

SELECTION METHOD OF THE PROJECT MANAGEMENT METHODOLOGY AND ITS APPLICATION

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Abstract – The task of selecting the methodology for managing a specific project is analyzed. The method, consisting of 2 stages, is suggested. At the first stage a project manager has to fill out a questionnaire. Based on the obtained results, a corresponding project management methodology is suggested. The second stage is devoted to evaluation of the work content of managing the project with the methodologies under study, the cost and risks of their application. Solution for the three-criterial optimization problem of selecting a methodology is suggested. An example of application of the method for selecting the methodology is provided for managing an IT project.

Key words: *project management, methodology, questionnaire, three-criterial optimization.*

I. INTRODUCTION

Before starting managing any project, the problem of choosing adequate methodology arises. Nowadays, there are plenty of project management methodologies, such as ISO 21500 standard, PMBoK, PRINCE2, P2M, RUP, Agile methodologies and many others.

The selection of the adequate project management methodology is a challenging issue as for project manager concerning an individual project, as well as for the whole company concerning managing all its projects. The selected project management methodology has a great impact on the personnel development programs, purchase of software necessary for managing the business, the set of business process, and even on the organizational structure of the company together with the department regulations and job descriptions.

In practice, project manager or company management do not always have a clear understanding of all existing variants of standards and project management methodologies, considering only limited number of options. In this case the specifics of the company or the project are not taken into account. The resolution of this

issue requires rather deep knowledge of a particular methodology or standard and the approaches to their selection.

The important factors, which should be considered while selecting a project management methodology, are described in the paper [1]. However, the practical application requires a method that is a set of processes and operations applicable for project managers with any level of expertise.

The objective of the paper is elaboration of the method for selecting the project management methodology for a specific project considering the different level of project manager's familiarity with existing methodologies, and its application for a software development project.

II. SUGGESTED METHOD

The method of selecting the project management methodology that consists of two parts is suggested. The first part is designed for the situations when the project manager and project team do not have a full knowledge of alternative project management methodologies and standards. As a rule, the project manager is familiar enough with one or two methodologies. The knowledge of all the others is rather superficial. In case the team does not have enough time and/or resources for studying alternative methodologies during managing a specific project, it is reasonable to use the existing recommendations about their application under specific practical circumstances. The first part of the suggested method serves exactly for accomplishing this purpose.

The given part is a questionnaire for a project manager. The initial variant of the questionnaire was presented in the paper [2]. In this paper the questionnaire was further developed. It consists of two parts. In the first part the short resume of the project is given (table 1). The second part is a set of fixed-choice questions (tables 2-6). They cover the areas of forming a project team, the level of its expertise, the choice of the means of communication and the ways of reporting, as well as the level of project manager's responsibility, the list of any possible risks and consequences in case of unsatisfactory

project outcome. The answers to the questions correspond to the scores on the scale from 1 to 4 depending on the level of detail of the project management processes, including the required frequency and thoroughness of the inspection of the project implementation processes. The lower is the score for the questionnaire or the theme blocks, the more control elements the corresponding methodology should include. The total score corresponds to the recommended methodologies, which are the most suitable for managing the project.

TABLE I. Brief Project Description

| Questions | Answers |
|-----------------|---|
| Project name | |
| Project scope | Main strategic project aim. Brief description of innovation/project |
| Project type | R&D, creation of new product (technology, service), creation of new manufacture |
| Project product | Brief description of the product, service, technology, innovation created in the project |

TABLE II. Project Team

| Questions | Possible answer | Score | Recommended methodology |
|--|---|-------|-------------------------|
| Customer's (investor's) experience of working with this project team | Has never worked with this team | 1 | PMBok |
| | Worked with some members of the team | 2 | PMBok |
| | Worked with the project team leader | 3 | SCRUM, PMBoK |
| | One or more common projects with the whole project team | 4 | SCRUM |

TABLE III. Evaluation of the Project Team's Expertise by the Project Manager

| Questions | Possible answer | Score | Recommended methodology |
|---|---|-------|-------------------------|
| Work experience in the given field | No work experience. | 1 | PMBok |
| | Experience of working in the field for less than 2 years | 2 | SCRUM*, PMBoK |
| | Experience of working in the field from 2 to 5 years | 3 | SCRUM |
| | Experience of working in the field for more than 5 years | 4 | SCRUM |
| Understanding of requirements, adapting ability, initiative | Almost do not understand the requirements; require frequent explanations and constant control | 1 | PMBok |
| | Understand the requirements, can follow them, but require regular control | 2 | PMBok |
| | Understand the requirements, can follow them, do not require regular control | 3 | SCRUM |
| | Have good understanding of the requirements; can follow them without regular control; can suggest better alternatives | 4 | SCRUM |
| Experience | Have never worked together | 1 | PMBok |

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|--|---|--|---------------|
| of cooperation | Worked together on the creation of a product, but in the different field | 2 | SCRUM*, PMBoK |
| | Worked together on the creation of one product in a field of interest. | 3 | SCRUM |
| | Worked together on the creation of several projects in the field of interest | 4 | SCRUM |
| | Knowledge of applied tools and methods | Tools and methods, applied in the given project, have never been used before and are unknown to the team | 1 |
| Tools and methods, applied in the project, are known to the team but have never been used before | | 2 | SCRUM*, PMBoK |
| Tools and methods, used in the project, are known to the team, but are rarely used | | 3 | SCRUM |
| Tools and methods are known to the team and have been widely used before | | 4 | SCRUM |
| Learning ability | It is hard for the team to learn new knowledge and technologies, and to adjust to changes | 1 | PMBok |
| | For some members of the team it is hard to learn new information and technologies, but the team can adjust to changes | 2 | PMBok |
| | Easily absorb new knowledge, can adjust to changes | 3 | SCRUM |
| | The team can easily absorb information, always tries to learn something new; can well adjust to the changes | 4 | SCRUM |
| Team's ability to clearly formulate and openly express ideas | Can't clearly formulate ideas and rarely express them | 1 | PMBok |
| | Can clearly formulate their ideas but rarely express them | 2 | PMBok |
| | Can clearly formulate their ideas and openly express them | 3 | SCRUM |
| | Can clearly formulate, openly express and justify their ideas | 4 | SCRUM |
| Ability to admit mistakes | Don't admit making mistakes and can't learn from them | 1 | PMBok |
| | Rarely admit their mistakes but try to never make them again | 2 | PMBok |
| | Openly admit making mistakes and try to never make them again | 3 | SCRUM |
| | Openly admit making mistakes and always learn from them | 4 | SCRUM |

TABLE IV. Reporting

| Questions | Possible answer | Score | Recommended methodology |
|--|--|-------|-------------------------|
| Means of communication | Written reports. Formal record-keeping | 1 | PMBok |
| | Voice communication (telephone connection, Internet-conference) | 2 | SCRUM* |
| | On-line communication (ICQ, E-mail) | 3 | SCRUM |
| | Direct communication (meetings, video conferences) | 4 | SCRUM |
| Frequency of reporting to the Customer | Reports on every operation | 1 | PMBok |
| | Reports on completing the blocks of work | 2 | SCRUM, PMBoK |
| | Reports on the readiness of a component of project's product | 3 | SCRUM |
| | Reports about project finish | 4 | SCRUM |
| Understanding the scope of works | There is a full list of works; further alternation is impossible | 1 | PMBok |
| | There is a detailed list of works, further alternation is possible | 2 | PMBok |
| | There is an approximate list of project works | 3 | SCRUM |
| | The team understands the project goal and several ways for its achievement | 4 | SCRUM |

TABLE V. Project Manager's Responsibility and Main Requirements to the Project

| Questions | Possible answer | Score | Recommended methodology |
|--|------------------------------------|-------|-------------------------|
| Consequences in case of unsatisfactory project outcome | Loss of life | 1 | PMBok |
| | Loss of irreplaceable sum of money | 2 | SCRUM*, PMBoK |
| | Loss of insignificant sum of money | 3 | SCRUM |
| | Loss of comfort in work | 4 | SCRUM |
| Project cost | More than 1 mln. \$ | 1 | PMBok |
| | From 300 thousand – 1 mln. \$ | 2 | SCRUM* PMBoK |
| | From 100 – 300 thousand \$ | 3 | SCRUM PMBoK* |
| | Less than 100 thousand \$ | 4 | SCRUM |
| Requirements to the project quality | Highest international requirements | 1 | PMBok |
| | International requirements | 2 | SCRUM*, PMBoK |
| | National requirements | 3 | SCRUM* |
| | Local requirements | 4 | SCRUM |
| Requirements to the realization period of the project | The period is unlimited | 1 | PMBok |
| | Not very urgent | 2 | SCRUM*, PMBoK |
| | Urgent | 3 | SCRUM |
| | Very urgent | 4 | SCRUM |

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|--|---|---|-------|
| Requirements to the precise compliance with a deadline | The deadline should be strictly met | 1 | PMBok |
| | Insignificant deviation from the deadline is allowed | 2 | PMBok |
| | Considerable deviation from the deadline is allowed | 3 | SCRUM |
| | Compliance with the deadline is not strictly required | 4 | SCRUM |

TABLE VI. Risks Probability

| Questions | Possible answer | Score | Recommended methodology |
|---|---|-------|-------------------------|
| Probability of occurrence of technical, manufacturing or qualitative risks | Risk will most probably occur (95%) | 1 | PMBok |
| | Risk is highly likely to occur (75%) | 2 | PMBok |
| | Probability of risk occurrence is equal (50%) | 3 | SCRUM* |
| | Risk is not likely to occur (10%) | 4 | SCRUM |
| Probability of occurrence of external risks (disruption of work by contractors, unfavorable political, economic situation in the country, market changes, etc.) | Risk will most probably occur (95%) | 1 | PMBok |
| | Risk is highly likely to occur (75%) | 2 | PMBok |
| | Probability of risk occurrence is equal (50%) | 3 | SCRUM |
| | Risk is not likely to occur (10%) | 4 | SCRUM |
| Probability of occurrence of organizational risks (disruption of funding, delivery of resources, inaccurate prioritizing, etc.) | Risk will most probably occur (95%) | 1 | PMBok |
| | Risk is highly likely to occur (75%) | 2 | PMBok |
| | Probability of risk occurrence is equal (50%) | 3 | SCRUM |
| | Risk is not likely to occur (10%) | 4 | SCRUM |
| Probability of occurrence of managerial risks (inefficient planning, controlling, communication problems, etc.) | Risk will most probably occur (95%) | 1 | PMBok |
| | Risk is highly likely to occur (75%) | 2 | PMBok |
| | Probability of risk occurrence is equal (50%) | 3 | SCRUM |
| | Risk is not likely to occur (10%) | 4 | SCRUM |

The cases, when application of the methodology is not stipulated by the situation but is still possible, are marked with the sign “*”. In the tables 1-6 the recommendations about application of two alternative methodologies – PMBoK and SCRUM – are given.

At this stage two existing methodologies, which are completely different in their approach to project management, have been analyzed. The choice of methodologies was stipulated by the intent to provide the most graphic example of application of two alternative approaches to managing a single project. On the one hand, it is the PMBoK Standard, which contains over 40 project management processes; and on the other hand – it is SCRUM, a framework methodology, which has been widely used for managing IT projects in Ukraine.

Based on the obtained recommendations, the project manager can choose the most reasonable methodology regarding the given project. The selection process can be rather difficult, especially when the scores for separate blocks of the questionnaire suggest different methodologies. In such case project manager should make a choice based on the majority of recommendations and his own preferences. If the methodology is being selected by the company management for several perspective projects, among these project the most standard ones should be considered. Then the questionnaire, which is the first part of the method, should be completed for all standard perspective projects.

The second part of the method is designed for the situations when the project team has sufficient knowledge of the alternative project management methodologies, and when it also has time and resources for evaluating the expenses and man hours regarding usage of each methodology as well the risks it may provoke.

The given part suggests the solution for the three-criterial optimization problem of selecting a methodology with regard to the constraints. The optimization criteria are: the work content of managing a project with the methodology under study; the cost of management, the risks related to managing the project with the methodology under study.

In the optimization process the constraints of the cost of the management processes and their labor intensity can be taken into account.

III. APPLICATION OF THE METHOD

The suggested method has been applied to selecting methodology for managing a software development project of forecasting and planning the organization development “ForPlan”. The given software is designed for solving problems, which may arise during the marketing analysis and strategic management on the level of a separate organization, corporation or field of economy. The software will include the well-known and well-established methods [3] such as:

- methods of forecasting nonstationary random processes with the use of H-criterion and boot-strap evaluation;
- method of optimization the perspective product prototype;
- method of the express-analysis of product’s competitiveness level;
- method of optimization of organization development plans.

With help of the developed questionnaire it has been determined that for managing this project by the specific team it is reasonable to use SCRUM methodology.

For each of the analyzed methodologies, the work content and cost of their application were evaluated.

The algorithm of work content and cost evaluation of a methodology consists of several stages.

1 Analysis of project management methodology – how the project is handled, which processes need to be completed, to what extent the project team members are involved into managing the project.

2 Creation of a list of project manager’s activities in terms of the given methodology. At this stage all processes, which may require involvement of the project manager both at the preparation stage, and during execution, have to be taken into account.

3 Calculation of project manager’s man-hours, required for managing the project.

4 Identification of the processes, which may require involvement of other project team members and to what extent it may happen. For example, reporting or development activities almost always require participation of not only the project manager, but the whole project team.

5 Calculation of each team member’s man-hours, required for managing the project.

6 Calculation of project management cost with the help of the following formula:

$$C_{PM} = PM_{hr} * PM_{mh} + \sum_{i=1}^m PMA_{hr_i} * PMA_{mh_i} + \sum_{j=1}^n TM_{hr_j} * TM_{mh_j}$$

where:

PM_{hr} – project manager’s hourly wage rate;

PM_{mh} – project manager’s man-hours;

PMA_{hr_i} – hourly wage rate of an i-th project manager’s assistant. An assistant can be represented by a business-consultant or any other professional, involved to managing the project;

PMA_{mh_i} – man-hours of an i-th assistant;

TM_{hr_j} – hourly wage rate of a j-th team member;

TM_{mh_j} – man-hours of a j-th team member.

The cost of management and work content were estimated for two alternative methodologies – SCRUM and PMBoK.

The cost of managing the project with SCRUM methodology is equal to 1200 US Dollars, and with PMBoK – 8 756 US Dollars. These amounts do not include the manufacturing expenses on software development itself.

Managing the given project with SCRUM requires 246 man-hours, with PMBoK – 2025,4 man-hours.

The sums of products of risks probabilities and their consequences for managing the project for “ForPlan” software development with SCRUM and PMBoK methodologies were evaluated. For SCRUM this sum is equal to 12,5, and for PMBoK – to 9,5.

As a result of comparison of management cost, work content and risks of managing the project for developing “ForPlan” software with the help of alternative methodologies, it has been decided that application of SCRUM methodology is more reasonable.

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