Application design of the Quality Function Deployment Tool (QFD)

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Abstract:

The present study is based on the proposal to design the Quality Function Deployment tool for the redesign of the spiral notebooks produced by INSUGRAFIX. S.A. whose currently implemented tools in order to identify the needs of the final customers are not enough to design a competitive product.

The QFD tool enables the company to translate the user´s needs into technical requirements, components, processes and finally to apply a Quality control and by this way enhance the possibilities to acquire competitive advantages and consequently a better market position.

Introduction

- INSUGRAFIX. S.A. is a national Enterprise dedicated to the fabrication and commercialization of notebooks and paper industry in general.
- The methodology and tools currently implemented by the enterprise in order to identify the needs of the final customers are not enough to translate them into technical requirements, components, processes and finally to apply a Quality control.
- The present study is based on the proposal to design the Quality Function Deployment tool for the redesign of the spiral notebooks, which is a product with the largest market power and one which is influenced by the constantly changing market preferences.
- This tool ensures customer's satisfaction through the adjustment of the design, process and quality control of the notebooks fabrications, orientated by the final customer´s needs.
- QFD consists of four interlocking matrices that translate the customer's requirements into product´s characteristics, processes and quality control. These four matrices are as shown below.

1. Technical requirements matrix or design parameters
2. Components matrix
3. Process matrix
4. Quality control matrix

- The first matrix is a process empathized to listen carefully to what are the customer's desires and then to secure that these desired characteristics are present during the product initial planning.
- In the components matrix the technical requirements resulting from the first matrix act now as the inputs and are converted into the product´s components which meet the technical requirements.
- The third matrix or process matrix is the production process design. For this analysis is necessary to take into account the elements that influence the product fabrication such as machines and labor.
- The fourth matrix is a quality control plan design that makes sure that the products are produced with the defined standards.

Methods.

- Population and sample

Following Formula was used for sample calculating the sample: $\eta = (\alpha z/\varepsilon)2$

η, optimum sample size
α standard deviation.
z, equivalent to1.645 for the level of confidence of 90%.

- **Data Collection Techniques**

Survey, Open Questions

There were obtained a huge quantity and variety of the so called ¨ Verbalizations¨, which were the starting point for the study´s development.

Interviews: A questionnaire was developed for getting useful information from the operators, supervisors and process managers with the purpose to define required technical and manufacturing aspects based on the already defined customer needs.

Brainstorming technique: This was a useful technique to generate ideas on how the enterprise can meet the market expectations.

Nominal group technique: By this technique the perception of the customers about the current product were found out. This technique consisted in evaluating the notebook that is currently sold in the market. The participants gave the product a score based on the scope of satisfaction of each need incorporated in the first matrix. By the same way the product of the competitor was evaluated.

- **Technical analysis**

For this it was used analysis the Quality Function Deployment tool. The predesigned tables in Microsoft Excel provided by the Latin-American QFD Association were used.

The study begins with the identification of the customer's needs and desires. From the interviews we obtained the ¨verbalizations ¨, then we need to classify them in order to find patterns , which are being seeked to understand, what the real customer needs are in a better way.

Once the necessities are obtained they are incorporated into the matrix. These necessities represent the fundamental base (input) for developing the analysis of the matrix. Then the aspects related with the product´s design are analyzed and the elements of the first matrix are defined. These elements are:

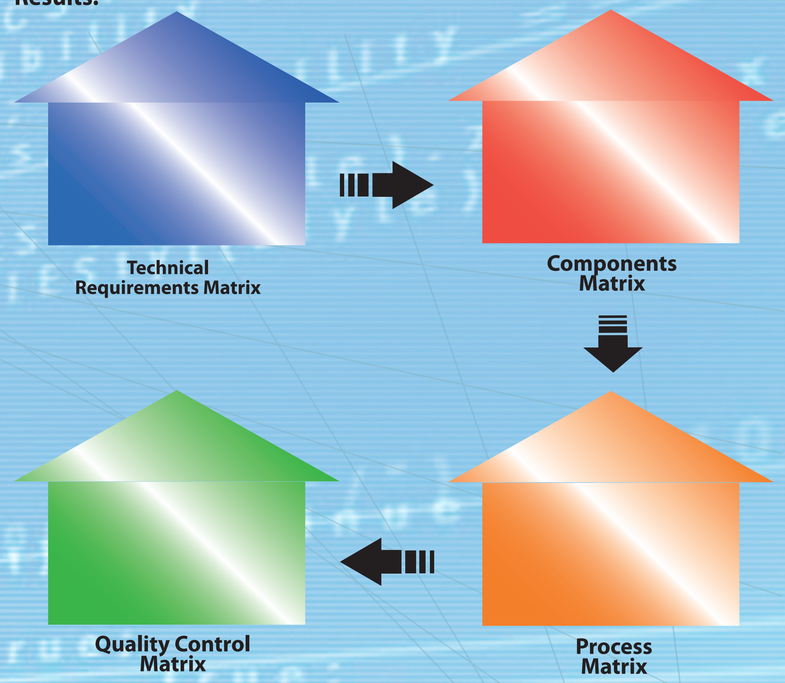
- The weighted necessities: to determine the most influential.
- Design parameters: they are the most important features that the product must possess to fulfill the customer´s requirements, these parameters are measurable.
- Necessities correlation to Design parameter: the purpose of establishing this correlation is analyzing if the Design parameters meet the customer´s needs adequately. The correlations are classified in three levels: High, medium and weak.
- Absolute weighted gab: indicates how many percentage points can be obtained if the performance of this necessity is improved by 100 %
- Relative absolute gab: indicates what percent of the total improvement is generated by the improving each necessity. From these results the technical requirements are determined, which the enterprise must focus in its objectives.

Once obtained the technical requirements and their weights are incorporated as the what in to the next matrix or component matrix, the resulting product´s components or parts (output) are the how, i.e. through which components or parts of the products which technical requirements can be reached. The steps from the first matrix are followed in this one.

The required components resulting from the first matrix and their weight were employed as the what in the third matrix or processes matrix, in this the how are represented by the stages of the process, i.e. how each component must be be produced.

To complete the fourth matrix, the quality control design, the processes were introduced into the matrix along with their weight and they were related with the technical specifications to determine the control critical points, for which a quality monitoring plan was designed.

Results.



Discussion

The results of this study mean for the company more possibilities to gain a better market position increasing its competitive advantages trough a product whose features were basically inspired by the users. This maximizes the market acceptance probability.

The product´s price-performance-ratio is enhanced. The initial market research revealed that most of the users are willing to pay a higher price for a notebook with functional and design features that meet their expectations.

Recommendations:

A challenge by using this tool is not to try to adapt the second and third matrix´s elements to the company´s capacity; on the contrary the capacities have to be adapted to the market´s findings. For this reason the implementation of this tool is more recommended for re-design than for new design. In most cases a redesign of a product faces fewer changes in the production.

Conclusions:

The application of the QFD tool for the redesign of one of its main product enabled the company to understand in fact what the users are looking for or what are those necessities that are not being met by the company or the competitors. On this base the company can know its positions, challenges and opportunities on the market.

The second matrix permits the effective determination of those design parameters and then the components that materialize the necessities. Some components have to be improved like and others are completely new.

In this company few changes on the production ware necessary, even for the new components, the company already owned the required machine, but they were part of other processes or were being underutilized. Even though it was necessary to include new process stages and a re–distribution of the production, machines and labor.