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METHOD OF ROLE ASSIGNMENT BETWEEN PARTICIPANTS IN PROJECT MANAGEMENT TEAM USING THREE-DIMENSIONAL INFORMATION MATRIX OF ROLES

The analysis of existent methods, algorithms and approaches of distribution of responsibilities and work in project was made. The method of role assignment in project management team was produced, in which knowledge and experience of each team member is taken into account. The method is based on the method, which is presented in the previous article , but the difference is that the mark importance for each type of work is currently used, which are very useful during role assignment between the project management team participants. Essence of this method consists of three-dimensional information matrix of roles in the project management team creation, in which the importance coefficients of the marks foe each criteria, which are given to participant to fulfil each type of work is used. This can help to make role assigning process more correct.

Keywords: project team, team participant, project management team, preliminary role assignment matrix, improved role assignment matrix, three-dimensional information matrix of roles, criteria for managers evaluation.

Introduction

In our country the issue of the project quality is one of the most important issue in the project management. But the result of the project depends on the working of project team. That is why the problems which are connected with creation and working of project team are actual nowadays. The successful creation of project team and effective work of project team participant depends the project end-point.

During team creation it is necessary to take into account professional preparation, theoretical knowledges and readiness of project participant to discharge his obligations. This can be very helpful to distribute the responsibility in project tem correctly and to reduce the terms of the project.

1. A problem raising

The using of methods, algorithms and approaches of personnel management and personnel evaluation is given special attention, because this can improve the work of the project participants. There are 3 main approaches of personnel evaluation [1]: evaluation of employee qualification, analysis of employee work and evaluation of personal qualities. But all of this approaches are general to determine the level of employee knowledge. It does not take into account the peculiarities of the project, in which the employee will attend, and the requirements to employee according this project.

A lot of works are devoted to these problems. For example, Volkova K.A. [2] shows the method of responsibility distribution between different departments. Moskaleva A.V. [3] tries to distribute the responsibility between team participants and shows an algorithm, which helps to define the priorities of each type of work and give to the employee the work with the highest priority, when he gets free. Funtov V. N. [4] in his work proposes the method of distribution, which is based on responsibility matrix.

But in all of these methods and algorithms the knowledges and participants readiness to perform the work isn't considered

One more problem which should be solved here is to distribute the work between participant in such way that nobody in the team will stay without work. All of them will involve in the project with 100% and all types of work will be executed with 100%.

In this article the method, which will help to distribute the responsibility according the employee knowledges is performed.

2. The problem solving

To improve the work effectiveness of the project participants the list participants should be define and an organizational structure should be created. However, all structure, which are existed nowadays are presented 2 levels: the project manager and all other participants or, another way, managing team and performers. But in the current article the new structure is supposed to be used [5].

The idea of the structure is to mark the management team in the separate element. So it should be 2 levels of management (project manager and project management team) and 1 level of performance. This structure will help to create functional tasks and knowledges about the project. Except this structure can help to define the list of participants in the project management team, which will be used in the method creation of role assignment matrix in the project management team. The method is based on the method, which is presented in the previous article [5], but the difference is that the mark importance for each type of work is currently used, which are very useful during assigning of roles between the project management team participants.

The analysis of project management team participants competence and complexity of each type of work is supposed to be made. The method is useful to determine the initial level of each participant in the team and his readiness to do common management tasks, besides this approach is helped get to know is some work made partly.

The method consists of the following steps:

1. List of participant in the project team creation.
2. List of project works creation.
3. Set of marks determination for role assignment matrix creation in the project management team for each work.

4. Importance coefficients determination of these marks to do these works.
5. Coefficients of the importance of these estimates for the work.
6. Participants rating for doing each type of work.
7. Creation of preliminary role assignment matrix in project management team.
8. Conducting the normalization of matrix elements.
9. Creation of improved role assignment matrix in project management team.

In this method the main criteria for managers evaluation is used. Nowadays the main criteria for evaluation are [6, 7]:

- level of education;
- level of training, level of qualification;
- level of theoretical knowledge;
- production experience and practical knowledge;
- organizational and managerial capability.

Lets represent the set of marks, which are given to participants and the importance coefficients of these marks in the matrix (fig. 1), which is called three-dimensional information matrix of roles in the project management team.
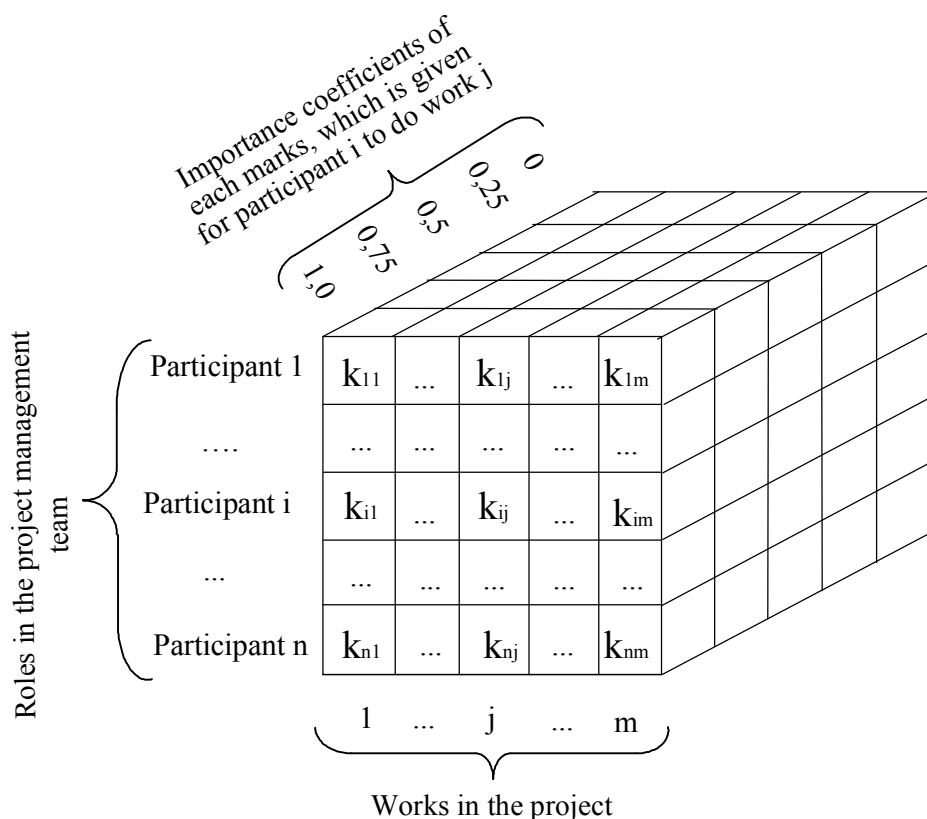

Fig. 1. Three-dimensional information matrix of roles in the project management team

Three-dimensional information matrix of roles in the project team, in which X axis − works in the project, Y axis − roles in the project management team, Z axis − importance coefficients of the marks foe each criteria, which are given to participant to do each type of work.

Set of marks k_{ij} for role assignment matrix in the project management team includes:

k_{ij}^1 − mark, which is given to i-th participant according his education to fulfil j-th work;

k_{ij}^2 − mark, which is given to i-th participant according his qualification to fulfil j-th work;

k_{ij}^3 − mark, which is given to i-th participant according his theoretical knowledge to fulfil j-th work;

k_{ij}^4 − mark, which is given to i-th participant according his experience and practical knowledge to fulfil j-th work;

k_{ij}^5 − mark, which is given to i-th participant according his psychological, organizational and managerial qualities to fulfil j-th work.

To create a preliminary role assignment matrix in the project management team complex marks should be offered and can be gotten by formula:

$$K_{ij} = \frac{\sum_{l=1}^{5}\left(k_{ij}^l \cdot koef^l\right)}{5}, \qquad (1)$$

where k_{ij}^l − marks for knowledge and skills of i-th participant to fulfil j-th work (they are presented before) and can be in the range $[0,1]$,

$koef^l$ − importance coefficients of the marks, which are given to i-th participant I to fulfil j-th work.

Marks for knowledge and skills of i-th participant to fulfil j-th work can be gotten by formula:

$$k_{ij}^l = \frac{O_{ij}^l}{\max O^l}, \ (l = \overline{1,5}), \qquad (2)$$

where O_{ij}^1 − mark, which is given to i-th participant, depending on how does his level of education correspond the reference level of education to fulfill j-th (five-point scale can be used for this purpose: 5- fully corresponding, 0 – not correspond at all) [8];

$\max O^1$ − highest possible mark of education;

O_{ij}^2 − mark, which is given to i-th participant, depending on how long did he take refresher courses in current area (five-point scale can be used for this purpose: 5- is participant took refresher courses in this yeas, 0 – didn't take refresher courses at all) [8];

$\max O^2$ − highest possible mark of qualification;

O_{ij}^3 − mark for theoretical knowledge of i-th participant to fulfil j-th work. The mark can be getten by using testing method, because the testing method is the most acceptable for managers [6];

$\max O^3$ − highest possible mark of theoretical knowledge;

O_{ij}^4 − mark, which is given to i-th participant, depending on experience and practical knowledge for current position (five-point scale can be used for this purpose: 5- if participant have experience more then 3 years, 0 – don't have experience in this area at all) [6];

$\max O^4$ − highest possible mark of experience and practical knowledge;

O_{ij}^5 − mark, which is given by experts to i-th participant according his psychological, organizational and managerial qualities (five-point scale can be used for this purpose) [9];

$\max O^5$ − highest possible mark of psychological, organizational and managerial qualities.

Complex marks set make preliminary role assignment matrix in the project management team $K = \left\| K_{ij} \right\|$ (table 1).

Table 1

Preliminary role assignment matrix in the project management team

Roles in the project management team	Works in the project				
	1	...	j	...	m
Participant 1	K_{11}	...	K_{1j}	...	K_{1m}
…	...	...	...	...	...
Participant i	K_{i1}	...	K_{ij}	...	K_{im}
…	...	...	...	...	...
Participant n	K_{n1}	...	K_{nj}	...	K_{nm}

The idea of developed method is in coefficients normalization of the matrix first with set of works in the projects (by rows), then with set of project management team roles (by columns).Normalization procedure is repeated until the sum of the rows and columns will be equal to 1 with a given degree of accuracy $\mu = 0,01$ [10]. New values describe the certain degree of employment between members in the project team and the percent of fulfilling each type of work.

Normalization procedure includes next steps:

1. First step of element normalization:

$$K_{ij}^{(1)} = \frac{K_{ij}}{\sum\limits_{j=1}^{m} K_{ij}}, i = \overline{1,n}, \qquad (3)$$

$$K_{ij}^{(2)} = \frac{K_{ij}^{(1)}}{\sum\limits_{i=1}^{n} K_{ij}^{(1)}}, j = \overline{1,m}. \qquad (4)$$

2. Step t of element normalization:

$$K_{ij}^{(2t-1)} = \frac{K_{ij}^{(2t-2)}}{\sum\limits_{j=1}^{m} K_{ij}^{(2t-2)}}, i = \overline{1,n}, \qquad (5)$$

$$K_{ij}^{(2t)} = \frac{K_{ij}^{(2t-1)}}{\sum\limits_{i=1}^{n} K_{ij}^{(2t-1)}}, j = \overline{1,m}. \qquad (6)$$

Normalization procedure is finished when system of inequalities is taken place:

$$\begin{cases} \left|1 - \sum\limits_{j=1}^{m} K_{ij}^{(2t)}\right| < \mu, \\ \left|1 - \sum\limits_{i=1}^{n} K_{ij}^{(2t)}\right| < \mu, \end{cases} \mu = (0,01). \qquad (7)$$

When the normalization procedure is finished the improved role assignment matrix in project management team can be created $K^N = \left\| K_{ij}^{(2t)} \right\|$ (table 2).

Thus this method can help to make the period of project shorter, because all members will know the areas, in which they should work and areas of all other members in the project and the participant works in the project will not cross between each other. The improved role assignment matrix demonstrates the level of project team member employment.

Conclusion

In the current article the analysis of methods, algorithms and approaches of distribution of responsibilities and work at the enterprise was made. Except this the method of role assignment in project management team was produced, in which knowledge and experience of each team member is taken into account, the result of this is creation of improved role assignment matrix.

Table 2

Improved role assignment matrix in project management team

Roles in the project management team	Works in the project				
	1	...	j	...	m
Participant 1	$K_{11}^{(2t)}$	...	$K_{1j}^{(2t)}$	...	$K_{1m}^{(2t)}$
...	...	...	...	...	...
Participant i	$K_{i1}^{(2t)}$	...	$K_{ij}^{(2t)}$	...	$K_{im}^{(2t)}$
...	...	...	...	...	...
Participant n	$K_{n1}^{(2t)}$	...	$K_{nj}^{(2t)}$	...	$K_{nm}^{(2t)}$

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МЕТОД НАЗНАЧЕНИЯ РОЛЕЙ УЧАСТНИКАМ КОМАНДЫ УПРАВЛЕНИЯ ПРОЕКТОМ С ИСПОЛЬЗОВАНИЕМ ТРЕХМЕРНОЙ ИНФОРМАЦИОННОЙ МАТРИЦЫ РОЛЕЙ

А.С. Губка, Н.Ю. Носова

Проанализированы существующие методы, алгоритмы и подходы распределения работ в проекте. Предложен метод назначение ролей участникам команды управления проектом, в котором учитываются знания и опыт каждого участника. Данный метод основан на существующем, предложенном в предыдущей статье. Суть метода состоит в создании трехмерной информационной матрицы ролей для команды управления проектом и выставлении коэффициентов важности определенного вида критерия для выполнения работ, что позволит сделать процедуру назначения ролей для выполнения проекта более точной.

Ключевые слова: команда проекта, команда управления проектом, предварительная матрица распределения ролей, усовершенствованная матрица распределения ролей, трехмерная информационная матрица ролей, критерии оценки руководителей.

МЕТОД ПРИЗНАЧЕННЯ РОЛЕЙ УЧАСНИКАМИ КОМАНДИ УПРАВЛІННЯ ПРОЕКТОМ З ВИКОРИСТАННЯМ ТРИВИМІРНОЇ ІНФОРМАЦІЙНОЇ МАТРИЦІ РОЛЕЙ

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Проаналізовано існуючі методи, алгоритми і підходи розподілу робіт у проекті. Запропоновано метод призначення ролей учасникам команди управління проектом з урахуванням знань і відповідної підготовки кожного учасника. Цей метод заснований на існуючому, який запропоновано у попередній статті. Суть методу полягає у створенні тривимірної інформаційної матриці ролей в команді управління проектом, та виставленні покажчиків важливості певного виду критерію виконання робіт, що дозволить зробити процедуру призначення ролей виконання проекту більш точною.

Ключові слова: команда проекту, команда управління проектом ,попередня матриця розподілу ролей, удосконалена матриця розподілу ролей, тривимірна інформаційна матриця ролей, критерії оцінки керівників.

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