The 5D Competencies Intelligence Model for Managing Innovation Projects

Sergiy Bushuyev, Natalia Bushuyeva, Victoria Bushuieva and Denis Bushuiev

Kyiv National University of Construction and Architecture, Povitroflotsky Avenue, 31, 03680 Kyiv, Ukraine

Abstract

Existing Intelligence Models for managing innovative projects and programs have been explored. The competency-based approach is considered the basis for building an Intelligence Model for managing innovative projects. Proposed 5D groups of Competencies Intelligence Model for Managing Innovation Projects. The model is based on the SMARTification of the system of five groups of interrelated competencies: emotional, social, cognitive, business and technical. For each group of competencies, the mechanisms of SMARTification and construction of the Intelligence Model are defined. To assess the competence level of the project team, the IPMA Delta model was used. An example of the application Intelligence Model to the implementation of the double degree project of the Kyiv National University of Civil Engineering and Architecture and the Dortmund University of Applied Sciences within the framework of the implementation of European Union DAAD VIMACS and ERASMUS+ WORK4CE projects is presented. During the implementation of the program, the levels of competencies that ensure the success of the project and the existing competencies of the project team were assessed. Based on the results, bottlenecks were identified and a training program for project participants in certain competencies was proposed. Re-assessment of the level of competencies allowed the project team to be confident in its success.

Keywords 1

Innovation project, competencies, 5D intelligence model, managing projects, information system

1. Introduction

The development of knowledge systems in the field of project management is characterized by ever shorter life cycles of their updates, the use of methodologies and approaches of the "third wave", elements of genetic models of projects, as an inexhaustible source of information, ideas and concepts for building projects based on analogues. The high dynamics of updating knowledge and project management concepts in world practice confirms the significant interest in this field of activity, both from science and from practice. The life cycle of knowledge and management concepts included in the fourth version of the IPMA Competence Baseline is almost exhausted by now [1]. The experience of applying the information system of professional knowledge and assessing the competence of the national branches of the International Project Management Association, accumulated over the past five years in many countries around the world, confirms the need to develop systems of knowledge and assessment of competence based on projects and programs, as one of the most important development tools. Modern science and practice of project management have developed knowledge systems and tools for implementing projects from "vision to reality" based on the philosophy of life cycles, goal setting and goal achievement systems. The formation of a "vision" for the development of project management competencies, when creating a new version, was carried out based on the

Proceedings of the 3nd International Workshop IT Project Management (ITPM 2022), August 26, 2022, Kyiv, Ukraine
EMAIL: Sbushuyev@ukr.net (Sergiy Bushuyev); natbush@ukr.net (Natalia Bushuyeva); bushuieva.v@gmail.com (Victoria Bushuieva), bushuievd@gmail.com (Denis Bushuiev)
ORCID: 0000-0002-7815-8129 (Sergiy Bushuyev); 0000-0001-7298-4369 (Natalia Bushuyeva); 0000-0001-7298-4369 (Victoria Bushuieva); 0000-0001-7298-4369 (Denis Bushuiev)

effective formalization of the system dynamics of international knowledge and experience accumulated in 80 member countries of the international association IPMA, a change in management concepts, etc. The idea of the future of project management in recent decades has been formed in the form of expectations, expressed through the following goal-setting concepts - "result, value, output and outcome, performance". Expectations and accepted concepts focused development projects on the result - result, added value (value) - value, product and result - output and outcome, performance efficiency within the remainder of the life path of the product and organization – performance [2]. Each of the concepts takes its place in the general system of development of knowledge systems and project management methodology.

Innovation problems implementation of innovative projects and programs, the depressed state of many countries combined with the challenges of globalization, digitalization and the inevitable adaptation to environmental change in response to the COVID-19 pandemic. At the same time strengthening the global information system, economic environment, global redistribution an ageing population, the global financial crisis and the need for professionals in the new formation have become the main driving forces to unite efforts in the direction of reorientation to driving technologies at all levels of management and ownership, implementation of innovative initiatives, optimization of production processes, strengthening technological capacity and promoting more open work with the global business environment [3]. Achieving the goal of overcoming the crisis and ensuring sustainable economic growth has brought together corporations, educational institutions, government agencies, government officials and foreign innovation funds. The way out of the crisis is to create a practice of standardization of management, as well as the development of mission-oriented professionals with a clear focus on accelerating the implementation of an innovative approach to managing infrastructure projects and project programs [4].

The rapid development of project management (project management) in world practice is associated with its impact on the sustainable dynamic development of countries in the context of the formation of electronic economies. The conscious synergy of project management as a tool for the development and promotion of SMARTification, E-business, E-commerce, E-economy, and E-employment based on open Internet technologies determines the main trends in information technology and the development of new methods and tools for project management. Under these conditions, the key trends in the development of project management are associated with the following areas:

- Globalization of knowledge and project management technologies.
- Information technologies.
- Social importance.
- Business practice.
- Development of human resources involved in projects.
- General development of science and technology.
- Development of construction, other project-oriented industries and design systems.
- Development of markets and market mechanisms.

The modern stage of development of methods and means of project management in the world is characterized by the general formula "from trust to understanding and active using". At the same time, with the development of modern information systems and technologies, the results of research in the field of "soft components of project management" (leadership in projects and building effective management teams) are defined as the main areas of research:

- the creation of effective organizational structures based on competence centres, and offices for managing projects, programs and project portfolios;
- effective partnership through joint training in international programs (benchmarking);
- integration of modern information technologies at the enterprise level;
- globalization and effective exchange of knowledge;
- assessment of the potential of project management at various levels of presentation (project manager, team, organization, industry, country) and management of this potential based on a system of models and tools.

2. Analysis of recent research and publication

In recent years, the understanding has come that project management, is a special art that can be distinguished and studied. Project management methodology is completely different from the purely technical methodology often associated with most projects [5]. In real life, there are many aspects of a project that lie outside the boundaries of technical areas and that need to be organized with the greatest possible care and attention. That is, to achieve the goals of the project with optimal use of resources and maximum satisfaction of project participants, such non-technical aspects of projects must be well managed. This largely depends on the competence of project managers and project management teams [6].

Project management is not something extraordinary - it is the most effective means of achieving results. For better or worse, depending on the skill, intuition and luck of managers, projects should always be manageable.

The situation is most obvious in the case of project management in the construction industry, in numerous government organizations, aerospace research, medicine, electronics, etc. Unfortunately, different people put different meanings into the term project management, and, naturally, there are different opinions about what and who is involved in such management. Related to this is a certain diversity of the new and dynamically developing profession of project manager. As a result, however, it is difficult to find a real connection here, especially where modern, innovative, interdisciplinary coordination is needed [7].

Projects are carried out by people with their respective skills and abilities. But the number of people and their qualifications change during the life cycle of the project following the level of effort involved. Consequently, many of the project participants are required only for a relatively short period. Therefore, the project should be led by a team led by a project manager [7].

In real life, the project team is also required only temporarily. However, much attention must be paid to the selection and coordination of its members, ensuring that they clearly understand the roles and responsibilities in the temporary organizational environment. This is where human resource management comes into play.

Consequently, there is a need for a constant forecast of the final result, including the consumed resources. Based on such a forecast, especially if the forecast is poor, it is possible to change direction by applying control.

Control makes sense if all project participants clearly understand their roles and responsibilities - the result of careful planning and coordination. In addition, the current state of the project becomes apparent after its comparison with the planned one. Often such a comparison can only be made by interpreting both the external and internal design environment. All this relates to communication management.

But the presence of people and communications is not enough to successfully implement the projects, programs and portfolio of projects [8, 9]. We also need services provided by people. It is common knowledge that the project manager must devote most of his time to aligning the responsibilities of the staff and the objectives of the project [10].

The uncertainty of projects is an objective factor and is associated with probability and risk. A professional project manager will take steps to reduce the possibility of realizing a less favourable outcome by reducing the risk of the project if this can be achieved effectively. This brings us to the need for a concise understanding of the nature of the project in the first place, especially if it is innovation and cross-sectoral. All these functions are performed in risk management.

Any project starts with the idea of changing someone or something. Ideas for changing the world around us (including ourselves) appear in various areas of human activity - science, art, production, economics, everyday life, etc. These ideas can capture functions of various scales, from rebuilding the country's economy and renovating a factory to buying a vacuum cleaner. Some of these ideas provide the study of the secrets of the universe and the universe by mankind [11].

From this, it follows that the world of projects is limitless and can be defined in a huge number of various features that divide projects into categories: research, product development, cultural development, financial and innovation activities, etc.

From where and how the idea of the project is born, its characteristic features depend. We do not think about why a cat has a kitten, and an elephant has a baby elephant.

Projects are born in a certain environment and very often in the same agony as all living things. The environment of the project "feeds" it with various ideas, approaches, tools, resources (including money) and means of solving the problems of the project - it forms the environment of the project. As for a person, clothing, housing, habitat and communication, etc. form an environment.

The specifics of managing innovation projects and the problems of dynamic leadership lies in the particular innovation of the tasks that project managers constantly have to solve, and the low level of performance culture among project participants: customer, investor, financing organizations, project managers, project performers, surrounding organization, control services (technical, financial, tax, etc.).

In this case, project management is considered a universal language of communication between project stakeholders. From the unambiguous and professionally correct understanding of the language of project management, the result of the implementation of an innovation project largely depends on the selected criteria (time, cost, quality, etc.).

The main problems of managing innovation projects are formed around the following factors [12]:

- customer requirements for the project and increasing their competence. At the same time, the principle “appetite comes with eating” works;
- the innovation of the resulting products or projects. This innovation is considered an objective property of the system, which requires the decentralization of management functions and the use of hierarchy as a means of dealing with the innovation of management tasks. Typically, in such a management scheme, a significant number of conflicts arise when decisions are made by managers of the same level. Every manager tries to "pull the blanket over himself";
- relationship and mutual influence with the external environment of projects (economic, political, environmental, social, cultural environment). Such connections quite often negatively affect the progress of the project.
- degree of uncertainty and risk. In innovation projects, the degree of risk is always much higher, as it is balanced by the effect of project implementation. Here the folk wisdom “you have to pay for everything” works [13];
- organizational restructuring. Such restructuring is inevitable since the project management system must reflect changes in the control object, which consist of changes in the structure of the reorganization. This is an objective property of any innovation project, and the absence of changes in an innovation project during its implementation is "not the rule, but the exception";
- frequency of technology change. This property is determined by the significant duration of the project, on the one hand, and the desire of the customer to obtain a result that corresponds to the latest technological advances, on the other. The inevitability of replacing technical and technological solutions makes it possible to meet the customer’s expectations of the type “I want this, but I don’t know what”;
- planning and pricing errors. These errors are an essential attribute of any innovation project. In this case, project managers are always under the "crossfire" of the designers, the customer and the contractors. This triangle is the source of most of the problems that arise in the process of project monitoring.

3. Existing intelligence models

Let's look at the existing intelligent service systems.

The first system applies CAPRA model [2].

The key to community policing within an intelligence environment is explained within the CAPRA model:

C = Clients

Effective intelligence requires an understanding of the diverse and changing needs of the full range of clients that intelligence serves.

A = Acquiring and Analyzing Information

The key to effective intelligence, especially in our information society, is the effective and efficient collection, analysis and documentation of information to specify and address problems.

P = Partnerships

An increasingly important dimension of police problem-solving is the development and maintenance of appropriate partnerships.

R = Response

While in the past, responses may have been driven primarily by law, policy and procedure, a client-centred approach requires that responses be shaped by client needs.

A = Assessment

Effective intelligence demands approaches and techniques for ongoing assessment which promote continuous improvement and learning.

Second system intelligence grading process model.

The intelligence grading process is defended by the following components [1].

Grading

Intelligence grading is a fundamental step in the intelligence collection process. Intelligence is graded so that any individual reading it can have the confidence to rely on it.

Sanitization

Sanitization is the process of removing any details that could lead to potential risk to the source.

Universality

One of the major problems with any grading system is that it has to be easily understood.

The third is the Cambridge Intelligence model [1].

According to this model, intelligence theories are grouped into four major theory types: (1) psychometric theories; (2) cognitive theories; (3) cognitive-contextual theories; and (4) biological theories.

Sternberg's theory [1] identifies three types of intelligence: practical, creative, and analytical.

Intelligence is a complex character of cognition. Many theories have been developed to explain what intelligence is and how it works.

There's Sternberg's triarchic theory of intelligence that focuses on analytical, creative, and practical intelligence, but there is also Gardner's theory which holds that intelligence is comprised of many factors. Still, other theories focus on the importance of emotional intelligence.

Which of the theories is most correct?

And how can intelligence even be measured?

Contemporary models of intelligence [1] for each of the three levels: psychometric, physiological, and social. The contemporary models that bridge more than one level are examined. The theory of fluid and crystallized intelligence (Gf-Gc theory), the three-stratum theory, the Cattell-Horn-Carroll (CHC) theory, and critique of the psychometric level and its models. According to the dual-process (DP) theory, intelligent behaviour can be explained through a hierarchical structure of directed and spontaneous mental processes.

Sternberg notes that his analytic, practical, and creative aspects of intelligence could be applied to Gardner's domains of intelligence. Similarly, neuroimaging studies could examine areas of the brain that are activated before and after the acquisition of expertise.

The psychometric, physiological, and social levels and their current models have headed the field of intelligence down three productive paths. Perhaps the time has come for these paths to converge into one.

Intelligence competencies for value creation of managing innovation projects and programs are systematic processes, implementation, preservation, and distribution, which are used as elements of the intellectual capital of the organization.

The intelligence models and methods for managing innovation projects are the tools for creating an effective system of competencies for project management teams [5]. Intellectual competencies form the core of project management in general. In the process of managing innovation projects, such a core plays a decisive role in their success. In [12] the following products are defined: analytical, search, knowledge products and systems products [14]. Each type of product of intellectual activity makes it possible to form potential innovation competencies in the management of innovative projects [15].

Analytic products include results analysis, research area structure analysis, innovation technology market profile, network analysis, risk and opportunity analysis, goal profile, and rapid assessment of the state and prospects of projects [12].

The search products are associated with the uncertainty, variety and quality of information [5,6].

Knowledge products serve as a basis for further development of the model itself and quality maintenance and balancing socio-cognitive space [14].

The system products are designed to ensure that the appropriate innovation models are available for its efficient operation and to minimize inefficient practices such as the use of multiple information systems platforms [15].

The most rational form of innovation project management is professional management, which is a higher stage in the development of management specialization and concentration of management functions for a specific breakthrough project [16]. With an increase in the scale, cost and number of ongoing projects, it becomes difficult for the customer to navigate and be competent in all matters related to the preparation and implementation of projects [17]. Therefore, it is typical for the customer to entrust the organization and management of projects to a specialized structure that professionally owns the methods and means of project management, has access to all the necessary information, and makes the main management decisions.

Tasks of the professional management structure:

- participation in the development of the concept of the project and the provision of advisory assistance to the customer;
- selection of designers, contractors and other project participants;
- organization and coordination of work on project implementation;
- organization and coordination of works to provide construction with financing, equipment, materials, etc.;
- meeting the information needs of all project participants;
- control, analysis and regulation of the state of the project at all stages of its implementation.

The structures of professional project management were the result of a continuous search for the most progressive forms of organization and management of innovation activities that would allow us to combine the stringent requirements of customers for the technical level and quality of projects with the achievement of acceptable risk and a given level of cost and timing of their implementation [18]. The fulfilment of such high requirements for large-scale and complex innovation projects required not only specialization and professionalization of management activities but also the development of special organizational forms, methodology and project management techniques based on the widespread use of computer data processing systems.

The project management methodology [19,20] provides for the creation of a special "team" for the project, with the inclusion of representatives of all participants in the innovation process. Following the goals, functions and tasks, the composition of the project team should cover the entire field of activity for the implementation of the project by managers. The team usually includes the project manager (manager) and his group, the customer, investors, architect, engineers, construction contractors, land owners, financial institutions, legal services and local authorities, suppliers of materials and equipment, and others. For the period of active implementation of the project, including the construction period, a single headquarters is created among the members of the project team. Thanks to this form of project management, increased activity of each participant are achieved, bottlenecks are predicted and promptly identified, and issues related to their elimination are effectively resolved.

The central figure is the head (manager) of the project (contract). This is, as a rule, a representative of a design, design and construction specialized professional management firm that has a group of targeted managers and technical personnel, equipped with and owning modern project management methodology and technology. Most often, he fully represents the interests of the customer, is endowed with appropriate powers and resources, and bears material responsibility for the final results.

Among the main functions of a professional project manager, the following can be noted [22, 23]: participation in the development of the project concept and provision of advisory assistance to the customer, selection of designers and contractors (organization of pre-project work and development of design assignments - preparation of documents for concluding contracts, i.e. e. execution of

contracts for the supply of components and equipment), detailed work planning and scheduling, control over the cost, volume and quality of work, putting the facility into operation.

Thus, the project manager coordinates the activities of all participants in the process of project implementation from its conception to completion.

According to experts, the considered form of project management organization is especially effective for the implementation of large and complex facilities (complexes for industrial and non-industrial purposes).

The choice of the organizational structure for the rational management of innovation projects is determined by the scale and specifics of the project itself [24], the form of ownership and scope of the organization, its specialization and production structure, the state of the innovation and contracting market in the region where the facility is located, the adopted supply system, the presence of appropriate customer structures.

4. Competencies intelligent model for managing innovation projects

In real practice project managers apply a conceptual model with five domains of competencies:

1. Emotional Intelligence (EI) competencies of Result Orientation, Initiative, Flexibility, and Self-Confidence;
2. Social Intelligence (SI) competencies of Empathy, Influence, Networking, and Distributed Team Leadership. They also showed significantly more cognitive competencies in Systems Thinking and Pattern Recognition;
3. Cognitive Intelligence (CI) competencies being key to effectiveness in Acquisitions of knowledge, Creativity and Innovation, Artificial Intelligence and Modeling in an organization;
4. Business intelligence (BI) competencies like Strategy, Culture and Values, Planning and Control, and Opportunity and Risk Management.
5. Technical intelligence (TI) competencies: vision of the product and result, technical, technological and organizational solutions in the implementation of the project, work in conditions of uncertainty and innovation, clear definition of boundaries and work with the context.

The 5D model of Competencies Intelligence for managing Innovation Projects is shown in Fig. 1.

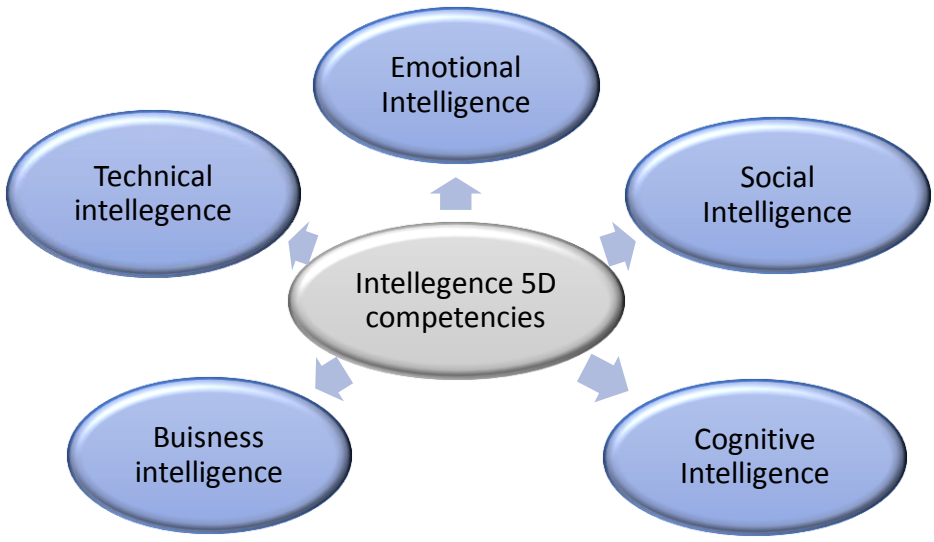

Figure1: The competencies intelligence 5D model

The approach to achieving a particular goal depends on the situation. The guiding intelligence principles are the elements of the prospective competency as well as the technology solution used to build the solution. This choice starts with what the best is already available and then what needs to be built on top of that. This will be the technological architecture.

We also face complexity and uncertainty, which means that every situation requires a different approach. Therefore, the various Agile approaches are commonly referred to as "Frameworks", they are the starting point from which the approach must gradually evolve. When you start a project, you

study the lessons learned, choose a certain structure, and realize that this choice is an assumption that has not yet been proven to be correct.

Work empirically when testing this assumption or hypothesis through an experiment. Such a hypothesis must be formulated in such a way that it can be falsified. We often adjust in small steps and sometimes you need to radically change the way of working. A clear, inspiring and supportive vision for the product or result to be delivered gives meaning to the higher goals the organization wants to achieve. It provides direction and sets boundaries. When there are many uncertainties and a changing context, it is often impossible to specify goals and requirements for the result. Therefore, the command continues to communicate with the user. The focus and boundaries of the product vision allow us to constantly improve it with the help of sub-goals. We then work in a plan-do-check-act mode until we achieve results.

Consider the mechanisms of intellectual support for 5D models based on their Smartification.

Emotional intelligence is supported by the Smartification mechanism based on flexibility, self-management, emotional contagion, and result orientation competencies.

Smartification of the socio-intelligence mechanism is determined based on the active use of social networks, distributed teams, and empathy.

Smartification of cognitive intelligence is based on Acquisitions of knowledge, Creativity and Innovation, Artificial Intelligence and Modeling in an organization.

Smartification Business intelligence mechanisms are based on competencies Strategy, Culture and Values, Planning and Control, and Opportunity and Risk Management.

Smartification Technical intelligence mechanisms based on the competencies Vision of the product and result, Technical, technological and organizational solutions in the implementation of the project, Work in conditions of uncertainty and innovation, Clear definition of scope (boundaries) and work with the context.

For the assessment of competence for the proposed model Key Intelligence Indicators have been developed for each competency.

In the case of the proposed intelligence competence model study according to the application of the proposed conceptual model. It had been developed by an assessment Double degree Master's program in preparation for Project Managers at Kyiv National University of Construction and Architecture. At the end of this program grope of 20 students had been assessed according to the four-domain conceptual model of innovation competencies (Table 1).

The project team's competence was assessed using the IPMA OCB and IPMA ICB 4 models [1,2].

Table 1

Results of assessment competencies level according to Benchmark of project success

Competencies by domain	Assessment level	Benchmark
Emotional Intelligence		
Result Orientation	8	7
Initiative	6	7
Flexibility	9	7
Self-Confidence	7	7
Social Intelligence		
Empathy	8	7
Influence	9	7
Networking	7	7
Team Leadership	6	7
Cognitive Intelligence		
Acquisitions of knowledge	8	8
Creativity and Innovation	9	8
Artificial Intelligence	7	8
Modelling by vision	8	8
Business intelligence		7

Strategy	9	
Culture and Values	8	7
Planning and Control	8	7
Opportunity and Risk	9	7
Technical intelligence		
The vision of the product and result,	9	7
Technical, technological and organizational solutions in the implementation of the project,	8	7
Work in conditions of uncertainty and innovation,	8	7
Clear definition of boundaries and work with the context	7	7

As a result of analyses, there are two competencies, where the assessment level low than Benchmark (Figure 2).

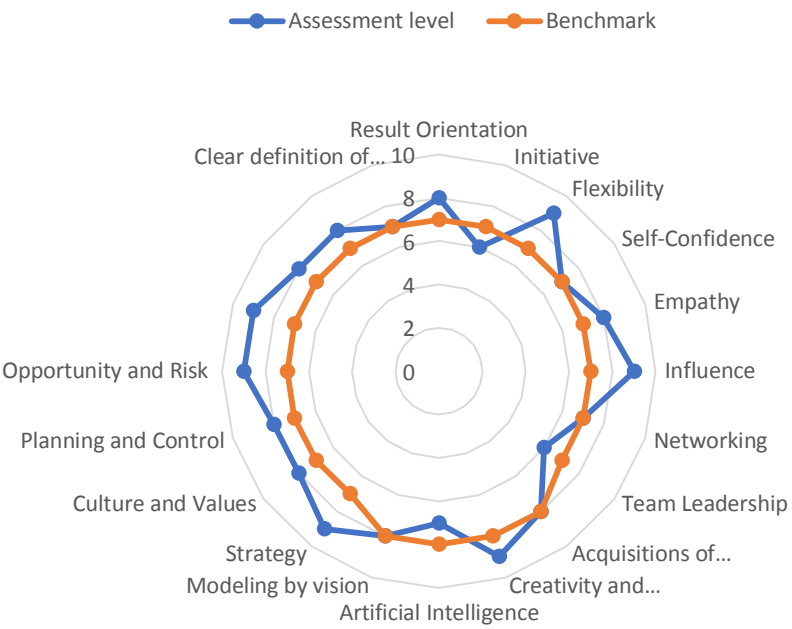

Figure 2: Results of the case study of assessment by 5D Intelligence model of competencies for Innovation Projects success

As the result of analyses, there are 2 competencies, where the assessment level is low the Benchmark. These are Initiative and Team Leadership and Artificial Intelligence competencies. To be successful project team need to improve these three competencies.

The project manager decided on the initial step to organize 3 pieces of training for the project team. The first training was devoted to the development of the initiative of the innovation project team. The second concerned leadership. The third training improves Artificial Intelligence competence. As a result, the assessment of the team's competence has changed significantly and is given in Table 2.

Table 2

Results of assessment competencies level according to Benchmark of project success

Competencies by domain	Assessment level	Benchmark
Emotional Intelligence		
Result Orientation	8	7
Initiative	6	7

Flexibility	9	7
Self-Confidence	8	7
Social Intelligence		
Empathy	8	7
Influence	9	7
Networking	9	7
Team Leadership	8	7
Cognitive Intelligence		
Acquisitions of knowledge	8	8
Creativity and Innovation	9	8
Artificial Intelligence	9	8
Modelling by vision	8	8
Business intelligence		
Strategy	9	7
Culture and Values	8	7
Planning and Control	8	7
Opportunity and Risk	9	7
Technical intelligence		
The vision of the product and result,	9	7
Technical, technological and organizational solutions in the implementation of the project,	8	7
Work in conditions of uncertainty and innovation,	8	7
Clear definition of boundaries and work with the context	9	7

The results of the evaluation of Innovation competencies compared to the benchmark are shown in Figure 3.

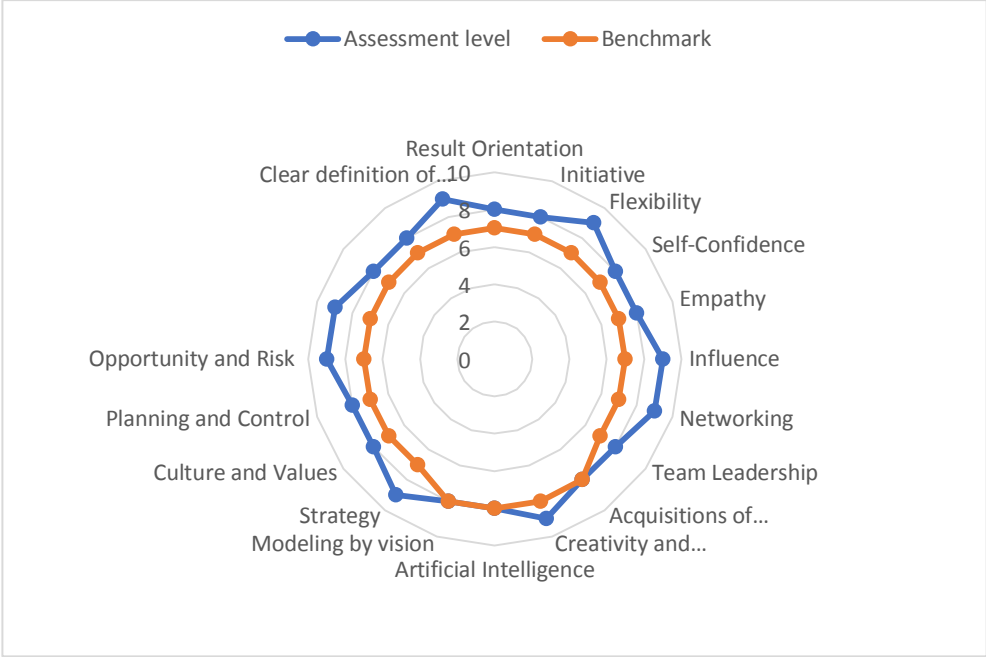

Figure 3: Results of the case study of assessment by 5D Intelligence model of competencies for Innovation Projects success

As a result of the pieces of training of the project team, the assessments of innovation competencies in almost all cases exceeded the level of the benchmark. This indicates the readiness of the project team for its successful implementation.

5. Implementation of 5D model Intelligence competencies for Managing Innovation Projects

Let's discuss step by step by step process for the application 5D conceptual model of competencies for managing Innovation Projects.

Step 1. Initiation

1.1. Definition of the Mission, vision and expected result of an innovation project. Profiling project goals
1.2. Installing a benchmark by directions
1.3. Generation of alternative directions for innovation projects
1.4. Entropy estimation for each direction
1.5. Breakout Direction Choice
1.6. Assessment of the competence of each member of the project team and the team as a whole
1.7.

Step 2. Implementation

2.1. Competence gap analysis of the team and the benchmark
2.2. Formation of an operational training program for an innovation project team
2.3. Using the conceptual model of innovation competencies for the successful implementation of the project
2.4. If the goals are not achieved, the next alternative is selected and Step 1 is repeated.

Step 3. Closing down

3.1. Results assessment
3.2. Lesson learns
3.3. Good practice

After achieving the goal of an innovation project, a report is generated and an analysis of the level of competence of the project team is carried out.

6. Conclusion

The proposed 5D Intelligence Competencies model for managing Innovation Projects includes five domains of competencies. These domains are the emotional, social, cognitive and business and technical competencies. Each domain has a set of basic interrelated competencies.

SMARTification process gives the possibility to develop Intelligence mechanisms for the 5D model. To support of the success an innovation project, a benchmark level of competencies assessment is used. It allows for the identification of the low level of some competencies and, at the stage of project initiation, plans the necessary corrective actions to develop insufficient project competencies.

The example of the program for the preparation of masters with double diplomas confirmed the effectiveness of the proposed model. The given step-by-step process model allows us to successfully carry out innovation projects.

The following issues should be highlighted as areas for future research:

- SMRTification of competence domain by intelligence mechanisms for managing innovation projects;
- managing the uncertainty in the value creation process of innovation project;
- creation of effective assessment models and tools for each domain of competence.

7. Acknowledgements

The authors express their deep gratitude to the German Academic Exchange Service (DAAD), financed from funds by the Federal Foreign Office, for its financial support of the “Virtual Master Cooperation Data Science” (Project-ID: 57513461) and the European Union ERASMUS + program

for financial and technical support of the project «Cross-domain competences for healthy and safe work in the 21st century (Work4Ce)» (№ 619034-EPP-1-2020-1-UA-EPPKA2-CBHE-JP).

8. References

[1] Individual Competence Baseline for Project, Programme & Portfolio Management, Version 4. International Project Management Association, 2015, 415 p.
[2] IPMA Organisational Competence Baseline (IPMA OCB). IPMA, 2013, 67 p.
[3] The Cambridge Handbook of Intelligence, Cambridge University Press, 2011, pp.58–82.
[4] Intelligence Models and Best Practices. IALEIA, 1999, 58 p.
[5] A Guidebook of Program & Project Management for Enterprise Innovation, Third Edition P2M, Project Management Association of Japan (PMAJ), 2017, 427 p.
[6] A Guide to the Project Management of the Knowledge (PMBOK® Guide). Seventh Edition. PMI 2021, 370 p.
[7] ISO 21502. Guidance on project management. Project Committee ISO / PC 236, 2020, 52 p.
[8] ISO 21503, Project, programme and portfolio management – Guidance on programme management. ISO / PC 236, 2017, 52 p.
[9] ISO 21504, Project, programme and portfolio management – Guidance on portfolio management ISO / PC 236, 2015, 24 p.
[10] ISO 21505, Project, programme and portfolio management – Guidance on governance. ISO / PC 236, 2017, 11 p.
[11] V. Obradović, M. Todorović, S. Bushuyev, Sustainability and Agility in Project Management: Contradictory or Complementary? in: IEEE 13th International Scientific and Technical Conference on Computer Sciences and Information Technologies, 2018.
[12] R. H. Pherson, R. J. Heuer. Structured Analytic Techniques for Intelligence Analysis. SAGE Publications Inc, 2020, 384 p.
[13] J. Jae-Yoon, C. Chang-Ho, An entropy-based uncertainty measure of process models. Information Processing Letters 111 (3) (2011) 135-141.
[14] C. Belack, D. Di Filippo, I. Di Filippo, Cognitive Readiness in Project Teams. Reducing Project Innovationity and Increasing Success in Project Management New York, NY: Routledge/Productivity Press, 2019, 252 p.
[15] N. Drouin, R. Müller, S. Sankaran, A.-L. Vaagaasar, Balancing leadership in projects: Role of the socio-cognitive space. Project Leadership and Society 2 (2021) 12 p.
[16] S.Bushuyev, A. Murzabekova, S. Murzabekova, M. Khusainova, Develop innovation competence of project managers based on entrepreneurship energy, in: Proceedings of the 12th International Scientific and Technical Conference on Computer Sciences and Information Technologies, 2017.
[17] The Availability of Information on the National Intelligence Mode. NCIS, 2000, 42 p.
[18] Global alliance for project performance standards. URL: http://www.globalpmstandards.org/
[19] K.Forsberg, H.Mooz, H.Cotterman. Visualizing Project Management, 3rd edition, John Wiley and Sons, New York, NY, 2005, pp. 108-116, 242-248, 341-360.
[20] A. Slivitsky, Value migration. Mann,Ivanov& Ferber, 2006, 432 p.
[21] S. Bushuyev, D. Bushuiev, A. Zaprivoda, J. Babayev, Ç. Elmas, Emotional infection of management infrastructure projects based on the agile transformation. CEUR Workshop Proceedings 2565 (2020) 1–12.
[22] Agile Practice Guide: Paperback. USA, Project Management Institute, 2017, 210 p.
[23] A Systems Approach to Planning, Scheduling, and Controlling (10th ed.). USA, New Jersey, Wiley, 2006, 1120 p.
[24] C. Wolff, B. Igel, U. Lauschner, A Structured process for transferring for academic research into innovation projects – Pimes case study. International journal of computing 13(4) (2014) 227–239.