he says that there are three major changes in the labor market that demonstrate the need to think and develop a model for other organizations, which he describes as: 1-the notion of an incident, ie may deal with situations in ways unforeseen, unplanned, 2 - communication that seeks to understand himself and another 3-service, which requires a client meet internal or external to the central focus, as well as being present in all the activities that engages them.

Other ideas about the meaning of competence related to both the individual and the organization are submitted by Magalhães (1997) which introduced the term as a body of knowledge, competencies and experience which enables a professional to develop a given function at a given time, aiming achieve a particular purpose. Already Boterf Le (1995), argues that jurisdiction is not a state, much less a scientific knowledge. He presents a concept as the focal point of the junction of three main characterized by the individual, with his biography and socialization, educational and ultimately, his professional experience. Bitencourt (2002) lists some key aspects of competence that are related by individuals during the work activities: Training, training, action, coordination of resources, results, questioning, self-development and interaction.

For a more comprehensive way, Fleury and Fleury (2000), describe the concept of competency as follows: "An act to know, transferring knowledge, competencies and resources that add economic value to the individual and social organization".

A different definition on the subject is presented by Brandão (1999), where in its design competencies go beyond a set of qualifications that the person has, because it comprises also the result or effect of development of such competencies in the workplace.

After reviewing the definitions of the above authors note that there is no consensus on the final concept of the term competence. However, there is a convergence in the debate on the question of human competencies, because when recognized and applied in the organizations they generate significant gains for both the company and the individual.

2.2. Competence within the school

In education, study competencies and competencies, whose genesis lies in experimental psychology empiricist, according to Manfredi (1998), has received multiple meanings over time. Currently, there seems to be a common idea, present the documents of the National Education Council, which gives jurisdiction to the notion of unity of knowledge,

which many authors call knowledge, the competencies, the notion of know-how related to practical work, although not identify with only manual action, but with the technical activity itself, and finally accomplished through cooperation, solidarity, participation in decision making.

In this sense, complement the papers today, "despite the powers always manifest themselves in observable behavior, bring implicit technological knowledge, the scientific and instrumental these technologies and the attitudes and values inherent in the performance of work" as the site of the University of Campinas-UNICAMP (1999), on the bulletin of the National Association for the Education of Professional Educators - ANFOPE.

Therefore, if the viewpoint of contemporary enterprise competence is conceived as a set of knowledge and competencies that professionals incorporate through training and experience, plus the ability to integrate them, use them and transfer them to different business situations , in line with the educational process must take responsibility for the possibility of effective and continuous transfer to cognitive contexts different from those that were acquired (Siécola, 2009).

Above this point the author cites the theory of Piaget (1986), seeking the genesis and development of cognitive and learning processes in an attempt to separate the descriptive and empirical psychology, they understand how problematic transfers require effort and cognitive work , which would form the basis of competencies. Ie consolidated competencies are transferable to different contexts and may, with new challenges, give rise to new competencies.

Siécola (2009) contends that while none occurs educate for incompetence, and consider that the concept of competence is not new, it must be recognized it has broadened its meaning in the face of new changes in the world of work produced by the current crisis capitalism.

According to Manfredi (1998) the business world has changed the concept of vocational training for "ways to do" to links between competencies, abilities and attitudes, with emphasis on cognitive, communicative and creative. Thus, as Perrenoud (1999) proposes to school in the direct determination and training, for the current business environment is not just about learning knowledge and operational modes, but the know-how, knowledge and know how to live ", adding cognitive knowledge , socio-affective and psychomotor. These issues are present in the speech "modern" accompanying documents of international agencies with the Commissioner of the European community La - FAST and the United Nations Education Science and Cultural and UNESCO as the texts of the school reform proposals.

According to Manfredi (1998), the term knowledge that appears frequently in discussions about competencies raises a question by Perrenoud (1999): "After going to school to acquire knowledge, or developing competencies?" With this question the He points to one of the dilemmas that has always been put to the educational process and who now, due to the mediation of new technologies that make work more abstract in the current regime of accumulation, takes on new dimensions.

For Perrenoud (1999), there is a misunderstanding to believe that by focusing on the educational processes in the development of competencies, give up is to transmit knowledge, since almost all human activities require some kind of knowledge, "sometimes superficial, sometimes deeper, coming from personal experience, common sense of shared culture in a circle of experts or scientific or technological research. The more complex, abstract, mediated by technology ... more detailed knowledge, advanced, reliable and organized them (stock) demand. " From this understanding, argues that building competencies takes time, and the dilemma of school.

2.3. Correlation between competencies and Training in the Brazilian Market

According to Ramos (2006), in Brazil, the integration of the concept of responsibility to the educational reform begins legally with the approval of Law 9394, 20 December 1996, new directives law and Bases of National Education (LDB), which focuses both on basic education and on professional education. Structurally, the main changes were on the one hand, the definition of the identity of secondary education as basic education, being the last step of this level and responsible for the consolidation of training that begins in kindergarten and elementary school, and, secondly, the separation of technical professional education of basic education, acquiring complementary to the school.

When it comes to the notion of competence in Brazilian education reform, the LDB defines that education at various levels of education, aims to develop in the learner, knowledge and skills needed for citizenship and integration into the world of work. The law establishes two levels of education: basic, consisting of kindergarten, elementary and middle and upper. Compulsory education comes down to fundamental level, covering eight years. Basic education is intended, according to Article 22 of the LDB, "develop the student, give you the training necessary for the exercise of citizenship and provide a means to progress at work and subsequent studies." The latter objective should be developed mainly by high school, since one of its specific aims include "the basic preparation for work and citizenship of the student" (Brazil LDB, article 35, section II).

Decree No 2.208/97 refers to the concept of expertise initially in the formulation of the full curriculum of technical courses, when it determines that the curriculum guidelines established by the Ministry of Education, after consultation with the National Board of Education shall consist of, among other parameters, " skills and basic skills by professional area, to be complemented by regulatory agencies for the system of education (ib id. art. 6, section I). These competencies, in turn, would be identified in profile shape, through studies of professional, heard the interested sectors,

including workers and employees to be constantly updated through institutionalized mechanisms by the Ministry of Education, with the participation of teachers, entrepreneurs and workers (ibid., art. 7).

Ramos (2006) shows the main stages of competency-based curriculum construction trotted out by the Department of Education Media and Technology - SEMTEC: a) analysis of the work process, b) construction of an array of referential skills: c) development of an educational project of their travel plans through the dialectic of matrix transpose and modulate an approach based on projects or solve problems.

From the standpoint of training, the focus of the competency is associated with modularity as organizing principle of the curriculum, conceiving themselves as separate training modules. The modular structure is essential to the idea of training route or path. The contour obtained by a module depends on the systematization of teaching and pedagogical activities (Ramos, 2006).

Observing the debate about competence, in Brazil the ideas were transcribed for curricular parameters and express the objectives of education and its evaluation thereof, such as the National High School Examination - ENEM, middle school, and the National Performance Review Student - ENADE known as Taste - for higher education.

2.4. Individual competencies and Business Organisation

From this perspective, competence can be attributed to different actors. On one hand we have the organization with the skill set of its own. These powers derive from the genesis of the development process of the organization and are implemented in their wealth of knowledge, establishing the organization's competitive advantages in the context in which it appears Fleury (2000). On the other hand we have people with your skill set, or not utilized by the organization. It is worth quoting here the definition for the competence of persons established by Fleury (2000): "Knowing how to act responsibly and recognized, which means to mobilize, integrate, transfer knowledge, resources, skills that add value to the economic organization and social value to the individual. " Figure 1 seeks to demonstrate the competencies as a source of added value to the individual and the organization.

Figure 1: competence as a source of added value to the individual and the organization (Fleury, 2001)

According to Fleury (2001) the notion of competence was associated with verbs such as knowing how to act, mobilize resources, integrate multiple and complex knowledge, learn to engage, take responsibility, have strategic vision. Side of the organization, powers should add economic value to the organization and social value to the individual. The meaning of the verbs that this concept definitions are proposed by Fleury & Fleury (2001) in Table 1.

Dutra (2008) argues that by putting the organization and people side by side, we can see a continuous process of exchange of competences. The organization transfers its assets to the people, enriching them and preparing them to face new professional and personal situations, the organization or outside. People to develop their individual capacity, transfer to the organization, enabling it to face new challenges.

Thus, they are people who, by putting into practice the knowledge assets of the organization, implements organizational capabilities and make their appropriateness to the context. By using, consciously, the organization's knowledge assets, people validate it and implement the necessary changes to improve it. The aggregate value of persons is, therefore, their actual contribution to the organization's knowledge assets, enabling it to maintain its competitive advantages in time (Dutra 2008).

Table 1: Competencies for the professional (Fleury & Fleury, 2001)

Saber agir	Saber o que e por que faz. Saber julgar, escolher, decidir.
Saber mobilizar recursos	Criar sinergia e mobilizar recursos e competências.
Saber comunicar	Compreender, trabalhar, transmitir informações, conhecimentos.
Saber aprender	Trabalhar o conhecimento e a experiência, rever modelos mentais; saber desenvolver-se.
Saber engajar-se e comprometer-se	Saber empreender, assumir riscos. Comprometer-se.
Saber assumir responsabilidades	Ser responsável, assumindo os riscos e conseqüências de suas ações e sendo por isso reconhecido.
Ter visão estratégica	Conhecer e entender o negócio da organização, o seu ambiente, identificando oportunidades e alternativas.

In this context, one can not think individual skills in a generic way, but tied to core competencies for the organization. Expected deliveries of the people must focus on the essentials.

Castione (2010) mentions in his book that the new stage reached by the organizations requires an employee to think more and run less, which means that its performance depends more on creativity, reasoning ability, rather than motor responses to a process controlled by the machine. "

3. PROPOSED METHODOLOGY FOR EXAMINING AN ENGINEERING GROUP

To define the engineering group that should be worked out regarding their development levels of competence was from a mapping of existing competencies in the sector, considering the distribution of labor in each technical area, the need to form a second appeal, duplication of labor considering strategic vision and difficulty of training and replacement labor.

Table 2: Notes for defined levels of expertise

Competence	Duplicity	Difficulty Training / Replacement
< 1,8 - Low 1,8 < x < 2,5 - Medium > 2,5 - High	1 - Low 2 - Medium 3 - High	1 - Low 2 - Medium 3 - High

From the definitions of specialties, we evaluated the structure, technical areas, knowledge and the individual competencies of all groups to generate a matrix of priorities presented in Table 3. Where the groups were evaluated by a total score, where the total is the product of Duplicity and Difficulty (Training / Replacement) divided by jurisdiction, the predominant factor in the evaluation, and group A with the highest score represents a greater need for action.

Table 3: Matrix of Priority specialties

Specialization	Competency	Duplication	Difficulty Training / Replacement	Total
Group A	1.3	3	3	6.9
Group B	2.4	3	3	3.8
Group C	2.6	2	3	2.3
Group D	2.4	2	2	1.7
Group E	2.5	2	2	1.6
Group F	1.5	1	2	1.3
Group G	2.5	2	2	1.6

According to the array of specialties was defined priority of Group A with the greatest needs for evaluation of their development, which was also found to be the group with shorter formation within the framework of the implementation of engineering activities.

3.1. Knowledge area and competencies expected

Knowledge Area	Competencies expected
Theoretical Knowledge	Mastering the technical knowledge about the components of engine cooling systems, cooling and exhaust. Being able to translate the goals of the subjective desires of the customer's data for the product being magnitudes engineering techniques.
Knowledge Standards	Master the standards specific to the assembler / international / legislative components and engine cooling systems, cooling and exhaust;
Application of the components set	Uncover the "black box", being able to understand and critique design solutions;
	Have a systemic view, be functional, application and / or specification;
	Knowing and understanding the anomalous field, feeding the expertise and the standard's Experiment;
	Know and understand the systems of competition (defining "best in class ") and state of the art;
	Understand, evaluate and "translate" technically the voices and notes of the assessments of quality and customer perspective;
Operating and equipment specification	Use, optimally, the available equipment obtaining reliable results;
	Being able to envision and specify equipment for defining the structure plan;
Virtual Validation	Being able to envision, design, develop and apply techniques for virtual validation;
Networking	Developing Networking, "is beside the Matrix / Suppliers / Universities;

3.2. Defining Actions

Having defined the action group, which required a special work for the development of skills, some actions have been defined for its development. Among them may be cited:

1 - Recruitment of new features (with experience);
2 - Specific courses in the technical area;
3 - Study and implementation of methodologies already available today in other groups;
4 - Visit the vendors;
5 - Training in related groups on other plants;
6 - Course of technical fundamentals applied in the automotive field;
7 - Development of methodology for calculation;
8 - Technical courses in reference centers;
9 - Implementing the use of the experimental apparatus available in engineering;
10 - Validation of methodologies for use of software;
11 - Technical training of the experimental apparatus;
12 - A partnership with universities in innovation projects;
13 - Increased technical library;
14 - Creating integrated database.

It is observed that the actions can be grouped, with some exceptions, into shares of technical training, methodology development actions and actions elevation of networking.

4. ANALYSIS OF GROUP A

The idealized actions were implemented in group A during the period between 2006 and 2010. In this period can be experienced the effectiveness of actions as well as the facilities and their implementation difficulties. In the first necessary action, which was to hire new resources to compose the group, stumbled on the difficulty of finding professionals with the expertise in the area. However, this point was overcome by accepting non-professionals with experience, but with the profile and the minimal prerequisites for the required skills were developed.

As part of technical training were consolidated several things such as the development of projects that led to the dissertations through partnerships with universities, courses offered by suppliers of components that has the expertise in the area of competence which wanted to develop, exchange with other development centers to acquire the expertise of working methods, validation methodology of calculation with experimental correlation. However, what comes to showing more effective, in fact, is the junction of the competences acquired by applying a real problem in developing a product, a situation in which the professional feels the necessity of self-competence development.

After the development of the professional skills, another complicating arises: if there is to hire the difficulty of finding a professional with the skills required, after developing them, the employee becomes highly valued by the market and harassed. Thus, the cycle starts again the search for the appropriate professional. To minimize the impact of a loss of competence developed, which required the company time and resources, it must create conditions for the professional to stay motivated and be valued by the new level of competence acquired.

Another point that helps to mitigate the loss of competence developed is to do it twice. Thus, it increases the chance of spreading the knowledge gained in the process of replacement skills. Since the internal processes of enterprises, as well as the dynamics of the labor market, induces a process of replacing a professional where the successor is rarely coexist with its predecessor. If there is duplication of skills, this transition can be made in parallel and there is transmission of knowledge and skills between generations.

5. FINAL CONSIDERATIONS

The concepts covered in this study provide evidence points that contribute to understanding of the term competence, its significance for the individual and the organization. It can be stated that there is a consensus on a final concept of the term competency as a result of different philosophies and procedures for its development in the organizational environment. However, there is a common issue in all approaches, the man and knowledge are the core issue.

The knowledge, above all, should be a prerequisite for a real reflection on the mode of social life, and not as a mere tool for survival in the workplace.

The study showed that the competence issue is complex, dynamic and comprehensive and that its formation depends on a series of complementary learning. Assign the function to the school to develop competence is to ignore the complexity and scope of the subject in the contemporary world. Within this universe, is the school to create learning situations that enable students to develop the cognitive, affective and systematic knowledge relating to intellectual work. In addition to resort to this perception Kueenzer (2003) which says: "The school is the place to learn to interpret the world in order to transform it from the domain of the categories of methods and content that will inspire them to change into practice of human emancipation in a society increasingly mediated by knowledge. "

The notion of power explored in this study reveals an important point: on one hand adds value to the organization, on the other no less important to add social value to people. To develop the essential skills required by the organization, people are also investing in themselves, not only as organizational citizens, but as world citizens, the power developed is owned by the employee. In this sense it is for the organization to reinvent itself to meet the emerging needs of employees with new competencies acquired.

6. ACKNOWLEDGEMENTS

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