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PRACTICAL ASPECTS OF ASSESSING THE PRIORITY OF IMPROVING PROJECT QUALITY MANAGEMENT PROCESSES

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In a complicated business environment, conditioned expediency of introduction of fast changes and resource constraints, the issue of assessing the priority of certain QMS processes in order to further improve them becomes relevant. Such assessment can be carried out as a result of the consistent implementation of the following typical stages of work: 1. classification and systematization of key project quality management processes (KBPs); 2. selection of criteria for the priority of processes for further improvement and determination of methods for their evaluation; 3. determination of the method of estimating process priority indices and streamlining processes according to certain indices; 4. visual representation of assessment results and analysis of the results of process priority assessment. In accordance with these stages, the priority of project quality management processes was assessed. The course of processes was researched based on of the design project organization.

Thus, at the first stage of evaluation, the key processes of project quality management (*KBPs*) were systematized in accordance with the Process Register, which was approved by the order of the organization's director and the requirements of DSTU ISO 10006:2018 [1] (harmonized with the international standard ISO 10006:2017 [2]) (Table 1).

At the second stage, using the expert method, the criteria for the priority of processes in the «weight – problem – opportunity» plane were evaluated. To do this, by order of the director of the project organization, an expert group was appointed, which included process owners, project directors, chief engineers, auditors, designers. In accordance with the Methodology [3] proposed earlier, the competence of candidates for experts on the integrated competence indicator was assessed and their optimal number was selected.

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Table 1

Register of project quality management processes

Level 1	Level 2	Level 3	Coefficients			
			W	***P***	***O***	***Pr***
5 Management responsibility	5.2 Strategic process	5.2.0 Strategic process	4.5	4	3.2	3.9
6 Resource management in projects	6.1 Resource-related processes	6.1.2 Resource planning	3.6	2	2,6	2.7
		6.1.3 Resource control	4	3.5	3	3.5
	6.2 Personnel-related processes	6.2.2 Establishment of the project organizational structure	4.7	4.5	3.2	4.1
		6.2.3 Allocation of personnel	4.3	3.7	4	4
		6.2.4 Team development	4.8	3	3.7	3.8
7 Product/ service realization in projects	7.2 Interdependent processes	7.2.2 Project initiation and project management plan development	4	3.2	4.2	3.8
		7.2.3 Interaction management	4.4	3	3	3.5
		7.2.4 Change management	3.8	3.6	3.8	3.7
		7.2.5 Process and project closure	4.8	4	3.2	4
	7.3 Scope-related processes	7.3.2 Concept development	4	2	3	3
		7.3.3 Scope development and control	3.8	2	3	2.9
		7.3.4 Definition of activities	4.2	2.6	3.8	3.5
		7.3.5 Control of activities	4.6	3.6	3.2	3.8
	7.4 Time-related processes	7.4.2 Planning of activity dependencies	4.2	2.8	3.6	3.5
		7.4.3 Estimation of duration	4.6	3	4	3.9
		7.4.4 Schedule development	4.6	3	4.2	3.9
		7.4.5 Schedule control	4.8	3.8	4.6	4.4

(End of Table 1)

Level 1	Level 2	Level 3	Coefficients			
			W	***W***	***W***	***W***
7 Product/ service realization in projects	7.5 Cost-related processes	7.5.2 Cost estimation	4.2	3.2	4.6	4
		7.5.3 Budgeting	4.8	4.2	4.6	4.5
		7.5.4 Cost control	4.8	4	3	3.9
	7.6 Communication-related processes	7.6.2 Communication planning	4.2	4.2	3	3.8
		7.6.3 Information management	4.2	4.6	4.6	4.5
		7.6.4 Communication control	4.2	4.6	4	4.1
	7.7 Risk-related processes	7.7.2 Risk identification	4.2	4	4.2	4.1
		7.7.3 Risk assessment	4.8	4	4	4.3
		7.7.4 Risk treatment	4.2	4.2	4.2	4.2
		7.7.5 Risk control	4.8	4.8	4.8	4.8
	7.8 Procurement processes	7.8.2 Procurement planning and control	3.8	2.8	4.2	3.6
		7.8.3 Documentation of procurement requirements	3.8	3.2	3.8	3.6
		7.8.4 External provider management and development	4	4.6	4.2	4.3
		7.8.5 Contracting	4.8	3	3	3.6
		7.8.6 Contract control	4.8	2	3.2	3.3
8 Measurement, analysis and improvement in projects	8.1 General	8.1 Improvement	4.2	3	4.6	3.9
	8.2 Measurement and analysis	8.2 Measurement and analysis	4.2	3.2	4	3.8
	8.3 Improvement	8.3.1 Improvement by the originating organization	4.8	4.8	4.8	4.8
		8.3.2 Improvement by the project organization	4.8	4.2	4.6	4.5

Then, according to [3] the competence of the candidates for experts was estimated according to the integrated competence indicator, and their optimal number was selected. *12* experts were involved in the first group of experts, with the integrated competence factor $K_{ком} \geq 0{,}83$. The second group involved 12 specialists whose integrated competence coefficient was $K_{ком} \geq 0{,}87$. As the determined level of competence of the experts was more than the acceptable level proposed ($K_{ком} \geq 0{,}67$), it was expedient to involve the selected experts in order to assess the priority of processes. Next, in the second stage, *the degree of weight of the process (W)* was determined by multiplying the share of CSF (*Critical Success Factors*) of the project and the degree of impact and making all the weighted estimates. To do this, we first assessed the degree of influence of individual processes on the critical success factors of CSFs. This approach means that processes that affect a large number of CSFs are likely to be more relevant to the organization than those that affect a small number of factors. Therefore, such processes need improvement in the first place. The degree of impact of the processes on CSFs was assessed by an expert group on a five-point scale (*1* – very low; *2* – low; *3* – medium; *4* – high; *5* – very high). At the beginning of the evaluation, *16* typical CSFs were identified. By conducting a factor analysis (principal components method), the list of typical CSFs was reduced and *8* CSFs were proposed, which more than other factors affect the success of the project (Table 2). The calculated values of the Kaiser-Meyer-Olkin test (KMO) and the Bartlett's Test of *sphericity* allowed us to draw a conclusion about the general suitability of the available data for factor analysis.

Table 2

The list of typical CSFs

CSF1	Project mission, project goals & objectives, project scope, project definition/perception, project vision
CSF2	Top/senior management support, top/senior management support commitment
CSF3	Project communication, communication/information systems/channels/ procedures, internal project communication
CSF4	Project planning/monitoring/control, monitoring & control, project monitoring/control mechanisms/systems/ procedures
CSF5	Project manager/team leader competence & relative/past experience
CSF6	Technological environment, modern/ advanced/appropriate technology, automatization, technology knowledge/transfer, knowledge & expertise utilization/support, technology level/ availability, technological advancement
CSF7	Project finance/funding, project economics/budget, adequate/guaranteed project funding, reliable funding source, project cash-flows
CSF8	Political environment, political stability/instability, political risks, political factors, political influences

The weight of each CSF (from *0* to *1*) was determined by the expert method using the Fishburne method [5]. To assess the degree of agreement of experts within the group, traditionally, the coefficient of concordance (agreement) of Kendall-Bebington Smith was used. The statistical significance of the concordance coefficient has traditionally been tested by the Pearson agreement criterion (χ^2). The degree of correlation of the assessments of the two groups of experts was assessed by the Kendall tau rank correlation coefficient τ (Kendall tau rank correlation coefficient) and, in addition, Shukeni-Froli. *Degree of problematic of process (P)* was assessed by an expert method on a five-point scale (A – excellent work; B – good work; C – satisfactory work; D – bad work; E – Very bad work) taking into account the influence of risk-dominant factors [4]. Such factors include 13 key risk-dominant factors ($m_i, i = \overline{1,13}$): m_1 – the existence and essence of the objectives of constructing a process; m_2 – the degree of the possibility of integrating the process with other internal and external processes; m_3 – the degree of documenting the process; m_4 – knowledge of process implementers; m_5 – skills of process implementers; m_6 – behaviour of the process implementers; m_7 – personality of the process owner; m_8 – the activity of the owner of the process; m_9 – authority of the process owner; m_{10} – the degree of use of information technology in the operation of the process; m_{11} – the current system of hiring, training, remuneration; m_{12} – certainty and transparency of indicators of process efficiency; m_{13} – the degree of applicability of the results of evaluation of the effectiveness of the process for its improvement. To determine the weights of each of the risk-dominant factors, followed by their distribution by levels of influence on the problem of QMS processes, the Fishburne method was used [5]. *Degree of possibility of process (O)* was assessed by an expert method on the strength of the impact of barriers to process improvement. Such barriers included: technological *(T)*, regulatory *(N)*, financial *(F)*, organizational *(O)*, personnel *(P)*, methodological *(M)*, information *(I)*. The next step was to determine the weight of each of the barriers (from *0* to *1*) using the Fishburne method [5]. The strength of the impact of each barrier on a single process was assessed on a five-point scale, which has the following characteristics: *1* point – very low; *2* points – low; *3* points – average; *4* points – high; *5* points – a very high impact. The next step for each identified process was to calculate the total strength of all barriers that may hinder its improvement. After that, the total value of the strength of the barriers was rationed in the range from *1* to *5* points for each of the processes, taking into account the weight of the barrier. Based on certain criteria, the process priority index is calculated using the formula $Pr = (W \times P \times O)$, where W – degree of weight of the process (importance); P – degree of problematic of process; O – degree of possibility of process for improvement. The resulting expression allows link all the criteria for the priority of processes. Thus, the highest priority for the organization will be the process with the highest priority index. The total value of the priority index (*Pr*) can reach a value of several tens, so it needs to be normalized, bringing it to the range from *1* to *5* for all processes. The results of calculating the process priority indices are presented in tab 1.

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