EXTENSIVE AREA TO APPLY THE VALUE OF ENGINEERING (I)

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Dacă în prezent Ingineria valorii este aplicată în ţara noastră, ca de altfel şi pe plan mondial, cu preponderenţă la proiectarea/reproiectarea produselor, în special a celor industriale, cercetările pe care le-am întreprins în ultimii ani ne-au permis să elaborarăm noi metodologii pentru extinderea ariei de aplicare a metodei la proiectarea/reproiectarea proceselor tehnologice de fabricaţie şi a obiectivelor de investiţii. În numerele 1/2007 şi 2/2008 ale revistei am prezentat aceste metodologii specifice. În acest articol ne-am propus să prezentăm o nouă metodologie elaborată de noi prin care extindem aria de aplicare a Ingineriei valorii şi la proiectarea/reproiectarea sistemelor informaţionale şi informatice ale întreprinderilor (prima parte). În partea a doua vom prezenta un studiu de caz, prin care vom demonstra fezabilitatea şi eficienţa metodologiei, prin reproiectarea sistemului informatic al unei întreprinderi mici, care desfăşoară activitate de comerţ.

While the Value Engineering is presently applied in this country, as well as worldwide, mainly in the design/redesigning of products, especially to those of industrial type, the research that we have undertaken in the recent years has provided us to develop new methodologies for expanding the area of application of this method to the design / redesign of manufacturing technologies and of the investment objectives.In the edition 1 / 2007 and 2 / 2008 of the journal we have presented these specific methodologies. In this article we set the intention to present a new methodology developed by us, that is expanding the scope of the Value Engineering to the design / redesign of informational an IT systems of enterprises (part I). In the second part we will present a case study, which will demonstrate the feasibility and effectiveness of the methodology, in redesigning the IT system of a small enterprise, with the area of activity in trade.

Keywords: Value engineering, function cost, use value, management, importance level

1. Introduction

1.1 Presentation of the Methodology

Our proposal to redesign the IT systems through Engineering Value (EV) comes in support of those managers who seek a formula for their business success, being aware of the influence of IT systems on the economic and financial results of the companies they manage.

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We are also addressing the developers of IT systems, for whom these represent the finished product they've done and they sell, and recommend the ways to develop new products, in the environment of competitiveness.

We underline that the proposed methodology does not oppose the classical methodologies of IT systems design, still complements them and enter into the evolution of current trends, by addressing systemic and functional orientation towards the beneficiary. The novelty in the proposed methodology is the use of FAST diagrams for establishing product functions and determining the connections between those functions.

1.2. Description of FAST Diagrams *(Function Analysis Systems Technique)*

These diagrams are used in the American methodology as tools of functional analysis to determine the interdependencies between the functions ordered by the destination of the product and to graphically represent them in the form of diagrams or trees. The inclusion of FAST diagrams into the new methodology has allowed us to remove the empiricism as found in the current methodology, through the process of determining and structuring the hierarchical functions, using tools that favor the separation of logic and justified basic functions from the auxiliary ones. In the FAST method the diagrams are presented in either of the two forms: technical diagram or diagram-oriented on tasks of the product [3].

1.2.1 *Construction of the technical chart-oriented FAST (Technical Oriented FAST)*

Technical Chart-Oriented FAST is characterized by frequent use of the terms and functions of the technical field, to the detriment of commercial functions and prestige [6]. The graphical development of a Technical Chart-Oriented FAST starts from the subject of study chosen for the project and presents two vertical lines of demarcation. Between the two lines the functional representation of the studied object is built (fig.nr.1).

Once the function of education (the use of the object) is established by addressing the question, "Why the object is necessary?", the identification of the critical functions follows. However, the fundamental question and functions required by the fundamental function are identified through the analysis and test functions proposed by the project team. In the graphical representation, the left limiting line separates the basic function from the superior function. The basic function is put to the right side of the left demarcation line, and the superior function is put to its left side. The relationship between the superior function and the basic function is given by the following question addressed to the fundamental function: "Why the superior function realizes the fundamental?". The

answer should be exactly the superior function. Checking reasoning should ask the question: "How the superior function is realized?". The answer needs to be the function identified as the fundamental. Determination of the fundamental function is performed by testing several previously identified functions, named candidate functions, selected from of a list of suggestions, through the chain of questions "How?" and Why?

The functions placed at the right side of the fundamental function become functions required by the fundamental function. This group of functions falls within the critical main road. For its completion the last main function required should be established, which is located to the left of the right limit line. By putting the question "How?" to this function, we will get a new function as a response, named causing function, which is equivalent to the need, which triggered the case study EV. The critical path consists of main functions.

The last group of functions to be determined is that of the auxiliary functions. Methodology of the chart-oriented technical aspects involves separating the auxiliary functions in two categories (see fig. 1):

Functions derive from to other functions or concurrent, resulting from the performance of functions of the critical path and acting as editor. These are functions directly connected to a critical function of the road, which is highlighted by the graph which places them under the function of critical path that constrains them, and shows the connection.

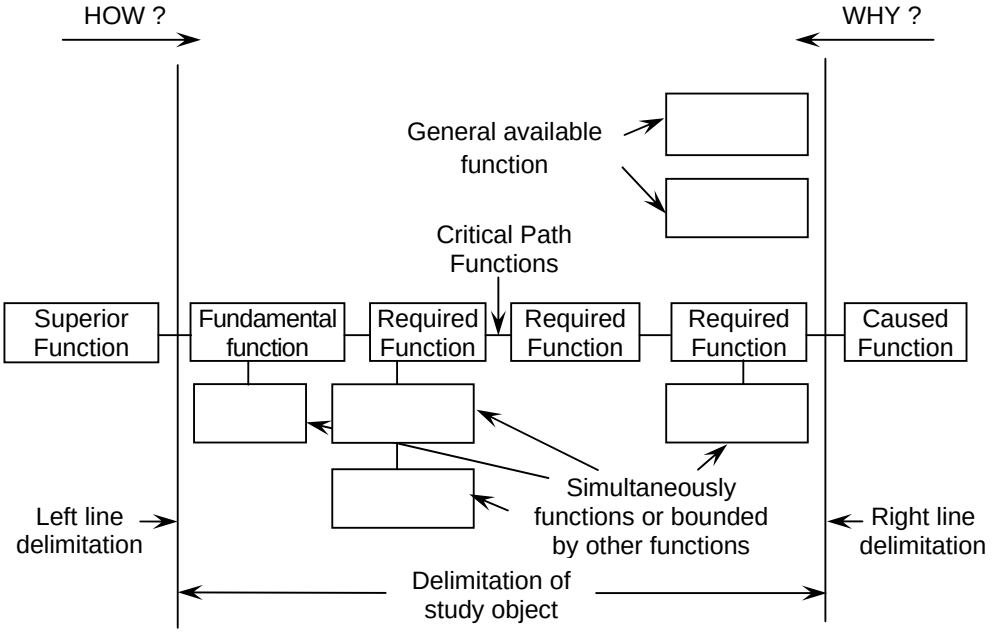

Fig. 1: The technically orientated FAST Diagram

Functions are generally valid when they are simultaneously amended by two or more of the critical functions of the road. On the chart, they are located above the critical road, without showing the links with the functions they constrain.

Using the system functions in the work of designing and developing a product proves that, within the design / redesign activity of a product, the designer takes into account features that reflect the needs of the users, to the extent that the costs of achieving the needs doesn't overload the manufacturing costs above the limit accepted by the manufacturer. This confirms that the success in implementing the EV can not be achieved without knowing, understanding and meeting the consumer needs.

1.2.2 Construction chart FAST-oriented tasks

As shown in Fig.2, the diagram of the major components is: the line of demarcation, the task, the basic functions of rank 1 and 2 and supporting functions of rank 1, 2.3.

The basic functions are those functions that prove being essential for achieving a task; without their existence the product would not work. The basic functions of rank 1 are interconnected and are essential for carrying out the tasks.

In the graphical representation, the basic functions of rank 1 are those located in the right side of the line of demarcation and in the immediate vicinity of this line (see Fig.2). After you have determined the basic functions of rank 1, may ask "How?" for each of those functions. The answers are often found on the ramifications of diagrams and are the basic functions of rank 2. In order to justify this one starts from the basic functions of rank 1, at least two basic functions of rank 2 must be determined. This rule applies to the third level of ramification.

Although non-essential to ensure the functionality of the product, helpful functions are extremely important for attracting and selling consumer product / service. The three main categories of helpful functions of level 1 are: - helpful features that offer comfort, - features that bring satisfaction to the user; - helpful functions which attract the user. The last step consists of distributing the helpful functions in the three groups, according to the classification given.

Helpful functions of level 2 fork to the right of the helpful functions of level 1. The same rule set to the ramification of the basic functions is applied: to identify two or more features to help justifying the split.

To set the nomenclature of functions in this case one starts with the tasks that must meet an IT system for managing business enterprises with a commercial activity, and provides information for the management and staff that carry out the trade activities. In this approach, determination of the functions was preceded by establishing the characteristics of the system. To achieve this phase we performed a study in the center of which the users of the IT system, and their component businesses over the target are treated as potential beneficiaries, the staff of supplying companies (traders) - mainly those who work directly with the beneficiaries and they know best the requirements [6].

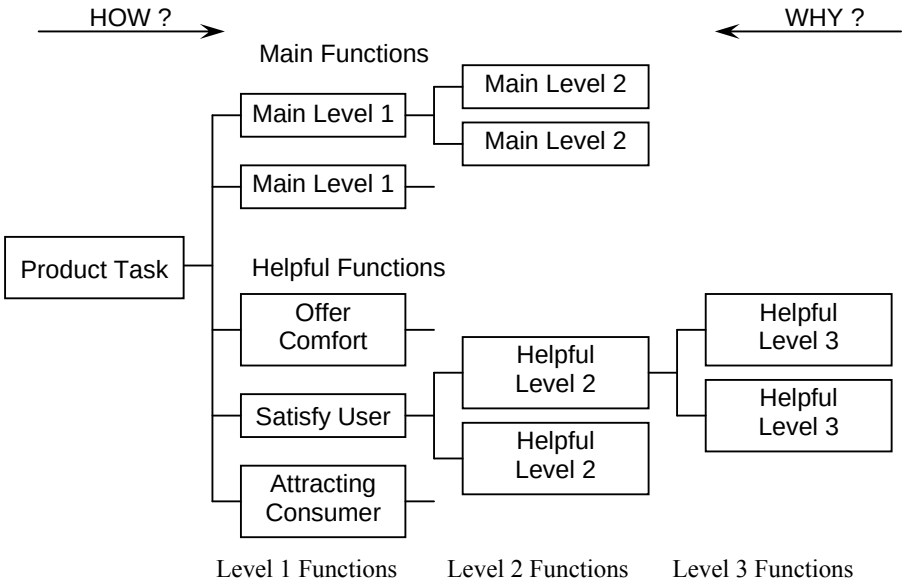

Fig. 2: FAST Diagram based on the tasks realized by the subject studied

The process of determining the characteristics of the system began by defining the categories of information to be collected, namely: information on social needs, and the expectations towards the new system, by comparison with other known products, information on the training of the staff and its ability to adapt to new requirements, information on economic issues, which mainly relate to how the company is willing to pay for the products offered. The methodology used to collect information has been adjusted to each staff component of the study sample.

Determination of the user's demand was made by investigating the opinions of the personnel from 10 SME (Small and Medium Enterprises), which have different kinds of trade as the main activity .

Users or potential users were divided into the following categories: operational staff, personnel management-level education and entrepreneur. To query the operational staff and managerial staff of medium level, questionnaire and interviewing methods were applied. The specifications that an IT system must have established in the processing of questionnaires and responses interpretation are determined by the experience in working with computer and the use of applications. The conclusion reached was that in these companies there is a crisis of staff ready for use, as well as of management of applications, the experience is extremely limited, mainly confined to the introduction of data into the computer (operating data). As a result, the specifications to be answered from the design system are: a nice, simple, easy to use and intuitive interface and a working unit for the operation of tracking data and results of operation, providing an easy way for listing the queries and results; system to be monitored and managed by personnel from outside the company.

Expectations of the employees from the computer systems are mainly related to shorten the time of data entry, the time of verification of the entered information, drafting and printing of forms and reports required and those required by management.

2. Conclusions

The two versions of the FAST diagram used for determining and structure the function system could bring some changes in the way the proposed methodology is put into practice, starting from the initial structure. This way, the Task Oriented FAST diagram will generate a greater number of functions, especially helping ones, because it starts from the requirements of the system, set up after studying the running features which they have to fulfill according to the users needs.

This diagram is more efficient in designing the IT software, in which case functions that lead to the fulfillment of particular needs of the analyzed sector, prevail. For designing the hardware, the operating system and the database, parts that have marked technical features, it is recommended that the determination of the functions be made by using the technical version of the FAST diagram, and critical road functions are thus determined and used as a start for base functions of the diagram feature oriented on tasks.

We consider that the new methodology of designing/redesigning the IT systems by using IV concepts, along with the two FAST diagrams, could establish a starting point for making an ISO European Standard through which the general

use of IV in the European Union could be secured. We are to mention that the two existing standards – EN ISO 1325-1:1996, Part 1: Value Analysis and Function Analysis vocabulary and ISO EN 1325-2:2004Value Management, Value Analysis, Functional Analysis, Part 2 do not represent a IV use methodology, but rather a vocabulary.

R E F E R E N C E S

[1]. *B. Boehm*, Value-Based Software Engineering, Software Engineering Notes vol. 28, No. 2, University of California, 2003
[2]. *D. Flynn*, Information Systems Requirements: Determination and Analysis, Editions Mc Graw Hill, 2000.
[3]. *I. Ioniță*, - Managementul calității şi Ingineria valorii, Editura ASE, Bucureşti, 2008.
[4]. *I. Ioniță,* - Contributions to expanding the fields of value engineering application, Scientific Buletin, Series D: Mechanical Engineering, nr.1/2007
[5]. *I. Ioniță, R. Mănăilă,* Increasing Competitiveness of Small and Medium Enterprises by Application of the Value Engineering in Product Design, University Politehnica of Bucharest, Scientific Buletin, Series D: Mechanical Engineering, nr.2/2008
[6]. *L. Moga,* Teză de doctorat, ASE Bucureşti, 2008
[7]. *L. Moga, C. Teodorescu*, Why is Necessary a Law for Open Source use in Public Administration, conferința Politics and Information Systems: Technologies and Applications (PISTA), Orlando, SUA, 2003
[8]. *K. D.Snyder, P. Paulson*, Healthcare Information Systems: Analysis of Healthcare Software, University of Phoenix, 2004