UDC 004.65

INFORMATION SUPPORT OF
USER'S REQUIREMENTS SPECIFICATION CONSTRUCTION CONTROL

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Abstract. In this paper is considered the questions of user's requirement construction to the software and software projects. It is necessary to construct user's requirement specifications from the complex system control position. Important component of construction of user's requirement specifications is uncertainty reduction of rather estimated modes of program system use, its functionality in different modes, etc. Instrumental basis to reduce uncertainty is to build a wide range of models, which form the basis of information support of user's requirements specification construction control. Authors of the paper offered the software system architecture, which allows analyzing it from clashing classes optimization of efficiency characteristics point of view.

Key words: user's requirement specifications; different modes; software system architecture; optimization of efficiency characteristics.

The complexity and scales increase of software projects, serious consequences of the strategic mistakes made at the project early stages and due to the poor requirements quality, the need to address the conflicting interests of the different owners groups involved in the project, limited material and non-material resources of projects forced to develop effective control systems for software project.

This, in particular, requires the development of methodological, methodical, models, tools, information bases control of quality requirements construction both to the software products and to the project realizing it[1].

In the literature devoted to questions of quality of products and projects control, importance of creation of an effective control system of the requirements to a product is emphasized[2] [1, 2].

The analysis of references [3, 4] allows to claim that the mistakes made at the requirements formation, involve to the serious consequences, up to a project failure. In [5] it is emphasized that poorly trained specialists identifying the problems and requirements of customers, insufficient tool support of this kind of activity is one of the main reasons causes of products release whose properties are not sufficiently meet the expectations of customers and users.

The control of requirement specifications construction is considered from the position of complex system control.

This conclusion is caused by the fact that controls of hardware-software complexes creation is the control of organizational and technical system, i. e, consideration of the human factor is crucial.

INTRODUCTION REMARKS

Specifications of user's requirements are the association of owners for achievement of the software project purpose, operating on the basis of certain principles and rules[3].

Specification of user's requirements is considered as the basis for the software project implementation, i. e. set of actions leading to the formation and improvement of relationships between software project resources at different stages of the software product life cycle.

Specifications of user's requirements are considered as a set of characteristics of external business processes and conditions [6].

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[1] GOST R 51901-2002 Reliability Control. Analysis of Technological Systems Risk.

[2] ESA PSS-05-02 Guide to the user requirements definition phase, March 1995; ESA PSS-05-10 Guide to software verification and validation, March 1995; IEEE Standart for Software Verification and Validation, IEEE STD 1012-2004, June 2005.

[3] ESA PSS-05-02 Guide to the user requirements definition phase, March 1995.

Owing to public division of labor, each of holders has its area of responsibility in the complex of tasks associated with strategic, tactical and operational control of system, in relation to which the software system acts as a subsystem.

Implementation tasks entrusted to the owners requires appropriate information support. Owing to this fact it is possible to claim that the specification of user's requirements is the characteristic of external business processes and conditions in relation to software system.

Specifications of user's requirements are considered as IT audit component. Specifications of user's requirements are allows to estimate, how created software system, first is useful (i.e. allowing to receive significant, concerning to the business processes, provided in a convenient form information).

Secondly, how effective is supposed to use the organization's resources, infrastructure, historical data and documentation, organizational and staffing structure (compliance with the principle of efficiency).

Thirdly, how exact and full information is supposed to be received, also to prove obtaining of this information and its compliance to expectations of owners (compliance to the principles of integrity).

In the fourth, software system ability is provided timely submission of information (compliance to the principle of availability).

In the fifth, compliance of requirements both to external requirements to business (presented in the form of regulating acts, contracts, current laws), and to internal business politics.

Specifications of user's requirements are considered as basis of the vulnerabilities analysis of software system at an initial stage of the software project.

Identification of the factors, capable to reduce quality of users requirements, an assessment of possible consequences, both from separate defects in requirements, and from set of defects, for quality of the results received at the subsequent stages of the software project at chosen model of life cycle of software system.

It creates a basis for identification of weak places in an organizational, technological and personnel component of the software project.

Key ideas. The architecture of software systems is the basic organization of system embodied in its components, its relations with each other and with an environment, and also the principles defining its design and development [7].

In references it is emphasized that quality of user's requirements to the software product is a critical factor of the software project success, and also a critical factor of success of the productive and effective software system use.

Despite the considerable number the researches devoted to the requirements management [8], the problem is far from a final decision. For example, well-known technology, formalizes procedures for transformation of the requirements for the final product in the requirements to project, project management and control is the QFD methodology [5]. At the same time, this methodology recognizes that requirements to consumer properties of the final product are accurately formulated. In case of software systems to make the last is rather difficult, at least because of the different vision of the result by different owners [9].

Recognizing that the specification of user's requirements is one of the representation forms of the software product, it is possible to conclude that user's requirements specifications should be approached from the position of complex system.

Important component of construction of user's requirement specifications is uncertainty reduction of rather estimated modes of program system use, its functionality in different modes, its functionality in the different modes, which provides realization of functions and restrictions on operations, etc. Instrumental basis to reduce uncertainty is to build a wide range of models (system, structural, mathematical, imitating), which gives the chance of versatile studying of specifications of user's requirements.

In the proposed approach to the allocation of architecture based on the following:

Various vision of software system and the software project realizing by different owners (groups of owners), users and developers [10, 11]. The consequence of it is different approaches to estimation of software system efficiency. Given that the approaches to the estimation software system efficiency depends on the mode of its use[4] [3].

Customer point of view based on how the appearance of a software system will increase the business processes efficiency [9].

The software developer point of view is based on the analysis of efficiency of the project resources use [5]. It is necessary that resources have the following components: organizational, technological, infrastructure of the project, an investment, auxiliary and providing processes of the project[5].

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[4] IEEE Recommended Practice for Software Requirements Specifications IEEE STD 830-1998, June 1998.
[5] IEEE Guide to the Software Engineering Body of Knowledge - SWEBOK, 2004

It is necessary to emphasize that external (from the customer point of view) and internal (from the developer point of view) efficiency criteria are clashing.

On Fig. 1 the hierarchy of software system components and the environment, without which it is impossible to research the software system is presented.

We will emphasize that to each of levels there corresponds a set of alternatives (influences from environment and on environment, operational scenarios of software system application, modes of use, etc.).

Environment (input and output space of software system)
Operational scenarios of processes of software system use
Modes of software system use and the purposes of application associated with it
Requirements to the software system
The operations connected with implementation of requirements
Plans of operations realization
Resources which is necessary for implementation of plans of operations

Fig. 1. The hierarchy of softwaresystem components

If the set of alternatives at every level countable, each of it is independent and it can be assigned a probability value. Alternatives form full group of events so the offered model is transformed to a set of operational profiles.

ARCHITECTURE OF THE SOFTWARE SYSTEM

On the figure 2 the architecture providing high efficiency of internal business processes of the project is presented. It is based on the architecture of the project with overlapping phases. Thus certain performers specialize on the solution of certain classes of tasks. Within this architecture reduces the duplication of similar developments in the internal business processes, increase efficiency of domestic resources use.

Feature of this architecture is need the coordination of critical resources use for several, parallel carried-out phases of the project. Besides, the same performers should work with different representatives of the customer (there is no specialization of performers on certain operational processes scenarios of software system application).

The consequence is an increase in costs associated with the formation of qualitative requirements of software system.

Within this architecture it is difficult to allocate uniform components (the purposes, requirements,

operations, plans, resources), associated with certain modes of use of software system.

In figure 3 the architecture providing high external efficiency of the software project is presented. High external efficiency is provided because resources of developers, first of all personnel, are focused on various modes of use of software system. At such approach developers rather deeply penetrate in particular use of system in different modes. Restriction of such architecture is the compelled duplication of the same development in internal business processes. At the same time, within such approach uniform components (the purposes, requirements, operations, plans, resources), associated with certain modes of use of software system are allocated.
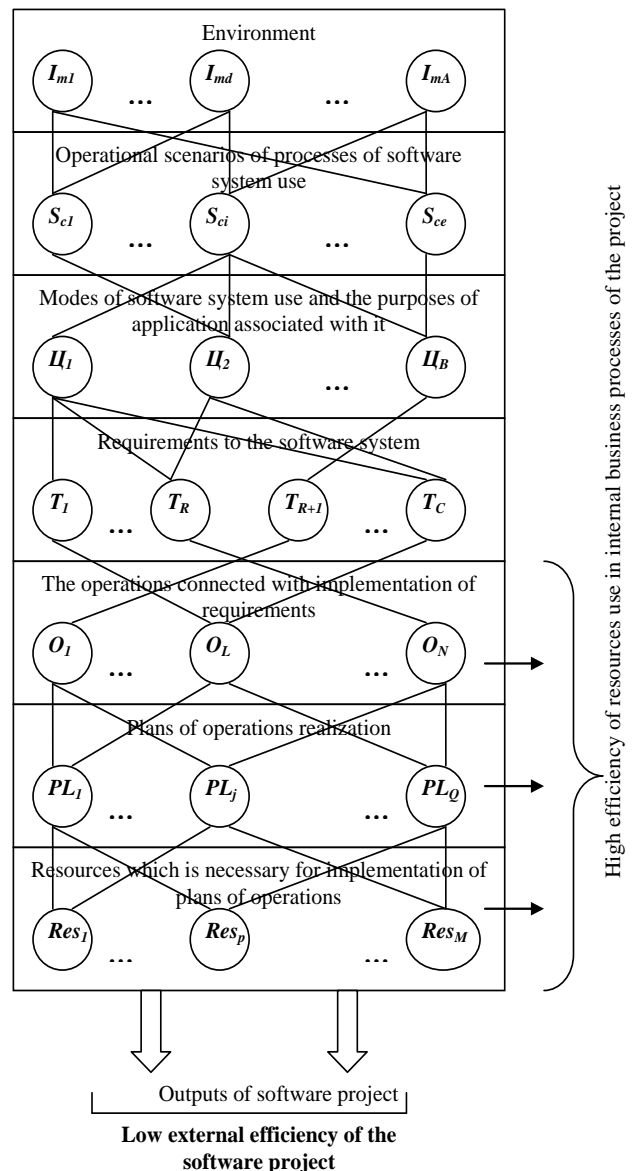

Fig. 2. The architecture providing high efficiency of internal business processes of the project

The approach to the evaluation of the software system efficiency depends on which mode (normal, extreme loading, hardware failure or software components) is function the system.

Thus, within functional approach in the paper the architecture of the software system, allowing to analyze it from positions of optimization of clashing classes of efficiency characteristics is offered: efficiency of internal business processes of the project and external efficiency of program system.
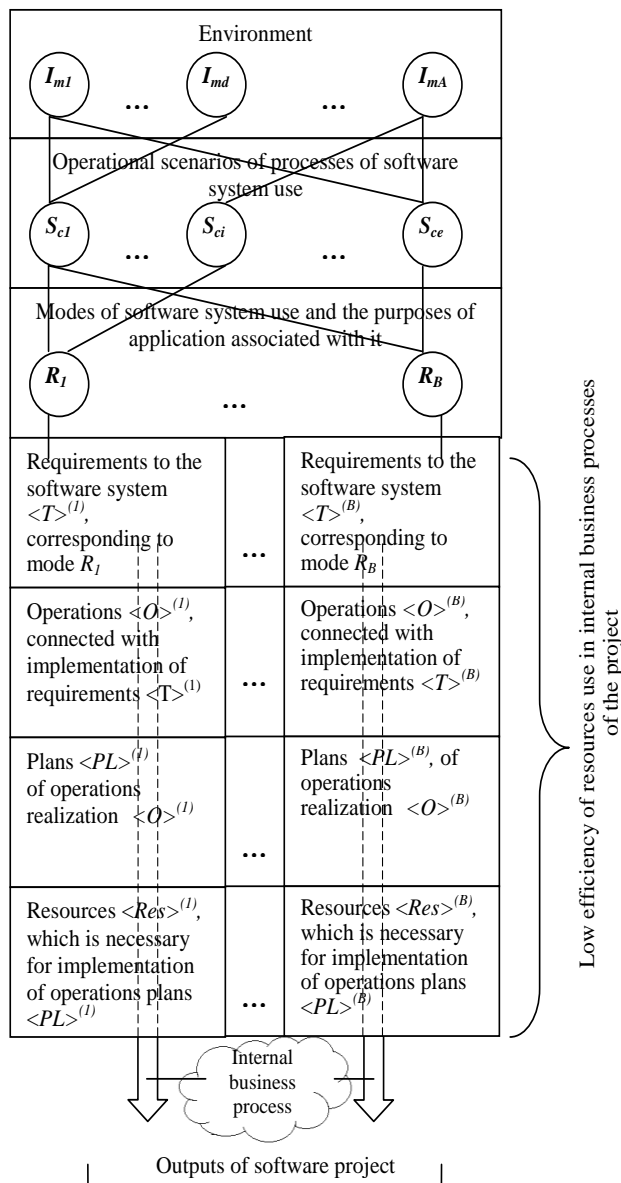

Fig. 3. The architecture providing high external efficiency of the project

CONCLUSION

In this paper is considered the questions of user's requirement construction to the software and software projects position of complex system control. Authors of paper offered the software system

architecture, which allows analyzing it from clashing classes optimization of efficiency characteristics point of view. Also in this paper is presented the hierarchy of software system components. Authors have been offered the architecture providing high efficiency of internal business processes of the project and the architecture providing high external efficiency of the project.

The received results create a basis for development of the interconnected system of the structural and mathematical models providing information support of user's requirements specification construction control, auxiliary and providing with processes of creation of software products with set consumer properties.

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МЕТАДАННЫЕ

Название: Информационная поддержка проектирования спецификаций требований пользователей.

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Источник: Вестник УГАТУ. 2014. Т. 18, № 5 (66). С. 57–61. ISSN 2225-2789 (Online), ISSN 1992-6502 (Print).

Аннотация: Рассматриваются вопросы проектирования требований к программным продуктам и программным проектам с позиций управления сложными системами. Важной составляющей проектирования спецификаций требований пользователей является снижение неопределенности относительно предполагаемых режимов использования программной системы, ее функциональности в разных режимах. Инструментальной основой снижения неопределенности является построение широкого спектра моделей, возможность разностороннего изучения спецификаций требований пользователей. Авторами статьи предлагается архитектура программной системы, позволяющая анализировать ее с позиций оптимизации конфликтующих классов характеристик эффективности.

Ключевые слова: спецификации требований пользователей; режимы функционирования; архитектура программной системы; характеристики эффективности.

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