

# **An Approach for Connecting the Participants in the Process of Product Development in Internet Surroundings**

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*Abstract: This paper presents developed method for connecting the participants in the process of product development in internet surroundings. The participants in the product development process can be classified in two groups: the manager of the product development process (chief designer) and the other participants in the development process (DFA, DFM and DFE analysts). The evaluation of suggested solutions, and eventually the acceptance of these is done using several criteria based on the defined relevant parameters obtained from DFX tool analysis.*

*Key words: Product development, Internet, DFX, Multi-criteria analysis.*

## **1 Introduction**

Research has shown that up to 80% of the product costs (Fig. 1) is determined during the product development process (Magrab, 1997). Besides these, there are team work requirements evolved in the product development process, as well as time-dependent information flows not only within a company (e.g. between

members of the development team and the production process), but also between the suppliers and customers (Coulter et al., 2002). Connecting the participants in the process of product development in internet surroundings enables the companies to reduce costs and to shorten the time necessary for developing new, or improving present products (Huang & Mak, 1998).

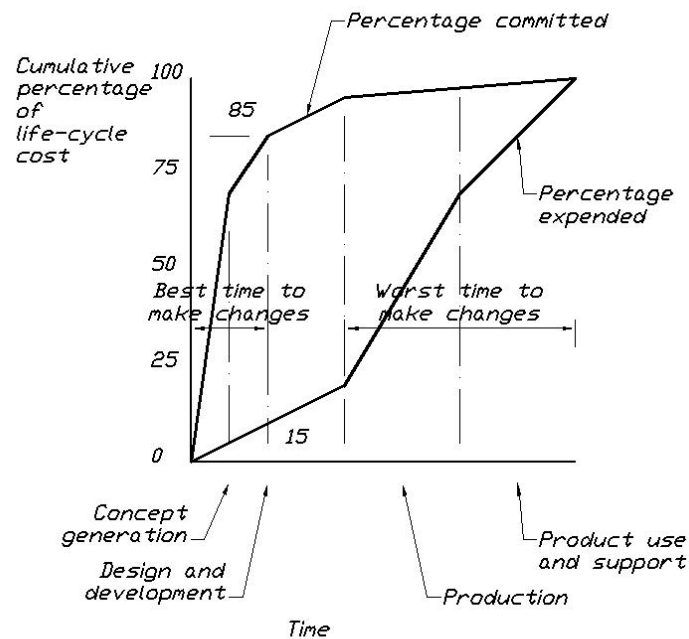


Fig. 1. Cumulative product life-cycle costs at the various stages of the product realization process (Magrab, 1997)

## 2 Developed method

One of the basic requirements connected to developing the method for product development in internet surroundings is that it needs to be of an open form, which enables the involvement of all participants of the development process from different computer platforms (Ahn et al., 1999).

As it is necessary to handle and access a great amount of data connected to the product and parts of the product, the need arises for the use of a management system, in other words, handling the databases (Kang et al., 1997). Since product

development is involved, the basis of communication is comprised of data connected to the product. Information about the products can be grouped into specialized and open structures. Specialized structures are connected to CAD formats. One of the limitations of the developed method is that all participants of the development process use the same type of CAD format, or do not use it at all.

The deficiency of specialized formats is the fact that typical CAD formats do not allow the input of data which are not directly connected to the data structure of the CAD model. This deficiency leads to the need for certain data to be processed in text format. There is a need in the development process to present the content of the CAD documents in an internet browser since some of the participants in the development process do not make use of CAD formats. It therefore becomes necessary to provide fast access to information (small-size documents), thus open formats need to be created which can be presented quickly in the internet browser.

One of the open formats is DFW (Design Web Format), which is a 2D vector format that can be used to present the CAD format in internet or intranet surroundings (in the internet browser).

The product or the parts of the product also have to be presented in three-dimensional (3D) interactive representation, the standard language «Virtual Reality Modeling Language» (VRML) is used, which enables 3D interactive representation of the product or the parts of the product in internet surroundings.

The system is to include data stored in a database management system and transfer them using a client-server model that supports «HTTP» open standard.

The client-server model used is shown in Fig. 2. In this model, the server contains information connected to the product, which can be accessed by the client. Depending on the need, the clients can use a CAD system or an internet browser for the representation.

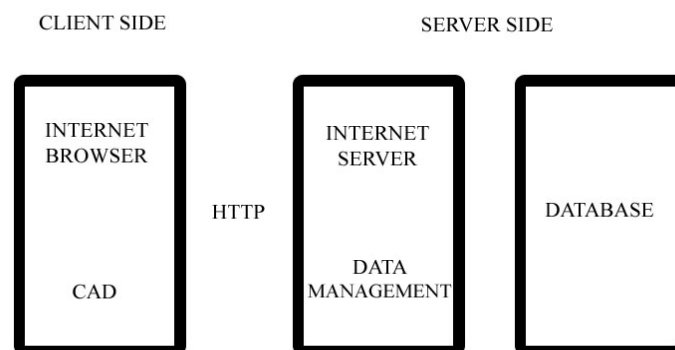


Fig. 2. General construction of client-server model

## **2.1 Participants of the product development process**

The participants of the product development process can be classified into two groups:

1. The manager of the product development process, who is represented by the chief constructor, i.e. the administrator of the development process;
2. The other members of the product development process, who are represented by the DFA analyst, DFM analyst and DFE analyst (Anišić, 2002; Boothroyd, 1994).

## **2.2 Phases of the developed method**

The developed method for connecting the participants in the product development process in internet surroundings has two phases:

1. Phase of initial project analysis;
2. Phase of altering the project.

During the initial project analysis phase all participants of the development process simultaneously define the relevant parameters for all elements of the project depending on field in which they analyze the project and the results are transferred into the developed database. The phase of initial project analysis ends when all the participants have defined and transferred all the relevant parameters.

The developed method supposes the simultaneous and parallel work of all participants in the development process, but depending on the requirements of the project manager different levels of access priority can be assigned to certain participants during the second phase. The level of access priority of the participants in the product development process determines the possibility for the participants to access the analysis and suggest improvements to the product.

At the beginning of the second phase the highest level of access priority is activated, when participants with active access priority analyze the project and suggest appropriate improvements, which are then transferred to all the other participants in the development process for confirmation. After confirmation, the results of the suggested improvements are transferred to the project manager who, based on the defined criteria for acceptance, accepts or rejects the suggested product improvements. Once all the participants with active level of access priority have finished the product analysis, the following, lower level of access priority is activated, and this process is repeated until all levels of access priority have been activated. If the project is still active, the highest level of access priority is activated again and process is repeated.

### 2.3 The acceptance criteria

The developed method defines several acceptance criteria based on the derived relevant parameters obtained from analysis of several DFX tools (DFA, DFM and DFE tools):

1. Criterion of respecting the deadline of the project;
2. Criterion of minimizing the determined overall time necessary for the production and assembly of the product;
3. Criterion of minimizing the determined overall costs involved in the production and assembly of the product;
4. Criterion of minimizing the determined overall effect of the product on the environment.

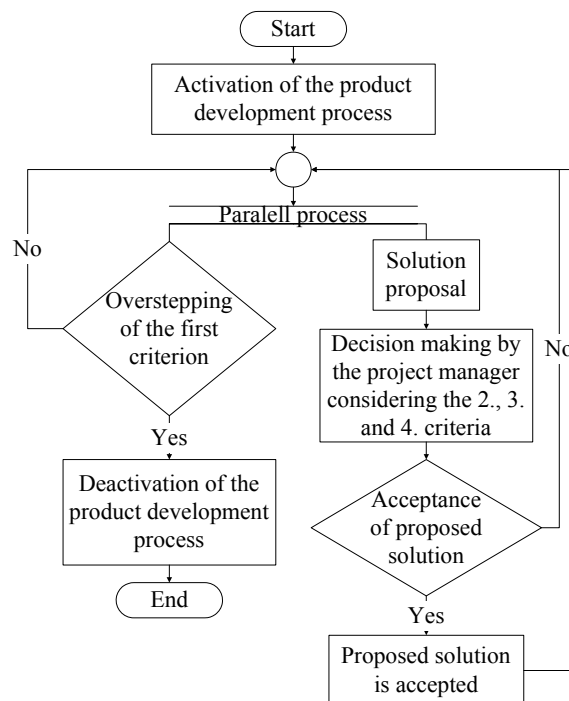


Fig. 3. Proposed algorithm for the acceptance of the proposed solutions

The first criterion is independent of the others and the overstepping of the time limit deactivates the development process, and thus the project. The other criteria are used by the project manager as a form of advice to ease the process of decision making, considering the acceptance or rejection of proposed improvements. This algorithm is presented in Fig. 3.

## 2.4 Developed database

The developed database includes data of the possible participants in the product development process, data of companies possibly involved in the product development process, data of the projects, data of possible types of analysis and needed information regarding the altering process of a project.

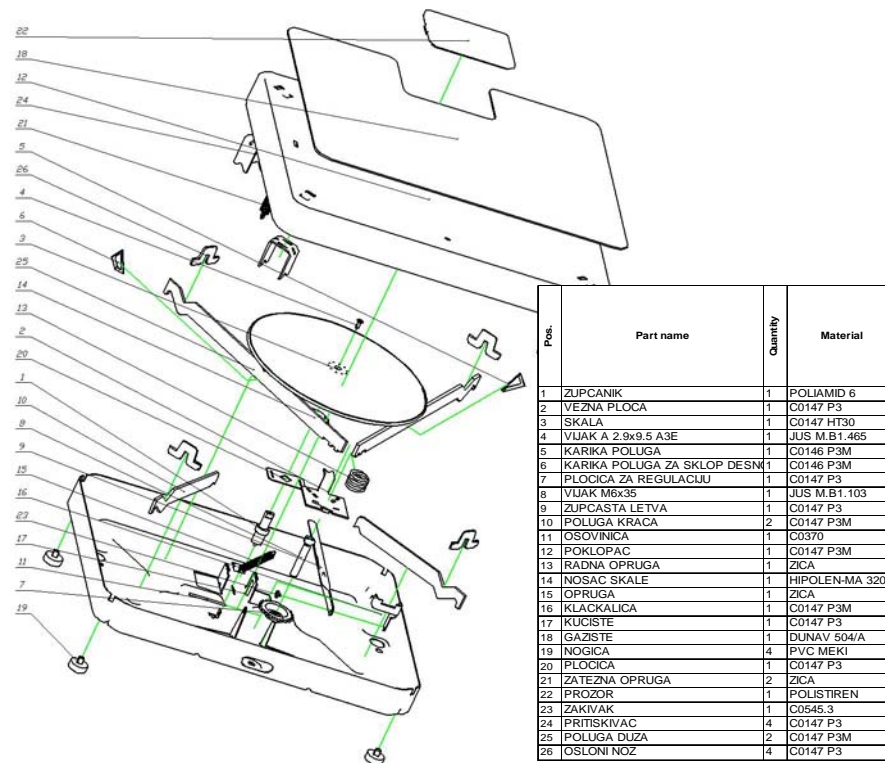


Fig. 4 Exploded view of the original product

## 3 Case study

The developed method is applied on the improvement process of a mechanical bathroom scale. An exploded view of the original product and the corresponding bill of materials are shown in Fig. 4.

The results of improvements after seven accepted solution proposals (four of which were given by the DFA analyst, two by the DFM analyst and one by the DFE analyst) concerning the reduction of the production time, reduction of the

production costs and improvement of the product's effect on the environment are shown in Fig. 5.

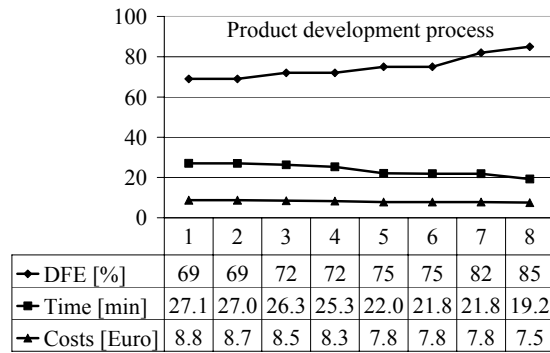


Fig. 5. Results of improvement of the product

An exploded view of the improved product and the corresponding bill of materials are shown in Fig. 6.

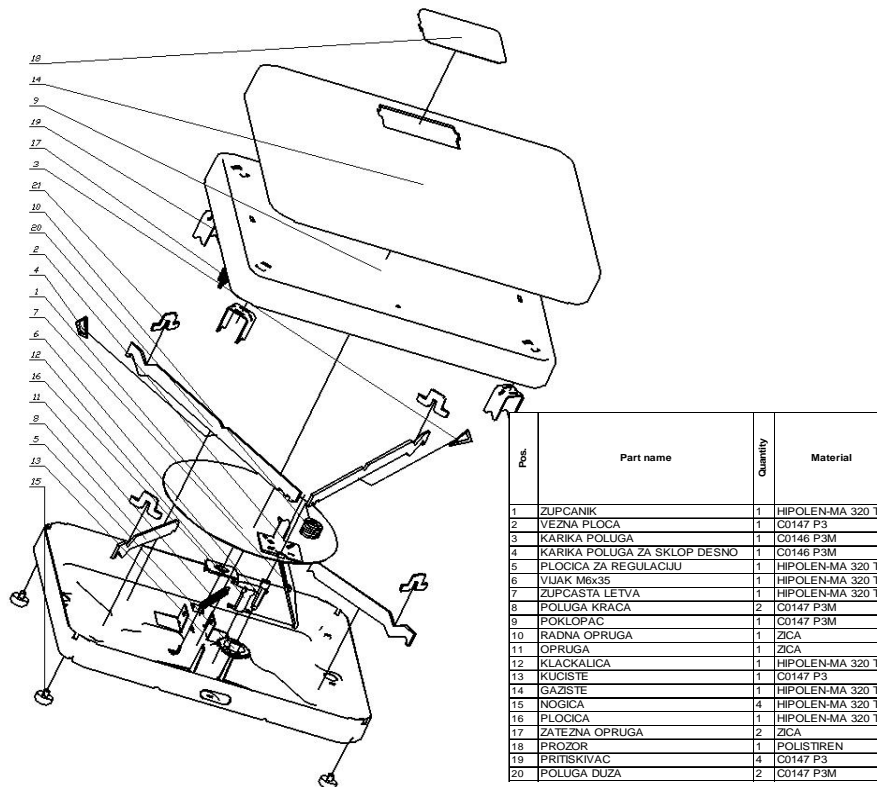


Fig. 6 Exploded view of the improved product

## Conclusions

The presented results of the application of the developed method show that by parallel and simultaneous work of all participants in the development process it is possible to shorten the time of the product development and determine possible improvements.

It is also shown that internet surroundings can be a suitable environment for connecting all the participants in the process of product development who can be working in globally distributed business environment.

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