Skills for driving continuous improvement in a electricity distributor

Tércius Cassius Melo de Morais, Maria de Lourdes Barreto Gomes, and Luiz Bueno da Silva

***Abstract*— This article presents variables and their respective impacts on the continuous improvement (CI) of a Brazilian electric company. In the case study conducted, a measuring instrument verified which CI organic behaviors were noticed by employees. The resulting data from these measurements were analyzed through factorial and descriptive examination methods. The factorial analysis identifies the four most important factors (abilities) that boost the organization into CI practices. The most significant one is the Commitment to the CI, that represents 25.4% of impact in the factorial model that impersonates the CI, followed by: Encouragement of the CI process (17.5%), Understanding of the CI meaning (16.9%); and Analyzing the CI (13.9%). The descriptive analysis indicates that the ability less perceived by the interviewees is the Encouragement of the CI process, with a 66.3% perception, and that the most perceived one is the Commitment to the CI, with 78.6%.**

***Index Terms*— continuous improvement, energy sector, skill, factorial analysis.**

I. Introduction

In the context of competitiveness in which companies are inserted, it's necessary to develop continuous improvement (CI) programs capable of fortifying the ability of acting effectively and efficiently, in order to attend an increasingly demanding market.

According to Slack *et al*. (2002), every operation, as optimal as it might be, needs to be improved, since the competition is continuously improving. In the author's vision, CI is a performance enhancement approach in which more and smaller steps are taken, with the participation of everyone in the organization in a constant and systematic fashion, aiming the upgrading of business products and processes.

It's important to notice that when a company evolves within a CI process, the gains associated with the changes are faster and more easily incorporated to the process, since an organization more used to changing, learning, and evolving offers less resistance to upgrading (Shiba, 1997).

While organizations can make use of structured CI methodologies to obtain and maintain a competitive edge, its implementation requires capital investment, resources allocation, and organizational commitment (Antony, Kumar and Madu, 2005).

Garvin (2000) noticed that CI programs are proliferating more and more in companies, but cases of failure are more numerous than those of success, and improvement indexes are disappointing. The author points out that CI requires a commitment with learning in order to enable more success in its programs.

A research conducted by Mendelbaum (2006) shows that only a tiny fraction of organizations has had consistent success in their efforts to continuously improve.

Therefore, businesses clearly need means to subsidize the setting of an appropriate environment for the adoption of CI programs, aimed to reduce the probability of failure and to reach the desired results. When the objectives are not achieved by these programs, leaderships are questioned and lose part of their credibility with their fellow equals, their subordinates, and their superiors. This signalizes that it is necessary to intensify the efforts in order to resume new CI programs; and there will probably be additional implementation costs.

Bessant and Caffyn (1997) relate abilities and constitutive behaviors in CI to the capacity of adopting a CI approach, and the routines that collaborators adopt that evidence this approach, respectively. It is in this context that our article analyses, in a Brazilian electric company, variables that characterize abilities in CI.

II. Theoretical Basis

A. Continuous improvement

Mesquita and Alliprandini (2003) highlight that the essence of continuous improvement is the search of a constant and conscious evolution, overcoming obstacles, solving problems, learning with trial and error, teaching, knowing, sharing this knowledge, and contributing to achieve not only a personal

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T.C.M. Morais is with the Federal University of Paraíba, João Pessoa-PB, CEP 58051-970 BRAZIL (phone: 55-83-3216-7124; e-mail: terciusmelo@yahoo.com.br).

M. L. B Gomes, was with the Production Engineering Department of the Federal University of Paraíba, João Pessoa-PB, CEP 58051-970 BRAZIL (e-mail: marilu@ct.ufpb.br).

L. B. Silva is with the Production Engineering Department of the Federal University of Paraíba, João Pessoa-PB, CEP 58051-970 BRAZIL (e-mail: bueno@ct.ufpb.br).

and individual growth, but also a professional and organizational one.

ISO 9004 (ABNT, 2001) states that there are two ways of conducting the CI process: rupture change projects, in which project management methods are used to improve existing processes or to implement new ones; and CI activities in small steps, which are taken by the group members in the existing processes.

Anand *et al.* (2009) define continuous improvement as a systematic effort to search and apply new ways of getting the job done, i.e., actively and repeatedly improving the processes.

Slack *et al*. (2002) treat CI as a performance enhancement approach through more and smaller incremental steps. The rupture projects are called revolutionary enhancements by the author, and they normally demand high investments.

According to Bessant *et al.* (2001), CI needs the appropriate environment to endure and to present the desired results. This environment needs a clear strategic direction, a strategic management of the improvement process, an organizational culture consistent with the CI spirit and infrastructural enabler tools. According to Harrington (1997), the decision of implementing an enhancement management system must be taken by the administration. The author points out that improvement processes are common in organizations managed by high administrations that have long-term vision.

In order to raise awareness to improvement activities, ISO 9004 (ABNT, 2001) recommends the creation of small groups, with leaders elected by its members, so that people can control and improve their own work place. This way, the organization can make possible the progress of individual knowledge, experience and skills as part of its quality management's global activities.

Shiba *et al.* (1997) define three types of improvement: process control, reactive improvement and proactive improvement. Process control consists in having a standard process to verify if the product satisfies the specifications, and then acting to take the process back to standard. The reactive improvement aims to respond to an existing issue in order to remove the causes of this abnormality. And the proactive improvement has the objective of solving problems that a process may present.

Anand *et al.* (2009) say that CI initiatives help integrating operations and processes, and increase the organization's capacity of becoming cohesive and fast during their performance improving process. These CI initiatives can be a dynamic ability for the business, translated by a pattern of collective actions that systematically generate and modify routines, angling for a better efficiency. The same authors state that the CI can only remain sustainable if there's an effective organizational infrastructure centered in a decision making process based in three categories: purpose, process and people. The infrastructural decisions in the purpose category comprise the formulation and communication of organizational goals and CI project goals. The process category requires organizational support for the adoption of uniform methods to discover and implement improvements. Finally, the people category refers to the employees' proper formation and motivation to promote the CI and allow information sharing with the support of information technology.

Bessant *et al.* (2001) say that a huge percentage of CI literature does not analyze well the processes' behavioral aspects, and claims that the lack of comprehension of this behavioral dimension is the main reason why CI programs fail. Many companies focus exclusively in the utilization of methods and tools, ignoring other organizational factors. Other enterprises are in such a hurry to collect the benefits that do not take into consideration the fact that progress requires time and dedication, and demands a trial and error approach and the adoption of an awareness posture compatible with the new way of executing things (Caffyn, 1999).

Bessant *et al.* (2001) assert that, because of the way certain behavioral patterns provide competitive edge, they are frequently described in the literature as "abilities," and there's an increasing interest in this approach as a way of understanding organizational behaviors. The research conducted by the authors reached the following conclusions:

– CI involves a set of behaviors that evolve throughout time, and that can be directly observed in structures, procedures or symbols within the organization;

– These behaviors are associated with several factors, such as: the search and systematic solution of problems, the monitoring and evaluation of processes, the strategic orientation, etc.;

– It appears to be a correlation between performance – CI activity level and its impact in the problems' organization – and the development measure of these behaviors;

– Developing abilities involve two types of learning: improving and reinforcing behaviors within a certain routine group, and adding new abilities to the repertoire;

– There are obstacles to the effective development of these behaviors, and the means to allowing its evolution have a generic nature. (For example, most companies use some sort of reward system to help reinforcing the CI behavior);

– Although the CI development has a long-term learning process, there's no correlation between time elapse and success degree. Rather, the key variable seems to be the quantity of management effort applied to build and maintain CI's behavioral patterns.

This research suggests that it is possible to identify a pattern of evolutionary development in which eight sets of abilities, and their respective constitutive behaviors, are involved. This way, the organizational ability is related to the capacity or skill of adopting a particular CI approach; the constitutive behavior correlates with the behavioral routines, adopted by the employees, that reinforce the CI approach; and the enablers are tied to the procedures or techniques used to propel the CI effort. The Table 1 shows a description of the CI abilities according to Bessant *et al* (2001).

The abilities are seen as behavior groups incorporated to the organization, that represent how things are done in the

company. Throughout time, this becomes explicit in the organization's symbols, structures and procedures, which, in turn, reinforce underlying behavioral laws. Seen this way, the "cultural change" problem becomes clearer, and in order to introduce a new behavioral pattern – to alter or add abilities – it is necessary to have an articulation process and to reinforce the new behavior, that must be repeated with enough frequency and enough times for the new pattern to root. In short, it's a learning process (Bessant *et al.*, 2001).

TABLE I
Abilities for continuous improvement proposed by Bessant *et al.* (2001)

Organizational skill	Description
Understanding of CI	ability of articulating CI's basic values.
Acquiring the habit of CI	ability of generating sustainable involvement in CI.
Focus on CI	ability of connecting the CI activities to the organization's strategic objectives.
Conducting CI	ability of conducting, directing and supporting the creation and maintenance of CI behaviors.
Adjusting the CI	ability of creating consistency between CI's values and behaviors and the organizational context (structures, procedures, etc.).
Sharing the solution of problems	ability of moving the CI activities through organizational barriers.
CI in the CI system	ability of strategically managing the CI development.
Building a learning organization	ability of learning with the CI activity.

Slack *et al* (2002) say that specific abilities, behaviors and actions must be consciously developed for the CI to be sustainable in the long run.

Wu and Chen (2006) expand the model proposed by Bessant *et al.*, saying that the authors do not explain how the abilities were developed in each CI stage, and propose a structural model that not only provides the knowledge about the CI level developed by the organization, but also assigns the material and human resources required for the CI activities to evolve.

The systematic improvement uses a scientific approach, i.e., the problem solving process is structured in stages and must be iterative in order to provide a cycle that reaches a solution or improves something already enhanced. The PDCA cycle is a method that allows the execution of systematic and iterative improvement efforts (Gonçalez and Martins, 2007).

The PDCA cycle was originally developed in the 1930s by the American statistic *Walter A. Shewhart*, and was continually used as a statistical control cycle in a certain process. But this method became popular in the 1950s with the help of quality specialist *W. Edwards Deming*, who used this method in the quality concepts of works developed in Japan (Andrade, 2003).

The cycle starts with the P stage (planning), that consists in gathering data and analyzing them in order to elaborate an action plan aiming the performance enhancement. The next stage, D (doing), refers to the implementation of the action plan. In this stage, there can be smaller PDCAs to regulate problems concerning the implementation. Then, in the C stage (checking), the results reached are evaluated and compared to the expected improvement levels. And finally, the A stage (acting) refers to the new steps taken after the first three stages. The PDCA cycle is non-stop; it continuously restarts and incorporates part of people's work. This cycle is the fundament of MC (Slack *et al*, 2002).

The Table 2 contains a concise description of the main CI approaches analyzed in our research and mentioned in this theoretical basis.

TABLE II
CI approaches by author

Author	CI Approach
Shiba (1997)	Presents the WV model to solve problems
Harrington (1997)	Presents the TIM (Total Improvement Management) model, that combines elements of quality, productivity, expenses, resources, and technology management with administrative methodologies within the organization
Bessant *et al.* (2001)	Present an evolutionary model for developing the abilities and behaviors that constitute the CI
Wu and Chen (2006)	Present an integrated structural model composed by problem, models and tools, and promotion as its core, aiming to improve your CI ability
Anand *et al.* (2009)	Identify the necessary infrastructural decisions to support the CI activities

Sources: Shiba (1997), Harrington (1997), Bessant *et al.* (2001), Wu and Chen (2006), and Anand *et al.* (2009).

Despite the many different concepts and conclusions about CI proposed by the authors mentioned in this article, this brief theoretical basis does not comprise it all, albeit it is useful to subsidize the understanding of how the CI is inserted in the organizational environment, and to show its importance and complexity. This way, managers must first and foremost accept the importance of CI for the organization, and then manage it efficiently.

III. Methodological Procedures

The research methodology used in this article is quantitative, and the approach is exploratory, with exploration of hypothesis and a case study (Gil, 1991).

The case study was carried out in a Brazilian electric company whose identity will not be revealed. This company has a functional structure and a hierarchy divided in 5 basic levels: board of directors, administration, coordination,

supervision and operational. The company, which is considered a large enterprise in the national market, has approximately 1 million consumers.

The research was conducted in three significant functional areas of the company – operation, maintenance and construction – to evaluate their CI abilities. A survey with 12 questions was prepared and submitted to collaborators of various levels (administration, coordination, supervision and operational).

The 12 questions were adapted from the constitutive behaviors suggested by Bessant *et al.* (2001) when he lists key variables that demonstrate CI abilities in an organization.

The collaborators had to point, using the six-level *Likert* scale, their perceptions about the main CI practices in each question of the questionnaire attached. The six levels of the scale, in ascending order, are: *0- strongly disagree, 1- disagree, 2- slightly disagree, 3- slightly agree, 4- agree e 5- strongly agree.*

65 collaborators were consulted in the three researched areas, and 59 of them answered, among managers (3), coordinators (6), supervisors (1), engineers (7) and medium level operational collaborators (42). From the 59 respondents, 25 belong to the operation area, 24 to maintenance and 10 from construction, which represent 83%, 53% and 90% of the total staff of the three areas, respectively. Few employees from the maintenance area were interviewed, because we tried to exclude those with a lower level of education, in order to reduce the possibility of distorted results that might be caused by lack of comprehension of the CI concept and/or misinterpretation of some of the questions.

We used the *2007 Microsoft Excel* and the *Statistical Package for Social Sciences* (*SPSS*) version 13.0 softwares to treat the research data, with descriptive and factorial analysis processes to identify the relative importance of the factors in CI practices in the company areas mentioned in this page.

IV. Results and Analysis

To apply the factorial analysis, three basic conditions were verified: the size of the sample, the degree of intercorrelation between the sample variables, and the internal consistency of the scale used.

Hair *et al.* (2005) assert that the size of the sample must consist of at least five times more observations than the number of variables to be analyzed. This condition was satisfied in this research.

The degree of intercorrelation between the variables is determined by the *Measure of Sampling Adequacy – MSA*, that varies between 0 and 1. Hair *et al.* (2005) state that it is unacceptable to use a factorial analysis with a MSA lower than 0.5. The MSA obtained in this research was 0.779, which means that the sample variables have an acceptable degree of intercorrelation between them.

To evaluate the internal consistency of the scale used, i.e., the consistency of the multiple measurements of a variable, we used Cronbach's alpha, a highly employed measure that has 0.70 as its commonly accepted inferior limit (Hair *et al.*, 2005). The value obtained in this research was 0.861, which validated the question about the scale's internal consistency.

To determine the latent factors structure, we used the main components method to extract factors, aiming to reduce most of the information to a minimum number of components without significantly compromising the total information. The data obtained from the main components extraction is presented in Table 3.

TABLE III
Components extraction with and without factorial rotation

Com-ponent	Inicial Eigenvalues		Rotation Sums of squared Loadings (*Varimax*)	
	Total	% of Variance	Total	% of Variance
1	5,01	41,72	3,04	25,36
2	1,52	12,70	2,10	17,51
3	1,26	10,50	2,03	16,93
4	1,05	8,79	1,67	13,92
5	0,77	6,45		
6	0,55	4,56		
7	0,45	3,77		
8	0,39	3,25		
9	0,32	2,70		
10	0,26	2,17		
11	0,23	1,91		
12	0,18	1,49		

To determine the number of factors that represent the latent structure of the data, we decided to use the latent root method, that chooses only the factors that present self value higher than 1; only four factors here present this trait (Hair *et al.*, 2005).

When extracting the components with or without factorial rotation, we noticed that the cumulative variance of the four components reckoned represent 73.7% of the total variation, which shows how well these four factors explain what all the variables together represent to the CI. We decided to use a rotation in order to obtain a better factorial distribution between the variables and to eliminate the quantity of variables that has significant correlation with more than one factor, facilitating, thus, the interpretation of the results. We used the VARIMAX rotation, a successful analytical approach to obtain an orthogonal rotation of factors (Hair *et al.*, 2005).

In Table 3 we can see that the most representative of the first four latent factors is component 1, that totalizes 25.4% of the total variance, followed by components 2, 3, and 4, with 17.5%, 16.9%, and 13.9%, respectively.

The result of the loads' factorial matrix is represented in Table 4. Considering that the questions numbered in this table relate to the same questions in the attached questionnaire, and that the factorial loads without significance were concealed, we can see that: questions 1, 2, 5, 8, and 10 are correlated to

Factor 1; questions 7, 11, and 12 are correlated to Factor 2; questions 4 and 6 are correlated to Factor 3; and questions 3 and 9 are correlated to Factor 4.

TABLE IV
VARIMAX rotated factorial matrix for analyzing the variables' components and communalities

Questions	Factor				**Communalities**
	F1	F2	F3	F4	
1	0,73				**0,67**
2	0,64				0,71
5	0,71				0,70
8	0,83				0,82
10	0,73				0,72
7		0,62			0,78
11		0,83			0,72
12		0,83			0,74
4			0,88		0,76
6			0,79		0,66
3				0,67	0,77
9				0,86	0,79

Analyzing the commonalities in the last column of Table 4, we can see that all the variables are proportionally well explained by the four factors of the factorial model found, since all the variables are above 0.5. We can see, however, that the variable best explained by the factorial model is question 8, which is associated with the employees' enthusiasm in searching for personal development opportunities.

We all know that the naming of the factors obtained in a factorial analysis is a process that depends on the researcher's interpretation. Hence, it is a subjective process and, thus, an easy target for criticism. Nevertheless, we aimed to reach a logical designation for each factor, in order to facilitate the comprehension and presentation of the factorial solution (Hair *et al.*, 2005). This way, the names of the designate factors for the factorial solution are: F1, *Commitment to the CI*; F2, *Encouragement of the CI process*; F3, *Understanding of the CI meaning*; and F4, *Analyzing the CI*. These factors will be further referred as abilities.

By positively exploring these four abilities, the company will be conducting a CI consistently in the long run. The benefit to managers is discussing plans to implement the CI based in these four abilities, instead of dealing with the variables separately.

Back to Table 4, we can see that question 8 of the applied questionnaire (attached) is the most correlated to the F1 factor (*Commitment to the CI*), the most representative one. This question is associated with the employees' enthusiasm in searching for personal development opportunities.

Questions 11 and 12 are more related to the F2 factor (*Encouragement of the CI process)*. These questions refer to the managers' attention to formally recognize the work done by the employees and to deal with their suggestions.

Question 4 is more associated to factor F3 (*Understanding of the CI meaning*). This question is related to the managers' posture in dealing with mistakes made in the process. In one hand there's the practice of seeking the guilty and punishing them, and in the other there's the search for opportunities of learning from these mistakes to avoid its future occurrence.

Finally, question 9 is more correlated with factor F4 (*Analyzing the CI)*. This question is related to the practice of analyzing the commercial viability of certain measures before their adoption.

Aiming to facilitate the descriptive analysis of the research data, we associated the possible results of *Likert* scale's objective opinions to numeric values and percentage levels according to the model presented in Table 5.

TABLE V
Likert scale answers associated to percentage levels

Opinion	**Value associated with the opinion**	**Range associated (%)**
Strongly Disagree	0	[0;16,7)
Disagree	1	[16,7;33,3)
Lightly Disagree	2	[33,3;50)
Lightly Agree	3	[50;66,7)
Agree	4	[66,7;83,3)
Strongly Agree	5	[83,3;100)

We can see in Table 5 that the value 0 (second column) is associated to the *Strongly Disagree* option (first column), the value 1 corresponds to the *Disagree* option, and so on. This way, the minimum value is 0 and the maximum one is 5.

Since we had 59 answers, we calculated the average of each one of them, and then reached the confidence interval for a 90% level. For example, the average of the 59 answers to question 1 was 3.8, and the confidence interval was 0.19. In percentage terms relative to the maximum obtainable value, which is 5, the average and the confidence interval equal (3.8/5) = 76% and (0.19/5) = 3.8%, respectively. This means that question 1 has its confidence interval between 3.8 ± 0.19, or, in percentage terms, between 76% ± 3.8%.

For the definition of the percentage levels associated to each objective opinion (see Table 5 third column), we used the following logic (see Figure 1): since the value associated to the opinion varies from a minimum, which is 0, to a maximum, which is 5, 5 represents 100% and 0 represents 0%. Hence, since there are six objective opinions in Table 5 column 1, we created six levels regarding to the column's objective opinions. In this case, each percentage level is equivalent to 16.7%, which is 100% divided by six.

To obtain the percentage level correspondent to the *Strongly Disagree* opinion, for example, we established 0% as its inferior limit and added this to the increment, which is 16.7%. To determine the *Disagree* level, we considered its inferior limit as being the superior limit of the previous level, which is, in this case 16.7%. Then, we added again the inferior limit of the level to the 16.7% increment, and so on.

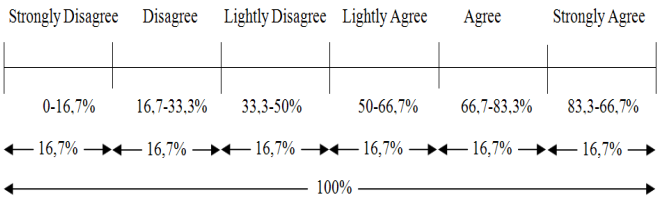

Fig. 1. Definition of the percentage levels associated to each objective opinion.

From then, we constructed the Figure 2 graphic, that represents the graphic result of the average and confidence interval's percentage of the interviewees' answers in relation to the CI questions in the three company areas researched.

The graphic results in Figure 2 represent the CI evidences present in the researched areas of the organization, according to a sample that represents the people who work in the researched areas. The *Min* and *Max* graphic lines of this image represent the minimum and maximum values determined by the average confidence interval for a 90% significance level.

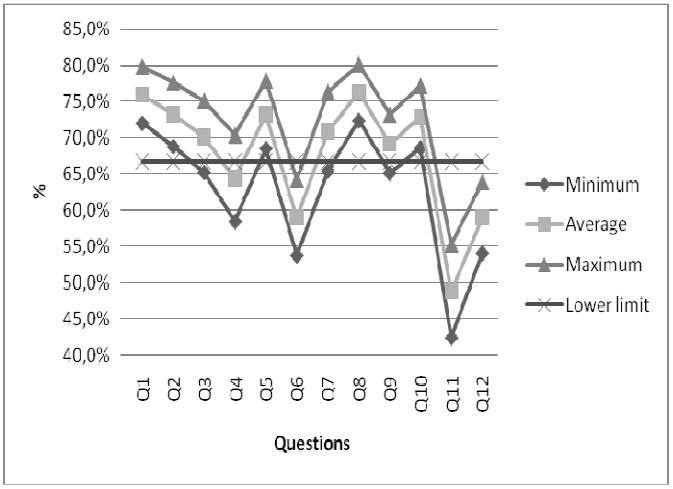

Fig. 2. Graphic representation of the researched variables' average percentage according to a 90% significance level.

The acceptable limit existent in the graphic was defined by following the two last levels of Figure 1, which are the *Agree* and *Strongly Agree* levels. Below these levels, we understand that the other ones had little concordance or high discordance.

By the angle presented in Figure 2, we can see that three questions deserve more attention from the researched company managers: questions 4, 6, 11, and 12, since they all have performance evaluations below the 66.7% acceptable limit.

Question 4 is about the *Understanding of the CI meaning* by companies, more precisely the managers' actions when dealing with mistakes committed in the process, either if they try to place the blame and punish people or if they see the mistakes as learning opportunities to avoid their future occurrence.

Question 6 deals with the organization's maturity about the approach when solving problems, i.e., their behavior in a corrective matter, which, according to the ISO 9000 (ABNT, 2005) concept, means "action to eliminate the cause of non conformity or other unwanted situation." When the organization's maturity is low in this respect, they don't look for the problem's root to take the appropriated actions to avoid its occurrence, since it is easier, in this type of organization, to find someone to blame and "pay the price" for the fault.

Question 11 is related to the managers' acknowledgement of CI practices in the organization, which serves as an incentive for the collaborators to adopt a CI systematic posture. Its low performance evaluation is an obstacle for the CI development, and Bessant *et al.* (2001) recommend a reward system to develop the CI behavior.

Finally, question 12 also deals with incentive for the collaborators to practice the continuous improvement with constant feedback given indiscriminately to them by managers and leaders.

In the Figure 3 graphic, we can see the factors' performance and the percentage average of each factor according to the respondents' perception. We can ascertain that *Encouragement of the CI process* (F2) is the dimension that has the higher variability in the researched organization, since its quarters encompasses the whole value scale from 0 to 5. This, along with the fact that its average value is lower than the average of the other abilities, means that F2 presents more opportunities of improvement for the company to explore. The second dimension with the biggest opportunity of improvement is *Understanding of the CI meaning* (F3), since its average is lower than those of F1 and F4 dimensions, as you can observe in Figure 3.

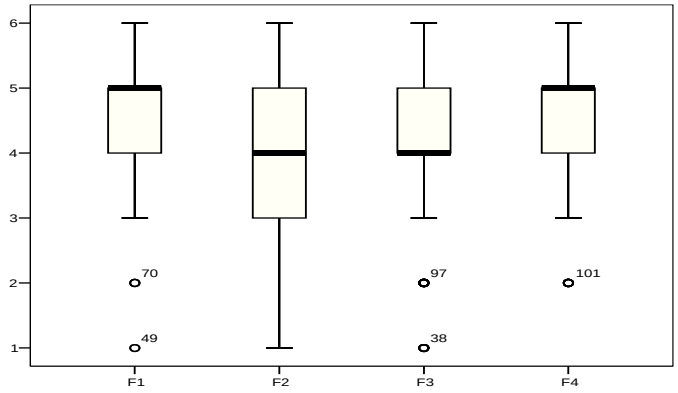

Fig. 3. *Box Plot* graphic about the abilities' performance.

On the other hand, we can see that the *Commitment to the CI (F1)* and *Analyzing the CI (F4)* abilities are the ones that represent the highest average percentage and the lowest variability, and are the strengths of the organization in terms of CI practices.

V. Conclusion

With these results, we could achieve the objective initially proposed. Such research results point out four abilities that

impel the organization into CI practices: *Commitment to the CI*; *Encouragement of the CI process*; *Understanding of the CI meaning*; and *Analyzing the CI*.

According to the research, the most significant ability was the *Commitment to the CI*, that has 25.4% of the factorial model's total variance. *Commitment to the CI* includes the following matters: mutual cooperation regardless of the area; interest in contributing with improvement suggestions for processes and products; alignment of the CI practiced with the organization's objectives; focus and importance attributed to (internal and external) clients' requirements in CI practices; search for personal capacitance to evolve in the CI system. We ascertained that this last matter represented the higher significance among all others. These conclusions will be very important for the organization to strengthen its CI systematic practices.

In the descriptive analysis this ability showed the best performance in the conducted research, with a 78.6% average. This shows that the organization has the best CI performance exactly in the ability that has more significance.

The *Encouragement of the IC process* factor represents 17.5% of the factorial model's total variance and it has the worst performance amongst the abilities, with 66.3%, a little bit lower than the acceptable limit of 66.7%. This ability comprises the following matters: managers' incentives to the organizational learning; creation of a formal reward system for CI contributions, with praises, bonuses, etc.; and the quick, indiscriminate and transparent processing of collaborators' suggestions. The rotated factorial matrix presented in Table 4 demonstrates that these last two matters are the most significant to the *Encouragement of the CI process*.

The third factor, *Understanding of the CI*, has 16.9% of the factorial model's total variance and the second worse performance, with 68.1%. This ability deals with the managers' posture when dealing with mistakes committed during the processes as well as people's reaction before these mistakes. The rotated factorial matrix presented in Table 4 shows that the first matter – the managers' posture – represents this ability's most significant factor.

Actually, this factor evidences the company's maturity degree regarding the problem solving approach. The focus of this approach, in order to reach a high degree of maturity, has to be aimed at identifying the root causes of the problems in order to generate corrective actions and an culminate in a learning process, and not searching for someone to blame, since this only causes more demotivation for the collaborators.

The *Analyzing the CI* ability has a 13.9% total variance in the factorial model and has the second best performance result, with 74.8%. This ability concerns the following matters: verification of the improvement efficiency in the results; and prior alignment of the improvements with the departments' objectives before their execution. This last matter presents the most significance in the composition of this ability, according to the rotated factorial matrix in Table 4.

It's important to notice that the four abilities studied are capacities showed by the organization for executing the CI. These abilities will guarantee the success in the implementation of CI programs and their maintenance in a sustainable fashion in the long run.

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Tércius Cassius Melo de Morais He is a graduate of the Federal University of Campina Grande (2003), an MBA in Business Administration (2007) and a Master's in Production Engineering from Universidade Federal da Paraíba (2011). He is currently Maintenance Manger in a Brazilian Electric Utility.

Luiz Bueno da Silva did postdoctoral at the Federal University of Pernambuco in 2009, and Ph.D. in Production Engineering at the Federal University of Santa Catarina in 2001. He is an Associate Professor I at the Federal University of Paraíba and leader of the research group Comfort, Efficiency and Safety at Work. He is coordinates the Laboratory of Applied Quantitative Methods and it's a researcher at the Analysis Laboratory of Labor. He is a member the Scientific Committee of International Conference

on Occupational Health and Safety at the University of Minho, Portugal. He is concentrates his research in the formulation of the regressive, bayesiano and multivariate model for the study of relations between the thermophysical comfort, health and worker performance.

Maria de Lourdes Barreto Gomes graduated in Economics at the Federal University of Paraíba (1973), Master in Production Engineering at the Federal University of Paraíba (1980) and Ph.D. in Production Engineering at the Federal University of Santa Catarina (2002). It's is currently Associate Professor III at the Federal University of Paraíba. It's has experience in Production Engineering, with emphasis on Planning, Design and Control of Production Systems, acting on the following topics: quality, technology, work, strategy and industrial organization.