DFLSS AND QFD: APLICATION IN A SERVICE COMPANY

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Abstract. *The objective of this article is to discuss how the goals of the DFLSS can be achieved through the complementary usage of the method QFD. The research was carried through a case study at an information technology service company where Lean Six Sigma was introduced. The study presents a simplified form of the QFD using the correlation of matrices during the phases of the DFLSS in the elaboration project of a RFP (Request for Proposal). The results show that the agreed DFLSS and QFD are efficient in the elaboration of the RFP. Therefore, focusing on the analysis of the necessities of the customer and prioritizing the customer's voice, detail the necessities of the project and guarantee not only the quality process but also its planned speed of operation.*

Keywords: *Quality Function Deployment, Design for Lean Six Sigma, Services*

1. INTRODUCTION

The participation of the Services Sector in Economy has been increasing in the last decades. This evolution has generated its increasing participation in the world's GIP. It has been seen that the number of job opportunities created by that sector has been performing bigger taxes of growth in comparison to other sectors of Economy. This scenario has been repeated in Brazil. (Carvalho et al.2006).

According to Prado (2000), the growth of outsourcing services in the Information Technology area has been big in the last years. The increasing competitiveness, the globalization of the markets and the evolution of the used technology have contributed to that growth. According to this author, the development of the Information Technology area has contributed a lot for the outsourcing expansion, as many products and services have become commodities and granted the attainment of economies of scale through external suppliers.

Lee (et al.2003), comments that due to such a competitive and inciting scenario, rendering service companies in Information Technology have been also led to outsource internal activities as training programs, bill paying, and even sub-contracting other suppliers for accomplishment of similar activities, outlining a level ahead of outsourcing.

George (2004) mentions that the constant search for finding ways to differ from the competition and reaching a superior performance is the rule that the rendering service companies (emphasizing the lender services in the Information Technology area) have adopted to survive in their competitive environment, in order to get operational effectiveness, as service processes are generally not only slow but also expensive. Slow processes are easily affected by bad quality, cost increase and reduction in the satisfaction of customers and income. The slow processes result in service application represents more than half the cost, or either, not-added value wastefulness.

Still according to George (2004), processes of services are slow because there is work in process (WIP) in excess, what is frequently the result of unnecessary complexity in services and products offer. In this context, it does not matter if WIP is constituted by reports pilled up on a table, e-mails in a box of electronic entrance or sale orders in a database. When there is too much WIP, the work can overcome 90% its waiting time which doesn't help customers at all, creating a substantial loss (not value-adder costs) in the process.

Here, the elimination of waste in the internal processes, the adoption of advanced technologies, the development of new products (goods and services) or processes, outsourcing of activities, the collaborators commitment and the continuous improvement of the processes, have become the businesses base. Based on it, the companies that desire to remain ahead competition, must make an effort to obtain the efficient management of its resources, with the purpose to keep its position in the market and to practice actions that make possible the analysis of the processes, searching for performance improvement. For this reason, quality management specialists are being led to develop specific tools and techniques in order to assist companies in the conquest of the superiority (Casas, 2006).

2. OUTSOURCING AND REQUEST FOR PROPOSAL (RFP)

The subject outsourcing has been acquiring importance in the context of increasing of the outcoming conditions of this new world's economic order. Outsourcing is a neologism from the word "third", understood as an intermediary, that in the business language means a technique of administration through which a third one interposes, generally a company, in the typical labor relation (employee versus employer). However, it is not the interposition in the traditional work relationship of a worker, so-called third, but of a company who will take on the service or the outsourced activity (Cavalcanti, 1996).

We can define outsourcing as being the process in which the company, aiming at reaching greater quality, productivity and reduction of costs, transfers to another company a particular service or the production of a specific one (Queiroz, 1998). According to the Wikipedia (2006) the order of proposal for acquisition of services through an invitation to suppliers, by a bidding process is called RFP (Request for Proposal). Usually, the RFP is part of a complex process of sales and that involves more than the price. Further information is requested as: description of the applying company to the services, financial information, technical capacity, main services executed for other companies, specific information and details of the offered service and project details. The more precise and closer to the needs of the requested services are the specifications, the biggest the chance of proposals acceptance. Generally, the RFP's are sent to a list of pre-approved suppliers that elaborate the answers in attendance to the invitation, to the bidders to the proposal, within a determined period in the RFP. Still, according to Wikipedia (2006), the proposals sent after the time limit are discarded. The proposals received in conformity are evaluated based on prerequisites of the RFP and the supplier is chosen.

3. LEAN SIX SIGMA

The Lean Thinking has its origin in the environment of production of the manufacture industry, more precisely in the Toyota System Production. After the Second World War II, Toyota initiated the manufacture of stroll cars, when it faced some problems. The main ones were: the Japanese market was limited (low volume) and demanded some models of automobiles and the competition of the American cars. With all these difficulties, Toyota developed Toyota System Production that in 1990 was called Lean Production by John Krafcik. Since then, this methodology has been applied with great results in the most different sectors of the organizations: administration, products development and services and production development. As well as in companies of different market segments - automobile, aeronautical, services, civil construction, health, production under order, among others (Lean Institute, 2006).

According to Harry (1998), the reason of the name "sigma" comes from a statistical measure related with the capacity of the processes, or either, the ability to produce products, or not defective units/parts. When Six Sigma equivalent specifications are necessary, then 99,99966 percent of the units will be within the limits of the specifications, not existing more than 3,4 defects for million of chances (DMPO). Higher levels of sigma correspond to products with better quality or even unsatisfied customers and it is a measure of operation performance.

The Program Six Sigma appeared in the 80s, in the American company Motorola, as an attempt of quality improvement. From 1987 to 1997, Motorola informed that they have gotten a five times growth on sales and profits going up close to 20% per year, accumulating economies of 14 billion. Despite the Six Sigma has been used in the beginning with emphasis in manufacture, some companies extended this concept to the operations and services. Many aspects of the businesses, such as: the consumer service and the delivery services. Beyond the product quality, it has an impact on the satisfaction of the customer, and, therefore, it becomes so difficult to reach a Six Sigma level. However, the simplification of processes is essential to reduce the number of defects and to increase the satisfaction of the customer (Feo, 2001).

According to Carvalho (2004), the Six Sigma has two sources of implementation, the DMAIC (It defines: Measurement, Analyses, Improvement and Control), that focus on the improvement of the quality in processes, and the DFSS (Design for Six Sigma), with focus on the quality of new products development projects, services and processes.

The consequent program of the integration between the Six Sigma and the Lean Thinking, by means of the incorporation of the strong points of each one, is called Lean Six Sigma, a more including, powerful and efficient strategy where each part, individually, is adjusted to the solution of all types of problems related with the improvement of processes, services and products (Werkema, 2006).

According to George (2004), some people always associate the Lean word to manufacture, however, Lean is a set of principles that speeds up all processes through the company. Lean Six Sigma is a methodology that can be applied in business-oriented goods companies and services, promoting the improvement that maximizes the value of the shareholder when reaching the tax of faster improvement in customer satisfaction, costs, quality, speed of process and invested capital. The fusing of the Lean methods of improvement with the Six Sigma ones is necessary because Lean cannot place a process under statistical control; neither can Six Sigma alone

drastically improve the process speed nor reduce the invested capital, and both allow the reduction of the complexity cost. This way, Lean Six Sigma allows us to work simultaneously with quality, cost and speed because it mixes Lean with its primary focus in process speed, with Six Sigma, its primary focus in quality of process. Still according to George (2004), the mixture of the central subjects of Lean and Six Sigma offers five "laws" that direct the improvement efforts:

0. The LAW of the MARKET: the CTQ (Critical for the Quality) for the Customer defines the quality and it is the highest priority for the improvement, followed by ROIC (Return over Invested Capital) and Present Liquid Value. This is called Law Zero because it is the foundation on which all the remaining portion is constructed;
1. The LAW of FLEXIBILITY: the speed of any process is proportional to the flexibility of the process;
2. The LAW of FOCUS: 20% of the activities in a process causes 80% of the delays;
3. The LAW of SPEED: the speed of any process is inversely proportional to the volume of work in process (or amount of things in process). The Law of Little affirms that: The amount of things in process, in turn, increases in result of long times of setup, the impact of the variation of offer and demand, time and complexity of product offer;
4. The LAW of COMPLEXITY and COST: the complexity of the service or the offered product generally adds more costs not-adders of WIP (Work value in Process) than the bad quality (low Sigma) or problems of process (no-Lean) due to slow speed.

4. DESIGN FOR SIX SIGMA (DFSS) AND DESIGN FOR LEAN SIX SIGMA (DFLSS)

The Design for Six Sigma (DFSS) is an extension of the Six Sigma for the project of new products (good or services) and processes, that appeared in General Electric (GE) in the end of the 90s (Werkema, 2006). According to Carvalho (2004), the methodology DFSS (Design For Six Sigma) deals with quality in the project of new products and can be applied in productive processes and services that need to be constituted in a way that when working, immediately reach the level Six Sigma. The DFSS can also be applied in processes in which its level of performance is so low and the process itself is so bad that any efforts carried out to perform an improvement process will not result in Six Sigma level process. So, either a new product or service can be projected or an existing product or service can be re-projected. The DFSS brings tools that can reduce costs and improve the quality but mainly it adds value to the product or service through innovations and the attendance of the real necessities of the customers. This program is pointed as the only form to reach the level Six Sigma in quality as the quality of product/process is projected, not improved.

DFSS Methodology is developed in five stages: in the cycle DMADV - to define (D), to measure (M), to analyze (A), to develop (D) and to verify (V) - that objective to minimize the undesirable occurrence of last-hour surprises and inconveniences that are traditionally associated with the launching of new products, services or processes (Hahn et al., 2000). They can also contribute for the probability of special causes of occurrence of variation reduction. In general, the use of that methodology requires a solid base of knowledge on statistical methods, beyond the other scientific methods used for the solution of problems, controlled and optimization of processes. The described principles for Hahn et al. (2000), concerning the application of methodology DFSS are:

- REQUIREMENTS OF THE CUSTOMERS/VOICE OF THE CUSTOMER: critical characteristics for quality and other requirements for the new products, services or processes are defined to the level of the customer. That is reached by the disciplined use of market research tools and others, like Quality Function Deployment (QFD);
- REQUIREMENTS FLOW DOWN: the customers requirements are gradually incorporated to the requirements of the functional project, to the detailed project and to the process control variables. This assures that a systemic vision is kept along the project development and prevents from a premature ending of the project;
- FLOW UP CAPACITY: the capacity to congregate the above mentioned requirements is continuously evaluated to the light of new data and/or those which are important. This allows an initial consideration of the trade-off potentials as well as prevents from undesirable surprises;
- MODELING: the modeling is based on the relation of the customer requirements with the elements of the project. This modeling is not made of a unique form. Simulation of discrete events and planning of experiments are some examples of methods used of the mathematical and statistical models that are applicable.

As mentioned above, the used methodology to implement the DFSS involves five organized steps in a structuralized way and guided to data. As a whole, the activities that characterize the stages that compose cycle DMADV are the following ones (Hahn et al., 2000):

1. (D) TO DEFINE: to identify new products, services or processes to be developed (or re-projected). To develop and to define a headline for the team, including the target, the scope of the business, economies, resources and a project plan. The activities in stage D are based on the common sense and constitute the biggest portion of any training program on project management. This stage requires care with target-sizing and resources availability;

2. (M) TO MEASURE: to plan and to lead research to understand the necessities of the customer and requirements associates. To translate these necessities and requirements in critical characteristics for the quality;
3. (A) TO ANALYZE: to develop alternative concepts. To select the concept more adjusted to develop a project of high level and to predict the capacity of the project to congregate the necessary requirements for its development. In this stage, some options of projects are considered and evaluated systematically. This can involve the agreed use of more advanced statistical tools;
4. (D) TO DEVELOP: to elaborate the detailed project. To evaluate the capacity of the considered project and to develop plans to pilot or re-project a new product or service;
5. (V) TO VERIFY: to construct an archetype or pilot of the complete function of the new product or re-projected the product/service, that is, a version in limited scale is submitted to a validation of its performance.

George (2004), defines that when we desires to project a new product, service or process the preferred model of improvement can have many names, or either, when the project is inserted in a program Six Sigma, this model calls DFSS. When the project is inserted in a Lean program Six Sigma the model calls DFLSS. Although the labels are different, both are basically business-oriented strategies for the execution of any projects of high value that requires a significant amount of a new project and use the same cycle DMADV.

George (2004), explains that all incorporate a bigger emphasis in capture and understanding the customers and the business needs than DMAIC and establish clear linking to each step, since the translation of "necessities" for "requirements" and finally until the used processes to create a new product or service. Although the DFLSS requires extra tools it comes from the basic methodology DMAIC and remains established in facts and moved by data.

5. QUALITY FUNCTION DEPLOYMENT (QFD)

The QFD (Unfolding of the Function Quality) was conceived in Japan, in the end of the 60s, as a method for the guarantee of the quality inside of environment TQC (Total Quality Control) to be applied in the initial phases of the process of development of new products and services. It was the time when the Japanese companies used the strategy of copying products to develop them, based on the originality. The quality importance of the since the project, although a way to establish it remains unknown. It was when Prof. Akao initiated the attempts of the unfolding of the quality based on the difficulties of the companies, which was the lack of clarity in the determination of the quality of project, and the understanding of the impossibility to instruct the lines of production on prior points of the project before the product entering the manufacture (AKAO, 1996). Still according to Akao (1996), the first step of the refinement of the theory for the establishment of the quality was given with the intention to relate the technical standard of the process, used by the industries after the launching of the products, to the necessities of the customers through diagrams of cause and effect. At the same time, the proposal of the Matrix of the Quality was a contribution of the studies of the Dr. Mizuno, where he delineates the specific activities for the guarantee of the quality as part of the documentation of the already established system. The theory was then being consolidated with the union of the unfolding of the quality in the restricted direction (defined by Prof. Mizuno), with the unfolding of the quality (Prof. Akao's proposals). From this moment, the QFD method (QD and the restricted QFD) was being spread in the companies, having its bigger impulse in 1978 with the publication of the first book on QFD.

Generally, the QFD can be applied not only for the product (goods and services) of the company but also for the intermediate product between customer and internal supplier. It can also be applied not only for revision or improvement of existing products but also for new products in the context of the companies. The introducing of the method QFD aims two specific purposes: (1) to assist the process of development of the product, searching, translating and transmitting the necessities and desires of the customer; (2) to guarantee the quality during the process of development of the product or service (CHENG et al., 1995).

Akao (1990), ponders that the satisfaction of the consumer is not only assured through the methodology of control of the quality, as to control the quality on-line is efficient to extinguish non-conformities, once the priority is the precaution of problems by means of procedure attendance, evaluation of the reasons of non-conformities and injunctions to hinder new events. The QFD systematically carries through the conversion of the demands of the consumers in quality characteristics, developing a quality of project for the product or service through the relationship unfolded between the demands and the characteristics, starting with the quality of each functional component and extending the unfolding for the quality of each part of the process. Thus, the product or service quality as a whole will be generated through a net of relationships. This way, the customer has relevant importance in the definition of the attributes of the products or services in accordance with its expectations and necessities. The task to transform the necessities of the customers into product or service attributes is difficult, as most of the time, the customer does not know exactly what he or she wants, even so he or she is completely sure about he or she does not want. This fact requires the company's good willing in "translating" the information taken from the market through research lead by the marketing area. Finally, the

qualities demanded by the customers are identified and used to define the strategic benefits for the product (Cheng et al., 1995).

One of the most important stages of an project based on the QFD is the formation of the application team. The intention of the team is to work engaged with the definite objectives and as much as possible the members must have aptitudes in relation to the project that will be developed and availability to work in the intention of the project. Any organization should have in mind that to select the team and to promote its training is the basis for a development supported by the QFD. Akao (1990), thinks that it is also important that the application team represents a good sampling of the functions of the company. That stratified representation is called multidisciplinary team. The use of multidisciplinary teams prevents what the mentioned author calls "myopic groups", which can occur when the majority of the members represent an only function. The definition of the goals of development describes the purpose, the problem or the objective of the project. The orientation of the activities of the QFD in the project are the real necessities of the customers, then the QFD selects the critical characteristics for the quality (CTQs) listening to the voice of the customer (VOC).

Mirshawka (1994), defines that once gotten the voice of the customer (VOC), he starts to group them and to classify them looking for quantifying the importance of each one for the customer of the process, product or service using values between 1 and 5. Still according to Mirshawka (1994), the quality desired for the customer is fed in the First Quality and it is called items "what", still, in this same called matrix, it lists items "as" that they are the interpretation given for the project to the desires of the customer. This new list is called Characteristics for Quality (CTQs). The CTQs are related with the VOCs in the Matrix of Relationships. In the Matrix of Correlation, the correlations between the CTQs are represented. Figure 1 shows the correlation between the CTQs matrices.

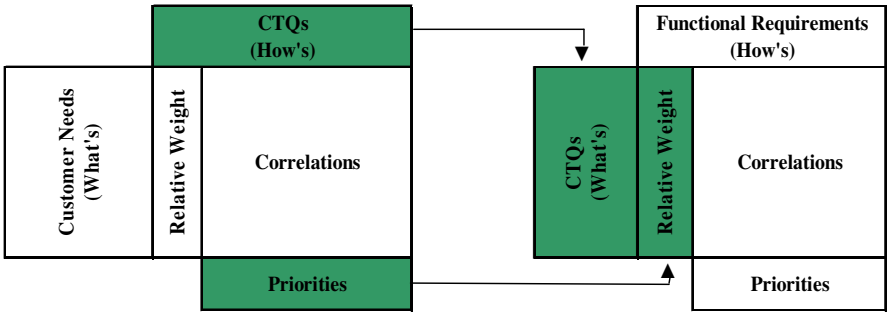

Figure 1. Correlation between the matrices. Source: QFD Institute (2006).

6. OBJECTIVES

This article has the objective to discuss how the goals of the DFLSS can be reached through the complementary and simplified use of the QFD. They analyze and also generically discuss the results gotten through a study of case in the development of a RFP in a company of Information Technology that introduced the Lean Six Sigma.

7. METHODOLOGY

The strategy of research adopted in this work is the case study. According to Yin (2001), the case study searches for examining a current phenomenon within its context, not separating from it, as it is the case of the experimental delineations, and also it is differentiated of the historical method for mentioning to the present and not to the past. The stages adopted for the case study form:

1. ELECTION OF THE COMPANY: the election of the company for the study was based on the following criteria: description in the implementation of the Lean Six Sigma program, size of the company and the pioneerism in projects using the DFLSS. Research was performed in the Internet, in company sites and in specialized magazines, aiming at identifying a company that fulfilled the proposed criteria, a rendering company of services in the area of Information Technology, called in this study as Pilot Company;
2. IDENTIFICATION OF DIFFICULTIES and COLLECTION OF DATA: as an instrument of collection of data the research used the interview, increased by documentary research and direct watching. For documentary research, internal documents of the company were analyzed. Regarding direct observation, this was performed in a non-systematical way by means of the use of the senses and critical examination, in order to get certain existing aspects of the company's daily routine. As for interviews, we opted for the open model through presentations performed by the interviewed people. The persons responsible for the quality, training and purchases of the company were interviewed;

3. STUDY OF THE CASE: it was used the simplified model of the QFD with the elaboration of four matrices of correlation, complementing each phase of the DMADV (to define, to measure, to analyze, to develop, to verify) in the project DFLSS. The Matrices were elaborated with the MS-Excel tool;
4. CALCULATION IN THE MATRICES: Weight of Importance (PI): It is the value of each technical requirement which will serve as a criterion in the priority of these requirements, and it is calculated through the multiplication of the importance (I) by the informed value (VI) in the head office of relationships.
   - The importance (I) is attributed in a scale of 1 the 5, being 5 the biggest level of importance.
   - The value informed (VI) in the matrix will be of 9 (High), 3 (Average) and 1 (Low).

8. RESULTS

8.1. Pilot Company

The Pilot Company is a rendering services multinational company in the Information Technology area with four thousand employees, it is located in São Paulo and it is present in 26 countries with its headquarter in the United States.

The company is one of the main users of the Lean Six Sigma programs in the segment of services and we can verify the diffusion of the culture quality in all levels of the company. In the organization chart of the company there is a specific direction of quality, being its director a Champion, moreover, there are two Black Belts working in projects to assure to the customers significant and measurable advantages concerning service rendering. We notice that there is a considerable parcel of employed that keep the heading of Black Belt or Green Belt. A point to be highlighted is the fact that the participation in improvement projects is part of the employees' performance evaluation.

The Pilot Company, in its constant search for service excellence, initiated its Lean Six Sigma program in 2002, with a series of strategically important projects and carefully chosen teams. As a result of its efforts, Pilot had the chance to generate excellent increase in the annual income due to improvements in its operations that brought economy in the elimination of costs and wastefulness.

The company assigns these results to the Lean Six Sigma program that can maximize the value of the shareholder when reaching the tax of faster improvement in satisfaction of customers, costs, quality, speed of process and invested capital. An outstanding fact to be mentioned is the Program Qualification QFD that has aimed at developing the capacities and abilities of the company employees in method QFD, complementing the Lean Six Sigma methodology.

With the solid culture of the Lean Six Sigma in projects of processes improvement, Pilot can give one more step in the direction of the development of new services and processes being pioneers in the use of the DFLSS - Design for Lean Six Sigma.

8.2. Identification of Difficulties

The Pilot Company has been searching for outsourcing some of its activities, however, in some outsourcing it has faced great difficulties in managing the quality of the services given for those companies, as the quality of a supplier incorporates the activities, materials, products and services destined to the service offer that will have to assure the attendance of the requirements demanded by the contractor or customer. However, the relation with the contracted companies has been very difficult due to the agreement of these rendering that in the contract celebrated between them does not fulfill properly the expectations of Pilot.

Recently, Pilot outsourced its bill paying area, after an extensive process, a partner was chosen, the contracts were signed and the activity started. After a few months, things went wrong; the partner was not fulfilling the requirements of the business. In its defense, the partner pointed out that the requirements were not covered by the level of the agreed service. In consequence, the relation between the companies weakened and the partner started to follow strictly the minimum contractual obligations, hinder the results and Pilot will have to wait for the end of the contract to replace the partner.

Because of the negative experiences with the process of outsourcing and the recent decision of also outsourcing the responsible area for qualification training and employees development, a request was directed to the quality area, asking for a project of a new process for the selection of service rendering that is object of the study case of this work.

8.3. Case Study

A team was created a multidisciplinary team, whose challenge was to project a process that allowed to identify and to carry the real business needs and desires of the internal customers to the project of elaboration of a RFP model (Request for Proposal) and then, to increase the probability of a positive result in the selection and contract of a services rendering company. The adopted model by the project team to help and to assure the

success in the process project of the model of the RFP was to use the correlation of matrices of the QFD during the phases of project DFLSS. Each successive matrix in the QFD was used to help to create the model of the RFP and complementing each phase of the DMADV (to define, to measure, to analyze, to develop, to verify).

8.4. DFLSS (DMADV) and (QFD):

- To define (D)

  - Creation of the multidisciplinary team;
  - Identification of the internal customers and sponsor of the project;
  - Survey of the necessities and petitions of the customers;
  - Development and process drawing.

- To measure (M)

  - First matrix QFD is used to convert the generic necessities into specific and tangible necessities (CTQs);
    - The necessities and definitions are listed;
    - The Insertion of the measurable requirements (CTQs).

Table 1. First matrix QFD is used to convert WHATs and HOWs.

	(HOWs)						
(WHATs)	**Importance**	Inclusion	Less than 2% of delay	Service level	Answers in skilled time	Cost < Equip own	Integrity information
Content of the course	4	H		L	M		
Punctuality	3	H	H	M	H		
Faculty	2			H	M		H
Available support	4	H	M	M	L		
Cost	5			H		H	
Security	3	H		M			H
Total		126	39	97	49	45	45
Weigh Relative (Priority)		31,42%	9,73%	24,19%	12,22%	11,22%	11,22%

- The project team identifies the rendering services potentials and sends a collection of information request;
- Second matrix QFD is completed;
- Functional requirements of the process are identified and prioritized;
- The description of the petitions is inserted in the description of the RFP;
- Detailing and creation of the process flows are elaborated and inserted in the appendix of the RFP;
- Accomplishment of the study of the potential rendering services.

Table 2. Second matrix QFD with functional requirements.

	(HOWs)								
(WHATs)	**Weigh Relative**	Workload	Didactic material	Practical classes	Amount students	To level group	Evaluations	Training Instructors	**Total**
Inclusion	31,421446		9	9			9	9	1131,17
Less than 2% of delay	9,7256858	3		9	1		3		155,61
Service level	24,189526	3		9	3	9	9	9	1015,96
Answers in skilled time	12,219451			9			9		219,95
Cost < Equip own	11,221945	3	1		9	1	1	9	202,00
Integrity information	11,221945						3	3	134,66
Total		135,41	294,01	698,00	115,96	228,93	684,54	702,49	2859,35
Weigh Relative (Priority)		4,74%	10,28%	24,41%	4,06%	8,01%	23,94%	24,57%	

➢ To analise (A)

- Third matrix QFD is completed;
  - The identification of the drawing of the final process or technical requirements;
  - The elements are added to the technical specifications of the RFP elements are added in the specifications techniques of the RFP.
- The matrix of service performance is completed. This matrix contains detailed information regarding the process performance and fixes expectations for the service rendering;
- At this point the project team has got the necessary information to conclude the RFP and to submit it to the potential rendering service. The rendering service replies can take days or weeks depending on the complexity of the process.

Table 3. Third matrix QFD with technical requirements.

	(HOWs)								
(WHATs)	**Weigh Relative**	Infrastructure rooms	Practical and real exercises	Installed softwares	Equipment for student	Continuous improvement	Oral evaluation	Evaluation instructors	**Total**
Workload	4,7357405	3	9		9	9	1	9	189,429618
Didactic material	10,282575		9	3	3	9	3	9	370,172684
Practical classes	24,411303	9	1	9	1	3	3	3	707,927786
Amount students	4,0554683	9	9		9	1	1	1	121,66405
To level group	8,0062794	1	3		9	9			176,138148
Evaluations	23,940345		3	3			9	9	574,568289
Training Instructors	24,568289	3		3			3	9	442,229199
Total		352,12	291,92	396,08	206,44	284,51	402,04	649,03	2582,13
Weigh Relative (Priority)		13,6%	11,3%	15,3%	8,0%	11,0%	15,6%	25,1%	

➢ To develop (D)

- Fourth matrix of the QFD is completed;
  - The technical requirements or drawings are translated into the 0 critical variables for the process;
  - These 0 variables will help the project team to evaluate the answers received from the rendering services. The results of this last house of the QFD can serve as a list of priorities and will help to justify to the project sponsor why a rendering service will be chosen.

Table 4. Fourth matrix QFD with key process.

	(HOWs)							
(WHATs)	**Weigh Relative**	Illumination - Conditioned Air	Servers e Network	Internet Link	Software Security	Switch's	Passwords	**Total**
Infrastructure rooms	13,636778	9	9	9	3	9	9	654,57
Practical and real exercises	11,305211		1	1			3	56,53
Installed softwares	15,339096		3		9	1	9	337,46
Equipment for student	7,994812		1	3			1	39,97
Continuous improvement	11,018452		3		9		3	165,28
Oral evaluation	15,570124						1	15,57
Evaluation instructors	25,1		9	1	3			326,76
Total		122,7	447,32	183,16	353,53	138,07	351,32	1596,13
Weigh Relative (Priority)		8%	28%	11%	22%	9%	22%	

- To verify (V)

  - Check information of the rendering service before signing any agreement of service level or contract;
  - The project can demonstrate a test of concept, or the pilot to assure that the rendering service take on the commitment with the CTQs identified in the first house of the quality.

After the rendering service is identified, evaluated, selected, validated and implemented is initiated the transition of the work responsibilities.

Extra tools DFLSS are used during the implementation of the project, transition of process or execution.

9. DISCUSSION

The studies carried out make possible a more including vision on the necessities of the business from the voice of the internal customer and through the unfolding of these petitions for the QFD that made possible to analyze the critical functions for the process project. According to Rotondaro (2002) the orientation of the activities of the QFD in the project are the real necessities of the customers, then the QFD selects the critical characteristics for the quality (CTQ) listening to the voice of the customer (VOC). To catch the voice of the customer, or either, the attributes that influence the perception of the customer for the product quality or service is a task of continuous monitoring, as the improvement of the standards of performance of the competitors influences the consumers, making them more demanding.

With solid culture in the Lean Six Sigma Program in the company, it becomes viable the application of the DFLSS and the cycle DMADV to project a new product, service or process. George (2004), explains that the DFLSS has bigger emphasis in capture and understanding of the customers and business needs and establishes clear links to each step, since the translation of "necessities" for "requirements" and finally until the used processes to create a new product or service.

The DFLSS acts in the unfolding of the functions and in the drawing of the parameters, establishing studies of capacity and analysis of cost benefit anticipating the drawing phases. Although the DFLSS requires tools you add it has left on the methodology DMAIC and remains established in facts and moved by data. DFLSS indicates the tools to be used and the QFD gets, analyzes and prioritizes the Voice of the Customer, therefore, the union of these two methods is advantageous for both. According to Carvalho (2004), a product or existing service can project a new product or service, or re- projected another one. The DFLSS brings tools that can reduce costs and improve the quality, but mainly adds value to the product or service through innovations and the attendance of the real necessities of the customers. This program is pointed as the only form to reach the level Six Sigma in the quality, as the quality of product/process projected is not improved.

The QFD as complementary method of the DFLSS and cycle DMADV offered a structuralized approach to translate necessities of the internal customer for the specific project or attributes of the process. The analytical and procedural power of the DFLSS as well as the QFD is excellent; however, the QFD is more efficient in the analysis of the necessities of the customers. The team of the project, according to the tables 2, 3, 4 and 5, used matrices known as "quality house", carrying the needs from the internal customer to specific attributes. The first house or matrix in the QFD translated the high-level voice of the elements of the customer in CTQs. The second matrix translated the CTQs into functional requirements, while the third transformes the functional requirements into drawing requirements. The last house converts drawing requirements into critical-for-process 0 variable. According to Mirshawka (1994), the quality desired for the customer feeds the First Quality and it is called items "what", still, in this same called matrix lists items "how" that they are the interpretation given for the project to the desires of the customer. This new list is called Characteristics for Quality (CTQs).

The QFD shares the principles of the Lean Six Sigma and the TQC, however, when used in projects DFLSS contributes for the reduction of the WIP speeding up the execution with efficiency. As George (2004), Lean is linked with speed, efficiency, and elimination of wastefulness and aims at speeding up any process through the reduction of waste in all forms and a primary goal is the reduction of WIP control (if it will not be able to control the WIP, it will not be able to control the time).

The DFLSS suggests a set of activities to assure the satisfaction of the customer while the QFD supplies to tools methods and structures accomplishment of these critical activities.

The use of methods QFD and DFLSS makes possible that the project of process in the elaboration of a RFP for the outsourcing area of training in a Information Technology rendering service company can have increased possibilities of success as much as the attendance of the necessities of the internal customer. Akao (1990), pondered that the satisfaction of the customer is not only assured through the methodology of quality control, as to control the quality on-line is efficient to extinguish non-conformity, a time priority is the precaution of problems by means of the evaluation of monitoring procedures of non-conformity reasons and injunctions to hinder new events.

10. CONCLUSION

- The use of methods QFD and DFLSS guarantees the elaboration of a RFP with the real needs of the internal cost.
- The agreed QFD to the DFLSS demonstrates in detail the necessities and desires of the customers of the project and guarantees the quality process Six Sigma and planned Lean.
- The DFLSS indicates the tools to be used and the QFD gets, analyzes and prioritizes the Voice of the Customer, therefore, the union of these two methods is advantageous for both. The DFLSS suggests a set of activities to assure the satisfaction of the customer while the QFD supplies to tools methods and structures accomplishment of these critical activities.
- QFD shares the principles of the Lean Six Sigma and the TQC, however, when used in projects DFLSS contributes for the reduction of the WIP, speeding up the execution with efficiency.
- The first matrix in the QFD translated the high-level voice of the elements of the customers into CTQs.
- The second matrix translated the CTQs into functional requirements.
- The third matrix transformed the functional requirements into drawing requirements.
- The fourth and last house converts drawing requirements into critical 0 variables for the process.

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12. RESPONSIBILITY NOTICE

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