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Developing the scientific project management: The Case of Ukraine

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Abstract

In the article, statistics and procedure of scientific project management in Ukraine has been studied. The classification of scientific projects in Ukraine has been defined. Application of the project management approach based on the matching the project management phases to the scientific projects and identification the executives of each phase were approved. The Total Quality Management principles were analysed and matched with standard quality management principles.

The result of the article, has developed the structural-logical scheme of interrelation between scientific projects management phases based on the scientific project classification, identification the phases of project realization and executives, following the principles of quality management.

Paper type: conceptual article

Keywords: principles of quality management, project management, scientific project management, scientific project

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Introduction[3]

Results of scientific projects in Ukraine are an index of the effectivity of the scientific institutions in state and also the factor of scientific and technological potential of the country. In this paper statistics of research projects in Ukraine and their effectiveness will be examined, and the application of the principles of project management in the implementation of scientific projects will be reviewed.

Nowadays the project management is widely used approach for operation of the projects and programs. In most common sizes, we would understand the project management terminology by the explanation of Project Management Institute (PMI) (n.d.) and its guide – *Project Management Body of Knowledge* (PMBOK) (2013). PMBOK is universal guide for planning, operation and evaluation the projects, but it is mostly used for the technical and IT areas. The same time, it is necessarily to underline, that different types of the project have some specific approaches in operations due to the features and characteristics of the projects. One of the most popular system of quality control – Total Quality Management – is also general approach for the evaluation and assurance the projects. Thus, the quality control of the project's results should be also adapted to the specific features of the projects filed. Therefore, it is extremely important to define the projects types and characteristics for further applying the various approaches in project management and quality control of the project results for achieving the long-lasting effects.

1. Scientific projects in Ukraine: Statistics

The scientific and technical research activities in Ukraine are carried out under the supervision of Ministry of Education and Science of Ukraine and National Academy of Sciences of Ukraine (NAS). According to Ukrainian law NAS is the highest academic self-governing organization of Ukraine, based on state ownership. Academy unites full members, corresponding members and foreign members, all scientists of institutions; organizes and carries out fundamental and applied research on major problems of natural sciences, engineering, social sciences and humanities (*Note on National Academy of Sciences of Ukraine*, 2016). Among other, characteristics self-governing status means that Academy identifies scientific priorities for research topics, forms of organization and realization. Every year NAS establishes the procedure of competitive selection of scientific and technological projects of NAS institutions of Ukraine. Projects' implementation should promote the

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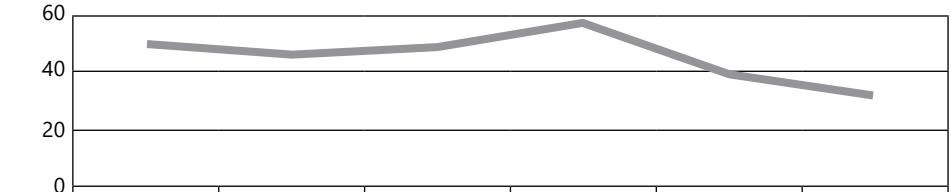
economic and social sphere of scientific research and development activities of institutions of NAS of Ukraine (*Legislative provision on procedure of competitive selection of scientific and technical projects of institutions of NAS of Ukraine*, 2015). The list of projects selected by competition, formed by their performance and ranked by the total amount of the financing provided in the budget of the NAS for the current year, and approved by the Presidium of the National Academy of Sciences of Ukraine. The number of the selected projects has a negative tendency in 2015–2016 years (Figure 1).



	2011	2012	2013	2014	2015	2016
number	50	46	49	57	39	32

Figure 1. *Number of scientific projects chosen in Ukraine in 2011–2016.*

Source: calculated by authors on the base of the data of NAS of Ukraine (*Legislative provision on approvement of scientific projects to be implemented*, 2009–2013).

In 2016 year the numbers of selected projects decreased almost twice comparing with 2014 year. At the same time, despite the complex procedure of evaluation the projects' results and based on final reports of the scientific teams by NAS and Independent Scientific Experts, the representative of the scientific community recognize the insufficient level of the projects' quality. It leads to low practical value of the results and the effectiveness of implementation. Considering the number of patents as an indicator of the effectiveness of research activities in Ukraine, it is worth comparing the number of patents with some developed countries (Table 1). According to these data, the number of patents in Ukraine has had growing tendency in 2010–2013, but decreased significantly in 2014. This index can be attributed to inadequate financial support from the state budget and the reduction of scientific capacity due to the peculiar situation in the country. Nevertheless, the comparison with Germany and the United States points to a significant backlog of Ukraine in the creation of intellectual property.

Although the nearest European neighbour – Poland – has a weak performance in comparison with Germany and the United States, it is twice better than the Ukraine's number of patents in 2014 (Figure 2).

Table 1 *Number of patents in Ukraine, Poland, Germany and USA in 2010–2014*

Year	Number of patents by countries			
	Ukraine	Poland	Germany	USA
2010	3,038	4,063	173,619	433,199
2011	3,318	4,901	175,606	440,632
2012	3,069	6,043	183,048	473,489
2013	3,499	6,032	184,523	501,280
2014	2,990	6,172	179,535	509,622

Source: based on WIPO data, *Statistical Country Profiles*, n.d.

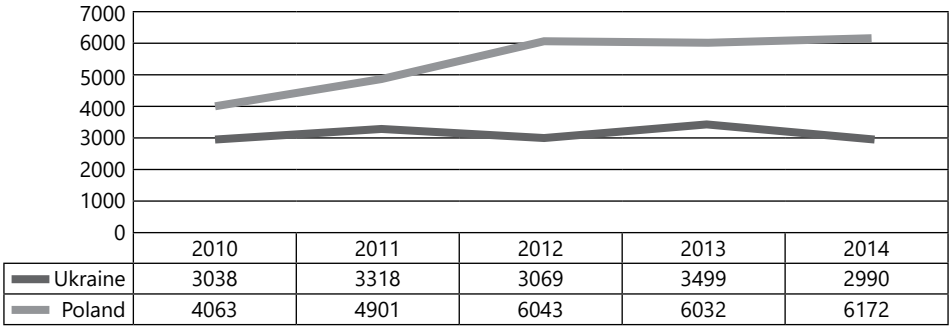


Figure 2. *Comparing the number of the patents in Ukraine and Poland in 2010–2014.*

Source: based on WIPO data, *Statistical Country Profiles*, n.d.

Low quantity of the patents symbolizes the low quality of the scientific and technical products as results of the insufficient level of the scientific projects management. For this reason the raising of the effectiveness and quality of the projects' management and the essence principles of projects management will be considered according to the specific of scientific projects.

2. Scientific projects in Ukraine: Types, target fields and results

According to Ukrainian law, Scientific Project (Scientific and Technology) is a project – set of measures related to enforcement and direct research and (or) scientific and technological developments in order to achieve specific scientific or technological research (applied) result (*Act of Ukraine on scientific and technical activity*, 2016). PMBOK describes a project as a temporary process, with defined beginning and end in time, and therefore, defined scope and resources. A project is unique operation, with a specific

set of operations designed to accomplish a singular goal. To define the goals of scientific projects', the projects' types should be firstly determined. The main difference and most important characteristic of the scientific project is the final result of the process.

It is generally accepted the next classification of the scientific projects:

– fundamental and
– applied (Figure 3).

Additionally, it is proposed to vary projects according to final results formulated by the Ukrainian law:

– theoretical with main research result – knowledge obtained in the basic or applied research and recorded on data carriers,
– practically applied due to final science and technology (applied) result – obtained during the applied research, scientific and technical (experimental) development of new or substantially improved materials, products, processes, devices, technologies, systems, technological solutions or developments that are introduced or can be introduced in social practice.

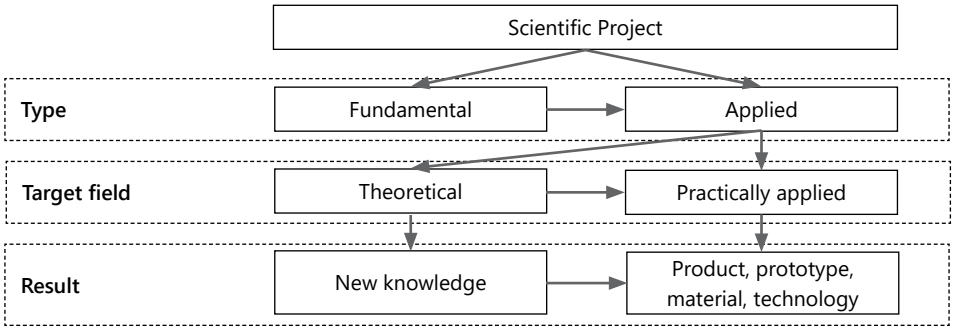


Figure 3. *Classification of scientific projects in Ukraine by types, target fields and results.*

As presented in Figure 3, the final results of scientific projects are varied as new knowledge or product, prototype, material or technology. Nevertheless, it is important to underline the complexity and interrelation of the projects types: the final result of the theoretical project – new knowledge – can be found on the both fundamental and applied researches. And practically applied results – product, prototype, material, technology – that are received from the applied researches, aren't possible without theoretical explanation. This variation has an impact on management of the scientific project and applying the project management approaches to the phases of the project.

3. Project management approaches for purposes of scientific projects

The most popular and widely known approaches in project management is PMBOK, guide developed by the world's leading not-for-profit professional membership association for the project, program and portfolio management – PMI (Kerzner, 2004). There some other approaches as Prince2, Oracle AIM developed by private companies and used in specific field. But for further researches the priority is on the ISO 21500:2012, the project management guideline, developed by International Organization for Standardization and implemented by many companies as universal standard (*ISO 21500:2012: Guidance on Project Management*, 2012). The guidance is developed with refers on the ISO 9000 series, and on ISO 9001:2008 *Quality Management Systems* in particular, which is especially important in this research. Comparison of the phases of the project management according to the PMBOK and ISO21500:2012 shows the insignificant differences in two approaches. It allows choosing the ISO 21500:2012 approach for further adaptation to scientific project (Table 2). Additionally, each phase is analysed as a particular step realized by executives.

Table 2 *Phases of the projects in approaches for scientific project management*

ISO 21500:2012	**PMBOK**	**Executives of the phase in scientific projects in Ukraine**
Initiating	Initiating	NAS/Scientific project team
Planning	Planning	Scientific project team
Implementing	Executing	Scientific project team/Stakeholder
Controlling	Monitoring and Controlling	NAS/Independent Scientific Experts
Closing	Closing	NAS

Based on the analysis ISO 21500:2012, it is justified that the project management approach could be used for the scientific project management, because scientific project has the same phases. The same time, the conclusion could be made about uncertain procedure of the scientific project management in Ukraine and absence of the system management approach to the executing the process. It comes from the situation that different groups are responsible for different projects phases. It could lead to low level of project realization and therefore, the low quality of the final results. Put the matter another way, the small quantity of the patents as the result of the low quality of the scientific projects' results is the reason of the poor quality management. It gives grounds to examine this problem though the principles of quality management, widely known as Total Quality Management system. And

as it was mentioned previously, ISO 21500:2012 refers on ISO 9000 family standards, before the updating ISO 9001 *Quality Management Systems* in 2015. Thus, the base for further analysis is ISO 9000 series principles. The matching and comparing analysis of the ISO 9000 series principles with the principles formulated by pioneers of TQM theory to review the details of each principle and to provide the interrelation with the classical principles is presented below (Table 3).

Table 3 *Matching ISO 9000 quality management principles with classical TQM principles*

ISO 9001:2012	Deming	Juran	Crosby
Customer focus			
Leadership	• Adopt and institute leadership • Drive out fear • Eliminate slogans, exhortations and targets for the workforce	_____	• Management Commitment • Supervisor Training
Involvement of people	• Break down barriers between staff areas • Remove barriers that rob people of pride of workmanship, and eliminate the annual rating or merit system • Put everybody in the company to work accomplishing the transformation	_____	_____
Process approach	• Cease dependence on inspection to achieve quality	• Carryout projects to solve problems • Report progress • Give recognition	• Establish an Ad Hoc Committee for the Zero Defects • Program Error Cause Removal
System approach to management	• Adopt the new philosophy • End the practice of awarding business on price alone; minimize total cost by working with a single supplier • Eliminate numerical quotas for the workforce and numerical goals for management	• Organize to reach goals • Maintain momentum by making annual improvement part of the regular systems and processes of the company • Set-goals for improvement • Communicate results	• Quality Measurement • Quality Awareness • Cost of Quality Evaluation • Goal Setting • Quality Councils • Corrective Action • Recognition

ISO 9001:2012	Deming	Juran	Crosby
Continual improvement	• Create constancy of purpose for improving products and services • Institute training on the job • Institute a vigorous program of education and self-improvement for everyone • Improve constantly and forever every process for planning, production and service	• Provide training • Build awareness of opportunity to improve	• Quality Improvement Team • Do It Over Again
Factual approach to decision making	• Create constancy of purpose for improving products and services	• Keep score	• Zero Defects Day
Mutually beneficial supplier relationships	_____	_____	_____

Source: based on Williams, 1994; Abrahamsson, Salo, Ronkainen, & Warsta, 2002; Crosby, 2005; Rose, 2005; Highsmith, 2007; ISO: Quality Management Principles, 2015.

Based on the matching the principles of quality management by pioneers with ISO 9000 series principles, it could be assumed that authors point and take deep attention to different principles. Deming's theory has a strong focus on leadership skills and applying the managerial potential of the personality as a factor of the quality management. This principle is interrelated with the principle of people involvement into the process as the result of enlightened bosses' policy provided under the leadership principle. Both principles are significant to the scientific project management because establishment the right relations between leader and the team, involvement of the personnel to the process and giving them the opportunity to influence and explain the responsibility on the final effects of the research will lead to the setup a creative and motivated environment in the team and increasing the focusing on the result.

All authors as well as ISO 9000 series principles underline and mostly detailed the principles of "Process approach," "System approach to management," "Continual improvement" and "Decision making." Together they form a core of a system approach for the management and quality assurance of the project or process. It means these principles are basic for the performance and goals achievement. And they will underlie the matrix of optimal criteria for the scientific project management.

Important issue is absence of the "Customer focus" and "Mutually beneficial supplier relationships" principle in basic principles by Deming, Juran and Crosby. It allows underlining the relevance of 9,000 series principles, which means that today management initiates the projects for satisfying the customer needs. And huge competitiveness on the market drive the companies with innovative development and

relations between supplier, executives and customer forms the chain of the product design and has an intense value on the project management. And for providing the results-on-demand for environment, scientific institutions and teams in Ukraine also should be oriented on satisfying the market and stakeholders needs. Among others, the main stakeholders for scientific projects in Ukraine are: scientific community, industry, education, government and society. This philosophy should help to ensure the initiation of the relevant and mainstreaming researches. And this principle will be the leading focus in the structural-logical scheme of interrelation between scientific project and quality management principles.

Summing up the analysis of the scientific project classification, the phases of their realization and principles of quality management as an approach for achieving the high-quality final result, the structural-logical scheme matrix is provided (Figure 4).

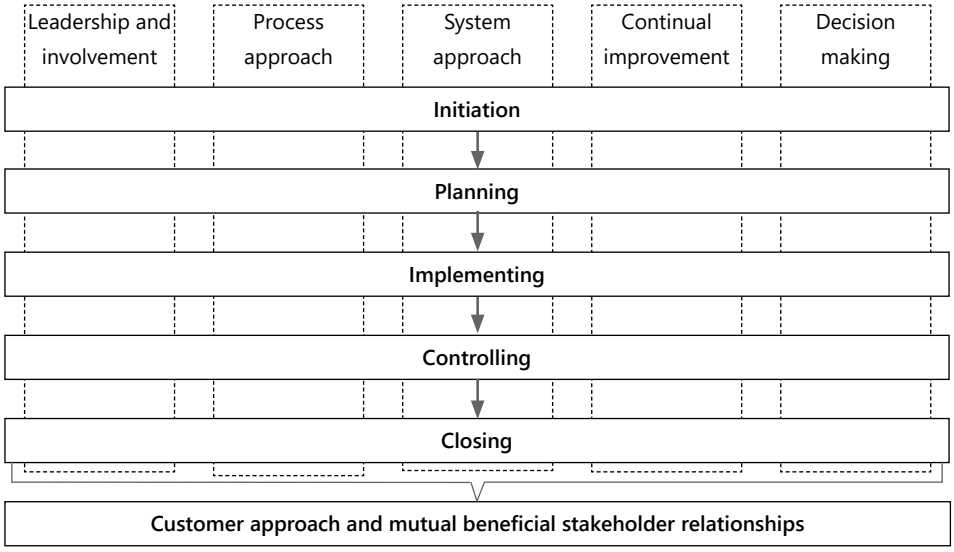


Figure 4. *Structural-logical scheme of interrelation between scientific projects management phases and quality management principles.*

The structural-logical scheme of interrelation between scientific projects management phases and quality management principles underlines the impact of all principles of quality management on all phases of the scientific projects realization. Principles of the leadership and involvement, process approach, system approach, continual improvement and decision making found the core of matrix. These principles influence on each phase of the project and lead to achievement of the Customer approach and mutual beneficial stakeholder relationships principles, which here means the accomplishment of scientific project results for achieving the long-lasting effects.

Discussion and conclusions

In the article the statistics and procedure of scientific project management carried out by the National Academy of Sciences of Ukraine has been studied. The number of the selected projects has a negative tendency in the years 2015–2016. Based on the comparison of the patents in Ukraine and with Poland, Germany and USA it is justified the low quality of the scientific projects results in Ukraine.

Based on the analysis of the scientific projects types, target fields and results according to the Ukrainian law the classification of scientific projects in Ukraine with explanation of the interrelation between types and results has been proposed. Based on the matching the project management phases according to ISO 21500:2012 guideline and PMBOK to the scientific projects and identification the executives of each phase has approved the application of the project management approach to the scientific projects. On the ground of analysis and matching the ISO 9000 series principles of quality management with the principles formulated by pioneers of Total Quality Management theory, the detailed analysis of each principle for perspective of the scientific project management for has been conducted. Finally, based on the scientific project classification, identification the phases of project realization and executives, following the principles of quality management the structural-logical scheme of interrelation between scientific projects management phases has been developed.

The issues for discussion are the search for the instruments and methodology for applying the principles of project management to the scientific project in Ukraine. The further research will concretize the application of the principles of quality management for realization the scientific project by its phases through the use of elaboration of each principle and development the recommendation for adaptation the principles to achieve sufficient results of scientific projects in Ukraine.

References

Abrahamsson, P., Salo, O., Ronkainen, J., & Warsta, J. (2002). *Agile software development methods: Review and analysis*. Technical report, VTT Publications 478, VTT, Finland.

Crosby, P.B. (2005). Quality classic: Crosby's 14 Steps To Improvement. *Quality Progress*, (December), 60–64, retrieved from: http://www.agiledevelopment.org/download/qp1205crosby.pdf [accessed: 27.04.2016].

Highsmith, J. (2007*). APM: Agile Project Management. Jak tworzyć innowacyjne produkty*. Warszawa: Wydawnictwo Naukowe PWN.

Kerzner, H. (2004). *Advanced Project Management: Best Practices on Implementation*. Hoboken, New Jersey: John Wiley & Sons.

Rose, K. (2005). *Project Quality Management: Why, What And How*. Boca Raton, Fla: J. Ross Publishing.

Williams, R. (1994). *Essentials Of Total Quality Management*. New York: AMACOM.

Internet sources

Act of Ukraine on scientific and technical activity (2016). Retrieved from: http://zakon5.rada.gov.ua/laws/show/848-19 [accessed: 30.04.2016].

ISO 21500:2012: Guidance on Project Management (2012). Retrieved from: https://www.iso.org/obp/ui/#iso:std:iso:21500:ed-1:v1:en [accessed: 03.05.2016].

ISO: Quality Management Principles (2015). Geneva: International Organization for Standardization, retrieved from: http://www.iso.org/iso/qmp_2012.pdf [accessed: 27.04.2016].

Legislative provision on approvement of scientific projects to be implemented (2009–2013). Retrieved from: http://www1.nas.gov.ua/innovations/Pages/default.aspx [accessed: 28.04.2016].

Legislative provision on procedure of competitive selection of scientific and technical projects of institutions of NAS of Ukraine (2015). Retrieved from: http://www1.nas.gov.ua/innovations/news/Documents/P-151230-323-6.pdf [accessed: 28.04.2016].

Note on National Academy of Sciences of Ukraine (2016). Retrieved from: http://www.nas.gov.ua/UA/About/Documents/2015_dovidka.pdf [accessed: 26.04.2016].

Project Management Body of Knowledge (PMBOK® Guide) (5th ed.) (2013). Retrieved from: http://www.pmi.org/pmbok-guide-and-standards/pmbok-guide.aspx [accessed: 26.04.2016].

Project Management Institute (n.d.). Retrieved from: http://www.pmi.org/ [accessed: 26.04.2016].

Statistical Country Profiles (n.d.). World Intellectual Property Organization (WIPO), retrieved from: http://www.wipo.int/ipstats/en/statistics/country_profile/ [assessed: 02.05.2016].

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