# HYBRID INTELLIGENT SYSTEM FOR ANALYSIS OF PROJECT DOCUMENT

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**Summary.**The structure of hybrid intelligent system of data extraction from a project document and analysis of project management system risks on the basis of genetic analysis of project document scope by means of forming of project product genetic code is presented.

Key words: hybrid intelligent system, project product, genetic analysis, project document.

# INTRODUCTION

Basic problem of project management consists of the gap between the ideal conception of project product, presented in a project document, and its real embodiment. Quality of management by a project is determined on the presence of result proper to the requirements of project participants. Information about a presence in the project of result proper to the purposes project participants is contained in the aggregate of the documents generated in the process of project management life cycle.

## ANALYSIS OF RESEARCHES AND PUBLICATIONS

Today the evolutional programming is perspective trend in intelligent system development. The genetic programming is used in the project management for research of project partial problem (or knowledge area) and descriptions of project management methodology [Babayev, Bushuev, Bushueva 2005, Babayev I.A. 2005]. The decision of partial problems is most widespread by means of genetic algorithm application. For example: in the USA 5750 patents have a different level of the use of genetic algorithms in the project management [FreePatentsOnline 2009].

From the 80th years of former century genetic models and algorithms are used for the analysis and choice of optimum decisions as most proper to maintenance of economic categories and interrelations between them in the process of optimization and forecasting of a different level management processes. The project management as a type of activity is not the exception. Moreover, in accordance with project type the deviation from a plan during realization are expressed by different indexes and values. Expenditures on project integration and scope management grow with the increase of complication of project. As a result, there is a necessity in a tool for the project product scope management by means of the formulation of product requirements [PMI 2008]. Problems with formalization of project product occupy the first positions in different researches of reasons of failures in IT-projects [Collins 2007, IT Cortex 2009]. Explanation is simple: the product of IT-projects is non-material; a customer realizes part of software product functions, based on existent experience, but not on understanding of future.

#### **RESEARCH OBJECTIVE**

The issue of the day for the new decision making support systems developers there is compiling a notions thesaurus in the system subject area and determination of weights of these notions. Weights characterize the degree of influence on made decisions with the purpose of teaching of intelligent system to links between key notions in subject area. Therefore interpretation by means of genetic approach of project product scope as bases of the system of project management and project documentation, will allow to develop the decision making support system, which will estimate inherent to the project management of links between notions of subject area (project context).

## **RESULTS OF RESEARCH**

Quality of management by projects is traditionally determined by means of providing of effective project implementation, namely: implementations on time, within the budget, in accordance with the product quality requirements. First two requirements are related to estimation of project feasibility, and last – with estimation of viability of project product. The innovativeness of project product in a theory must provide the receipt from the project product of necessary result during the exploitation period. Thus, by analogy with a natural selection, product innovativeness, as a result of mutation, must provide the function of adaptation of product to the external environment conditions.

Execution of the given function is possible, if user of signs innovation both with technical, and from a functional side. By other words, all elements of project product configuration must be accepted by its recipient – by a customer. The subsequent generation of subproducts by the project product is the necessary condition of product viability. It follows to take into account the presence of contradiction: unlike the biological systems, project product does not reproduce itself similar by generating

subproducts. The project product reproduces the ability (technological) to produce the subproducts, delivered to the group of project participants, named "users".

From this point of view, the structural model of project scope must present configuration of product on semantic elements. That takes place in the work breakdown structure (WBS) of project. The WBS is the constituting structural model of project: the first level is the result of the general action (product of project); the second level is basic semantic elements (function); the other levels go into detail of whole scope – the first level. Final (basic) configuration of project product is presented in WBS either at the second level in a structure by product, or in the phase of realization in a structure by phase, because there must be the elements of one level.

A project documentation (including the project management plan) contains information which is "coded" by facilities of natural language. The sequence of signs forms the "name" for every notion in the subject domain of project management. Thus, description of project product has by the result the determination of constituents of project product as an eventual set of signs identifying properties both project product on the whole and every its constituent.

Documents in the project management, must present a kind of "pattern of product", proper by the requirements of customer to the project product. However conception of project participants of scope and form of project product and its reflection in a text form – not the same. A break between the desired and real product description is the factor of the risks related to product scope and project management planning.

If the aggregate of notions describing the product of project (thesaurus of product) presents the project product encoded information, relations between them and character of co-operation, notions which the text of documents consists of can form the ribbon of "notions-genes" (fig.1). From other hand, these notions can be just some sequence of signs, requiring the obligatory presence of additional information. The sequence of notions-genes in a ribbon does not determine the technological sequence of "assembling" of project product and vice versa. As such the technological process of project product receipt is not the object of influence for the project management. But the product of project is the result of both two processes.

Presentation of project product by means of the "notions-genes" allows identify the project product in a project document and simulate the processes of project product receipt (or technological product configuration) and its exploitation (or functional product configuration) for the analysis of project proposal. Thus, the set by a genetic code elements and properties of project product determine eventual configuration of project product. Notion-gene presents the element of appearance of future product. The genetic code of project product must be identical to its supposed configuration, as a genetic code sets the purpose of engineering of project product and project management processes. Distinctions between the genetic code of product and "visible appearance" testify to the presence of assumptions with negative influence, which it is necessary to eliminate. For effective determination of risks and assumptions it is necessary to select all meaningful for a customer properties of project product in the project product genotype.

The scope of project product changes under influences of endo- and exogenous factors during the project life cycle. As such project product does not exist to ending of project implementation phase. Therefore to the mutation the genotype of ideal project

product can be subject exceptionally. The mutation takes place through the elements of project product and description of resources providing the receipt of properties set in a project product genotype.



Fig. 1 Extraction from the project document of notions-genes

Formalization of project product genotype consists of identification of customer key requirements, which are the objects of control in the project implementation process. The key requirements must be interpreted through project constrains, assumptions and exceptions. As a result scope of project management plan lines up on critical processes, by the set genotype of project product. Thus, the project product genotype comes forward a connective link between the project management processes and processes of project product receipt.

The selected keywords form the project profiles and project product and set the language (terminology) of scope description. The accumulated information is used for forming and analysis of existent legal documents, accompanying development process and project implementations.

Taking into account foregoing the genetic analysis of project document does possible to perform the following operations: estimation of project management system risks, document changes and archiving of project activity results. For implementation of the given actions an intelligent system analysing a text by program facilities is needed. Thus, before an intelligent system the task of text analysis, selection of semantic elements from text and subsequent determination of degree of his coherent and plenitude is put. These indexes will allow to define the level of the system risks included in a project document. All existent approaches to the analysis of texts can be dashed on two categories. The methods of analysis on the basis of statistical descriptions of text fall into first category. They are mainly universal, do not rely on the language of text and it subject area. Statistical methods allow to conduct the rough, but rapid analysis of text.

The methods of linguistic analysis, built on the basis of linguistic model of text are second category. The methods of linguistic analysis are potentially able fully to take apart sense of every sentence, but speed of work of these methods it is considerably less than at the first category of methods. At the analysis of specific texts with the fated structure and form linguistic analysis can give good results. That allows fully use potential of these algorithms at the analysis of the project document built on definite methodology of project management.

The algorithms of linguistic analysis work most effectively with such to the specific texts, how contracts are. For contracts there are the produced and withstanding rules of composing. A legal language a priori is directed on the use of monosemantic and monosyllabic phrases eliminating double interpretation. The text of contract contains thesaurus.

However development of complete linguistic analyzer for legal texts is an intricate research problem. On the current stage of development of the text analysis systems, the most effective approach must combine in itself the advantages both the categories of algorithms. The following functions are needed for implementation of text analysis: selection of subject domain thesaurus, design of document thesaurus and text profile context, selection from the text of keywords, forming of hypertext structure of text and vectors "notion-value", development of notions network model, recognition of text on key indexes, accessible presentation of information to the user.

Foundation for the analysis of text is formed at extraction from the text of index as a network of basic concepts. The subsequent conducting of statistical text analysis according to the index words and their links allows to build the gravimetric model of text. Thus the weighted network of notions is considered as a logical text profile. To all great number of linked between itself keywords or steady combinations of words weights reflecting meaningfulness of this notion in a text are appropriated [Kharlamov 2006]. Additionally weights are determined and appropriated to links between notions. The use of links allows to weigh notions of text more exactly. Design of logical profiles of project documents texts allows to create the knowledge base of project, to check up a presence and plenitude of project thesaurus, to carry out navigation on notions in mass of documents and watch the changes in the documents versions. This especially important for documents which project and project product scope is described in.

As a result input information (fig. 2) is formed for the analysis of semantic breaks in the project documents, risk analysis, semantic breaks correction and forming of intelligent system knowledge base. As addition to the knowledge base is a permanent process, it is necessary to use the algorithm of evolutional development of the system.

Analysis of project document as such is a complex method. Composition of analysis is determined by the chosen project management methodology, degree of project product innovateness, aggregate of the project stakeholders and character of their co-operation during the project life cycle. Thus, an intelligent system must be some hybrid of the modules, the set and sequence of the use of which are not beforehand definite. Traditional expert systems are not suitable for implementation of



functions of project document analysis in the presented aspect in a kind their limited nature.

Fig. 2. Module presentation of intelligent system

The structure of intelligent system for project document analysis (fig.2) is most near to the hybrid intellectual systems, combining different methods of design of the intellectual systems. The resulting structure of the intelligent system is based on the methods of expert system, neural network and genetic algorithms. It allows the system to attain the necessary spectrum of cognitive and calculable possibilities for the decision of project document analysis tasks.

The described intelligent system allows to carry out extraction of information from a project document for the analysis of project risks, to give out estimation of the entered document and recommendation on correction of project document scope and decline of system risks.

# CONCLUSION

1. For development of the support decision making system in area of project product scope management the tool of formalization of requirements to the product and management of its creation is needed. The necessary requirements can be extracted from texts describing the project product.

2. Application of genetic analysis methods allows to select from a text basic concepts for the further forming of semantic profiles of documents accompanying project development and realization. It allows to estimate quality of project management and project risks by means of project document genetic analysis.

3. The intelligent system structure combines in itself genetic approach to recognition of key notions, neural network authentication of semantic patterns and evolutional development of the intelligent system.

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## ГИБРИДНАЯ ЭКСПЕРТНАЯ СИСТЕМА ДЛЯ АНАЛИЗА ПРОЕКТНОЙ ДОКУМЕНТАЦИИ

#### Кушнарев А.В., Литвинченко А.А.

**Аннотация.** Представлена структура гибридной экспертной системы извлечения данных из проектной документации и анализа системных рисков управления проектами на основе генетического анализа содержания документации проекта посредством формирования генетического кода продукта проекта.

Ключевые слова: гибридная экспертная система, продукт проекта, генетический анализ, документация проекта.