

ABSTRACT

Abdulkadir K. Project portfolio configuring based on discounted cumulative flows. – Qualification scientific dissertation manuscript.

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Research relevance. Project portfolio management is one of the most rapidly developing areas in project management nowadays. In portfolios management activities, the "cornerstone" is their formation. Matter is that none of the existing methods provides an exhaustive and universal answer to the problem of projects selection to the portfolio.

Over the past 15 years, traditional "assessing" approach has become the most popular in portfolio management. This reflected in a large number of publications, as well as by the content of standards and practical guidelines. Nevertheless, increasing complexity of portfolios, their multi-purpose character activated appearance of new "configuring" approach to the portfolio selection based on a logical methodological technique of synthesizing diverse knowledge, different systemic ideas (projections) of the same object. When configuring, different systemic views cannot be directly matched, merged, and transformed because of their different essence. Therefore, there is no optimality criterion for such a procedure. The correlation by a decision-maker of different systemic views about the same object, bypassing the object itself, regarding the purpose of configuring, is fundamental. Based on this, within the configuring approach, each project should be presented in different projections.

For portfolios of large socio-economic entities (large firms, enterprises, districts, regions, states) flow representations of a project (and a portfolio) about costs, expected results, etc. matter as diverse knowledge corresponding to each projection. As flows, the costs traditionally are presented in the form of the magnitudes cumulative at a certain point in time. Similarly, projects expected result can be presented in flows form. In relation to portfolio, it is necessary to consider costs and results flows that are formed by respective individual projects flows totality included in its structure.

Portfolio flows general characteristics depend on project implementation sequence over time that in turn, is determined on at least two factors basis: projects priority (strategic importance) and resources for their implementation adequacy.

By now, the elements of the configuring approach have already been partially implemented in theory and practice. With their help, the problems on a rucksack combinatorial optimization, the formation of portfolios of investment and security projects, life safety projects, and environmental projects were partially solved. Key contributions were made by Vaezi F., Sadjadi S. J., Makui A., Jafarzadeh M., Tareghian H., Rahbarnia F., Ghanbari R., Abramov A., Radygin A., Chernova M., Havrys A., Khrutba V., Evdokymova A. and others.

However, the configuring approach remains a non-explicit one. That is why its use is more intuitive in nature and is limited to portfolios with a small number of projects. With an increase in their number and the essential variety of expected results, the problem of the formation of a rational portfolio is complicated by orders of magnitude. And under conditions of project funding flow that is alternating in time, the problem becomes almost unsolved without specially developed software. The development of such software implies the availability of a scientifically sound and explicitly presented method of configuring. In this regard, the scientific and practical problem of development of the method of portfolio formation by configuring the projects-candidates by flow characteristics is relevant nowadays. The expediency of solving such a problem is enhanced by the expansion of the use of management of large social-economic entities based on multi-purpose project portfolios.

Despite fruitful researches made by Martinsuo M., De Rooij M.M.G., Janowicz-Panjaitan M., Mannak R.S., Ning Y., Salerno M.S., Gomes L.A. de V., Silva D.O., Bagno R.B., Freitas S.L.T.U., Valavanides M.S., Fernandes E., Valdiviezo L.E., Molokanova V., Warburton R.D.H., Cioffi D.F., Mavrotas G., Caloghirou Y., Koune J., Maravas A., Pantouvakis J.-P., Rach D., Leyman P., Vanhoucke M., Ofosu M.K., Amponsah S.K., Erdem S., Hale A., Holmström S. and others, nowadays there are no investigations focused on framing multi-reason venture portfolios utilizing configuring approach. Main theoretical problematic within the configuring approach still relates to

system-holistic vision of forming a multi-purpose project portfolio activity and understanding the appropriate place for configuration process; developing the project/portfolio configurator; identification of unifying features for configurator panels with view to their further use in criterial portfolio configuration indicator construction; modelling the flow portfolio characteristics calculating under given restriction in form of step-by-step portfolio financing schedule; suggesting numerical characteristics for projects costs (results) description in S-curves form; developing criterion for portfolio configuring with a given step-by-step schedule for its financing.

The goal and objectives of the research. The research goal is to ground scientific approach to project portfolio formation by development of the method for configuring multi-purpose project portfolio based on flow costs and project results characteristics for a given step-by-step portfolio financing schedule.

To achieve the goal, the following objectives have been stated:

- to develop a system-integrated reflection of activities for the formation of a multi-purpose project portfolio to establish the place of configuration in its structure and design a project/portfolio configurator;
- to identify the connecting features for the configurator panels for their further use when constructing the criterion of the portfolio configuring;
- to develop graphical and mathematical models for calculating the flow characteristics of the portfolio at a given constraint in the form of a step-by-step schedule of the portfolio financing;
- to propose a numerical characteristic of projects costs (results), presented in the form of S-curves;
- to develop a criterion for configuring the portfolio with a given step schedule of its financing;
- to investigate the effectiveness of the proposed provisions for configuring a multi-purpose project portfolio.

Object of a research is processes of the project portfolio formation.

Subject of a research is a process of the project portfolio formation based on configuring technic considering discounted cumulative flows of projects costs and

expected results.

Methods used. The methodological foundation for the research is the conceptual provisions of a holistic approach to the consideration of any activity, the ordinalistic approach to the consumer behavior theory and the provisions from the fundamental studies by N. Luhmann on the essence of risk and danger. When developing the method's toolkit, the discounting theory, heuristic methods, multi-criteria rankings and methods of qualitative mathematics were used. The models and methodical provisions to represent project costs and results in the form of *S*-curves were used to visualize and analyze flow characteristics. The author's quartile model of a system and the model of a holistic representation of the activity "3M Pyramid" were used as a gnoseological toolkit for the systemic research. The systemic model is simultaneously a configurator for the holistic target representation of various projections of the object under consideration, "bypassing the object itself". "3M Pyramid" model implements a three-level scale for considering processes and phenomena.

In addition, other following methods were used in the research: comparative analysis, graphical modeling, semantic text analysis, graphical system modeling, ranking, mathematical modeling, pairwise comparison, multi-criteria scale method, discounting, flow representation of activity, index method, computer simulations.

Scientific result and findings. The main scientific result is the development of scientifically grounded method to configure project portfolio based on discounted cumulative flows of projects costs and expected results. The novelty of the scientific result of the research is as following.

Structure of the project portfolio formation activity is *improved*. It differs from the known system-integral representation of its elements in the form of a quartile system model. This allowed to establish the place of the configuring stage in integral relation to other stages (conceptual, preparatory, research) and stages of the portfolio formation and to highlight configuring steps, on this basis to design a six-panel portfolio configurator (costs, results, attainability, feasibility, strategic importance, portfolio financing). Result is presented in section 1.3 (pp. 26-38).

For pairs of configurator panels "cost-feasibility" and "result-attainability" configuring points are defined, in which the unifying features are the flow nature of projects costs and results, S-shaped form of their reflection and environment of creation and using of the project product. This allowed to introduce norms of projects feasibility and attainability as analogues of the discount rate; to formalize indices of projects feasibility and attainability in the form of functionality; to offer the structure of the criterion indicator of the portfolio configuration that is "attractiveness", which is based on knowledge about the feasibility, attainability and strategic importance of projects. Result is *first developed and* presented in sections 2.1-2.3 (pp. 39-62).

As a numerical characteristic of the project costs (results), presented in the form of S-curves, the indicator is proposed in the form of a normalized value of the discounted cumulative flow. This allowed to quantify the feasibility and attainability indices of projects with shorter duration and regressive nature of costs. Result is *first developed and* presented in sections 3.2, 3.3 (pp. 76-96).

Further development has come to project portfolio packing task. Unlike the backpack problem, it takes into account the S-shaped nature of project costs when determining the sequence of their inseparable financing with a given constraint in the form of a step schedule of the portfolio financing; this allowed to offer graphical and mathematical models for cost flows, results, portfolio feasibility and attainability norms based on projects characteristics. Result is presented in sections 4.1, 4.2 (pp. 97-124).

A criterion to configure a portfolio is *firstly developed*. It provides maximizing the index of the portfolio attractiveness as the sum of projects feasibility and attainability level in the portfolio. The application of this criterion allows for a given schedule of the portfolio financing, as well as for projects strategic importance and for their inseparable financing in the portfolio to determine the optimal configuration of the portfolio from the number of selected and prioritized projects according to the proposed algorithm. Result is presented in sections 5.1, 5.2 (pp. 125-137).

Also the scientific fact of absence of regularities in configuration of multi-purpose

portfolios because of a large number of projects indicators that reflect the peculiarities of their implementation and using of their products. Result is presented in section 5.3 (pp. 138-161).

Practical value. Utilizing of the research findings and recommendations provides to consider the portfolio not as a static set of projects, but as continuously running processes of cost accumulation and results achievement. This allows to select most optimal portfolio that is a combination of projects in a certain sequence of their implementation, that provides maximization of the sum of multiplications of indices of the potential level of projects feasibility and their results attainability within a given flow of portfolio funding. Such mechanism of the portfolio configuring allows to more adequately and accurately determining the potential attractiveness of project-candidates and the portfolio as a whole within its resource constraints. Method is recommended for use in the formation of multi-purpose (complex) portfolios, which combine a wide range of diverse projects (social, commercial, educational, etc.). This is a premise to transfer organizational decisions in the management of project-oriented enterprises. Main applied instrument based on the proposed portfolio configuring method is the computer program "SESPortfolio", developed and registered as a copyright object.

The research findings and recommendations were introduced in practical activities within the educational master program on project management for English speaking students at "KROK" University. Basic findings were introduced to elements of the educational courses "Project oriented management of a firm", "Project office for innovative development".

Structure and scope of work. The dissertation consists of introduction, five chapters, conclusions, list of references and attachments, placed on 279 pages. The text body is presented on 171 pages, it contains 22 tables and 82 figures. The list of references includes 255 positions from 235 sources, and placed on 26 pages, 8 attachments placed on 82 pages.

Key words: project portfolio formation, multi-purpose portfolio, project/portfolio configurator, project flow characteristic, portfolio configuring,

projects feasibility and attainability norms, normalized value of the discounted cumulative flow, portfolio configuration criterion.

List of candidate's publications

Articles in scientific periodical foreign editions (including in the specialized editions of Ukraine, which are indexed in the international science-based databases)

1. Rach, V., Abdulkadir K., Medvedieva O., Biriukov O., Rossoshanska O. Construction of a portfolio formation method by configuring project-candidates based on flow characteristics. **Eastern-European Journal of Enterprise Technologies**, [S.l.], v. 1, n. 3 (103), p. 47-61, feb. 2020. Available at: <http://journals.uran.ua/eejet/article/view/193935>. doi: <http://dx.doi.org/10.15587/1729-4061.2020.193935>.

Articles in professional editions of Ukraine

2. Abdulkadir K. Petroleum distribution in Nigeria: actual state and challenges / Kabir Abdulkadir. *Управління проектами та розвиток виробництва: Зб.наук.пр. Луганськ: вид-во СНУ ім. В.Даля, 2016. №3(59). С. 74-83.*

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