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QUALITY TOOLS OF THE INNOVATIVE PROJECT IN THE PLANNING PHASE ANALYSED ON A CHOSEN EXAMPLE

NARZĘDZIA JAKOŚCI W FAZIE PLANOWANIA INNOWACYJNEGO PROJEKTU NA WYBRANYM PRZYKŁADZIE

Abstract

Project planning is an especially important and difficult part of a project preparation. Errors made at these stages usually cause accumulation of difficulties in the implementation phase, causing for example the need to introduce a number of changes in the schedule or the budget, and may even lead to the failure of the project. This article attempts to outline the characteristics of a selected quality management tool used in the project planning phase. The Product Flow Diagram was presented as one of the elements of product-based planning on the example of a project on developing a prototype system for identifying people.

Keywords: quality of the project, *Product Flow Diagram*, *CTQ Tree*

Streszczenie

Planowanie projektu to szczególnie ważna i trudna część przygotowania przedsięwzięcia. Błędy popełnione w tych działaniach zwykle powodują spiętrzenie trudności w fazie realizacji, wywołując np. konieczność wprowadzania licznych zmian w harmonogramie czy budżecie, a nawet mogą prowadzić do porażki projektu. W artykule podjęto próbę charakterystyki wybranego narzędzia zarządzania jakością projektu stosowanego w fazie planowania. Na przykładzie projektu dotyczącego opracowania prototypu systemu identyfikacji osób zaprezentowano Diagram Następstwa Produktów jako jeden z elementów planowania opartego na produktach.

Słowa kluczowe: zarządzanie jakością projektu, *Diagram Następstwa Produktów*, *CTQ Tree*

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1. Introduction – Project Management Problems

Planning is one of the most important stages in the process of project management, before the start of implementation phase. It is associated with a thorough analysis of the size, objectives, resources, time, quality and budget of the project. Each of these elements is a potential source of problems, which should be eliminated as soon as possible and without additional funding. In order to prevent the occurrence of unplanned events already in the planning phase, the project team takes measures to identify potential risks. It also proposes a scenario of solutions to problems, so that in the event of their occurrence they can be quickly solved. In the phase of project planning, the essential threats are: the improper assignment of roles and responsibilities in the project team, improper communication and ineffective project planning. This last factor is associated with the invalid defining of design constraints and quality from the point of view of the user and the manufacturer [1].

Problems related to project planning are compounded in the case of innovative projects, i.e. projects with a high or even very high degree of novelty (or originality) [2]. The risk is included in the definition of each project, but in the case of innovative projects the degree is much higher. This is due to the nature and construction of the components of risk in enterprise innovation, such as potential events that may occur, the probability of their occurrence and their consequences.

In order to prevent the risks associated with improper quality planning at the project planning stage, it is necessary not only to have a correct choice of quality planning methods, but also appropriate definition of the process steps of an innovative project with a focus on the quality of product design [3, 4]. The recognition of the right moment for quality planning and quality monitoring of a project by means of the feedback loop effect on minimizing potential problems is raised in the article.

To sum up, the quality planning of a project can generally be treated as taking into account, from the very beginning of the project, the issue of the required quality of the final product of the project. Selected elements of quality management of the project, especially quality planning of the project, will be presented on the example of a project on building a prototype system for identifying people.

2. Characterization of the Innovative Project – the global identity identification prototype system based on frontal sinuses

A front sinus is a pneumatic structure of the frontal bone of the mouth of the hole fronto--nasal of the nasal canal. Each person has an individual shape of sinuses which proves the uniqueness of biometrics. The examination of polimorphic sinus based on the computer analysis of X-ray images helps identify people on the basis of frontal sinuses [5]. The research conducted at the Institute of Applied Informatics at the Cracow University of Technology and the Jagiellonian University shows that the method for identifying people involves the examination of the polimorphic line sinus of a man by means of X-rays and then develops an algorithm of computer image analysis to determine the area sinus [6]. The analysis made a scheme alphanumeric description of frontal sinuses for identification of people.

3. PFD, CTQ Tree and DFMEA dedicated to the global identity identification prototype system

The purpose of quality planning is to provide a solid basis for a common understanding of what the project intends to achieve and above all to guarantee the customer that the product will meet the project's requirements. Proper quality planning can apply methods and techniques aimed at ensuring quality through quality awareness and early defining of problems and possible solutions. In order to illustrate quality planning at the project planning stage we used an example of a prototype system for identifying people based on facial analysis by means of automated image analysis algorithms. Items related to project quality planning can be traced in a classic project management, but also in the PRINCE2 methodology.

At the stage of product-based planning, PRINCE2 recommends the establishment of a Product Structure Diagram (DSP) [7]. It provides information that tangible and intangible elements are necessary to produce the product design. After building the Structure Diagram Product, the next step is to proceed to a detailed description of each element of the diagram. Enter the ID, name, purpose, composition, origin, appearance, people assigned to the manufacture of the product and the criteria, methods of control and tolerance for quality. Already at this stage there is an initial review of the characteristics of the elements that the final product should have. In the case of a prototype system for identifying people, distinguished DSP for products belong to the group: the system (software, hardware, products integrating) and the core group of product integration (managers). Drew up: the Product Description was chosen on the basis of multi-criteria, a comparison of the criteria validity and creation of linguistic matrix of pairwise comparison, showing the criteria and the extent to which they are more important than others. The importance of each criterion α_i according to the rule of Saaty was established [8]:

$$\alpha_i = \frac{\sqrt[n]{\prod_{j=1}^{n} a_{ij}}}{\sum_{k=1}^{n} \sqrt[n]{\prod_{j=1}^{n} a_{kj}}} \tag{1}$$

and then each criterion was assigned a utility function. Aggregation was done according to the method of Sewastian [9], according to three different methods: Maximum pessimism criterion (DD_1), multiplicative criterion (DD_2) and Additive criterion (DD_3):

$$DD_1 = \min(\mu_1(x_1)^{\alpha_1}, \mu_2(x_2)^{\alpha_2}, \ldots) \tag{2}$$

$$DD_2 = \prod_{i=1}^{n} \mu_i(x_i)^{\alpha_i} = \mu_1(x_1)^{\alpha_1} \cdot \mu_2(x_2)^{\alpha_2} \cdot \ldots \tag{3}$$

$$DD_3 = \prod_{i=1}^{n} \alpha_i \mu_i(x_i) = \alpha_1 \mu_1(x_1) + \alpha_2 \mu_2(x_2) + \ldots \tag{4}$$

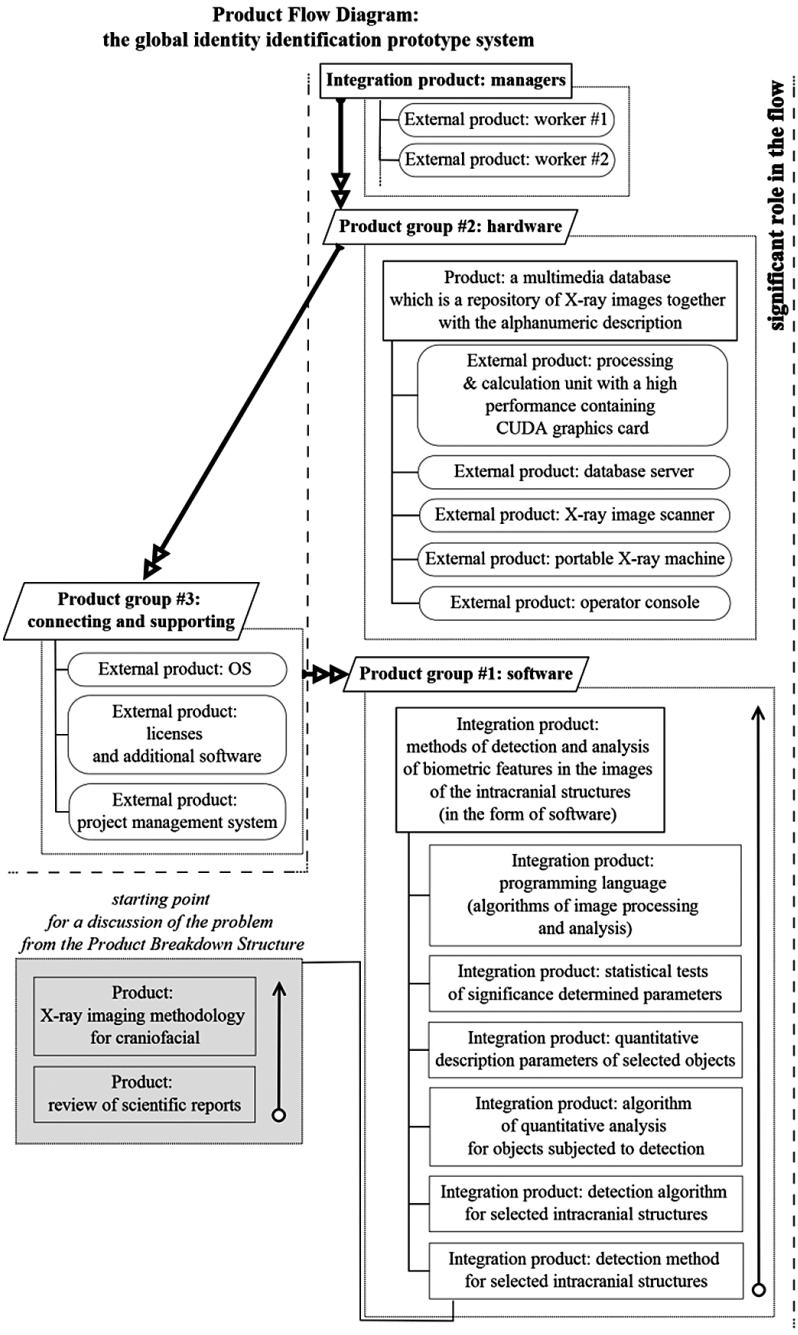

Fig. 1. Product Flow Diagram for the global identity identification prototype system (source: own calculations based on data from [7, 10])

where:

x_i – quality parameters,
$\mu_i(x_i)$ – total utility (functions),
α_i – relative importance of criteria (coef ficients),
i – 0 ... n, n = 7.

The final stage of product-based planning is the construction of Diagram Aftermath Products [7]. It shows the sequence of production and interdependencies of the products listed in the Product Structure Diagram. In the discussed system, a full DNP identification of people was presented in the diagram in Fig. 1.

Knowing the needs and requirements of the customer concerning the product project, potential hazards that may occur in their environment must be identified. We must prevent the effects of possible defects that may occur in the designing stage. Expectations are fulfilled by the DFMEA method (Design Failure Mode and Effects Analysis) – analysis of the types

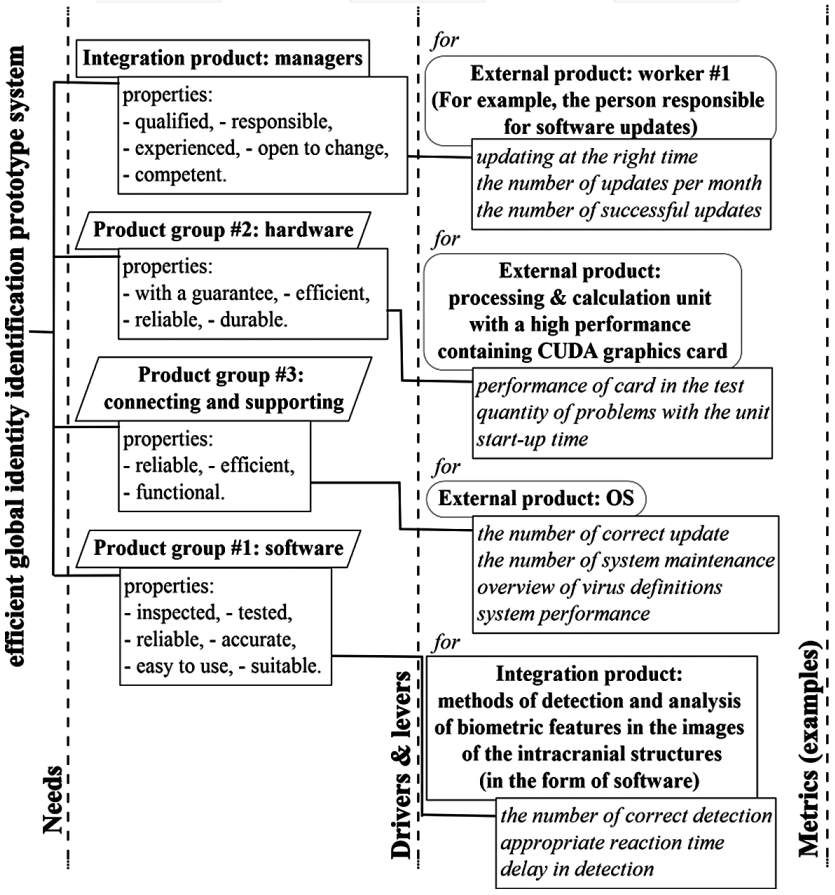

Fig. 2. Simplified CTQ tree dedicated to the efficiency of the system
(source: own calculations based on data from [7, 10])

and effects of possible errors [11]. The presented need for an efficient system to identify in a CTQ tree (Fig. 2) automatically becomes the function of the system, which must be examined in the DFMEA.

4. Conclusions

Planning is a type of immune mechanism against all kinds of wrong decisions. It requires solving some important problems at a time when there is possibility of a choice between different options of these solutions [12]. Abraham Lincoln aptly captured this when he said: "If I have six hours to chop a tree, I will use the first four for sharpening the axe". This means that good preparation for work makes it easier and more resistant to failure. In connection with project planning itself, we should answer at least two questions: what should we do? (Requirements) and how should we do it? (Design and specification). The course of planning depends on the competence of individuals, as they have a significant impact on the requirements, design and project budget, which translates into the success or failure of the project.

The article presents product planning based on the example of an innovative system for identifying people as a way/methodology which leads to project quality management, maximizing the quality of products and the success of the project. That alone, trying to develop a methodology for identification of people, to implement and create a prototype device and introduce this innovative product to the market is a tool of entrepreneurship by means of which the change makes the opportunity to take a company to a new action of economic or provision of new services. Yet biometric systems is still a growing industry not only in the Polish market, but in the whole world [13]. Since the first identification solutions were made, revenue from their sale continues to grow. Thus, the challenges of biometrics in the field of identification of people is one of the opportunities for entrepreneurs and innovators.

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