

## Application of the Model of Measurement of the Formal Knowledge in Improvement of the Quality Management System - ISO 9001:2000: The Case in the Industry Cobra D'Água

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### **Abstract:**

The quality management system became a powerful tool for the improvement of the business processes and as such was mentioned in several important literatures as one stream of the business strategy for cost as well as differentiation.

However, among the estimated ones defended by the proper programs of quality management, the qualification of the involved professionals became, as well as the technological improvement has asked for the main key for the sustentation of the programs of quality management a time that one of the postulates defended for the quality management is the constant improvement.

Given the afore mentioned, the present article presents a technical evaluation of the implementation of ISO 9001:2000 in Cobra D'Água - a company specialized in the manufacture of clothing. From this technical evaluation, the identification of the levels of formal education in all departments of the company and the verification if there was a correlation between the problems identified in the implementation process and the absence of formal knowledge. This was done through the use measurement model of the formal knowledge as supported by Daher (2006).

**Keywords:** Quality, Knowledge, Strategy.

## 1 Introduction

The system of quality management - SGQ's comes to consolidates more each time with one of the most efficient instruments of the management tools. Because the word "quality" became the most expectances of the clients, supplier and partners that believe in your products and or services shall present: Conformity in the specifications; Value of goods (or service); Adjustment in the correct use of the product (or service); Market attractiveness; Trustiness in the process and Satisfaction of the parties involved. (MARANHÃO, 2001, p. ix).

In this perspective, the present article approached in a specific way of planning of the quality in management system based on the rules of the NBR ISO 9001:2000 in the Cobra D'Água Confections Industry, a 100% "Capixaba" company. Located in the address of Santa Ines, in the district of Vila Velha - ES, with the goal of adjusting the company to a discrimination of the actual situation and the steps to improve considering the model of measurement of the formal knowledge of the organizations proposed by Daher et. Al (200).

## 2 Why Quality

Why an industry, in special the confection industry, should implant the program of total quality? After all, what an executive thinks when is hiring a consulting service, with the purpose of managing resources of the productive capacity, and is there an indication of the need of a quality control in his procedures?

Maranhão (2001) mentions that for the executive to be fully convinced of the benefits that an investment of this extent he needs to understand that will bring in the next few years a "sustained profit". In that mean to have a brief certitude in this sustainable growth, it has to have a minimum of control of the processes regarding the business in which is being invested. Where is very clear that: making with quality it is making with no wastage, producing more and spending less. With the bigger margin of profits and less operational costs, it is trusted by the client giving the assurance to the client that the given product or service will really satisfy their needs. It is creating effective partnerships with contractors and suppliers of the manual work certain that they are dealing with an organized company that will pay on the determinate date and will not

bring improvement to business. It is finding permanent the qualification to the worker warranting the position, self-improvement and improving the quality of life.

Meanwhile, the main perception that the quality management gives to the managers is the quality that brings competition word that means in the market today survival in the business area.

### **3 Quality management under the NBR ISO 9001:2000**

As the company concerns with the ethical values of the society in which is part in a way the sense of contributing to the satisfaction of the personal needs or involved entities it, 's noticed that the company has better chances of perpetuating in the market. Observing like that, we the business that has a quality management system and will have the purpose of obtaining a literature in the way of the management system that recognizes the necessity of the involved in the process and activities of companies as a whole. (CAMPOS, 1999).

The system of quality control is an administrative system improvement from the administrative in Japan from the American ideas there introduced after the Second World War and that became in the whole world as TQC.

Since that, the word quality in a business became the graduation of limits in which a sum of characteristics presented (products property differentiators of and generated services in the company).

Inherent of the business (the mission in the market) the organization satisfies the requirements (implicit expectances and mandatory demands of the negotiation) generated since the study of the process (activities that generate the product or service of the enterprise). (MARANHÃO, 2001).

In this case, to the implantation of the system of quality management in a confection industry, in this case is the study it is necessary to understand how the process happens in the analyzed organization as the process that defines the relation of causes that affects one or more result. (CAMPOS, 1999).

The relation of cause and effect in a systemic context of the organization makes believe that all the business activities connected under the form of the processing that gives the

origin of the chain of value. Being the final product only one material connection of what latter will be a relation of trust.

Thinking like that, the Quality Management starts to utilize a various statistics tools and conception with a purpose of regulating the process that guarantee the full system functioning. (MARANHÃO, 2001)

Thinking over the process it is possible that the main tool of analysis seen in picture one is the PDCA circle once the basic proposal is seeking improvement:

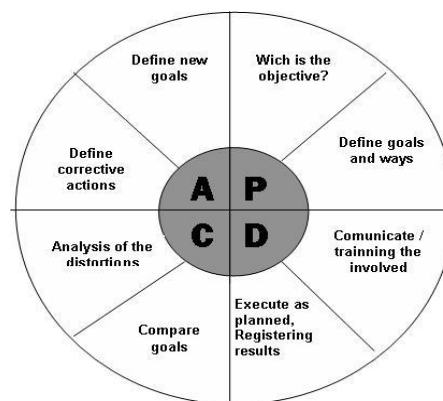


Figure 1: The PDCA circle

Source: Euvaldo Lodi Institute, 2004

The methodology of the PDCA Circle allows the revision, of development, planning and the control of all the phases of the process in the advances of the system. Fitting in the quality management system the necessary organization so that the process realized is and that can reach the objective of the Enterprises and at the same time giving satisfaction for the clients. Maranhão (2001, p.27) endorses this quality management vision when the author defines the quality management system as being only a complex of resources and minimal rules implement in the correct way with the objective of orienting each part of the Enterprise. So that the can be executed in an accurate way in due time for the task and in harmony with the other being all focuses to the common objective of the company: that is being competitive (having Quality with productiveness).

The conception of combined rules as a way of maintaining the organization's efficiency and the satisfaction of the partners and clients, born to the rules of ISO in the case of the NBR ISO 9001:2000.

Is the complex whole of the fundamentals and requirements that guides the organization of a SGQ, since the implantation to the maintenance allowing to the work process of this organization to be structured in such way that can always be improved, if that is necessary.

In a general way, the implantation of a SGQ follows a system that we define in the following form:

- Definition of business unit: this phase has as objective the definition of authority in the process and responsibility about an operational result that contributes to the realization of the mission.
- Politic definition and the quality objectives: this phase shall reflect the intentions and global line of direction of a company related to the quality as the vision a mission incorporates should express in a high direction.
- Process guide: in this phase as declares Mello et. al (2002), to each identified process of the phase the process of the diagram boxes during the definition of the business unit, should be elaborated a flux diagram to identify the activities and tasks that are inherent. The structure of a process represented in a detailed level with the work in question in other words for a long process and a complex whole process is the result of a series of activities. The companies develop their process for satisfying the interested parties (Clients, partners, shareholders and community). Those needs can translate in five dimensions of total quality: intrinsically quality, cost, moral, security and delivery. For the companies to can attempt to all those requirements they need to identify and manage the process of interactive and inner relations. It is good to remember that the approach for the process that utilizes the declared principals in the PDCA circle what make the management process a continuous methodology to the continual evaluation. Analyze the development of the key process of the business unit.
- The standard process: the standards process complements the map phase of the critical process providing the details for the operation of each activity, defining who, where, how, when and why. As says Campos et. al (1992) the standard procedure shall not be to limit the standard established but also to include the use and has to be in the occasion of the implementation focusing in their efforts in to goals: standard system in this way the documents established for technical matters of the product or process.

- The system of quality management: As Mello et. al (2002) says, this phase consists in describing and to standard, the process required by ISO 9001:2000 and will sustain the SGQ by the organization chat, process of projects control, training and purchasing in other practical system of standards.

From this, strategies of implantation above mentioned made an evaluation of the researched company considering the evaluation items proposed by the *Prêmio Nacional da Qualidade - PNQ* in the National Foundation for Quality.

So that we can be evaluating for the certification ISO 9001:2000 apply the measurement model of formal knowledge of organization proposed by Daher et. al (2006) as a way of verifying the motives that can bring to the researched company to fail in the attempt to obtain the ISO 9001:2000 certify in their quality management with the *PNQ*.

#### **4 Study of case: The Cobra D'Agua Confection Industry**

The Cobra D'Agua Confection Industry based on an annual plan to contribute with the direction of the organization in their action in the market. One of the organization planning premises that the company adopts are:

- The actuation way of the company has to focus in a market-in system where the process change according to the market needs and production line classifies as a combined system.
- The market strategy of the business shall always be restructured and organized by the company in a way that can mach to the structure of their investments making then structured financially and profitable.
- The vision of the company is that “being a profitable, solid and innovating company with a pleasant work ambient acting with recognizes brands in the national and international market generating results that answers to the needs of the action holders and partners”.
- The mission of the business is to “satisfy, enchant and surprised their clients with innovating products and services in the youth market”. For such, utilize a program entitled “SENSU” that means that “satisfaction, enchanting and surprising” where are actions worked for the continuous improvement of the

unification of all the departments for the process in the company flow since the suppliers to the clients.

For a better understanding of your company, the enterprise structure is in function terms and processes as is shown in the following pictures 2 and 3:

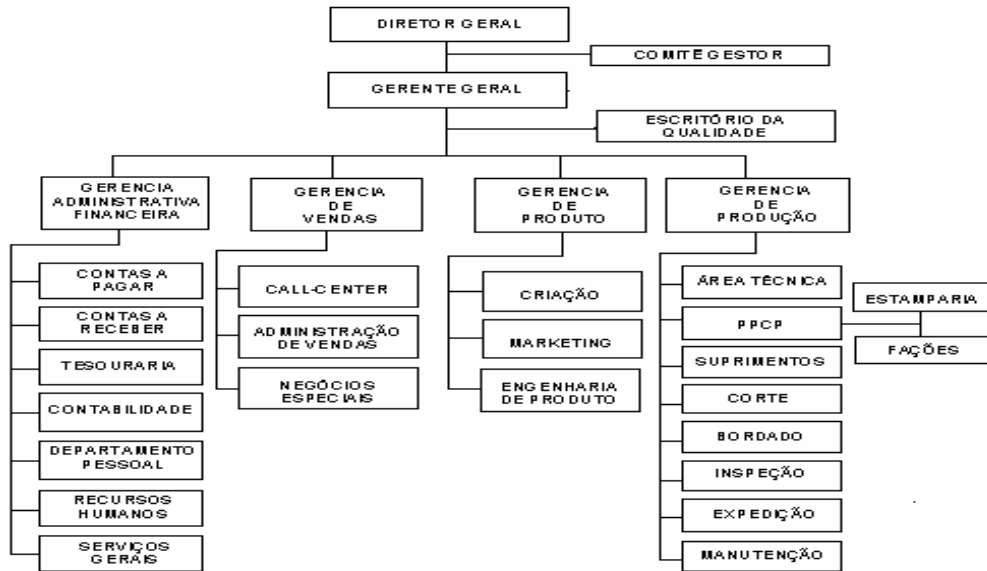


Figure 2: Cobra D'Agua chart  
Source: Researched company, 2005

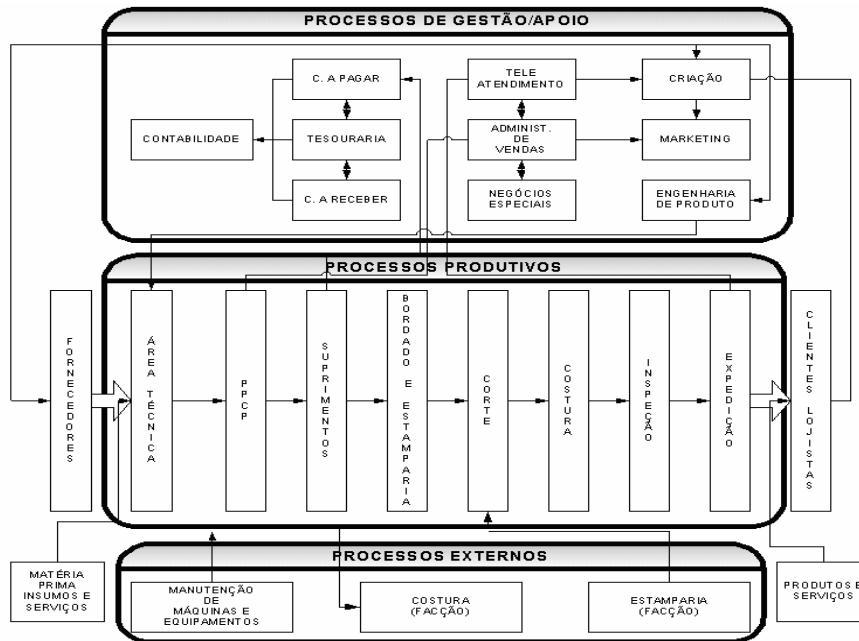


Figure 3: Map of the processes and interactions  
Source: Researched company, 2005

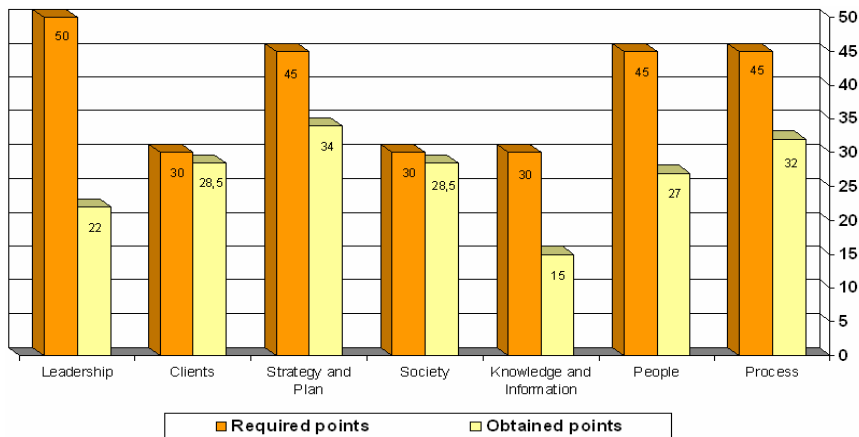
The diagnoses of the procedures for the certification ISO 9001:2000 of the Cobra D'Agua industry was utilized the questioner "First steps to Excellence" of *PNQ* that is composed with 08 (eight ) items, punctuated according to the development of the company mentioned as description in the chart bellow:

**Table 1: Evaluation criteria of *PNQ***

<b>1</b>	<b>Leadership</b>
1.1	Leadership system
1.2	Cultural Excellency
1.3	Critical analysis of the global development
<b>2</b>	<b>Plans and strategies</b>
2.1	Strategies formulation
2.2	Strategy structure
2.3	Planning of the development measure
<b>3</b>	<b>Clients</b>
3.1	Image and market recognition
3.2	Client relations
<b>4</b>	<b>Society</b>
4.1	Environment Responsibility
4.2	Ethics and Social Development
<b>5</b>	<b>Knowledge and Information</b>
5.1	Company information management
5.2	Comparative Information management
5.3	Intellectual management of the resources
<b>6</b>	<b>People</b>
6.1	Work system
6.2	Development and capacity
6.3	Life Quality
<b>7</b>	<b>Processes</b>
7.1	Related process of management of the product
7.2	Management support
7.3	Management of the process related to the suppliers
7.4	Economical and financial management
<b>8</b>	<b>Results</b>
8.1	Results related to clients and market
8.2	Personal related results
8.3	Personal related results
8.4	Results relating the suppliers
8.5	Product Relating results
8.6	Society results
8.7	Support and organizations results

**Source: First steps to Excellence, FNQ (2004)**

In the criteria defined by the *PNQ*, the Cobra D'Agua Industry presented the following result:



**Figure 4: Evaluation of the PNQ questioner**  
Source: Authors Research (2005)

The evaluating commission understood that the leadership system of the company presents discontinuity of the processes of leadership and that the cultural experience of the excellence is the gain of only one of the leaderships of the company not having the following of the actions implemented in a structured way.

In concern to the plans and strategies the evaluating commission verified that the formulated strategies it is not discriminated for the internal partners. There is no indication of the development in all areas in this company and in the already existing areas; they are missing the integration of their members. This just compromised the implemented actions.

About the evaluation of the items related to the criteria "Client", the commission of evaluation verified that the company has an excellent performance as what concerns the image and recognition in the market. However, as the relation with the client noticed that is deficient having the delay of the information regarding the market to the marketing a production departments.

As the evaluation of the items related to the criteria "Society" the evaluating commission verified that in what refers to the social and environmental responsibility, the company presented an excellent control for the risks in the environment. The same is valid to the request of Ethical and social development where the Industry comes to interact with the local community as a stimulant by a number of events.

The related criteria to the information and knowledge request the evaluating commission verified that as what concerns the management system the information of the organization in the departments are not flowing in an effective manner and the work force in general does not utilize the given information.

Still in this evaluation, the commission verified that when intellectual capital management exists identification but it is no indication of the intellectual capital what makes the company contribute to the employee to develop but does not retain their intellectual capital.

In the people request, the evaluating commissions notice that although the work system is well defined the non-observation of the said above makes them inefficient and notice the absence of training for the employees. The employees do not perceive the benefits offered from the company, even so, in the request of quality of life the employees have registered a good satisfaction level.

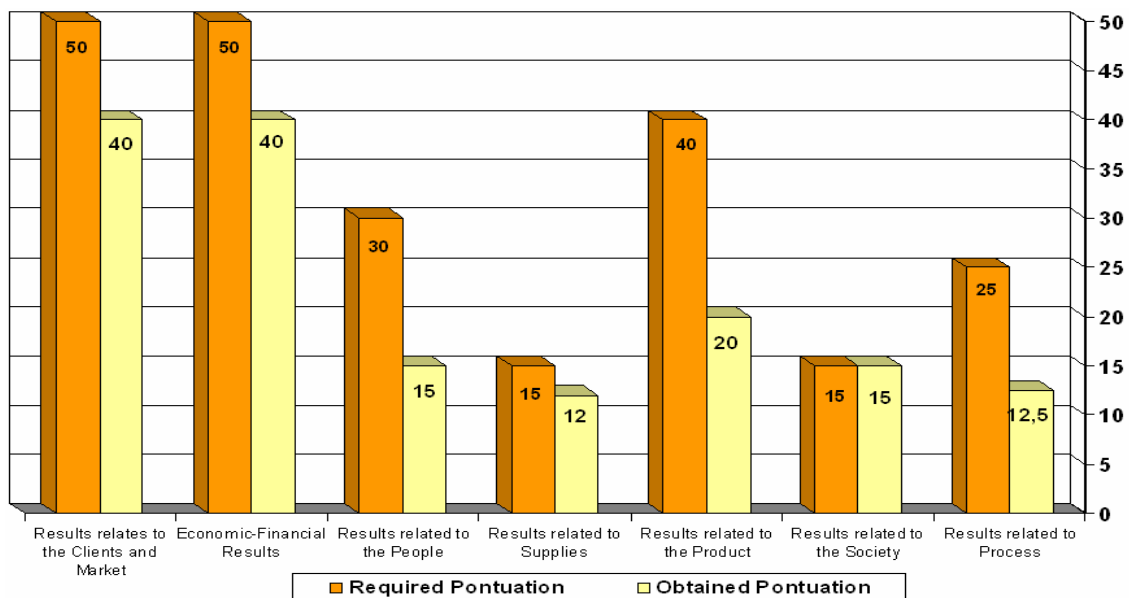
In the analysis of the businesses process, the evaluation commission considered that the management of what relates to products even with the good result it was not well defined. In the request of suppliers, it verified that the suppliers evaluated correctly and that the company does not evaluate the financial parameters.

- The results related to clients and market: The company has a type of client well defined, direct competition, potential and subsidies well identified and researched, after sale research, market participation, complaint form for the clients use, their image towards the society, participation in the volume purchase of the clients.
- The financial and economical results: The company controls the absences, employee rotation, and suggestion form, an index of satisfaction of the partners, level of competency of the organization, promotion, investments in training offered by their partners.
- Results concerning to the suppliers: The company has and controls a quality and products, percentage as the index requests, cost and sums, attending time, solution of the non-conformities, level of the suppliers delivery, participation of

the suppliers of the obtained by the companies, satisfaction level of work, trust, and answering period.

- Results concerning the society: The organization that the company has and the percentage control of the investment in the social action rejects index, level of pollution, number of non-conformities in the environment, associated companies, volume of the donated resources, h/h quantity dedicated to the social actions.
- The results regarding the process: The organization has and control the cost of the management, time of internal services, research of in the ethics of the directors of the organization and the function of the public agent, number of constant projects of strategic plans, quantity of computers per partner, network available, relations between the realignment of the strategies and the action plans.

The Figure 5 presents a summary of the evaluation of the request "Result" made by the evaluation commission with bases on the PNQ criteria.



**Figure 5: Evaluation of the request "Results"**

Source: Authors Research (2005)

From the results presented, the evaluation commission suggested improvements points to certificate the company, as the result present in the graphic bellow:

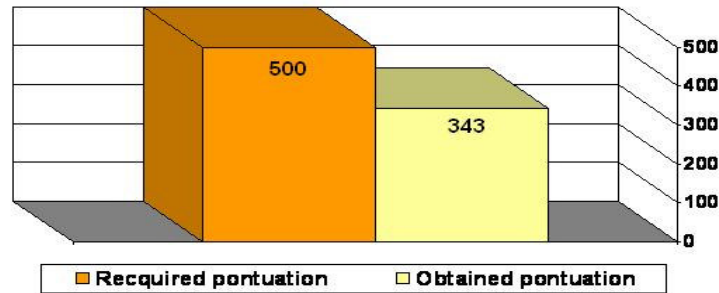


Figure 6: Evaluation of the general form in the *PNQ*

Source: Authors Research (2005)

The commission left the suggestion of implantation a quality management - SGQ model and bases on the orientation on the ABNT (2000) and of Mello et al (2002). The sum of the analysis gives grounds to the ISO 9001:200 and the relation with the decrypted in the next chart.

Table 2: Analyzed items and area with relation to the *PNQ* proposal

SUBJECT	ISO 9001:2000 Item	RELATION WITH PNO
Required Documents	4.2	Information and knowledge
Directors compromising	5.1	Leadership
Focusing on the clients	5.2	Clients
Quality Policy	5.3	Leadership, Strategies and plans; Information and knowledge, Process.
Planning	5.4	Strategies and plans; Process
Responsibility, Authority, Communications.	5.5	Leadership; knowledge and Information
Critical analysis of directors	5.6	Leadership, Strategy and plans
Provisions resource	6.1	Strategies and plans; Processes
Human resources	6.2	People
Infra structure	6.3	Strategies and plans
Work place	6.4	Leadership, People and society.
Realization of the production plan	7.1	Strategies and plans; Information and knowledge; Process.
Relating clients processes	7.2	Information and knowledge; Process.
Project and development	7.3	Leadership; Strategies and plans; Information and knowledge.
Acquisition	7.4	Information and knowledge; Processes.
Production and services supplies	7.5	Clients Information and knowledge and Process.
Tools control of the measurement and monitoring.	7.6	Leadership; Information and knowledge; Processes.
General	8.1	Leadership; Strategies and plans; Process.
Measurement and monitoring	8.2	Strategies plans; Clients; Processes; Results.
Control of a non-conformity product	8.3	Processes
Analysis Dada	8.4	Leadership; Strategies and plans, knowledge and information; Processes.
Improvements	8.5	Leadership; Strategies and plans; Processes; Results.

Source: First steps to Excellence, FNQ (2004)

Observing the table 2 what is verified is that the 22 items focused to the analysis for the certification to the company researched if compared to the proposed chart if compared with the chart of the *PNQ*. At least ten (10) of the discussed themes approached directly related to the “knowledge and information” against nine (09) items that is concerning with the “Leadership” the others that are about the “People” and “Process”.

With that information the purpose of this article that is made a analysis made by the company considering the indicator of the verification of the coefficient of the enterprise learning proposed by Daher et. Al (2006) which the intention is to verify from this study of case if there is a formal relation between the level of formal education in the organization the success in obtaining the ISO 9001:2000 of the companies certification.

#### 4.1 The model of measurement and formal knowledge

The model of measurement of the formal knowledge contemplates the level of formal education and the practical knowledge of the company participants attributing the importance to the education to each employee of the organization and in the same way attributing the time of work dedicated to the company as a form of contemplating the empiric knowledge.

Daher et. al (2006) attributes the weight of the formal education of the participants in the organization considering the systemic vision of the enterprise organization.

**Table 3: The science versus a Systemic vision of the company**

FORMATION	WEIGHT
Administration	5,00
Accounting	5,00
Economy	5,00
Engineering	4,00
Sociology	3,00
Psychology	3,00
Pedagogy	3,00
Law	2,00
Statistics	2,00
Philosophy	1,00
Theology	1,00
History	1,00
Other sciences	0,75
High school	0,50
Junior High	0,25

Source: Daher et. al (2006)

From the table 3 the authors define than the coefficient of the formal education in each participant as shown in the formula demonstrated below:

**Formula 1: Parameter of formal knowledge and scientific**

$$\text{Coef 1} = \frac{N1 [\text{Course (weight)}] + N2 [\text{Specialization 1 (weight)}] + N3 [\text{Specialization 2 (weight)}] + N4 [\text{Masters (Weight)}] + N5 [\text{Doctored (weight)}]}{\text{Base 10}}$$

**Source: Daher et. al (2006)**

The other variable in the model is the measurement of the organizational knowledge it is the empiric of the organization. This type of contemplated Knowledge in the time dedicated to the company where it can be as the authors affirm deducted according to the time of work, bigger will be your knowledge of the routine. However, the authors understand that the knowledge of the routine is does not gives the capacity of improving. In the chart 3 is presented the utilized criteria to the measurement of the empiric knowledge of the organizations.

**Table 4: Weight of the empirical knowledge**

Values per worked years	Weight
0 to 10 years	1
11 to 20 years	2
21 years up.	1,5

**Source: Daher et. al (2006)**

The fact of big importance is the second line of the chart that is the idea of the learning skills considering the absence of scientific knowledge the biggest development in the work will be a consequence of the maturity of the employee in his place of work and presents a decaying function of the repeating work.

Locking to this measurement the empiric knowledge demonstrates in chart 2 that will be possible to obtain an individual coefficient and empiric knowledge to each employee of the company.

**Formula 2: The measurement of empiric Knowledge**

$$\text{Coef 2: } \frac{\{\text{Service Time} \times [\text{weight}]\}}{\text{Base 100}}$$

**Source: Daher et. al (2006)**

Once the measurement of the empiric knowledge of the employee the authors conclude that the individual level of knowledge of each employee of the organization from the sum of the knowledge as the formula 3 demonstrates.

**Formula 3: Coefficient of the level of the employee formal education**

$$\text{Coef 3} = \{ \text{Coef 1} + \text{Coef 2} \}$$

Source: Daher et. al (2006)

Having this result of the education of each employee of the organization, is calculated than the coefficient of the formal education of the company being in that case is obtained by the sector, time worked, by time or in general, the average verified by the inserted employees in the exhibition. The formula 4 presents the indication of C.F.K. - *Coefficient Of Formal Knowledge* and their evolution. However, the obtained information in each group can be passive of changes with the use of other tools of the statistic as a form of improving the understanding of the indicator.

**Formula 4: Coefficient Of Formal Knowledge**

$$\text{C.F.K.} = \frac{\sum \text{Coef 3 [Local]}}{n}$$

Source: Daher et. al (2006)

As the indication of C.F.K. of the same would be a subject matter to the organizational structure which application of that indication will permit the verification of the existing gap's in the organizational structure, even in the time of work levels. In this perspective the functional structure idealized in this first instant would be contemplated in the existing functions and position as is shown in the table 5.

**Table 5: Traditional Functional structure**

<b>Position of the structure</b>	<b>Level</b>
- President	1
- Directors	2
- Managements	3
- Commissioners	4
- Sub manager	5
- Worker	6

Source: Daher et. al (2006)

The distribution as shown in table 5 permits that the vertical development in the C.F.K., and can extend in a horizontal development.

Once is measured the knowledge the same are situated in relation to the scale that defines the position of the organization or the sectors and analyzed groups, as is shown in the picture bellow.

Organizational Formal Knowledge Level				
Organizational Knowledge Scale				
0,00	0,78	1,55	2,33	3,10
Low Qualification	Medium Qualification	High Qualification	Excelent Qualification	

Figure 7: Scale of positioning in the level of the company knowledge

Source: Daher et. al (2006)

#### 4.1.1 Application of the measurement model of the formal knowledge in the researched company

The application model of the researched company limited the structure of the existing positions in the enterprise and the information contained in the company to the date 01/30/2006. The chart bellow presents the dada of the analysis.

Management Level		Operational Level		General	
Avarege	0,360844598	Avarege	0,119175323	Avarege	0,140140028
Mistake pattern	0,089464155	Mistake pattern	0,013891913	Mistake pattern	0,015820991
Average	0,524488434	Average	0,082618702	Average	0,084858505
Method	0,554132269	Method	0,032146099	Method	0,032146177
Pattern diversion	0,236699905	Pattern diversion	0,131790261	Pattern diversion	0,156619818
Shown Variable	0,056026845	Shown Variable	0,017368673	Shown Variable	0,024529767
Curtiss	-2,775288694	Curtiss	4,657222969	Curtiss	2,119857777
Symmetry	-0,364987351	Symmetry	2,432165311	Symmetry	1,927040798
Intermittence	0,468520548	Intermittence	0,539273973	Intermittence	0,539273973
Minimum	0,0998309	Minimum	0,030721441	Minimum	0,030721519
Maximum	0,568351448	Maximum	0,56995414	Maximum	0,56995492
Some	2,525912188	Some	10,72577904	Some	13,73372256
Counting	7	Counting	90	Counting	98
Variable coefficient	65,60%	Variable coefficient	110,59%	Variable coefficient	111,76%
Trust Level (95,0%)	0,2189109	Trust Level (95,0%)	0,027602935	Trust Level (95,0%)	0,031400286

Formal Knowledge Position		
Formal Knowledge Level	Level	CAE
President	1	0,482023
Sub manager	2	0,360845
Operational/Administrative	3	0,119175
<b>Organization General Average</b>		0,14014
Variation Coefficient		111,76%

Organizational Formal Knowledge Level				
Organizational Knowledge Scale				
0,0	0,775	1,55	2,325	3,1
Analyzed company	Medium qualification	High qualification	Excellent qualification	
Low qualification	Medium qualification	High qualification	Excellent qualification	

Figure 8: Sum of the enterprise analysis

Source: Daher et. al (2006)

## 5 Conclusion

The application of the measurement of formal knowledge about the result of the auditory to the implantation of the system of certification of ISO 9001:2000, shown that the sense that permitted the verification of the knowledge level in the company and the consolidation of the observed problems by the occasion of attempting the implantation of the quality system of organization.

As it is shown in the model the organization presents a low level of formal knowledge and what brought problems was to the implantation of the system. The question is in this article will give future sustainability is the investigation that makes a great level of knowledge to the application of the system in a way that the company can be prepared before the organizational structure so that they don't have unnecessary costs and the systems implantations.

In other case, relevant to this matter the diagnoses of the evaluating commission of PNQ that was presented in this article the bigger part of the organizational problems it is in the absence of information, knowledge, leadership, people, processes and strategies. What means that the problem of the company is knowledge because of the leadership, people, process and strategies in fact they presented in excellence of knowledge.

Finally, the researched company since 2004 is attempting to obtain the certificate ISO 9001:2000 without success. What does not means that the financial results are not causing satisfaction.

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