

Matrix models of the structure of goals and works of the project portfolio

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Abstract

The paper deals with the processes for planning the content of a project portfolio to identify the links between the main elements of the content of projects within the portfolio taking into account the interests of stakeholders. The structure of goals and works of the project portfolio, relations between the elements of these structures were determined and the matrices of relationship – “goals-works” and “stakeholders- goals” were built, the matrix of relationship “stakeholders-works” was calculated.

Keywords: interconnection matrix, interests of project stakeholders, project works

1 Introduction

Under the conditions of market relations, the problem of system project management becomes urgent. This means that instead of separate techniques and tools that are not efficient any more, the complex and interrelated system of management should be built. At present, scientists who deal with the project management pay attention to the formalized description of the impact of project external environment factors taking into consideration their instability [1, 2]. The portfolio approach to investment projects is used. The assessment of a project by stakeholders is applied in the process of selecting projects for the portfolio. The issues of structural description and analysis of the degree of interest of individual stakeholders in certain works of project portfolio to involve them in the project management at certain stages of the project life cycle remain unresolved.

2 Basic material

The project content that takes into account various information needs of stakeholders is developed at an early stage of its life cycle and is updated to reflect changes in the stakeholder community [3]. The preliminary plan of stakeholder engagement is developed after the initial identification of stakeholders. For this purpose, the matrix of relationship “goals-stakeholders” should be built; this matrix reflects those goals of the project particular groups of stakeholders are interested in and, therefore, participate in their achievement. If these stakeholders are actively involved in the process of managing a project portfolio to perform individual works, the efficiency of achieving the portfolio goals will be significantly enhanced.

Taking into consideration the fact that the portfolio of construction projects is complex and their properties cannot be fully described within the same structure, for a

formalized presentation of the content of the project portfolio, the following structural models will be developed:

- the model of goal structure that is determined by the interests of stakeholders $\{P\}, p_i \in P, i = \overline{1, n}$;
- the model of project portfolio structure $\{W\}, w_j \in W, j = \overline{1, m}$ which describes a set of projects, stages and works that are necessary for achieving the goals of the project portfolio;
- the model of stakeholder structure that also contains the organizational structure of project performers $\{S\}, s_k \in S, k = \overline{1, t}$ which describes a set of stakeholders whose interests correspond to the goals of the project portfolio.

As the basic stages of building the models of portfolio content of investment projects will be indicated [4]:

- the table description of WBS-structure of project portfolio;
- the graph representation of the structural models of a project portfolio;
- the formalized description of the elements of project portfolio models;
- the matrix representation of the relationship of project portfolio models.

WBS-structure contains several hierarchical levels of project works and they can be divided into separate subsets: $W^{Proj}, W^{GrTask}, W^{Task}$.

To represent the structures of project portfolio models and their relationships, the basic concepts and methods of graph theory will be used; they enable conducting the structural analysis of the target object, determining the structure connectivity, its redundancy and compactness, the degree of centralization in the structure, the rank of elements and structural joint of elements.

For the formalized description of the relationship between these models of the portfolio of construction projects, let the following matrix projections be introduced:

- the matrix projection between the model of goal structure $\{P\}$ and the model of work structure $\{W\}$ that coordinates the works of the portfolio goals: $\|r(p, w)_{ij}\|, i = \overline{1, n}, j = \overline{1, m}$,

$$r(p, w)_{ij} = \begin{cases} 1 & \text{if the } j\text{-th work promotes achieving the } i\text{-th goal} \\ 0 & \text{if the } j\text{-th work does not promote achieving the } i\text{-th goal} \end{cases}; \quad (1)$$

- the matrix projection between the model of goal structure $\{P\}$ and the model of stakeholder structure $\{S\}$ that coordinates the project goals with the interests of stakeholders: $\|r(p, s)_{ik}\|, i = \overline{1, n}, k = \overline{1, t}$,

$$r(p, s)_{ik} = \begin{cases} 1 & \text{if the } i\text{-th goal expresses the interest of the } k\text{-th stakeholder} \\ 0 & \text{if the } i\text{-th goal does not express the interest of the } k\text{-th stakeholder} \end{cases}. \quad (2)$$

The examples of matrix projections “goals-works” are given in Table 1.

TABLE1 The example of the matrix projection of the “goals-works” of the second level

| Groups of works | The goals of the second level | | | | | | |
|-----------------|-------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | p_1^{GrTask} | p_2^{GrTask} | p_3^{GrTask} | p_4^{GrTask} | p_5^{GrTask} | p_6^{GrTask} | p_7^{GrTask} |
| W_1^{GrTask} | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| W_2^{GrTask} | 0 | 1 | 0 | 0 | 0 | 1 | 1 |
| W_3^{GrTask} | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| W_4^{GrTask} | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| W_5^{GrTask} | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| W_6^{GrTask} | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| W_7^{GrTask} | 0 | 1 | 0 | 0 | 0 | 0 | 1 |

By multiplying the obtained matrices $(R(P, W)$ and $R(P, S)$), the matrix can be calculated with the elements:

$$\|r(w, s)_{jk}\|, j = \overline{1, m}, k = \overline{1, t},$$

$$r(w, s)_{jk} = \begin{cases} 1 & \text{if the } j\text{-th work is done for the benefit of the } k\text{-th stakeholder} \\ 0 & \text{if the } j\text{-th work does not concern the benefit of the } k\text{-th stakeholder} \end{cases}. \quad (3)$$

that is

$$R(P, W) \times R(P, S) = R(W, S). \quad (4)$$

Some elements of this matrix have value “2”. This can be interpreted as the “double: interest of stakeholders in this group of works. Thus, the relationship between the elements “stakeholders-works can be assessed by a quality scale with a set of values $\{0, 1, 2\}$. This scale is comparable to the set of linguistic values {“irrelevant”, “average interest”, “significant interest”}.

3 Conclusions

Taking into consideration the fact that the project portfolio is complex and all its features cannot be fully described within the same structure, a set of interrelated portfolio models was developed and the content and sequence of their development were determined.

With the help of the developed relationship models, the works to be performed within the project to ensure the interests of individual (or many) stakeholders are defined. Analyzing the parameters of these works and matching them with specific stakeholders, the efficiency of project portfolio management can be improved. These structural models and matrix projections between them are the basis for building network models of a project portfolio management plan taking into account the interests of stakeholders.

The next step of the study is to quantify the degree of interest of stakeholders in the performance of relevant work. On the basis of assessments obtained, it is possible to manage the engagement of stakeholders at certain phases of the project portfolio life cycle.

References

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