

**CONSTRUCTION OF A MULTIPLICATIVE-ADDITIVE CRITERIA
CONVOLUTION IN THE SPACE OF QUANTITATIVE AND QUALITATIVE
INDICES TO DETERMINE THE PRIORITY OF PROJECTS**

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One of the main problems in scientific activity organization on a competitive basis is to improve methods of R&D project evaluation and priority determination. The project priority level may be determined using approaches based on the multi-attribute utility theory (MAUT), whose development is the subject matter of many studies and publications. Despite of the large number of publications on the subject, the development of a scientifically substantiated mathematical apparatus for multicriteria project evaluation is still a topical and challenging problem. The complexity of the development of project priority determination methods is due to difficulties in the construction of a unified rating scale that would allow one to measure the value of project indices differing in physical content and dimension. That is, what is difficult is the structurization of a decision-making person (DMP)'s preferences and the formalization of preference evaluation. It is also difficult to construct a criterion-target model that would adequately represent the system of DMP preferences in the form of a scalar value function, which is termed a criteria convolution, an integral criterion, or an integral value function (IVF). MAUT-based computational algorithms widely use procedures of common criteria scaling, in which one quality index is replaced with another. Such algorithms have a resolution equal to one; however, they operate with quantitative criteria alone, thus significantly narrowing their application area. Another drawback of theirs is the lack of simple methods to determine the value function at indifference (DMP preference equality) points. The aim of this work is to eliminate these drawbacks in a multiplicative-additive IVF model. To do this, the following was done. Functional relationships between DMP preferences and alternative quality indices were established to give analytical expressions for evaluating local value functions at indifference points. A method was developed for constructing a multiplicative-additive criteria convolution to evaluate and rank alternatives in the space of quantitative and qualitative indices. An algorithm was developed to determine the priority of projects; the algorithm allows one to rank alternatives with a resolution equal to one. In this work, decision theory, multicriteria utility theory, and verbal decision analysis methods were used. The results obtained may be used in R&D efficiency evaluation, competitive project selection, and space program formation in the rocket space industry.

Keywords: quantitative and qualitative criteria, value function, criteria convolution, alternative ranking.

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