FUNCTIONALLY ORIENTED APPROACH IN RESEARCH-RELATED DESIGN

A. V. Palagin

Abstract. This article considers the functional approach in research-related design based on the technology of scientific-technical creativity with its morphological and transformation methods. The supplement of the technology with elements of marketing research makes it possible to obtain an innovative product with high technical characteristics. This approach provides a combination of the mentioned properties. The emphasis is placed on the class of computer facilities (smart systems) that are currently developing intensively.

Keywords: research-related design, technology of scientific and technical creativity, marketing research, transdisciplinarity, ontological method, artificial intelligence, smart system.

INTRODUCTION. USING THE TECHNOLOGY OF SCIENTIFIC AND TECHNICAL CREATIVITY IN RESEARCH-RELATED DESIGN

The development of technologically new objects belongs to problems of research-related design [1] in which this process is constructed as a number of interactive procedures of formation of intermediate hypothetical versions based on a comprehensive analysis of information on a design object, its application, and its object domain as a whole. In this process, the phase of conceptual and paradigmatic design is singled out that is associated with the formation of a primary image (configuration) of the object being designed by synthesizing metaphorical models and their description in natural language according to the results of comparing it with other objects on the basis of common and distinctive characteristics. In fact, this phase is simultaneously one of the main stages of both marketing research (MR) and scientific and technical (inventive) creativity. The difference is that, in the first case, the objective is the formation of an efficient collection of functional (consumer) characteristics, and, in the second case, the formation of distinctive technical characteristics in relation to the selected prototype. At the same time, it is essential that the correct choice of a prototype in the case of marketing research (in contrast to the inventive approach) guarantees not only the novelty of the synthesized object of modern technology but also its positioning and promotion in the market of goods.

The process of research-related design is based on the technology of scientific and technical creativity consisting of a collection of formal and heuristic expedients (methods) of searching for an efficient technical solution in the object domain being investigated [1, 2]. It always consists of stages of analysis and synthesis. The first is related to the search for and analysis of the closest analogs and prototypes, and the second is related to the definition of the configuration of the product being designed and the corresponding technical solution. In [2], the following two alternative methods of the technology of scientific and technical creativity are described: a transformation technique and a method of morphological classification. In [1], a combined method called the combination of an efficient collection of consumer characteristics (CECCC) is presented, which intrinsically brings it closer to problems of marketing research. The CECCC method was developed using a transdisciplinary paradigm and on ontological approach, though intuitive expedients of the subject of...
creativity and the model of his semantic space with the zones of erudition, ideology, motivation, etc. are not excluded from the general support tools of his creativity.

In the new interpretation, the life cycle of the process of research-related design can be represented in the general case as the sequence of the following stages:
— collection of material that represents the object domain (OD);
— formation of the objective of the research project;
— analysis of the material and ontological description of the OD in the form of the structure shown in Fig. 1, where O is an ontological graph with a function of interpreting concepts and relations and SD of OD is the structured description of the OD marked by ontology;
— identification of contradictions and formulation of the problem situation;
— statement of the problem of the research project;
— refinement of the problem situation, namely, singling out external (collections of subproblems of the main task) and internal (extension of functionality of the product being designed (DP) as a system) contradictions;
— identification of analogs-prototypes and formation of the collection of their consumer characteristics;
— formation of the collection of technical characteristics and configuration of the DP;
— execution of the sketch-technical design stage and preparation of materials for patenting.

Most stages (excepting intuitive processes of the subject of creativity) can be supported by information technologies based on the ontological approach and the concept of a semantic space, which is based on modern methods of syntactic-semantic analysis of natural language text documents. An example of a technological system of syntactic-semantic analysis of text documents is described in [3]. The system has passed approbation in a number of object domains and can be recommended for application in problems of knowledge-oriented research-related design.

**FORMALIZATION OF MARKETING RESEARCH PROBLEMS**

Marketing research is a complex system of studying the organization of production and marketing of goods (services) and also developing a marketing strategy that provides the maximum economic effect in developing a new type of products.

The general principles of marketing research are as follows: systemness, complexity, objectivity, economic efficiency, regularity, operationability, accuracy, and thoroughness. Their observance guarantees the obtaining of substantiated managerial decisions.

All MRs are subdivided into fundamental and applied ones as follows: the former are focused on studying the basic market regularities and trends of macroeconomic indicators, and the latter are related to studying the needs of a concrete organization and making concrete managerial decisions (for example, in developing a new kind of goods).

An MR process begins with the definition of its problems and objectives and the development of its plan and terminates with its implementation and interpretation and systematization of the obtained information and also with the prediction of prospects of this (new) type of goods on the basis of SWOT analysis, which is a method of strategic planning based on the analysis of factors of the internal and external environments.