

Exploration of Project Cost Management Challenges Based on Process Approach ¹

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Abstract

Effective cost management is necessary to implement projects successfully. However, in practice organizations may face unique challenges that need to be addressed. To achieve this goal, the paper explores project cost management challenges, using survey responses from 51 managerial/senior-level staff on the open-ended questions connected to the project cost management processes. Data analysis, supported by process approach, was conducted with the use of systematic coding. The findings reveal that managing projects creates challenges, connected to the project cost management processes such as (1) cost management planning, (2) cost estimation, (3) cost budgeting, and (4) cost control. The research allowed for the discovery of a set of project cost management challenges, definition of their causes and effects, and development of possible countermeasures. Implications and recommendations for future research are given.

Keywords: Project cost management, Challenges, Process approach.

1. Introduction

In the last years the interest in project management has grown by a considerable amount. The field of project management seems to be expanding, and the growing importance of project work in the global economy supports this trend (Harvey & Aubry, 2018). However, many researchers agree that managing projects is a complicated and challenging task (e.g., Niederman et al., 2018; Amer, 2020; Kahvandi et al., 2018). Project managers face various challenges every day, which despite the distinct characteristic of projects, appears to be common (Walkowska, 2020). New studies on this topic are developed every year, but there is still a lack of attention given to project management challenges (Patil, 2016).

Mossalam (2018) states, that it is almost impossible for a project to be delivered smoothly without facing any obstacles and issues during its lifecycle from its concept till closure. This topic of “project issue management” seems to be inevitable, but still, it did not attain the necessary attention neither in the literature nor in the project management standards or use in practice.

The true challenge lies in not being absolutely sure when and how the risks are going to show themselves (Sachan et al., 2016). The high level of uncertainty makes it impossible for managers to forecast all the risks (unknown unknowns) and prevent all the problems connected to the teams, levels of motivation, and organization of work (Raydugin, 2014).

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The demand for professional expertise in project management appears to be rising without a sign of stopping, which is caused by the progressive complication of environmental processes and the functioning of various organizations together with developing issues through the execution of the projects (Bukłaha et al., 2016).

Equally with the scope, time and quality project cost management is one of the most important areas of PMBOK® Guide. Project costs are connected to all activities or resources in a project (Da Silva & de Oliveira, 2017). The project cost management profession is not widely recognized in society compared to professions such as architects and engineers, and it still faces plenty of challenges on the way of informing the society of the benefits that project cost management delivers to projects (Smith, 2014).

A project is a one-time and temporary affair, where planning and budgeting are based on estimations (Kwon & Kang, 2019). Despite the fact that tools and methods to account for uncertainty are introduced, projects with cost overruns are still a common occurrence (Torp & Klakegg, 2016). Researchers have studied the sources of cost overruns and created solutions to prevent them from happening in different countries and in a variety of ways. The said study also mentions that inaccurate cost estimation and uncertainties are the main causes of cost overruns (Kwon & Kang, 2019).

The practical challenges of effective project control are not widely recognized, and a deeper understanding of the routine practical problems that obstruct project cost control from the perspective of practitioners must be provided (Olawale, 2020). The implementation of modern cost management processes would definitely boost the progress prospective to keep up with challenges facilitated by current business environment (Annapoorna & Kumar, 2019).

According to Kembro et al. (2017), a challenge reflects a complicating factor, which has a high possibility to be solved or overcome. Monyane et al. (2018) stated that cost management challenges manifest through “dissatisfactions” which are connected to either the lack of expenditure of the budget or its over-expenditure. In this research we define cost management challenges in a similar way – as “problems”, “dissatisfactions” or “matters of difficulty” that can influence the effectiveness of project cost management.

Many studies were dedicated to identifying project cost management challenges in various projects, yet to the best of our knowledge, none of them have applied process approach to investigate such challenges, and coherent knowledge was also not developed to a necessary degree, which led to an insufficient amount of solutions to use in the industry.

This study aims to respond to this knowledge gap and takes a theoretically informed approach to create an understanding of project cost challenges through the following research question:

Employing process approach, what challenges exist in project cost management, and what are the possible reasons for their appearance?

The focus group consists of Russian managerial managerial/senior-level staff involved in project management. A discussion of theoretical and practical implications can be found in Section 8 below.

2. Literature Review

Project success is affected by a variety of factors, outside the control of project management. It relies on project management success and the success of the end-product. Although it is important to note that the term “project success” is difficult to define. Its meaning is still vague, to the point that the literature on project management does not reach a broader agreement on its definition and measurement, which makes the achievement of such only more difficult (Ika, 2009; Al-Hajj & Zraunig, 2018).

Project success is a subjective measure, which has no relation to the individual success criteria and factors. Among the surveyed projects none show the achievement of project success, without applying project management tools and techniques (Al-Hajj & Zraunig, 2018). Moreover, the understanding of success can change according to the profile of the organization, the project, and the stakeholders (Takagi & Varajão, 2019).

It is absolutely important to make sure that any project guarantees its feasibility and outcome that fits the needs of the customer without facing any challenges that might create chaos and cause havoc in the project (Sachan et al., 2016; Walkowska, 2020). One of the fundamental challenges for project management is to find the balance of time, cost, and quality. As a result, project success is heavily influenced by whether it is possible to achieve these three major components (Kahvandi et al., 2018; Amer, 2020). Management has to understand these challenges in advance and be ready to take them on as and when they emerge with proper preparations made on how to resolve these challenges and do it in an effective and time-optimized manner (Sachan et al., 2016).

In recent years many researchers studied project management challenges both on an international level, e.g., Al-Hajj & Zraunig (2018); Amer (2020); Isern (2015); Patil (2016); Parizotto et al. (2020); Teubner (2018); Walkowska (2020); Zhang et al. (2015), and on a level of particular countries and regions, e.g., Bukłaha et al. (2016); Ekanayake et al. (2019); Kahvandi et al. (2018); Luucky et al. (2014); Ray et al. (2019); Saukko et al. (2020).

Cost management forms one of the vital parts of project management (Annapoorna & Kumar, 2019). Effective cost management is crucial to achieve the investment made by the sponsor of the project and to prevent project from failing. Even so it is often challenging to control cost and time effectively in practice (Hanid et al., 2011; Olawale, 2020).

The management and control of costs is crucial to most projects, but it is also important to pay careful attention to cost overruns in projects that often occur all over the world. The cases of budget blowouts on large projects around the world that amounted to hundreds of millions and billions of dollars have raised concerns and attention at all levels of society (Doloi, 2011; Smith, 2014).

Different approaches have been developed, which paid the necessary attention to uncertainty in the cost estimation, budgeting, and cost control processes to respond to the dynamic nature of projects. The lack of all needed information about the future appears due to uncertainty, and the assumptions we make today may not come to be true as the project progresses. Even so, the implementation of these approaches helped reveal some challenges (Torp & Klakegg, 2016).

There is a substantial amount of modern publications dedicated to project cost management challenges, and the overwhelming majority of them concern only the certain types of projects, most of which are related to the construction industry, e.g., Derakhshanlavijeh & Teixeira (2017); Doloi (2013); Faten Albtouch et al. (2020); Hanid et al. (2011); Hatamleh et al. (2018); Kwon & Kang (2019); Media (2016); Monyane et al. (2018); Olawale (2020); Sinesilassie et al. (2018); Smith (2014); Torp & Klakegg (2016).

The construction projects tend to have a variety of cost management challenges, such as changes in design, inaccurate estimation of project duration, risk and uncertainty, poor performance of subcontractors and suppliers, and complexity of works (Olawale, 2020); inaccurate cost estimations, inadequate planning, repeated design changes, the lack of labor availability, inflated costs of machinery, labor, raw materials and prices of transportation (Derakhshanlavijeh & Teixeira, 2017); design changes, lacking management in the site, delays in progress payment by the owner, changes in material price (Faten Albtouch et al., 2020); slow estimating, lack of organization in the bidding process, inability to benchmark estimates, implementation of systems that are resistant to changes, and limited office-jobsite visibility (Media, 2016).

Torp & Klakegg (2016) identified cost management challenges in the project that concerned decommissioning of a nuclear power plant, including uncertainty in the process of decision making, misjudgment of uncertainty in cost estimates, the human challenge, and the “lost opportunities” challenge.

Many researchers, e.g., Adoko et al. (2016); Issa (2010); Ramasubbu & Balan (2012) studied cost management challenges in software development projects. For instance, Issa (2010) identified such challenges as inefficiency in planning, insufficient documentation, funding and budgeting, scarcity of useful resources and statistics, inefficiency in utilization of existing systems, lack of training, low salaries of public employees, and lack of engagement of top-management.

Kujala et al. (2014) analyzed challenges of managing costs in projects of different levels of complexity, and this study has shown several challenges in performing a variety of cost management functions connected to cost estimation, cost control and monitoring, revenue recognition, margin definition, and profitability analysis. Authors highlight that cost management is influenced by the large size, level of complexity, uncertainty, and uniqueness of projects.

The lack of attention paid to cost management challenges that appear in various types of projects, as well as the fact that the systematic approach was not implemented to analyze these challenges allowed the authors to apply process approach to study cost management challenges in a broad selection of projects of different sizes and levels of difficulty. The definition and reasoning behind the application of process approach in the study can be found in Section 3.

3. Theoretical Framework: Process Approach

Every organization uses processes to achieve their objectives (ISO, 2015). The process approach, which has become a vital component of managerial practice in the company in recent years, highlights the business processes. Concentrating on processes and making them better in companies is a work to increase the quality of response to changing customer requirements and to provide new opportunities that will help increase the performance and competitiveness of businesses (Papulova, 2020).

A process is defined as a set of interrelated or interacting activities that use inputs to create a specified result. The process approach describes the organization's processes to work as an integrated and complete system and can be used in any organization and any management system with no relation to type, size, or complexity (ISO, 2015). Generally, process theory serves to explain and create an understanding of how particular outcomes appear from a sequence of actions and events, taking into account specific inputs (Niederman et al., 2018).

Project management is standardized to a large extent, as shown by the well-known bodies of knowledge and the ISO standard (Harvey & Aubry, 2018; Stellingwerf & Zandhuis, 2013). The idea to consider processes as the center of the integration and synthesis of knowledge is apparent in the PMBOK® Guide (Niederman et al., 2018), which postulates that project management is executed through the proper application and integration of logically grouped rational and predictable project management processes that apply world-wide to various industries (PMI, 2017; Sergi et al., 2020).

Every project management process creates one or more outputs from one or more inputs by implementing necessary project management tools and techniques. Processes may incorporate overlapping activities that happen throughout the project. The amount of process iterations and interactions between processes depends on the needs of the project (PMI, 2017).

Project management processes are arranged into the five project management process groups: initiating process group, planning process group, executing process group, monitoring and controlling process group, and closing process group. Project management processes are grouped based on knowledge areas as specified areas of project management that are expressed in terms of the component processes, inputs, outputs, practices, etc. (PMI, 2017).

Project cost management, one of the knowledge areas, involves the following processes: cost management planning, cost estimation, cost budgeting, and cost control. These processes are interrelated and interact with processes in other knowledge areas. Sometimes, cost estimating and cost budgeting processes are strongly linked and can be considered to be a single process that can be implemented by a single person over a relatively short time period (PMI, 2017).

This discussion allowed us to argue that a process approach provides a strong underpinning to systematically identify challenges related to project cost management processes because of its focus on activities, interrelations and interactions between them, the resources needed, the responsibilities and authorities required, and the intended outputs (results of a process). Therefore, this approach was chosen and adopted for this study.

4. Research Methodology

4.1 Research Method

The design of the research required a large-scale data collection from the experts in project management using a survey that comprised both qualitative and quantitative questions. We used the qualitative part to obtain responses to the open-ended questions about project cost management challenges and display the results in this study. This approach is consistent with the approach that was used in prior studies (e.g., van den Heuvel & Bondarouk, 2017).

We designed a survey that consists of different types of questions, including multiple-choice and open-ended ones. The questionnaire aimed to collect detailed information on respondents' profiles, including their job title, core duties, work experience, organizational size, and industry type as well as the information related to the projects considered in the survey. The questionnaire also provided the respondents with the open-ended questions that inquire about their opinion on project cost management challenges (Kaminsky, 2021). The application of the open-ended questions allowed the respondents to leave flexible responses, which in turn prevented them from providing preconceived replies.

We asked the respondents the following questions:

Q1. Please indicate the project cost management challenges you faced in the process of execution of any project in your organization.

Q2. Please define the main reason or reasons for the appearance of these challenges.

The open-ended questions are consistent with process approach, as shown in the theoretical underpinning section, and that allowed us to ask them in relation to each of the cost management processes: (1) cost management planning, (2) cost estimation, (3) cost budgeting, and (4) cost control. Therefore, respondents were prompted to complete a survey of 8 open-ended questions. To make a proper comparison every respondent was asked to analyze one finished project, which was implemented based on traditional project management approach, that is consistent with that of prior studies (e.g., Ekanayake et al., 2019).

All other questions (including the multiple-choice and open-ended questions) do not share any relation with project cost management challenges, and therefore, do not have any connection with the results demonstrated here. For this reason, in this study we explained and analyzed the answers, that the respondents gave to the separate open-ended questions on the topic of project cost management challenges.

4.2 Sample Selection and Data Collection

Because the investigated problem involved specialized expert knowledge, we implemented purposive sampling to identify possible respondents. This approach allowed us to connect with respondents who could provide a deep and knowledgeable perspective (Patton, 1990).

The participants were invited in local seminars and meetings organized by, among others, Russian Project Management Association SOVNET and some Russian universities to participate in this research.

In total, we collected 51 responses. We found this sample size appropriate because it allowed us to have a large amount of data from knowledgeable respondents for qualitative content analysis. The high quality of data received soon became obvious from the wide variety of challenges named by these respondents.

The respondents were from Russia and included a variety of professionals engaged in project management. 42 out of 51 respondents answered our questions on project cost challenges.

This selection can be compared, for example, with the sample of Faten Albtoush et al. (2020) of 41 respondents; other studies had a comparable number of samples (e.g., Ameh et al., 2010; Olawale, 2020). Having a wide selection of respondents with a different amount of experience, most of which are currently working in predominantly senior positions, was a big advantage when trying to find new insights in an area with limited research.

4.3. Data Analysis

We implemented a qualitative content analysis technique to study data received through gathering responses to the open-ended questions (Hsieh & Shannon, 2005), which were also used in the earlier studies (e.g., Ninan et al., 2020). First, we checked whether our data are complete or not. Out of the 51 respondents 9 did not provide responses to the open-ended questions so the response rate was 82%.

It means that we had 42 completed responses to analyze. Because the questions were of an open-ended nature and not quantitative, we decided that having 42 responses still provided us with enough data for high-quality content analysis; missing data appear to be more of an issue when the data are quantitative.

In the initial stages of analysis, we concentrated our efforts on building a “themes and subthemes” structure for key problems found in data. To achieve that, we implemented the directed content analysis approach suggested by Hsieh and Shannon (2005). We read all 42 suitable responses and developed initial themes and subthemes (Hsieh & Shannon, 2005), that lie within the theoretical basis of process approach.

Firstly, we coded challenges related to one main theme, “Project cost management challenges”. Then, we carefully read and understood respondents’ comments, and grouped classified

challenges into 38 subthemes under the main theme, such as “repetitive information”, “irregular control”, and “incorrect data transferring”.

We then arranged these subthemes into themes of high order. In the result of the analysis, we created a hierarchy of 38 subthemes within 12 higher-order themes, such as “Incompleteness of the cost management plan” and “Delays in the development of the cost management plan”, which correspond with process approach. The initial coding and refinements can be found in Table 1.

Table 1. Themes and subthemes coding aligned with processes approach

Initial coding	Refined coding leading to development of sub-themes	Project cost management processes	Final coding presenting main and sub-themes structure	Total number of references
Incomplete nature of the cost management plan	Incompleteness of the cost management plan	Cost management planning	Cost management planning Incompleteness of the cost management plan Inadequate quality of the cost management plan Delays in the development of the cost management plan	30
Insufficient level of detail				
Information deficit of the cost management plan				
Lacking size of the document	Inadequate quality of the cost management plan			
Incorrect information				
Incoherent nature of contents				
Poor structure of the document	Delays in the development of the cost management plan			
Repetitive information				
Late start of document development				
Prolonged duration of document development	Delays in the development of the cost management plan			
Delays connected to the review and approval procedure				
Mistakes in cost estimation of certain activities		Incorrect cost estimation	Cost estimation	25
Incorrect application of parametric estimation				
Incorrect application of analogous estimation				
Absence of contingency reserves	Incorrect contingency reserves			
Mistakes in allocating contingency reserves				
Limited range of activities with allocated contingency reserves	Inadequate budget quality	Cost budgeting	Cost budgeting Inadequate budget quality Delays in developing budget	28
Mistakes in budget development				
Insufficient level of budget specification				
Unrealistic management reserves				
Incorrect identification of the project’s funding sources	Delays in developing budget			
Extending the planned duration of budget development				
Additional time spent on correcting the budget				
Delays in budget review and approval	Exceeding the planned budget	Cost control	Cost control	51
Going beyond the planned cost of certain activities				

Going beyond the planned cost of project phases			Exceeding the planned budget Late or irregular project cost control Inadequate quality of cost management control Delays in providing the work performance data Incorrect work performance data
Going beyond the total planned project cost			
Delays in project cost control	Late or irregular cost control		
Irregular control			
Decrease in quality of cost management control in the process of execution of the project	Inadequate quality of cost control		
Incompleteness of control procedures			
Superficial control			
Poor quality of documentation of control results			
Late provision of the work performance data	Delays in providing the work performance data		
Irregular updating of the project status			
Incorrect data transferring	Incorrect work performance data		
Falsified data transferring			
Irrelevance of work performance data			

Then, we studied the coded data under each theme and subtheme further to find similarities, differences, and patterns to interpret them. For example, the final version of the section titled “Incompleteness of the cost management plan” includes the following problems: “incomplete nature of the cost management plan”, “insufficient level of detail”, “information deficit of the cost management plan”, and “lacking size of the document”. This approach to data coding complies with that of earlier studies (e.g., Hsieh & Shannon, 2005; Ninan et al., 2020). The Analysis of Results section demonstrates the findings in detail.

We did our best to make the results as reliable and valid as possible. First, respondents had a high level of knowledge of project management and their reports were supported by data from different types of projects. Second, after one of the authors analyzed the data, other authors independently checked the coding and proposed some improvements. This process allowed the authors to recode the data to some extent until they reached a consensus on the naming of themes. Third, systematic, detailed, and replicable data coding allowed for high reliability and validity of findings. The coding and analysis provided is in line with the studies that were published recently and in a similar context (e.g., Ninan et al., 2020).

5. Analysis of Results

The results of the analysis are presented in Table 2. As stated before, they are consistent with process approach based on the PMBoK® Guide.

Table 2. Summary of project cost management challenges and possible countermeasures

Identified challenges	Causes of the challenges	Suggested countermeasures
1. Cost management planning		
1.1. Incompleteness of the cost management plan	(1) Insufficient amount of time spent on planning, (2) unnecessary formality in planning, (3) mistakes in authority delegation, (4) lacking amount of information about the project, (5) excessive workload of project team members on other projects.	Regulating the duration of the project cost management plan development; application of lessons learned; improving project prioritization.
1.2. Inadequate quality of the cost management plan	(1) Inadequate quality of planning, (2) short deadlines for planning, (3) incompetence of the project manager, (4) insufficient coordination with project stakeholders in the process of document development, (5) high level of project innovation.	Involvement of experts; raising qualifications of the project manager; improvement of project communication.
1.3. Delays in the development of the cost management plan	(1) Low priority of the document development, (2) a large number of parties involved in the reviewing process, (3) excessive bureaucratization of the approval procedure.	Regulating the duration of the project cost management plan development; optimization of its review and approval procedure.
2. Cost estimation		
2.1. Incorrect cost estimation	(1) Poor data analysis in cost estimation, (2) difficulties that prevent the objective estimation, (3) lack of knowledge of corporate financial planning software.	Providing trainings on corporate financial planning software; application of the expertise of project team members.
2.2. Incorrect contingency reserves	(1) Limited knowledge of project scope, (2) lack of risk analysis, (3) unfounded optimism that the project manager shows concerning the assessment of contingences.	Involvement of a risk manager; implementation of lessons learned.
3. Cost budgeting		
3.1. Inadequate budget quality	(1) Shortage of time allocated to planning, (2) formal attitude towards development of a budget, (3) high level of project complexity, (4) lack of necessary flexibility in planning, (5) incorrect aggregation of project cost estimates.	Implementation of financial planning software; application of the expertise of the employees in financial departments.
3.2. Delays in developing budget	(1) Difference in location between project team members, (2) changes in the project scope made by the customer in the process of planning, (3) extensive amount of time dedicated to identifying the funding sources.	Employment of remote work technologies; recording the accountability of the customer for any changes in the project scope; optimization of project review and approval procedure.
4. Cost control		
4.1. Exceeding the planned budget	(1) Low quality of planning, (2) ineffective project management, (3) late project implementation, (4) untimely financing.	Improving project management system; optimization of project review and approval procedure; identification of alternative funding sources for the project.
4.2. Late or irregular project cost control	(1) Lack of feedback from project team members, (2) shortage of time of the project manager to do control regularly, (3) project team members being in different time zones, (4) a large number of parties involved in the approval of project changes.	Motivating team members to leave feedback; improving communication between project team members; regulating the number of parties involved in the approval of project changes.
4.3. Inadequate quality of cost management control	(1) Ineffective project progress monitoring system, (2) lack of specialized software, (3) high workload	Improving project monitoring system; organizing real-time project control: video monitoring, etc.;

	of the project manager on other projects, (4) lacking qualifications of the project manager.	prioritizing the ongoing projects; increasing qualifications of the project manager.
4.4. Delays in providing the work performance data	(1) Poor quality of reporting, (2) remote character of work of project team members, (3) high workload of project team members outside the project.	Regulating the reporting system; implementation of remote work technologies; motivating project team members to update the work performance data in a timely manner.
4.5. Incorrect work performance data	(1) Ineffective system to collect and control work performance data, (2) subjectivity in the estimation of the work progress, (3) project team members purposefully omitted or falsified work performance data, (4) formal attitude of project team members towards the process of updating the project status, (5) delays in monitoring the current project status.	Improving system to collect and control work performance data; regulating the process of estimation of the work progress; motivating project team members to duly update work performance data.

5.1 Cost Management Planning

5.1.1 Incompleteness of the cost management plan

The results of the analysis show that cost management planning is missing certain aspects, which makes us address its incompleteness to be one of the key challenges of project cost management in general. This challenge can be presented in different forms – it includes the incomplete nature of the plan itself, insufficient level of detail, information deficit, and the lacking size of the document.

One of the main causes of incompleteness of cost management planning was said to be the insufficient amount of time spent on planning (respondents 9, 16, 24, etc.), which could have also been a consequence of existing time limitations inside the project team caused by the excessive workload on other projects (respondents 7, 23, 42). Quoting the respondent 23:

Team members experience excessive workload on other projects, which in turn leads to them carrying out cost management planning in a highly limited way.

Respondent 19 stated the negative consequences of authority delegation as the root of the problem:

The project manager delegated the task to other project team members, and they did not complete it adequately.

Respondent 33 pointed out unnecessary formality, while respondent 24 accentuated the lacking amount of information about the project, which led to the development of a flawed cost management plan with many missing aspects.

5.1.2 Inadequate quality of the cost management plan

The lack of quality of the document is another challenge that appears in cost management planning. It can be presented in the form of incorrect and repetitive information, the incoherent nature of contents, and the poor structure of the document.

The most widespread cause of the challenge seems to be the inadequate quality of cost management planning (respondents 10, 17, 20, etc.) Respondent 10 put emphasis on short deadlines:

Extremely short deadlines lead to a variety of different problems including low-quality documentation, which regulates project cost management.

For respondents 11 and 31 the reason appeared to be the incompetence of the project manager, while respondents 3 and 33 indicated it to be the limited experience in creating a cost management plan. According to respondents 2 and 9, the low quality of the plan is caused by the insufficient level of coordination with project stakeholders in the process of document development. Respondents 29 and 40 pointed to the high level of project innovation and great uncertainty in its environment.

5.1.3 Delays in the development of the cost management plan

Delays in the development of the cost management plan were deemed to be another challenge in cost management planning. These delays include the late start, the prolonged duration of document development, and delays connected to the review and approval procedure.

They were caused by the low level of priority assigned to the development of the document (respondents 13, 31), a large number of parties involved in the reviewing process (respondent 15), and the excessive bureaucratization of the approval procedure (respondents 12, 26).

5.2 Cost Estimation

5.2.1 Incorrect cost estimation

According to the respondents, one of the main challenges that exist in project cost estimation is incorrect cost estimation. That includes mistakes in cost estimation of certain activities and incorrect application of parametric and analogous estimation.

Cost estimation can be inadequate in several cases. It can happen if the cost was estimated roughly, without doing proper analysis before giving the final estimate (respondent 14). Inadequate estimation can also be done due to difficulties that prevent the objective estimation (respondents 20, 25, 34, etc.) Some participants have also mentioned the difficulties that exist in the estimation of the competence of project team members, which in turn facilitates the appearance of new obstacles in estimation of human resources costs (respondent 8), the cost of components necessary

to produce the project's end product (respondent 28), and the cost of equipment and contract costs (respondent 18). The other reason can be the lack of knowledge of corporate financial planning software (respondents 4, 16) and the inability to properly use it (respondent 33).

5.2.2 Incorrect contingency reserves

The next challenge lies in the incorrect contingency reserves. The study shows that incorrectness is represented in their total or partial absence, mistakes in allocation and limited range of activities with contingency reserves. It was caused by several factors – the lack of risk analysis (respondents 27, 41), poor risk management skills (respondents 24, 35), and the difficulty of making an accurate forecast (respondents 3, 13, 18, etc.) Respondent 3 stated:

The fluctuations of the exchange rate between the dollar and the national currency were not taken into consideration, which led to equipment expenses rising by 30%.

The participants have also mentioned other reasons which can lead to contingency reserves being improper. They named the limited knowledge of project scope (respondent 17), which appears partly due to the poor understanding of specifics of the project (respondents 20, 26), and the unfounded optimism that the project manager shows concerning the assessment of contingencies (respondent 40).

5.3 Cost Budgeting

5.3.1 Inadequate budget quality

Another challenge that concerns budget development is the inadequate level of the quality of the budget. It manifests in a variety of ways – mistakes in budget development in general, insufficient level of budget specification, unrealistic management reserves, and the incorrect identification of the project's funding sources.

The participants indicated the shortage of time allocated to planning (respondents 1, 10, 21) and developing a realistic budget (respondent 5) to be the source of the problem. The process of budget development is also said to be too formal (respondent 6), lacking the necessary flexibility and level of detail in planning (respondents 3, 30, etc.) Respondent 42 stated the following:

The process of budget development involved “rough” project cost estimation procedures without further cost specification.

Respondents 23, 40 stated that the high level of project complexity leads to inaccurate project cost forecasts, while respondent 40 called the incorrect aggregation of project cost estimates to be at fault.

5.3.2 Delays in developing budget

Delays in budget preparation is another challenge that concerns cost budgeting. It includes extending the planned duration of budget development, additional time spent on correcting the budget, and delays in budget review and approval.

The delays appeared because of the difference in location between project team members (respondents 6, 15, 39) and the difficulty of organizing the working process between project team members in different time zones (respondents 5, 30). The participants also stated other reasons, such as changes in the project scope made by the customer in the process of planning (respondent 34) and an extensive amount of time dedicated to identifying the funding sources (respondents 1, 14, 35, etc.)

5.4 Cost Control

5.4.1 Exceeding the planned budget

The first challenge of project cost control is exceeding the planned budget. It includes going beyond the planned cost of certain activities, project phases, and the total project cost.

Some participants (respondents 7, 12, 39, etc.) deem the low quality of planning, which is linked to the inadequate assessment of project risks (respondents 21, 37), to be the root of the problem. Respondent 37 mentioned:

If the project manager had paid more attention to risk analysis on the planning stage, he would have been able to prevent problems which led to exceeding the project budget.

Moreover, a large part of the participants (respondents 16, 22, 31, etc.) believe that the problem lies in the ineffectiveness of project management. That leads to inadequate project cost management (respondents 2, 6, 28) and ineffective project procurement (respondents 22, 38). The budget was said to be exceeded due to the late project implementation (respondent 32) and its untimely financing (respondent 17).

5.4.2 Late or irregular cost control

The second challenge is the late or irregular project cost control. This was caused by the lack of feedback from project team members (respondents 21) and the late reporting (respondent 31). Respondent 31 said:

Project participants failed to complete the project reporting in time, and that caused them to spend twice the amount of time on reporting later.

Respondents 4 and 13 stated that due to the lack of time of the project manager, control was done irregularly and that negatively affected the speed of decision making. The participants have also listed other reasons – irregular control happened because of project team members being in

different time zones (respondent 26) and a large number of parties involved in the process of approval of project change requests (respondent 19).

5.4.3 Inadequate quality of cost control

The third challenge is the inadequate quality of project cost control, which extends to the incompleteness and superficiality of cost control, the poor quality of documentation of control results, and decrease in quality of cost control in the process of execution of the project.

Respondents 5 and 8 stated that the inadequate quality of cost control was caused by the ineffectiveness of the project progress monitoring system. Respondent 5 further defined the problem:

At least in half of the cases, monitoring and control were conducted remotely or delegated ineffectively.

Respondents also named other reasons – high workload of the project manager on other projects (respondents 5, 9, 11, etc.) and the lack of specialized software (respondents 6, 38). In addition, the participants of the survey have said that the lacking qualifications of the project manager (respondents 3, 15, 31) and the limited experience in project management could have also been the cause of the problem (respondents 8, 27).

5.4.4 Delays in providing the work performance data

The next problem of project cost control lies in the late or irregular update of the project status. Most of the participants (respondents 1, 4, 20, etc.) deem the lack of an effective reporting system to be the cause of the problem. Respondent 20 said:

Some project team members did not report properly due to their poor knowledge of the project management information system.

Respondent 29 stated that the work of project team members was conducted remotely, which led to the delays in providing updated work performance data, while respondents 10 and 41 pointed to the high workload of project team members outside the project.

5.4.5 Incorrect work performance data

The last discovered problem of cost control was wrong reflection of the work progress, which extends to incorrect and falsified data transferring, and the irrelevance of work performance data.

Respondent 22 supposed that it was caused by the absence of an effective system to collect and control work performance data, which, according to respondent 3, made the estimation of the work progress become subjective. Respondents 9 and 18 said that the project team members purposefully omitted or falsified some work performance data. Respondent 18 stated:

Some project team members omitted parts of information to protect themselves against the possible sanctions from the project manager.

Respondent 36 pointed to the formal attitude of project team members towards the process of updating the project status, while respondents 3, 39 named the delays in monitoring the current project status.

6. Discussion and Conclusion

In this study we have investigated project cost management challenges based on process approach in relation to the following processes: cost management planning, cost estimation, cost budgeting, and cost control.

Proficient planning is an essential part of a successful project (Serrador, 2013). Our analysis shows that project cost management planning comes with a substantial amount of challenges. PMI (2017) defined cost management planning process as characterizing how the project costs will be estimated, budgeted, managed, monitored, and controlled. The main output of this process is the cost management plan, where cost management processes, and their associated tools and techniques are documented.

Incompleteness and lack of quality of the cost management plan can reduce its effectiveness, which can lead to the exceeded project budget, while delays in the development of cost management plan can negatively affect the start of the following cost management processes and extend the project duration. The analysis results allow us to propose the following measures necessary to reduce or mitigate these challenges – application of lessons learned, improving project prioritization, involvement of experts, raising qualifications of the project manager, improvement of project communication, and optimization of the project cost management plan review and approval procedure.

Cost estimation plays a crucial role in project planning (Torp and Klakegg, 2016). Despite the tremendous improvements in project cost estimating methodologies and their wide distribution, project cost estimate accuracy persists as a vital challenge of project management (Friedman, 2009).

Cost estimation process is intended to develop an approximation of the cost of resources required to finish the project work. The main output of this process is cost estimates that are a quantitative assessment of the likely costs of resources needed to carry out the activity (PMI, 2017). It is necessary to provide comprehensive information, expand the level of knowledge, involve experts with a considerable level of expertise, and make continuous improvements to achieve accurate cost estimation (Hatamleh et al., 2018).

Incorrect cost estimates and contingency reserves can lead to the creation of unrealistic project budget, inaccurate project funding requirements, and cause cost overruns. To deal with such challenges organizations can provide trainings on corporate financial planning software, application of the expertise of the project team members, involvement of a risk manager, and implementation of lessons learned.

According to PMI (2017), cost budgeting is the process of collecting the estimated costs of individual activities or work packages to create an authorized cost baseline. A project budget includes all the funding authorized to implement the project. The cost baseline is the main output of this process, that is the accepted version of the time-phased project budget.

Inadequate budget quality can lead to irregularities in project financing, lower the effectiveness of cost control, facilitate delays in the execution of the project and handling contractors, and make the project budget exceeding. Delays in determining budget can cause the late approval of the project management plan and increase the project duration. These challenges need to be addressed by the implementation of financial planning software, application of the expertise of the employees in financial departments, employment of remote work technologies, recording the accountability of the customer for any possible changes in the project scope, and optimization of project review and approval procedure.

Control is the universally approved method to avoid project failure and keep a project functioning successfully (Olawale, 2020). Cost control is the process, which is dedicated to monitoring the project status to update the project costs and provide the necessary changes to the cost baseline. The main outputs of this process are work performance information, cost forecasts, and change requests (PMI, 2017).

Exceeding the planned budget can prolong the payback period, lower the value of NPV and other indicators of financial effectiveness of the project. Late and low-quality control, delays in giving access to the information on project status can lead to difficulties or mistakes in decision making, lack of coordination in completing project tasks, excessive amount and misinterpretation of information, which in turn will have a negative effect on project delivery.

We suppose that the main mechanisms to reduce or mitigate the consequences of these challenges are improving project management system, optimization of project review and approval procedure, motivating team members to leave feedback, improving communication between the project team members, prioritizing the ongoing projects, increasing qualifications of the project manager, regulating the reporting system, and implementation of remote work technologies.

Therefore, systematic analysis of challenges related to project cost management, their triggers, effects and implementation of possible countermeasures will provide the opportunity to plan the project cost more effectively, increase the efficiency of decision-making process, prevent cost overruns, and avoid many difficulties and mistakes during the project life cycle.

7. Implications, Limitations and Future Research Direction

The research contributes to theory and practice in several ways. First, underpinned by process approach, the research defines a variety of project cost management challenges, their causes, effects and proposes possible countermeasures. Our findings can be used to supplement the project cost management knowledge area of the process-based project management standards, such as PMBOK® Guide (2017). The classification of challenges related to the four project cost management processes will enable managers to systematically and holistically concentrate on the

most concerning challenges and create a comprehensive plan to overcome the challenges and improve the project work.

Second, to the best of our knowledge, this is the first research that has investigated project cost management challenges supported by process approach, which will also allow for better understanding of challenges in other project management knowledge areas. This will afford grounds for researchers to develop a common perspective of such challenges by applying process approach and develop theory on strategies that will give the opportunity to confront the identified challenges and improve planning and implementation of projects.

Although it is important to mention that the research is limited in several ways. First, while its results provide profound knowledge, which makes it similar to other qualitative studies, the results may be subjective because they are based on the opinions of experts in the project management field. Second, the research concerns only projects that were realized in the framework of the traditional project management approach. Third, the respondents come from only one country – Russia, and therefore it is important to practice caution in extending the results to a broader (international) context.

Nevertheless, the study gave many new ideas for further research. First, it would be helpful to conduct more thorough (e.g., qualitative and quantitative) studies for examining inter-relationships among challenges to develop a comprehension of such challenges. Second, future studies could analyze challenges in other project management knowledge areas, for example, project scope management, project quality management, project communications management, etc. Third, further studies are necessary to explore challenges from an international or industry-specific perspective to build specific knowledge. Fourth, there seems to be a necessity to examine projects executed based on agile methodology. Last, future studies can rely on multiple approaches as their underpinning lenses to inspect such challenges.

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