Management of project for automation of investment control at industrial enterprise

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Management of project for automation of investment control at industrial enterprise

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Abstract. The article describes the issue of IT-project management at industrial enterprise under conditions of fast changing external environment. Very often projects are implemented without the necessary grounds and selection of certain IT-development task, detailed planning and elaboration of the main stages of project that may adversely affect its results. Management of creation and implementation of informational systems faces many troubles such as rescheduling, improper quality of works, exceeding of budgeted costs etc. To prevent such troubles the approach has been developed to help in performing detailed planning at the early stages by determining work and project quality monitoring methods, risk assessment, means of communication within the project team.

1. Introduction

Now development of information technologies is the way for many companies to defend leadership in the current economic situation and obtain competitive edge in the market. However, high interest in improving its activities through the introduction of information products leads to the fact that projects are implemented without proper justification and selection of a specific informatization task, detailed planning and elaboration of the main stages of the project which may adversely affect its results [1, 2]. That is why IT projects, especially, creation, development or support of informational systems require separate project activity in a company [3].

Besides, often project and development programs launched by organization are not bound to global strategy and serve for resolution of local tasks. It leads to spending the investments on resolution of wide range of tasks not related to each other, in spite of their focus on strategically significant projects [4].

As part of the work, planning and development of a project for the implementation of an information system for analyzing performance indicators for an industrial enterprise in the oil and gas industry is being implemented, which allows to coordinate investment projects and programs with the strategic goals and objectives of the enterprise. Oil and gas exploring, recovering and trading company was considered as the object of the research. Remarkably, now there is such a situation in the market that it becomes more difficult to compete in oil recovery volumes. That is why the corresponding active companies are aimed at optimization and improvement of internal processes at enterprise.

2. Work goal and main tasks

The project is aimed at development of the system for automation of processes of planning and monitoring of investment project performance as well as establishment of continuous investment planning in informational system saving the entire project work's history. IT project unites all divisions in which production indicators are collected. Based on such data the decision is made concerning investment in this or that object (exploration, hole drilling etc.).

The current business-process of affiliates and their interaction with corporate center during investment project planning and monitoring, as well as investment activity control may be subdivided into the following life cycle stages: launching and planning; investment project appraisal; project approval; monitoring; investment post-monitoring. Investment planning and monitoring business-process is aimed at making decision concerning appropriateness of investment project implementation, control over implementation and making timely correcting decisions in case of significant deviations from the implementation of coordinated plan. Annual investment planning process starts with determining long-term strategic opportunities and risks related to development of oil recovery enterprise and ends with inclusion of investment projects and programs into business-plans.

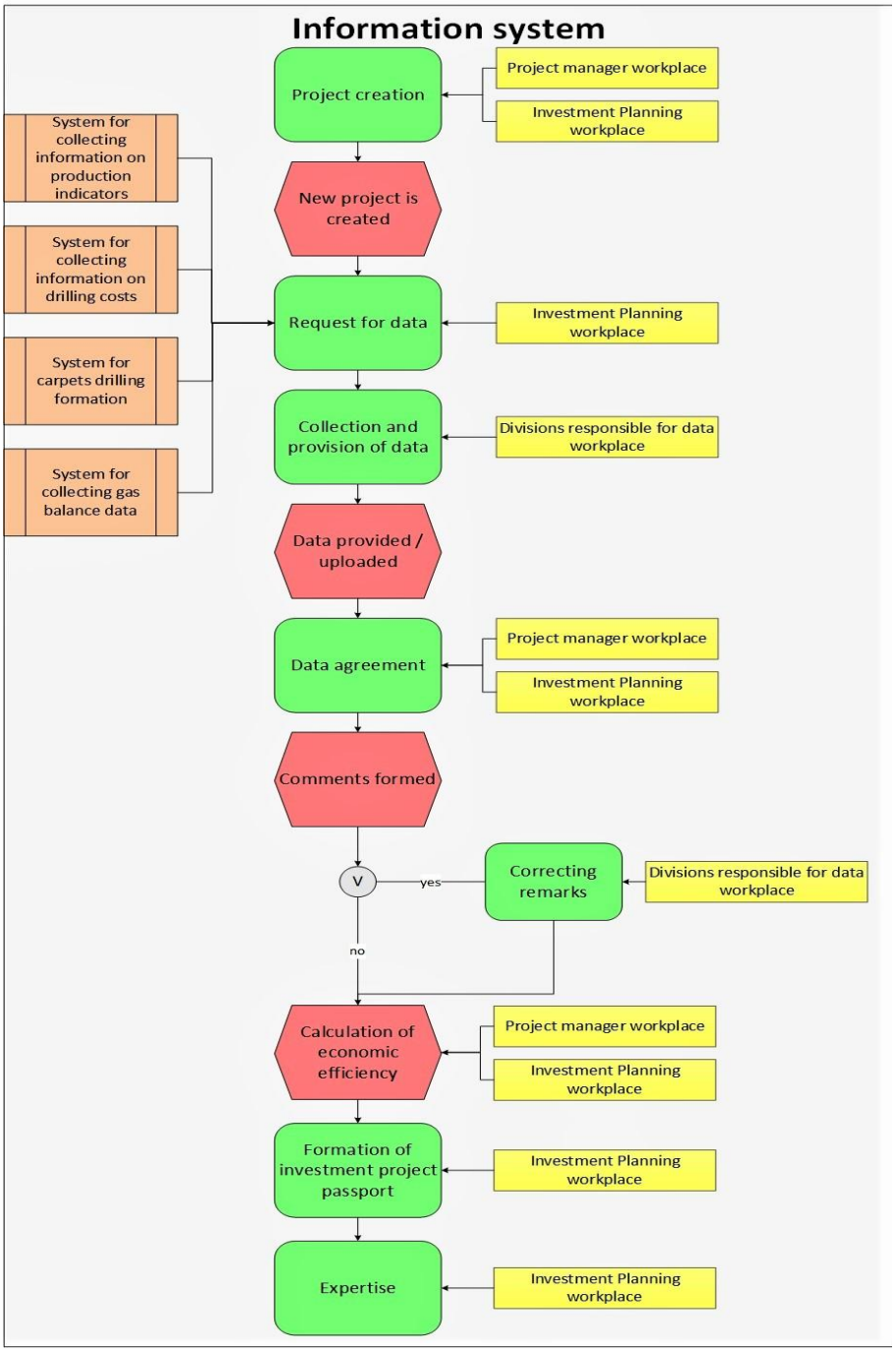

Figure 1. Target business-process.

During business-process data analysis the following troubles were detected that require IT support:

- Most of the information collected and analyzed during planning and monitoring process is located in MS Excel books;
- These files contain big data volumes and big size, opening of files takes a long time;
- Data files exchange is performed via e-mail that reduces timeliness of location of this or that document;
- There is no unified approach to submission of initial data for investment project calculation;
- Low quality of initial data requires manual inspections and repeated re-calculations in case of error detection;

- Simultaneous work of several users is impossible
- It is necessary to download information on many indicators from other systems [5, 6].

Target process implemented in the system developed is shown in figure 1.

3. Methods and approaches to project management

After analysis of several project management techniques, taking into account project complicacy, cascade approach has been chosen as the basis. Project life cycle is presented as cascade model with iterative approach in development part, where intermediate results are shown to the client and adapted for the requirements received [7, 8].

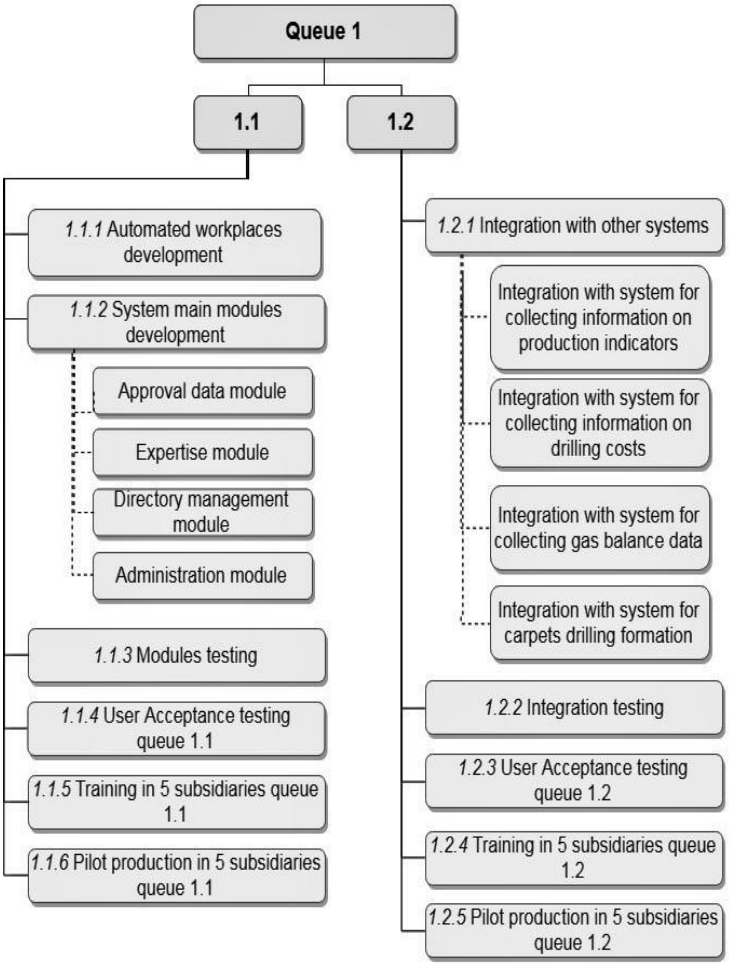

Figure 2. WBS of queue 1.

After pre-project analysis and receiving of the initial functional requirements for evaluation and possible analysis of project works, WBS of all the project works was worked out [9]. Complicacy of this project is caused by the following factors:

- big organizational volume (several affiliates) and big number of users;
- big functional volume of project;
- integration with other projects.

The main project goal has been determined at the stage of requirement formation; detailed elaboration of requirements should be completed during performance of trial and industrial operation of all the queues in affiliates. For the purpose of optimization of project works it has been decided to divide system features development into 2 queues.

1st queue: Crucial functionality. The main functionality is developed, necessary for passing the through business-process of investment project management (figure 2).

2nd queue: Non-crucial functionality. Supplementary functionality is being developed, not interlocking passing the business-process but considerably increasing convenience and speed of work of users with the system (figure 3). Such iterative approach allows getting feedback faster and performing flexible work with the requirements. Upon completion of each queue the customer is shown intermediate result.

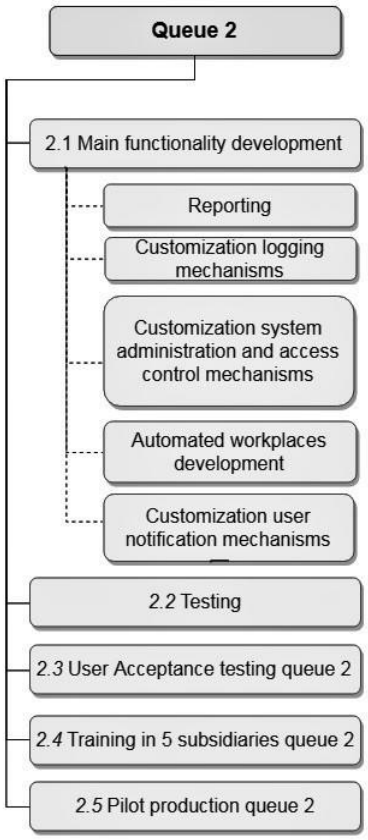

Figure 3. WBS of queue 2.

For successful implementation of informational system it is necessary to know and be able to deal with different risks. Wherein it is necessary not only to reduce, avoid, forward risks-threats but also to develop risks-possibilities [10, 11]. Dealing with risks is very important and may considerably influence on project success or failure. Figure 4 shows risks matrix where they are analyzed on two main parameters – risk occurrence probability and level of risk influence on the project. The matrix shows some risks for this project, certain risk importance level is marked with color. Qualitative risk analysis is shown in figure as matrix of probabilities and consequences. It helps to pay attention at crucial risks, determine terms of monitoring of every risk. Monitoring provides timely execution of preventive measures and plans for mitigation of consequences and is executed with the help of indicators – triggers, indicating the possibility that risk events happened or will happen as soon as possible. Description of dealing with risks, response to risks and monitoring are shown in table 1.

Table 1. Roles in project risk monitoring.

Role	Responsibility
Project Managing Committee	• Approves response measures for risks related to the Managing Committee; • Approves decisions concerning changing project parameters (deadlines, budget, resources and volume) in accordance with the restrictions.
Uniform accounting point	• Participates in the process of detection, determination of priorities and assessment of risks, transferring to the level of the Steering Committee; • Escalation of problematic risks at the level of the Managing Committee.
Project Manager	• Determines other nature risk response strategy; • Organizes and hosts risk meetings; • Analyzes risk information; • Participates in the process of identification, determination of risk priorities and risk measurement; • Plans risk response measures; • Controls risk response measure performance; • Escalates problematic risk for the level of the Project Managing Committee.
Other project participants	• Escalate any risks detected at the level of Project Manager; • Participate in the process of identification, determination of risk priorities and risk measurement; • Participate in planning of risk response measures.

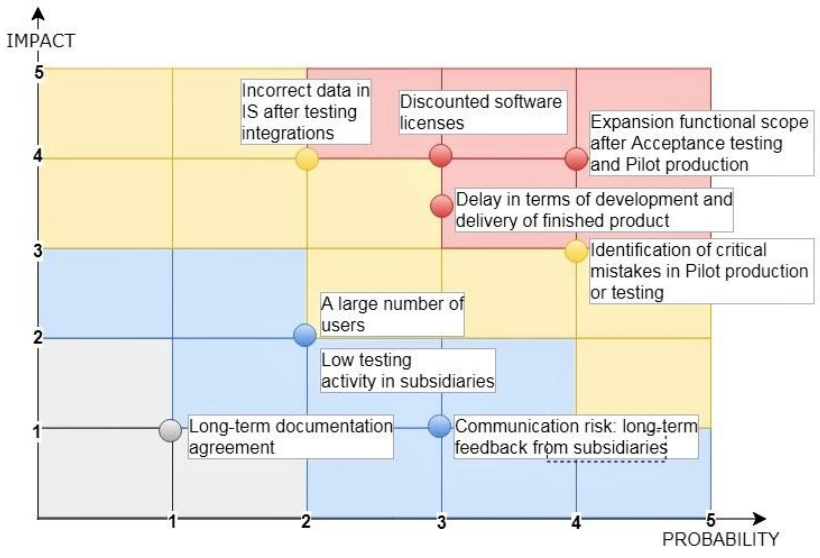

Figure 4. Matrix of risks.

Many appearing troubles may be resolved via proper establishment of project team. Part of troubles is caused with insufficient elaboration of concept and inaccurate task setting, organizational and administrative issues may also become a trouble when implementing a system. The project team should have the possibility to both successfully complete the project and manage, i.e. control all its processes [12, 13]. For this purpose a project team is established in a definite way taking into account

specifics and complicacy of tasks. After the preliminary evaluation of the project scope it becomes clear that current competence of workers is not enough. That is why the decision has been made to attract external resources – Contractor's team, consisting of project manager, architect, business analyst, developers as well as designer, testers and other technical specialists. Besides, the Customer provides experts, especially, architect, business analyst and service manager, business experts, informational security experts, system administrators etc.

Important decisions concerning the project, such as change of deadlines, budget and cost, are made by Project control board, consisting of the representatives of the concerned parties in the project – client, supplier, business representative (main Project contractor), making the final decision concerning the project.

To increase project team performance Project responsibility matrix was developed, its fragment is shown in table 2.

Table 2. Project responsibility matrix.

Trouble	Activity
Absence or improper information / data in IS after integration testing	• Integration testing should be planned earlier upon completion of development; • Make additional inspection of presence of information in source systems.
Licensed software purchased for the project may be purchased with discount if all the purchases are made till the end of the year	Plan purchasing licenses till the end of the year.
Low testing activity in subsidiary enterprise (SE)	• Regular meetings during trial performance and testing; • Monitoring of work in SE during trial performance and testing.
Delay in deadlines of development and delivery of the finished product, improper evaluation of task workload	Include additional time reserve for development deadline into the schedule.
Determination of crucial error during pilot operation (PO) or inspection	Include float time for troubleshooting into the schedule.
Expanding functional volume during trial performance and acceptance tests (AT), appearance of new requirements from SE not included into the contract and engineering project earlier	• Noting remarks and offers in general Register with classification of feedback (FB) received from SE. • Regular discussion of the offers received from SE for earlier decision making concerning their processing.
Big number of system users in SE and call-centers (CC) (organizational, training, testing troubles)	• Establishment of working groups in SE with determining single persons responsible for functions (orders); • Designate deputies for the representatives of testing and trial performance members from SE; • Preliminary drawing of the lists of testing and training members
Continuous accord / incomplete documentation	Accord of trial performance completion reports from the part of single person in charge (SPC) without coordination with SE

Efficient communication may considerably increase the possibility of successful completion of the project. It concerns both the team "inside" and project presentation for high-level management, future product consumers. Positive effect may be achieved at launching stage. Distribution of project information, explaining of its goals and values allows to early determining supporters and counterparts

of the upcoming changes. The plan includes: communication methods, mandatory meetings of participants, form of accounting and frequency of meetings. Proximately during the work over the project and upon its completion it is necessary to perform collected information analysis [13]. Such knowledge is useful both in this and the future projects of the company. Often lessons learnt from the experience of one project allow collecting experience and knowledge for each project manager and the whole company.

Project efficiency evaluation is usually determined by the level of correspondence to the project goals and participant interests. To evaluate costs for informational systems Total Cost of Ownership technique has been used. The technique includes amount of all the costs from the beginning stages of informational system implementation and the further costs for maintenance till the end of ownership [14, 15].

Project cost evaluation begins at the pre-project stage before conclusion of contract and is executed during the whole project implementation. The work has the total cost of system ownership calculated. For calculation key cost factors have been determined and their values have been calculated for 7 year period of use. Herewith the following factors are taken into account: initial costs of development, system implementation and testing, costs of modernization, costs of system maintenance, costs of license purchase, operation and maintenance. Total project cost is about 30 million rubles.

Because of IT-system implementation initial data quality improvement is planned for investment project efficiency prediction. System implementation will result in reduction of personnel involved into collection of performance and economic indicators at the expense of system integration and sample unification. Implementation will also lead to reduction of number of errors because of decrease of manual input, investment decision quality increase by means of dynamic response to changes of project economic efficiency, timely control, data quality increase. The company will adopt unification of approach to work with initial data in the process of investment planning. IS implementation will also allow to increase data reliability at the expense of direct integration with the system of accounting of technological indicators of oil and gas recovery and accounting systems for capital and operational costs.

Thus, one of the main quantitative effects may be minimization of investments into inefficient projects by means of automation of data collection process and provision of correct calculations. Total volume for 5 years period is about 5.5 bln. System implementation will allow reducing investments into inefficient projects. Total effect from implementation will be achieved in several years and will be about 300 million rubles. Several project efficiency indicators were calculated in the work. Net Present Value, NPV = 96,660,118 rub., NPV> 0; Internal Rate of Return, IRR = 59%, r = 14%, IRR> r; pay back period is about 4 years. These calculations allow asserting that informational system implementation will be commercially efficient.

4. Conclusions

Thus the work describes IT project management in oil and gas sphere which is considered very vulnerable because of strong correlation with external environment and national economy. Taking into account the above-mentioned peculiarities as well as IT project characteristics implementation and software development management faces many troubles.

Such projects often face troubles of failure to meet deadlines, incompliance of project product with quality criteria, exceeding the planned costs. In this relation to prevent such troubles the approach has been implemented to help to perform the detailed planning at the early stage, determining methods of work and project product quality monitoring, ways of communication within the project team, risk assessment, project team functioning.

Within the work also the necessity of project integration with company strategy and clear project management order within portfolio have been detected. Engineers and constructors face big troubles in oil and gas sphere in the process of their development and establishment of entertainment and resource processing infrastructure, that will influence on global economy within the following several decades.

To summarize, it should be noted that the results obtained in this work may be used for other IT projects.

References

[1] Kertsner G 2010 *Strategic management in the company: a model of mature project management* (Moscow: DMK Press)
[2] Mednikov M D, Sokolitsyn A S, Ivanov M V and Sokolitsyna N A 2017 *Proc. of the 30th Int. Business Information Management Association Conf.* 1053–1063
[3] Roberts P 2007 Guide to Project Management: Achieving Lasting Benefit through Effective Change (New York: Bloomberg Press)
[4] Khudyakova T and Shmidt A 2017 *Proc. of the 12th Int. Conf. on Strategic Management and its Support by Information Systems* 46–52
[5] Wiegers K 2013 Software Requirements (Microsoft Press)
[6] Levina A I, Borremans A D and Burmistrov A N 2018 *Proc. of the 31st Int. Business Information Management Association Conf.* 4643–4652
[7] Ghosh S and Forrest D 2015 *PM World Journal* **4** (9) 75–87
[8] Archibald R D 2003 *Managing High-Technology Programs and Projects* (New Jersey: Wiley)
[9] Westland J 2007 *The Project Management Life Cycle* (London: Kogan Page)
[10] Rostova O, Shirokova S and Shmeleva A 2018 MATEC Web of Conferences **170** 01024
[11] Ilin I V, Izotov A V, Shirokova S V, Rostova O V and Levina A I 2017 *Proc. of 2017 20th IEEE Int. Conf. on Soft Computing and* Measurements 812–814
[12] Grekul V I 2015 *Management of information systems implementation* (Moscow: National Research University Higher School of Economics)
[13] Gray C F and Lawson E W 2008 *Project Management: The Managerial Process* (New York: McGraw-Hill Higher Education)
[14] Sokolova I, Leskina O, Gubanova E, Orlovtseva O and Kanikhin T 2018 *Conf. Proc. IEEE DSDT* 155–162
[15] Yescombe E R 2013 *Principles of Project Finance* (Cambridge: Academic Press)