# Introducing Technical Oriented Fast Diagrams in the Projecting of the Informatics Systems for the Management of Small and Medium Size Enterprises

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**Abstract**

*If the Value Engineering is currently applied mainly for the projection/reprojection of the products, the researches made in the last twenty years allowed to elaborate new methodologies in order to extend the application area of the method to the technological processes of fabrication and to the investment objectives. This article is meant to present a new methodology, able to be applied in the projection/reprojection of the enterprises' informatics systems.*

*The use of the Value Engineering instruments whose purpose is to project the informatics systems, which represent an essential part of the informational system, help to reconsider the managerial system's mode of action with all its subsystems, so as to bring increased benefits to the enterprise.*
*The projection methodology of the informatics systems, by using the Value Engineering concepts, completed with the Technical Oriented FAST diagrams that is proposed by this article could constitute the basis of the reconsideration of the value concept in the process of the informatics systems projection.*

**Keywords**: informational system, value, technical oriented FAST diagram, informatics system, function

## 1. Introduction

The proposal for the reprojection of the informatics systems by using the Value Engineering (VE) is meant to support those managers who are looking for a success formula in business, yet being aware of the influence of the informational systems on the economic and financial results of the enterprise they manage. Likewise, we address to the enterprises that developed and commercialize their finite product that is the informatics system, by recommending to

them a method to develop new products on a competitive background.

Using the suggested approach will allow the elimination of the discrepancies between the beneficiaries' expectations and the characteristics of the delivery informatics systems – as main shortcoming caused by the use of the traditional methods – by placing in the centre of the methodology the beneficiaries' demands. The initiative is considered an innovation from the perspective of the functional approach in the re projection of the informatics solutions for the informational systems of the enterprises, and is also technically and methodologically highly useful because it changes the managers, designers, specialists and executors' way of thinking, from the constructive approach (from what the informatics system is) to the functional one (to what the informatics system does).

The suggested methodology does not contradict the traditional methodologies of projecting the informatics systems, but it comes to complete them and enrolls in the present trend of evolution by its [1]. The proposed methodology is based on theoretical concepts and practical experience accumulated by the authors after some contract-based studies meant to reproject products, technological processes, investment objectives [3].

For the application of the theoretical concepts of the Value Engineering in a case study where the objective is to reproject the informatics system, will be used the stage succession that must be covered for the projection of the products, framed in STAS 11272/2-79 [9], actualized with the recommended emendations [2]. Must to be mentioned that the European standards EN 1325-1:1996 [11] and EN 1325-2:2004 [12], do not contain the practical methodology of application in the projection and, consequently, they are not useful in this direction. The new elaborated methodology presents considerable emendations in relation to the one offered by the above-mentioned Romanian standard, by integrating the last elements appeared in the evolution of Value Engineering, respectively the FAST diagrams elaborated by American specialists so as to perfect the function analysis. Moreover, still related to the methodology applied to products, the present methodology has a series of characteristics shaped by the specific of the informatics system that make it different towards an ordinary product and customize the methodology, by leaving aside those referring to products, technological processes and investment objectives.

In the American methodology [10], FAST diagrams (Function Analysis Systems Technique) are

instruments of the functional analysis for the determination of the interdependence between functions classified according to the destination of the product and the graphic representation in diagrams. Including the FAST in the new methodology allowed eliminating the empiricism – detectable with the present methodology in the process of determination and hierarchizing the functions, by using some instruments which favor the logical and justified separation of basic/main functions from the supporting functions.

This paper will introduce the Technical Oriented FAST as a suggestion for developing the function system based on technical rationales which will reveal original technical solution for the informatics systems that will able to satisfy in a better way the informatics systems users needs.

## 2. Methodology

*Brief Presentation of the Value Engineering methodology*

The methodology that will use in the reprojection of the informatics systems is structured into six stages as it is presented in figure 1. The methodology does not differ in the structure of the stages of application from the one applied to products, but its content presents considerable characteristics and it has been elaborated and improved by including the FAST diagrams.

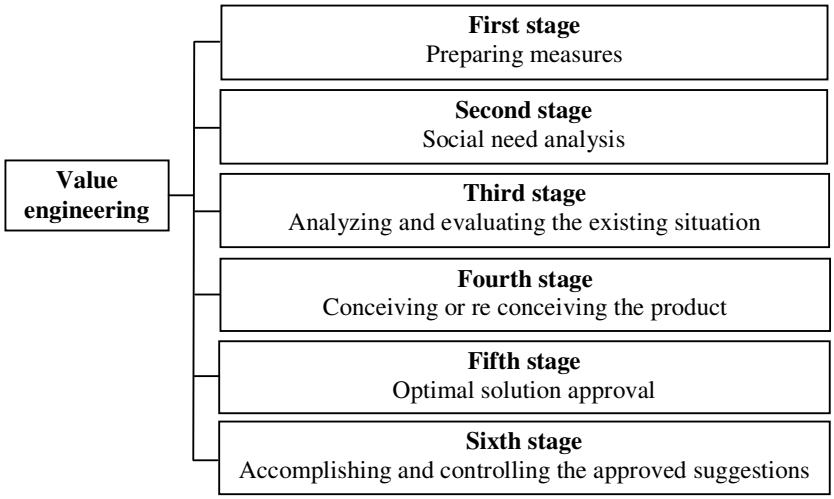


*Fig. 1: The methodology of projecting/reprojecting the informatics systems*

*Developing the Technical Oriented FAST Diagram*

The Technical Oriented FAST is characterized by the frequent use of terms and functions from the technical domain, to the detriment of commercial and prestige functions. The graphic development of a Technical Oriented FAST diagram begins from the object of study and two vertical scope lines [7]. Between the two lines, the whole functional representation is created (figure 1). The first stage is dedicated to the identification of the critical path functions. The fundamental function and the functions required by the former one, identify themselves by means of the analysis and the evaluation of the functions proposed by the project team. In the graphic representation, the left scope line separates the basic function from the higher order function. The basic function lies on the right of the left scope line and the higher order function lies on its left. The relationship between the higher order function and the basic function is given by the question asked to the basic function: „Why does the higher order function brings about the basic function?". The answer should be precisely the higher order function. The verification of the argument should be completed by adding the question: „How does the higher order function fulfill?". The answer should constitute the function identified as being basic. The determination of the basic function is made by testing more of the previously identified functions known as candidate functions and centralized on a list of suggestions, by asking successively the questions „How?" and „Why?". The functions situated on the right of the basic function become functions required by the basic function. This group of functions belongs to the main critical path. In order to accomplish it, a last basic required function ought to be established, situated on the left side of the right scope line. By asking the function „How?", an answer having a newly created form will be received, that is the causative function, which is the equivalent of the social need unleashing the study of VE. This is the starting point for the critical path with all its basic functions.

The last group of functions that has to be determined is that of the secondary functions. The methodology of the Technical Oriented FAST presupposes the separation of the secondary functions into two categories:

1. Functions caused by another function or by concomitant functions that result from the performance characteristics of the critical path functions and act as modifiers. There are functions that connect directly to a critical path function, fact that is emphasized graphically by their placing under the critical path function that the creation of the connection also conditions;
2. Functions that happen „all the time" and modify in the same time two or more of the critical path functions. On the diagram, they are placed above the critical path, without highlighting the connection with the functions they condition.

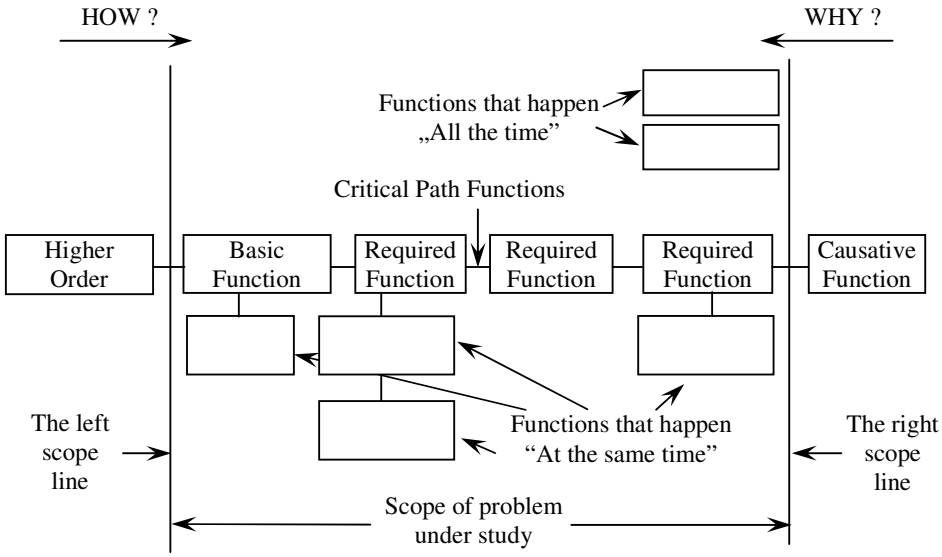


*Fig. 2: Technically Oriented FAST – Ground Rules*

*Introducing the Technical Oriented FAST diagram in the Romanian Value Engineering Methodology*

Since all critical path functions have a major contribution in achieving the use value, we can assert that the critical path functions enframes in the category of main functions. In the proposed methodology, we consider inadequate the name of „required secondary function" given in the American methodology to the functions from the critical path functions that connect to the basic function, because it may generate confusions regarding their role in achieving the use value of the analyzed product [8].

The next step in creating the diagram consists in the identification of the auxiliary functions. Part of these ones are connected to the critical path functions, including also the functions known as „required secondary function", fact that contravenes the definition of auxiliary functions (according to all the analyzed standards, an auxiliary function supports the achievement of a basic or main function and not of another auxiliary function). That is why, we suggested to modify the typology of critical path functions by identifying a primary basic function and including the functions required by this one in the category of primary functions known as functions required by the basic function. All the critical path functions are basic functions, fact that will favor the next step in applying the methodology, according to the emendations of STAS 11272/2-79, where functions are classified depending on the possibility to objectively quantify them and the importance in achieving the use value, objective and auxiliary functions [3]. By means of our suggestions, we also bring about unification in the typology of functions proposed by the two diagrams, since the functions of the Task-Oriented FAST are devised in basic and supporting functions. Alongside with the presented types of functions, the Technically-Oriented FAST introduces two new categories – the higher order function and the lower order function (causative function), which are defined only in the American standard of function analysis, being necessary for the finalization of the theory that emphasizes the starting and final points of the critical path. The significations given to the two functions are: the higher order function reflects the reason that the primary basic function ought to be achieved for. The term of „higher order" does not refer to the importance of function, but to the ability to reflect the results of the process: the lower order function (causative) reflects the motive that initiates the study of VE.

The second category of used functions is represented by the secondary functions. They have been divided into two groups, specific to the methodology of the Technical FAST: functions caused by other functions which connect directly to a function of the basic critical path and functions that happen all the time that contribute in the same time in the

achievement of two or more of the critical path functions.

## 3. The application of the suggested methodology to the reprojection of an enterprise's informatics system

The stages of applying the suggested methodology are illustrated in figure 1. Obviously, the space does not allow us to refer to each of them that is why we have chosen the most suggestive stages so as to demonstrate the feasibility and efficiency of the methodology.

The main purpose of the case study is represented by the reprojection of the informatics system of SMEs, by using the value based methodology. Since the requests from the informational system, and implicitly from the informatics system, differ according to the type of activity performed by the enterprise they are destined to (for example: commerce, production, services) and by the dimensions of the enterprise that influence the practiced management's characteristics, we focused in this study on the reprojection of an informatics system of a small commerce enterprise [5]. Besides testing the new methodology, choosing this type of application was conceived out of practical reasons based on the absence on the informatics solutions market of some adequate solutions for the specific demands of SMEs, available at accessible prices for their investment budget.

In order to elaborate this study, some categories of professionals like managers of some SMEs, specialists in coordinating the financial-accounting activity, project managers for the development of informatics systems and specialists in informatics were co-opted.
In this case study, the objectives were as listed below:

1. experiencing and testing the validity of the new methodology, based on concepts Value Engineering which assimilated also the Technical FAST diagrams;
2. reducing the total cost of the informatics solutions to the level where it becomes attractive to the SMEs, if the demands of their informational system are satisfied;
3. improving the functions of the informational system being an essential part of the informatics system so as to obtain an improvement of the management, with direct consequences on the competitivity of the whole enterprise.

*Developing Technical – Oriented FAST Diagram of the reprojected informatics system*

The Technical – Oriented FAST diagram originates from the determination of the function system for each and every major component of the informatics system: hardware, operating system, database and software (informatics application for business administration) [6]. Selecting the information has been made by interviewing a group of IT (information technology) specialists. After having explained to them the aim of the study and put forward the specific concepts, they were asked to present their own point of view with respect to the functions carried out by each of the major components of the informatics system, belonging to an enterprise with commerce-based activities. After the first attempts to establish the functions, it has been noticed that hardware functions cannot be separated from those that the operating system is expected to have and, moreover, the technical solutions for the two components of the informatics system mutually determine each other. After having gone through all these stages, the function list for each component of the system was established.

Hereinafter, by applying the rules presented minutely while describing the development of Technical – Oriented FAST Diagram, the classification of functions into critical path functions and auxiliary functions was conceived and therefore, the hierarchy of functions was established within each category. In table 1 there are illustrated functions for hardware and operating systems and figure 3 mirrors the Technical – Oriented FAST diagram, which is shaped for the above – mentioned components.

Table 1: Functions for hardware and operating system

| Symbol | Function | Type of function |
|---|---|---|
| A | Use resources | Basic function |
| B | Distance maintenance | Secondary (determined by A) |
| C | Distance work | Secondary (determined by A) |
| D | Render information | Required function |
| E | Stock information | Required function |
| F | Assure security | Secondary (determined by E) |
| G | Memorize information | Required function |
| H | Perform calculations | Required function |
| I | Introduce information | Required function |
| J | Assure reliability | Secondary that „happens all the time" |
| K | Easy use | Secondary that „happens all the time" |

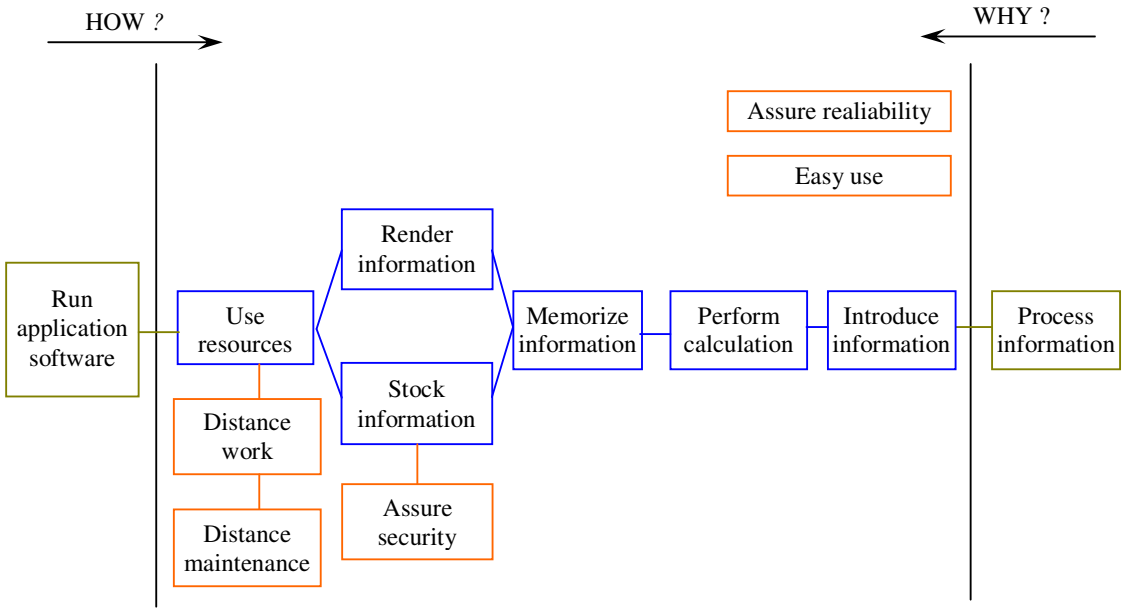


*Fig. 3: Technical FAST Diagram for hardware and operating system*

In table 2 are illustrated functions for the database and figure 4 presents the Technical – Oriented FAST Diagram shaped for the mentioned component.

Table 2: Functions for the database

| Symbol | Function | Type of function |
|---|---|---|
| A | Aggregate information | Basic Function |
| B | Stock information | Required function |
| C | Modify information | Secondary (determined by B) |
| D | Delete information | Secondary (determined by B) |
| E | Catalogue information | Required function |
| F | Permit independence | Secondary that „happens all the time” |
| G | Assure reliability | Secondary that „happens all the time” |
| H | Reduce maintenance | Secondary that „happens all the time” |

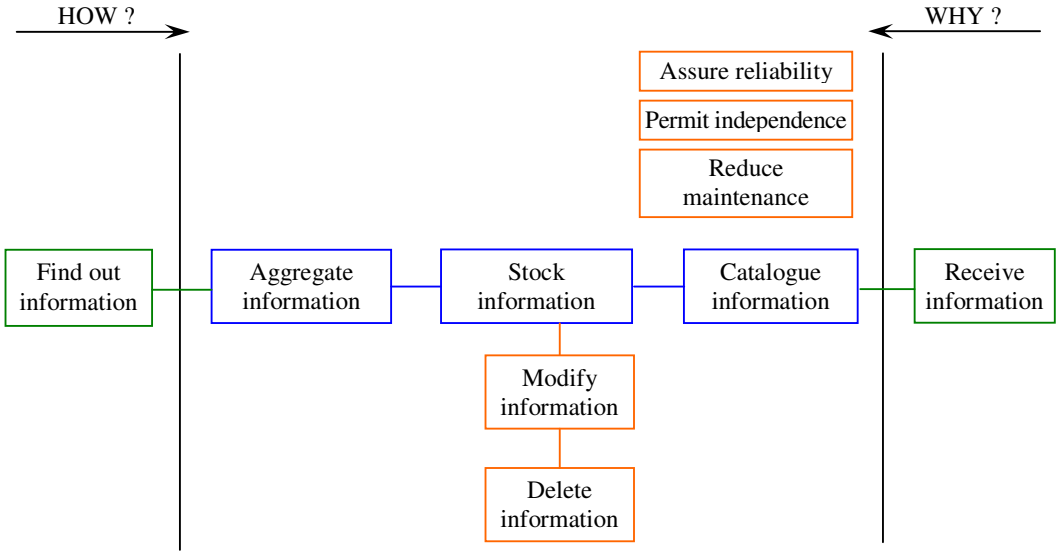


*Fig. 4: Technical FAST Diagram for the database*

In table 3 there are illustrated functions for the software while figure 5 shows the Technical – Oriented FAST Diagram for the mentioned component.

Table 3: Functions for the software

| Symbol | Function | Type of function |
|---|---|---|
| A | Perform calculations | Basic function |
| B | Eliminate redundant information | Secondary (determined by A) |
| C | Save information | Required function |
| D | Assure security | Secondary (determined by C) |
| E | Process information | Required function |
| F | Receive information | Required function |
| G | Assure reliability | Secondary that „happens all the time” |
| H | Easy use | Secondary that „happens all the time” |
| I | Allow extension | Secondary that „happens all the time” |
| J | Permit independence | Secondary that „happens all the time” |

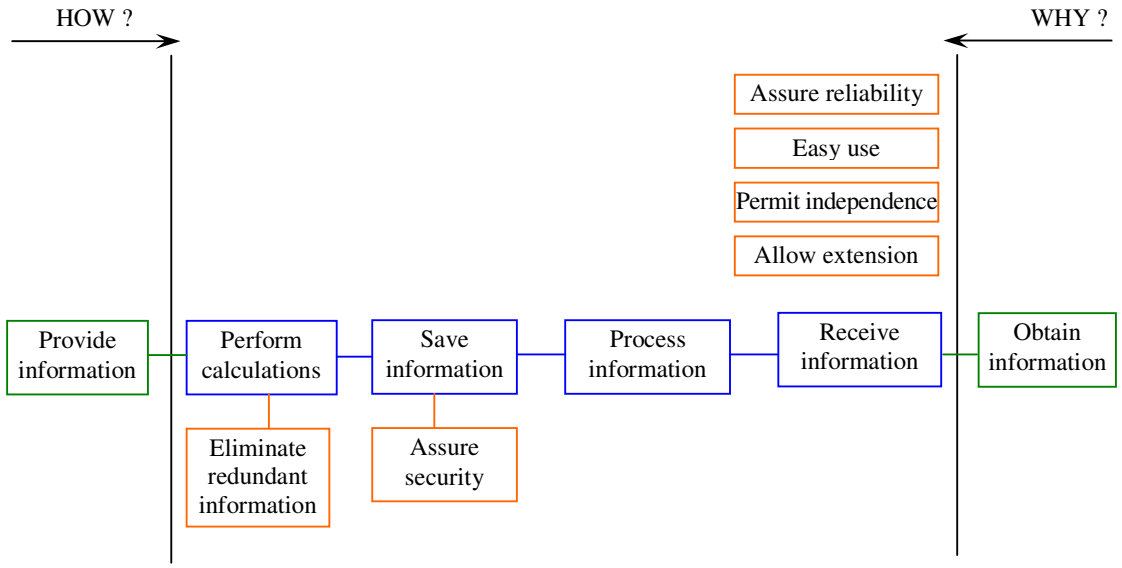


*Fig. 5: Technical FAST Diagram for the software*

*The technical solutions analysis*

From all the solutions formulated by the specialists in informatics, we have chosen for the analysis the solution that suggests the use of a Linux data server and of a LTSP (Linux Terminal Services Protocol) server, which allows using terminals without an intrinsical Operating System instead of client stations. The constructive elements for this solution are: server, LTSP server, LTSP terminals, licence for the OS of the Linux database and licence for the the OS for the LTSP server.

Since hardware elements are standardized components of the informatics system, their cost will be registered as such, by using the catalog method [3]. The distribution according to material costs functions, generated by the acquisition of hardware components was made proportionally to the importance levels of functions.

## 4. The economic dimensioning of the functions by means of the Technical Oriented FAST for the reprojected informatics system

*The economic dimensioning of hardware and operating system functions*

The server contributes to the achievement of the following functions: Render information (D), Stock information (E), Assure security (F), Memorize information (G), Perform calculations (H) and Assure reliability (J).

Client stations concur to the achievement of the following functions: Render information (D), Assure security (F), Perform calculations (H), Introduce information (I), Assure reliability (J) and Easy use (K).

The Linux data base server and the LTSP server are Open Source solutions that do not need license. That is why the functions of the licence for the OS of database server, respectively: Use resources (A), Distance maintenance (B), Distance work (C), Assure security (F) and Assure reliability (J) and those belonging to the license for the OS of client stations, respectively: Use resources (A), Distance work (C), Assure security (F), Introduce information (I), Assure reliability (J) and Easy use (K), in the suggested variant it is accomplished with 0 material costs.

Hereinafter, the importance order of the hardware and operating system functions was established and thus, total costs were distributed in turns for each function of the components previously identified, as illustrated in table 4.

Table 4: Centralizing the cost of functions for hardware and operating system (RON)

| No. | Function / Cost articles | A | D | E | F | G | H | I | J | K | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | License for the operating system of the database server | 900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 900 |
| 2. | License for the operating system of the LTSP server | 1,920 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,920 |
| 3. | Server | 0 | 4,000 | 3,200 | 0 | 2,400 | 1,600 | 0 | 800 | 0 | 12,000 |
| 4. | Clients PCs | 5,622 | 4,919 | 4,217 | 0 | 3,514 | 2,811 | 2,108 | 1,406 | 703 | 25,300 |
| **Total cost :** | | **8,442** | **8,919** | **7,417** | **0** | **5,914** | **4,411** | **2,108** | **2,206** | **703** | **40,120** |

*Economic dimensioning of the data base functions:*
The selected constructive solution is highly original. It is *an Open Source solution,* which uses a PostgreSQL database.

The cost generated by the construction of database reflects the specific of the suggested solution. Thus, using PostgreSQL as a database does not imply any cost of acquisition and that is why the database administration system fulfils the functions Assure reliability (G), Permit independence (F) and Reduce maintenance (H) without material costs.

The accomplishment of the database is executed in the enterprise that develops infomatics applications and implies only manual labour costs. The direct manual labour was identified in the following opreations: creating the database structure, the rules of database consistency and the database system of internal functions. The functions fulfilled after the three operations were established by applying a logical reasoning, connected to the operations performed in the creation of the database.

Building the database structure contributes to the fulfilment of the following functions: Catalogue information (E), Stock information (B) and Reduce maintenance (H).

Forwarding the database rules of consistency concurs to the fulfilment of the functions Stock information (B), Modify information (C) and Delete information (D).

Creating the database system of internal rules leads to the accomplisgment of the functions Aggregate information (A), Stock information (B), Modify information (C) and Delete information (D).

The cost distribution per functions was made starting from the direct identification of hours/person number, necessary for each operation's accomplishment of functions, as illustrated in table 5.

Table 5: Centralizing the cost of functions for the database (RON)

| No. | Function / Cost articles | A | B | E | F | G | H | Total |
|---|---|---|---|---|---|---|---|---|
| 1. | DBMS | 1,200 | 990 | 900 | 0 | 0 | 210 | 3,300 |
| **Total cost:** | | **1,200** | **990** | **900** | **0** | **0** | **210** | **3,300** |

*The economic dimensioning of the functions belonging to the informatics application:*
The application accomplishment is performed in the enterprise that develops the informatics applications and implies only manual labour costs. The distribution of costs with direct manual labour per function was made by identifying the number of hours/person in the achievement of each function of the informatics application for business administration, as illustrated in table 6.

Table 6: Centralizing the cost of functions for the software (RON)

| No. | Function / Cost articles | A | C | E | F | G | H | I | J | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Software | 4,350 | 3,750 | 3,300 | 3,000 | 2,250 | 540 | 1,050 | 1,650 | 19,890 |
| **Total cost:** | | **4,350** | **3,750** | **3,300** | **3,000** | **2,250** | **540** | **1,050** | **1,650** | **19,890** |

**Note:** The total value of the manual labor has been divised to 10 that is the name of the active clients whose informatics application will be changed and reprojected according to the specifications resulting from the present study.

*The systemic analysis of functions of the reprojected informatics system*

A real state illustration of each component belonging to the informatics system, reprojected by means of the Technical Oriented FAST, has been obtained by comparing the cost level per functions with their importance level, in the general use value. Using the data obtained from the calculation of function costs for hardware and software, we have designed the graphic from figure 6, the graphic from figure 7 for the database and graphic from figure 8 for the software.

As the graphic itself illustrates, functions J, H and G are situated on the regression line, therefore the accomplished costs are directly proportional with the weight of functions in the use value. Functions K, I and A, are easily under evaluated whereas E and D were over evaluated. The under evaluated functions are the functions with a successful accomplishment determined by the components of the informatics system that do not imply acquisition costs.

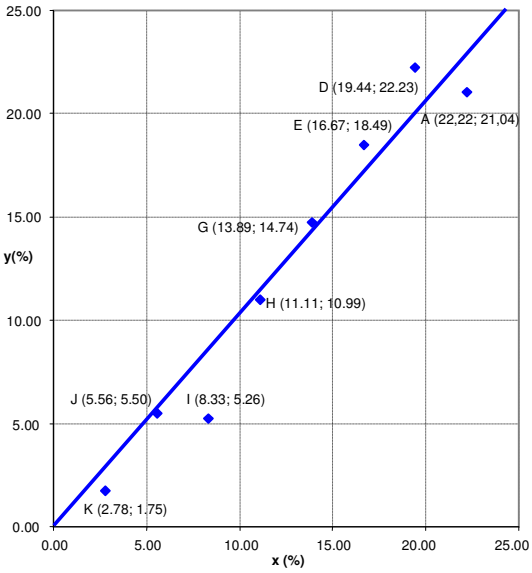


*Fig 6: The graphic representation of the hardware and operating system systemic analysis*

Figure 7 shows that functions G and F are placed on the *x* line, which indicates that the accomplishment of the two functions did not imply material costs with the manual labor. On the contrary, functions A, D and E are easily over evaluated, which can also be a consequence of cost distribution for the accomplishment of the database only for these latter ones.

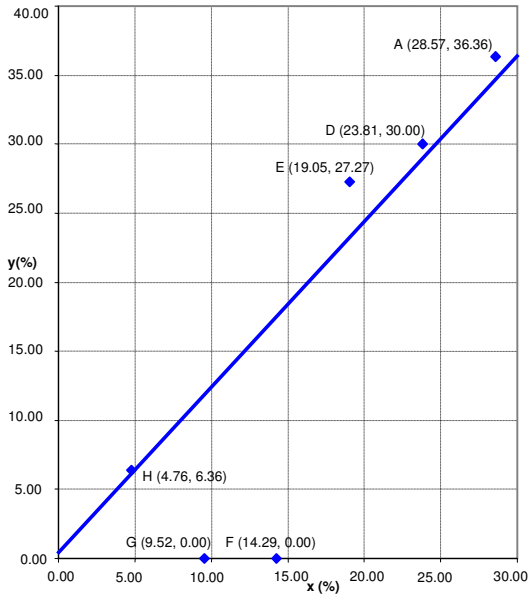


*Fig. 7: The graphic representation of the database systemic analysis*

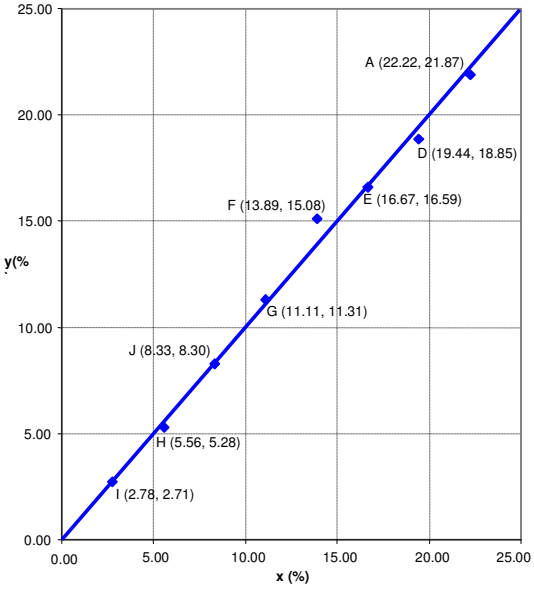


*Fig. 8: The graphic representation of the software systemic analysis*

Figure 8 illustrates that the functions of the informatics application (except for F) were accomplished by means of costs that are directly proportional with their importance in the use value.

**5. Conclusions**

The experiment allowed us to demonstrate the feasibility of the suggested methodology and, by means of the registered results we aim at justifying its superiority towards the methodology currently used by developers of informatics applications. The introducing of the Technical Oriented FAST diagram for the determination and hierarchical classification of the function system brought some changes in the way in which the suggested methodology was applied, starting from the initial structure. After applying the Technical Oriented FAST for the hardware components, operating system and database, constructive and original solutions were proposed, which assured the successful accomplishment of the function system, especially of the basic ones. If we refer to the solutions that can be proposed for the technical accomplishment of the informatics system in comparison with the traditional methods used for the projection of the informatics systems, the use of Technical Oriented FAST is superior. That is why, our suggestion for the projection of the hardware, operating system and database, which has a strong technical feature, is to use the technical variant of the FAST diagram. With respect to the description through functions of the informatics application, the use of a relative number of functions is obvious. Characterized by a great degree of generality these functions do not bring any help in obtaining a product able to satisfy the specific demands of SMEs, which negatively affects the efficiency of the study about value engineering. Because the software projection involves the accomplishment of the demands specific to the studied domain, are predominant we suggest the use of the second variant of FAST diagram, named Task Oriented FAST Diagram. The second variant of the diagram could prove its efficiency in the projection of the software, a situation in which the functions that lead to the accomplishment of the demands specific to the studied domain, are predominant [4]. In this way, it is obvious that a better satisfaction of the users' demands will be obtained if some informatics systems based on technical innovative solutions, at attractive prices and software based on the satisfaction of the customers needs.

The new methodology of projecting/reprojecting the informatics systems by using the concepts Value Engineering, completed by the two FAST diagrams (Technical Oriented FAST Diagram for the hard components of the informatics systems and Task Oriented FAST Diagram for the application software), could constitute a efficient alternative for the projection of the SMEs informatics systems.

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