

FORESIGHT OF THE INNOVATION MANAGER COMPETENCIES

Kurmanov N., Tolysbayev B., Amirova G., Satkanova R., Shamuratova N.*

Abstract: In the current circumstances, creation of a model of innovation manager competencies appears to be an important scientific and practical task of ensuring the innovative development of the economy. Identification of future needs in competencies enables the education system to adapt elaborately the process of professional training of innovative personnel and increase the competitiveness of educational programs. The following paper summarizes and examines the existing models of competencies and skills based on bibliometric analysis of published works and content analysis of documents in Scopus and Web of Science, two leading databases. Studied were the competencies of the managerial profession on junior and middle management levels engaged in innovation activities, which includes the following: assessment of the commercial potential of innovations; operational planning and organizing management of innovation activities; management of all stages of the innovation project; working with partners in the innovation market; control of measures to promote innovations in the market, etc. An approach to form a model of competencies of an innovation manager has been proposed in the form of an ordered list of five groups: professional, functional, digital, socio-cultural and cognitive competencies. The paper uses foresight methodology to determine the future demand for competencies and areas of professional innovative training. The authors analyze the potential of foresight methodology and study of future in the development of innovation management competencies. First and foremost, an attempt has been made to assess the level of training and significance in practice for managers of 61 competencies through a large-scale national survey of innovation experts working in Kazakhstan companies. The researchers consider modern methods of training and developing the competencies of innovation managers. For this purpose, the study has been supplemented with in-depth interviews.

Key words: manager, innovation activity, competencies, skills, trends, study of future, foresight.

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Introduction

Kazakhstan pays great attention to innovation; there are state programs to support and stimulate innovation, development of the competencies of innovative personnel

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in the education system is given an important role. However, there is still an acute problem of a demand for innovative personnel, which can be explained by the fact that the heads of enterprises fail to rationally organize their work to derive maximum benefit. The business community is still not ready to accept the innovative personnel produced by higher educational institutions due to the lack of ready-to-implement results of scientific, technical and innovative activities. It is believed that overcoming the existing negative phenomena is only possible with a sufficient number and level of training of young innovators and managers of innovation activities. Managers are an important part of innovation as they are involved in every stage of innovation. More than any other category of performers of the innovation process (the emergence of innovation), managers are interested in its success. The work of an innovation manager is organizational and creative in nature and requires appropriate competencies.

In the twenty-first century, according to the Third Wave concept by Alvin Toffler (Toffler, 1980), the ability to "learn, unlearn, and relearn" will become necessary, i.e., skill management will be the most important skill in a changing labor market. Numerous studies of innovation manager competence models in the twentieth century have demonstrated the need to see a new perspective that will allow adopting new approaches to the demands and challenges of the modern labor market. Innovation managers have to operate in a dynamically changing world based on information and knowledge in a globalized economy. Innovation requires modern theoretical solutions that focus on such expert characteristics as adaptability, flexibility and readiness for continuous training.

Thus, in modern conditions, the creation of a model of innovation manager competencies is an important scientific and practical task of ensuring the innovative development of the economy. Research and determination of future needs in competencies based on the foresight methodology enable the professional education system to implement a well-thought-out adaptation of the process of professional training of innovative personnel and increase the competitiveness of educational programs within the framework of the concept of lifelong learning.

Literature review

During the research stage of theoretical and methodological foundations of creating the model of innovation manager competencies, the authors performed a bibliometric analysis of scientific literature and a content analysis of works published in two significant databases Scopus and Web of Science. Relevant scientific publications were filtered by keywords: "Manager's competence" and "Competence of an innovation manager".

Analysis of "Manager's competence" and "Competence of an innovation manager" publications has shown positive dynamics in both databases.

For Scopus, the search results for "Manager's competence" over the period of 1959-2021 have revealed 6823 publications. Of these, the largest number falls in 2019 (455) and 2020 (381). For "Competence of an innovation manager", there are

615 publications over the period of 1972-2021. Of these, the largest number falls in 2019 (42) and 2020 (36) as well.

For Web of Science, the search results for “Manager’s competence” over the period of 1979-2020 have revealed 171 publications. Of these, the largest number falls in 2019 (19) and 2020 (20). For “Competence of an innovation manager”, there are 321 publications over the period of 1992-2020. Of these, the largest number falls in 2019 (27) and 2020 (32) as well.

The bibliometric analysis results indicate an increase in scientific attention to research issues in innovation manager competence.

Distribution of Scopus and Web of Science “Manager’s competence” and “Competence of an innovation manager” publications by the main branches of knowledge is as follows: Business, Management and Accounting; Medicine; Social Sciences; Treatment; Engineering; Computer Science; Economics, Econometrics and Finance.

The top 10 countries in terms of publication activity for “Competence of an innovation manager” in Scopus and Web of Science by countries and territories are as follows: the USA, the Great Britain, Australia, Germany, Canada, the Netherlands, Sweden, China, Italy and France. Kazakhstan takes on 46th place among 74 countries and territories of the world with two publications on the specified keywords “Competence of an innovation manager.”

Duffield C., Liang Z., Aunguroch Y., Davidhizar R., Gunawan J., Leggat S. G., Meretoja R., Jha K. N., Leino – Kilpi H., Mulder M., Bowie C. R., Fisher M. L., Flin R., Heilmann P., Howard P. F., Numminen O are active in both Scopus and Web of Science for “Manager’s competence.” For “Competence of an innovation manager,” the list of the most active authors is as follows: Bushuyev S., Choudhury K., Mulder M., Amorim T. N. G. F., Baker G. R., Biemans H. J. A., Burmahl B., Cedergren S., Chan S. L., Chung R. C. P., Davies B., Edwards N., Esteves L., and Filiposki O.

The results of the first stage served as the basis for the second stage of the study, which filtered out published works relevant to the areas of management, business, innovation, and economics. The results of the content analysis of Web of Science and Scopus publications served as the basis for the next stage of the study, which resulted in the analysis of the list of innovation manager’s competencies in the most cited scientific papers.

For greater concreteness and the importance of labor, the study has been conducted within some acceptable limits. The paper examines competencies of the managerial profession on junior and middle management levels engaged in innovation, which include:

- assessment of the commercial potential of the innovation;
- operational planning and organizing the innovation management;
- management of all stages of the innovation project;
- working with partners in the innovation market;
- control of measures to promote innovation in the market.

The study also analyzes the most famous models of competencies in the context of innovation management in the programs (strategies) for the modern society transformation (Table 1).

Table 1. Competencies and skills of innovation managers in programs (strategies) for the modern society transformation

A program (strategy)	Country, region of the world, organization	Competencies
10 Essential Skills for Industry 4.0 (Grey, 2016)	World Economic Forum	People Management; Complex Problem Solving; Creativity; Critical Thinking; Negotiation; Judgment and Decision Making; Coordinating with Others, Emotional Intelligence; Cognitive Flexibility; Service Orientation
DigComp 2.1 (Carretero et al, 2017)	European Union (EU)	Problem Solving; Communication and Collaboration; Digital Content Creation; Safety
DigCompEdu (Redecker, 2017)	EU	User digital competencies: Basic and derived digital skills Specialized professional digital competencies
New digital economy competencies and skills (Markow, 2018)	Burning Glass	Managing Data; Analyzing Data; Digital Security and Privacy; Software Development; Computer Programming
Russia 2025: Resetting the Talent Balance (Butenko, 2017)	The Boston Consulting Group, Russia	1. Cognitive Skills: Management Skills, Achieving Results, Self-Development, Self-Discipline, Adaptability, Solution of Non-Routine Tasks 2. Socio-Behavioral Skills: Intercultural Interaction, Interpersonal Skills, Communication 3. Digital Skills: Information Management, Creating Systems
The state program “Digital Kazakhstan”, 2017	The Republic of Kazakhstan (RK)	Programming Skills; Information Analysis Skills; ICT Competencies; Creative Thinking
The state program of industrial and innovative development of the Republic of Kazakhstan for 2020-2025, 2019	RK	Development of innovative and business competencies (business process, know-how, technology knowledge)

The state program for the development of education and science for 2020-2025, 2019	RK	Formulation of arguments and problem solving; Knowledge and understanding of the study area; Information collection and interpretation; Self-study skills; Communication of information, ideas, solutions
Note: Compiled by the authors		

Of particular interest was the paper by M. S. Blokhina, who analyzed in detail several educational standards and highlighted the innovative competencies of future managers. The author identifies a universal group of 31 innovative competencies belonging to the innovative activity of a modern manager (Blokhina, 2017). The results of the study by M. S. Blokhina appear relevant and can be used as a basis for developing a model of professional competencies of an innovation manager.

The existing Bachelor's and Master's programs of a number of Kazakhstan universities in both "Management" and "Innovation Management" have also been analyzed in detail. Based on the results, it is concluded that many professional competencies of graduates of Kazakhstan universities belong to the category of innovative ones or can be easily transformed into them.

Having analyzed a number of various models of competencies in both scientific literature (Adelaja, 2018; Aurik, 2018; Bhat, 2018; Bordean, 2018; Blokhina, 2017; Wrahatnolo, 2018; Tazhiyeva, 2015; Esaulova, 2015) and programs (strategies) for the modern society transformation, the authors conclude that the 21st-century skills shall be focused on such areas of life as critical thinking and problem solving, creativity and entrepreneurship, innovation, and the digital economy. Based on the results of the study, the researchers propose a more detailed division of the competencies of an innovation manager considering their relationships in the context of the concept of lifelong learning (Table 2):

-Professional (basic) competencies. These are formed in the process of professional education. These include academic knowledge, skills, research and analytical skills, abilities and efforts required by innovation managers to fulfill their job responsibilities;

-Functional competencies. The individuals demonstrate knowledge, special skills, skills and abilities in their areas, acquire and continuously develop them directly in the course of their work;

-General cultural competencies. Knowledge of the peculiarities of the country's cultural spheres: Legal, linguistic, communicative, etc.

-Cognitive competencies. Creative thinking and logic, mathematical skills and literacy, verbal literacy, etc.

We feel it important to highlight the digital competencies of the innovation manager considering current trends in the development of science and strategic objectives set in state programs and strategies for the digital transformation of modern society.

Table 2. Model of innovation manager competencies

No.	Competence groups	Code	Competencies
1	Professional competencies	C1	Generating ideas
		C2	Strategic thinking
		C3	Forecasting
		C4	Analytical thinking
		C5	Search and assessment of new opportunities
		C6	Team building
		C7	Management decision-making
		C8	Motivation of subordinates
		C9	Adaptation to a changing environment
		C10	Development of a business plan for an innovative project
		C11	Search for extraordinary solutions
		C12	Project activities
		C13	Entrepreneurial skills
		C14	Introduction of innovations
		C15	Risk assessment and management
		C16	Marketing in a technology firm
		C17	Financial planning
		C18	Business process modeling
		C19	Determining a company's competitive advantages
		C20	Process administration
		C21	Quality management
2	Functional competencies	C22	Work planning
		C23	Organization of interaction between participants of the innovation process
		C24	Innovation project management strategy
		C25	Innovation investment management
		C26	Operational management of innovative projects
		C27	Consulting in innovation management
		C28	Forecasting the behavior of market participants
		C29	New product sales management
		C30	Evaluation of the commercial potential of an innovative product
		C31	Employee development organization
		C32	Conducting a technical audit
		C33	Quality control of innovative products
		C34	Technology transfer
		C35	Defining the areas of application of ideas and developments
		C36	Copyright and licenses

3	Digital competencies and security	C37	Information literacy
		C38	Information management
		C39	Personal data protection and privacy
4	Socio-cultural competencies	C40	Ability to work in a team
		C41	Writing and negotiation skills
		C42	Collaboration orientation
		C43	Foreign languages and cultures
		C44	Openness to new things
		C45	Ethics
		C46	Presentation skills
		C47	Social responsibility
		C48	Cross-functional and cross-disciplinary interaction
		C49	Legal foundations of innovation
5	Cognitive competencies	C50	Training setup
		C51	Critical thinking
		C52	Proactivity
		C53	Organization of own activities
		C54	Curiosity
		C55	Self-efficacy
		C56	Willingness to change
		C57	Creativity
		C58	Perception of criticism and feedback
		C59	Improvement orientation
		C60	Perseverance in achieving goals
		C61	Responsibility, risk-taking
Note: Compiled by the authors			

Competence model presented in Table 2 is a working tool for developing the competencies of an innovation manager. It is ready to be used in any innovation-oriented organization and universities.

Accordingly, the composition of the innovation manager's competencies is quite diverse and extensive. An attempt to assess the level of formation and develop all competencies simultaneously is likely to lead to a dispersion of resources with low results. In this regard, the study advises to sort by the uniformity of content and distinguish between the groups of innovation manager's competencies: professional, functional, digital, general cultural and cognitive ones.

The present research would like to emphasize that in modern conditions, the employee must take responsibility for maintaining the level of their competencies and choose the means to achieve the intended goals in their professional activities. It is believed that socio-cultural and cognitive competencies, formation and development of which took place in the education system, should be the employee's own responsibility if they strive to continuously maintain the level of their competitiveness in the labor market. Within the lifelong learning paradigm,

the state, employers and the employees themselves must take active participation in the development of professional, functional and digital competencies.

The main questions of the proposed research are as follows:

- Level of competence formation of innovation managers and their attitude to the future, especially in their professional practice.
- What competencies shall become important and mandatory for managers in the future?
- How will the competencies of innovation managers transform?
- What methods of training and developing the competence of innovation managers are the most modern and effective?

Materials and Methods

The idea to combine the study of innovation manager's competence with a foresight was at the core of an interdisciplinary methodology used for the project AP08956487 "Development of an innovation manager's competency model based on the foresight methodology" (grant of the Committee of Science of the Ministry of Education and Science of the Republic of Kazakhstan). Its two core thematic areas were as follows:

1. Study of the theoretical and methodological foundations of creation of an innovation manager's competency model based on the foresight methodology. This task (with an implementation period of October 2020 to December 2020) assumed the following:

- Research of the existing innovation manager's competency models;
- Study of the foresight methodology's potential in the study of creation of an innovation manager's competency model;
- Generalization and analysis of the world experience in conducting foresight research of competencies;
- Development of a program for foresight research of competencies.

2. Foresight of an innovation manager's competencies in Kazakhstan. This task (with an implementation period of January 2021 to September 2021) assumes the following:

- Creation of a model of an innovation manager's competency on junior and middle management levels considering the trends of innovative development and changes in the Kazakhstan economy until 2030;
- Development of a "Roadmap" for adapting the system of professional training of innovative personnel to changing conditions.

The first stage of research consisted of the development of methodological tools and identification of foresight methodology and the study of future limits in the applied field, as well as the necessary competencies.

Currently, there is a fairly large volume of research papers devoted to foresight research of competencies. An analysis of scientific literature (Kononiuk et al., 2020; Carretero et al., 2017; Grey, 2016; World Bank, 2016) has shown that over the past 20 years, foresight has become a well-known and frequently used tool for

predicting the needs for competencies. Foresight methodology is used to develop an innovation management competency model until 2030 based on the identification of both global and national trends, modeling innovation processes, building scenarios and forecasts, and managing future risks. In most cases, quantitative forecasts of the labor market demand for innovative personnel are based on education level. Furthermore, predictive activity is a structural component of the state education policy. Forecasts serve as basic information in the state order for innovative personnel. When implementing the strategic task of establishing a quantitative balance between the labor market and the higher education system, the issue of a qualitative imbalance (shortage of some and overabundance of other competencies when entering the labor market of university graduates) is not to be underestimated. In this regard, the issues related to forecasting the most significant competencies of an innovation manager based on the foresight methodology appear relevant. For this purpose, a program has been developed for conducting a foresight study of an innovation manager's competencies.

The foresight program for the innovation manager's competencies includes four stages:

1) Preparation stage (a preliminary foresight). Stage tasks:

- Stage of determining the scope of work;
- Search, systematization and analysis of scientific literature on creation of the model and development of an innovation manager's competencies;
- Collection of potential stakeholder data for conducting a foresight.

The empirical basis for the first stage of foresight consisted of more than two thousand papers, presentations, reports, and documents relevant to the areas of creation and development of an innovation manager's competencies.

In the course of desk research, the following types of sources have been analyzed:

1) scientific papers on the keywords "Manager's competence" and "Competence of an innovation manager;" 2) programs (strategies) for the modern society transformation; 3) regulations governing this area; 4) curricula of Bachelor's and Master's degree programs of a number of Kazakh universities in "Management" and "Innovation Management." Based on the results of the study, the study proposes a more detailed division of the competencies of an innovation manager: professional, functional, digital, general cultural and cognitive competencies.

2) The stage of involving stakeholders in foresight. Stage tasks:

- Providing resources and technical support for foresighting;
- Involvement of relevant stakeholders (Kazakhstan state authorities, ministries and departments, various social and professional groups, innovative enterprises and companies in the production sector);
- Combining players by interests and forming groups for foresighting.

3) The stage of actual competence foresight. Stage tasks:

- Identification of priority areas, development of an innovation manager's competency model on junior and middle management levels considering the trends of innovative development and changes in the Kazakhstan economy until 2030;

-Assessment of the level of formation and significance in the future (projection horizon is five years) of competencies necessary for innovation activity. Performed in the first quarter of 2021 (a quantitative analysis);

-Development of a training program and development of an innovation manager's competency (a qualitative analysis).

The empirical basis of the second stage of the foresight consists of the following: a survey of a total of 218 respondents from among the innovation practitioners, representatives of the employment service, government agencies, the National Chamber of Entrepreneurs "Atameken", employer association, trade unions, organizations working in the education area, innovative enterprises and companies in the production sector, and youth organization representatives.

Quantitative research tools (evaluation surveys) have been used to assess the level and significance of competencies required for innovation. To find out the degree of significance of competencies for the implementation of innovative activities, the respondents were offered the following scale:

-Extremely significant: 8.6 to 10.0;

-Significant: 7.6 to 8.5;

-Average: 5.1 to 7.5;

-Not very significant: 2.6 to 5.0;

-Negligible: 0 to 2.5.

To assess the level of competence formation, the respondents were offered the following scale: 1) beginner (0 to 2.5); 2) below-average (2.6 to 5.0); 3) intermediate (5.1 to 7.5); 4) above-average (7.6 to 8.5); and 5) advanced (8.6 to 10.0).

A quantitative study has been supplemented with a qualitative one, which included 18 individual in-depth interviews with 18 experts from areas related to the support and development of competence. The main objectives of qualitative research are to assess modern methods of training and developing the innovation manager competencies.

4) Stage 4 of the foresight: control of the results. Stage tasks:

-Presentation of the results of the foresight study of competencies to a wide audience (discussion of the results at international scientific and practical events, publication of a paper in a peer-reviewed scientific periodical).

Results

At the stage of qualitative analysis, a total of 218 respondents has been surveyed. At least three from each of 17 territorial units of Kazakhstan: 14 regions and 3 cities of national significance. The largest number of innovation managers operates in Almaty (23%), Nur-Sultan (16%), and Shymkent (7%). Almost half of the respondents (98 people or 45% of the sample) belong to the age group of 35-44 years, a third to 45-54 years and 12% were older than 54 years. Most of the respondents have been actively practicing for more than 10 years; a fifth (21%), over 15 years; a third, 10 to 15 years; and a little more than 30%, 5 to 10 years.

Majority of the surveyed managers (78%) work on junior and middle management levels and are engaged in innovation, which includes:

- assessment of the commercial potential of the innovation;
- operational planning and organization of innovation management;
- management of all stages of the innovation project;
- working with partners in the innovation market;
- control over measures to promote innovation in the market.

All participants in the sample have higher specialized education: 80% – basic technical education, 20% – natural science, 13% – business and management, 2% – humanities.

Majority of respondents (2/3 as well) indicated that they had completed a retraining program: a second higher education, an MBA, one-year professional retraining (mainly within the framework of the national educational program “Bolashak”), a Master’s program. Only 21% have mentioned short (72 hours) training programs as a source of their additional education.

Respondents were asked to assess 61 competencies related to the use of foresight and study of future methods in two dimensions: self-assessment of the level of proficiency and assessment of practical usefulness (significance) of competence for innovation. The aim of the study was to identify potential gaps in competencies (Lester and Religa, 2017).

For the final list of competencies, the authors considered “knowledge” and “skills” identified at previous stage of the study, and expert consultations with practitioners. For each of the 61 competencies included in the questionnaire, the arithmetic mean values of the scores in both dimensions have been calculated to determine the individual degree of proficiency (a subjective assessment) and the usefulness of this competence in professional practice.

Table 3 shows the arithmetic mean values of assessments of the level of formation and significance of each of the 61 competencies included in the list of the innovation manager’s competence model.

Table 3. The level of formation and significance of competencies for innovation managers (results of a quantitative study)

No.	Competency groups	Code	The level of formation of a competence (arithmetic mean values)	Assessment of statements of the competence significance (arithmetic mean values)	Gap
1	Professional competencies	C1	6,80	8,61	-1,81
		C2	5,64	8,38	-2,74
		C3	6,49	7,45	-0,96
		C4	6,12	8,62	-2,50
		C5	4,20	6,65	-2,45
		C6	4,70	6,57	-1,87

		C7	3,72	6,12	-2,40
		C8	4,17	7,25	-3,08
		C9	4,72	6,12	-1,40
		C10	5,64	7,56	-1,92
		C11	4,11	6,24	-2,13
		C12	3,15	8,57	-5,42
		C13	4,72	8,27	-3,55
		C14	5,31	8,02	-2,71
		C15	3,93	6,15	-2,22
		C16	4,68	9,21	-4,53
		C17	6,43	9,42	-2,99
		C18	7,82	8,84	-1,02
		C19	4,99	8,56	-3,57
		C20	8,71	7,21	1,50
		C21	4,61	8,92	-4,31
2	Functional competencies	C22	7,88	8,58	-0,70
		C23	5,05	6,87	-1,82
		C24	6,75	7,86	-1,11
		C25	4,70	8,71	-4,01
		C26	5,06	7,82	-2,76
		C27	3,50	5,86	-2,36
		C28	2,90	8,53	-5,63
		C29	2,46	7,76	-5,30
		C30	7,06	7,96	-0,90
		C31	3,39	6,23	-2,84
		C32	5,96	8,35	-2,39
		C33	5,23	7,46	-2,23
		C34	2,94	4,56	-1,62
		C35	7,30	7,89	-0,59
		C36	3,95	5,54	-1,59
3	Digital competencies and security	C37	7,42	8,57	-1,15
		C38	3,56	6,48	-2,92
		C39	1,98	4,15	-2,17
4	Socio-cultural competencies	C40	7,63	9,21	-1,58
		C41	7,51	9,32	-1,81
		C42	7,32	9,11	-1,79
		C43	5,68	8,46	-2,78
		C44	8,24	8,92	-0,68
		C45	7,34	8,46	-1,12
		C46	7,12	8,27	-1,15
		C47	5,12	7,56	-2,44
		C48	5,32	7,67	-2,35
		C49	4,15	7,02	-2,87
5	Cognitive competencies	C50	8,23	9,23	-1,00
		C51	7,88	8,94	-1,06

	C52	7,28	8,65	-1,37
	C53	8,42	8,56	-0,14
	C54	8,84	8,91	-0,07
	C55	7,15	8,74	-1,59
	C56	8,19	8,46	-0,27
	C57	6,98	8,45	-1,47
	C58	6,47	7,86	-1,39
	C59	5,78	7,84	-2,06
	C60	5,72	6,89	-1,17
	C61	4,58	6,75	-2,17

Survey results have shown that 53 respondents lack some of the competencies mentioned in the questionnaire in the first case (a subjective assessment) (See Table 3, Figure 1).

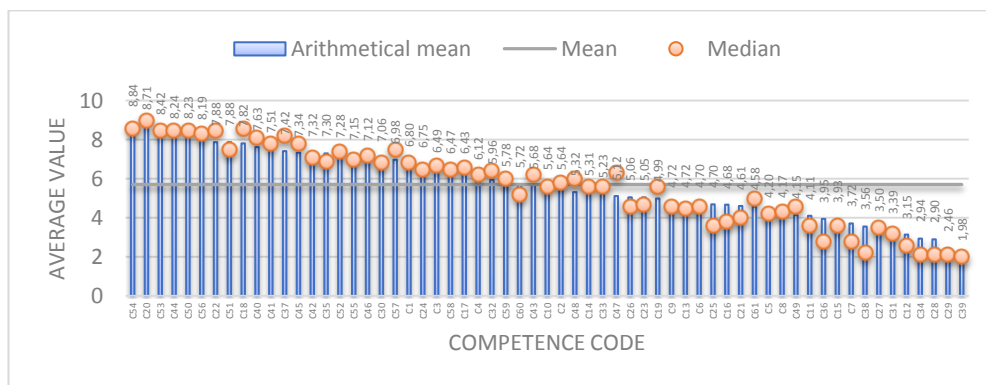


Figure 1: Ranking of average values of statements about competence formation level

Almost half of these respondents (25) reported that they lack such competencies as personal data protection and privacy (C39) and new product sales management (C29). A significant group (61 respondents) have rated their competencies as below average in such areas as forecasting the behavior of market participants (C28), technology transfer (C34), project activities (C12), employee development organization (C31), consulting in innovation management (C27), information management (C38), management decision-making (C7), risk assessment and management (C15), copyright and licenses (C36), search for extraordinary solutions (C11), legal foundations of innovation (C49), motivation of subordinates (C8), search and assessment of new opportunities (C5), responsibility, risk-taking (C61), quality management (C21), marketing in a technology firm (C16), innovation investment management (C25), team building (C6), entrepreneurial skills (C13), adaptation to a changing environment (C9), determining a company's competitive advantages (C19). Effectively, according to innovation managers in Kazakhstan, these competencies (C39, C29, C28, C34, C12, C31, C27, C38, C7,

C15, C36, C11, C49, C8, C5, C61, C21, C16, C25, C6, C13, C9 and C19) can be considered their weaknesses. Curiosity (C54), process administration (C20) received the highest marks (advanced level). Calculation of average values has allowed us to pronounce competencies C53, C44, C50, C56, C22, C51, C18, C40, and C41 as developed above average. Almost half of the respondent competencies are at the average level of formation. These include the following: C37, C45, C42, C35, C52, C55, C46, C30, C57, C1, C24, C3, C58, C17, C4, C32, C59, C60, C43, C10, C2, C48, C14, C33, C47, C26 and C23.

As for the second dimension, respondents consider the majority of competencies proposed in the questionnaire to be the most significant for innovation, except for the following competencies (not very important): personal data protection and privacy (C39) and technology transfer (C34) (See Figure 2).

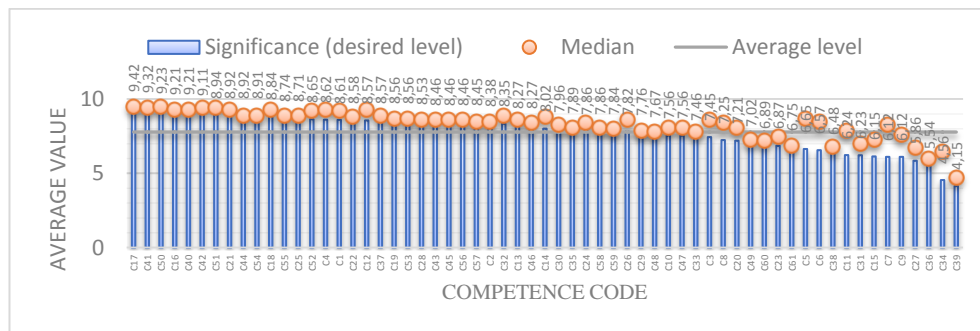


Figure 2: Ranking of average values of statements about competence formation level

A comparison of average subjective assessments of the respondent competence formation levels and average assessments of their significance for innovation has revealed differences illustrating significant gaps (see Figure 3).

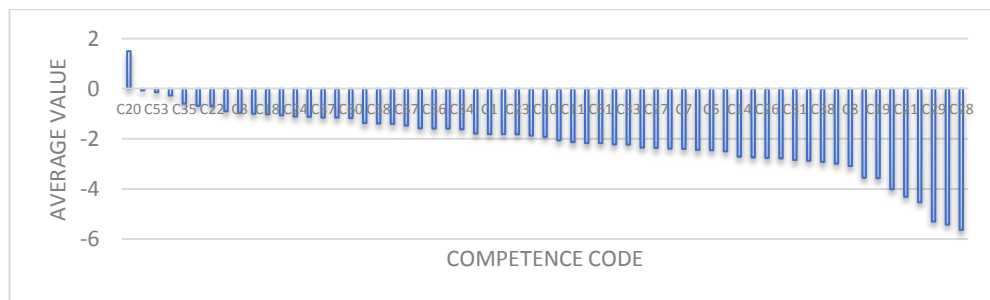


Figure 3: Ranking of gaps between the average assessment of the competence formation level and the average assessment of its significance

The study has found maximum discrepancies in cases of competencies managers have the worst command of: C28 – forecasting the behavior of market participants, C12 – project activities, C29 – new product sales management, C16 – marketing in

a technology firm, C21 – quality management, C25 – innovation investment management, C19 – determining a company’s competitive advantages and C13 – entrepreneurial skills. Significant gaps have been found in mastering the tools and methods for motivating subordinates (C8), financial planning (C17), information management (C38), legal foundations of innovation (C49) and employee development organization (C31).

The identified gaps raise the question if a particular method of training innovation managers provides higher competence in certain areas. A special analysis was supposed to determine if there was a relationship between the method of training and developing the innovation manager competencies and the level of the most popular competencies.

Qualitative analysis results

A qualitative research has been used to identify determinants of the quality of proposed methods of training and developing innovation manager competencies. By expertise, the authors have identified the most suitable methods of training and developing innovation manager competencies considering the level of their formation and the proposed criteria for choosing methods (see Table 4).

Table 4. Characteristics of methods of training and development of innovation manager competencies

No.	Training and development method	Competence code
1	Mentoring	C13, C2, C14, C32, C59, C24, C30
2	Briefing	C19, C15, C18
3	Mini-project method	C29, C49, C5, C48, C3, C22
4	Trainings	C16, C38, C43
5	Brainstorming	C25, C11, C57, C51
6	Business and role-playing games	C28, C17, C4, C9, C58, C52, C60, C56
7	Rotation	C61, C23, C40
8	Case method	C12, C21, C7, C9, C35, C53
9	E-learning	C26, C33, C46, C37, C54
10	Benchmarking	C10, C55, C45
11	Learning by action	C8, C31, C47, C41, C1, C36, C44
12	Computer simulation	C42, C34, C20
13	Behavioral modeling	C27, C39, C50
14	Basket method	
15	Responsibility delegation method	C6

According to expert assessments, the best methods of training are still interactive ones, i.e., involving seminars and including business and role-playing games, action training, E-learning, analysis of specific (real) situations (case method) and adapted mentoring methods. Such training provides innovation managers with practical skills that will prove useful in the professional field.

Didactic tools have a serious role to play in the training of innovation activity experts. These are interactive methods based on new technologies: computer simulation, behavioral modeling, brainstorming, behavioral modeling, benchmarking, training on working out actions in specific professional situations and formation of “soft” competencies.

Respondents admitted that they were not aware of using a basket method in Kazakhstan's practice of training and development of innovation managers. At the same time, such tools (especially when they are complex) allow assessing the ability of an innovation manager to work with information and the ability to make decisions based on available information. Responses indicate a significant potential for the introduction of new methods and techniques in the process of training and developing innovation manager competencies. A specific reference was made to creative approach, the use of new technologies (e.g., mobile ones), tools for group work and involvement of team members, and methods involving the use of elements of psychological and pedagogical research.

Based on data obtained, the study can formulate recommendations on selecting the most appropriate training methods and developing innovation manager competencies, that is, to draw up a programme for the competency development.

The following methods of training and developing innovation manager competencies should be used: mentoring, instructing, mini-project method, trainings, brainstorming, business and role-playing games, E-learning, action training, computer simulation, rotation, case method and benchmarking.

Result Discussions

Kazakhstan pays great attention to the industrial and innovative development of enterprises. Since the adoption and implementation of the first State Program of Forced Industrial and Innovative Development for 2010-2014 (SPFIID) and both subsequent programs SPIID-1 and SPIID-2, support for innovative enterprises has become a national priority. State programs allocate significant republican budget amounts for measures to support and stimulate innovation.

Introduction of program documents to support and stimulate innovation in Kazakhstan had its positive effects. Specifically, from 2010 to 2019, the innovative activity of manufacturing enterprises increased from 4.6% to 14.4%, i.e., times three. At the end of 2019, implementing innovations in the manufacturing industry went up by 1.3 times compared to 2010. In 2019, the volume of innovative products produced in the manufacturing industry increased by 4.9 times compared to 2010. However, despite the positive trends in the growth of innovation activity indicators, the cost efficiency of innovation (2.7 during its prime) and the share of innovative products in GDP (1.6%) remain extremely low (Kurmanov et al., 2019). Kazakhstan still lags behind many developed and a number of developing countries in terms of the output and implementation of innovative products. In other words, the effectiveness of innovation in Kazakhstan still leaves a lot to be desired. The main reason for this is the lack of competent staff and the lack of development of

the manager competencies necessary for the implementation of innovations (Kurmanov et al., 2016).

Despite all the uncertainty persisting in the labor market, attempts to shape the image of the future in this area are being made constantly (Balliester, and Elsheikhi, 2018). The influence of global trends on transformation of professions and the growth of requirements for managers, as well as rapid changes in career paths, form the need for a constant change in the model of innovation manager competencies. Innovation managers should consider the emerging opportunities and complex social processes (Pryor, Bright, 2018).

Similar studies by foreign scientists (Kononiuk et al., 2020; Hendarman & Cantner, 2018; Yashin et al., 2018; Esaulova et al., 2015; Waychal, 2016) demonstrate that managers have a high command of professional and functional competencies. However, our research results show the important functional competencies of innovation activity in the respondents as "lagging," and the degree of most professional competency formation is not at the proper development level. This indicates the need to develop problem competencies in additional and non-formal education in accordance with the proposed training program.

This research has revealed a maximum discrepancy between the level of formation and the level of significance in those competencies that managers have the worst command of forecasting the behavior of market participants, project activities, new product sales management, marketing in a technology firm, quality management, innovation investment management, determining a company's competitive advantages and entrepreneurial skills. The authors have also identified a significant gap in terms of mastering the tools and methods for motivating subordinates, financial planning, information management, legal foundations of innovation, and employee development organization. Interestingly enough, the final number of survey participants was higher than expected. Such activity indicates a clear demand for change in innovation. Considering the challenges of Industry 4.0, the development of innovation manager competencies should become the primary focus for government, business and the education system.

Qualitative research has been focused on analyzing the quality of determinants of the proposed methods of training and developing the innovation manager competencies. Teachers and end-users of innovative products were left out of the survey as it was not our task to work with these groups of respondents. However, since it is important to take into account the views of all concerned parties for a comprehensive analysis of the issue, this aspect can become the subject of further research.

Conclusion and Recommendations

Innovation managers need to be point-selected and specially trained. The lack of skills for the development and implementation of innovations appears to be the main obstacle to the activation of innovation in Kazakhstan.

Only time will tell what direction innovation activities of Kazakhstan will take. In conclusion, we shall go as far as to venture to make a few assumptions about the possible directions of the development of innovation manager competencies in the immediate future (5-10 years).

First of all, we should expect a further increase in the importance of innovation process and project management activities for Kazakhstan companies. This is due to the exhaustion of the growth model that existed until recently, which was based on the use of relative natural and human resource cheapness, industrial and scientific potential, and the rapid growth of the domestic market. The COVID-19 pandemic seems to have convinced everyone that further development within this model is no longer possible, and further work is needed to improve the efficiency of all (mostly technological) processes and develop original products allowing to enter new markets or those having higher profitability. These issues cannot be addressed without the development of innovation activities. In this regard, it will steal more and more time and attention from management.

The issue of mastering the innovation management competence to manage complex technological projects is becoming one of the key issues for the near future. While for managers working in the mode of managing established processes, the topic of managing innovative projects is auxiliary; no innovation management is possible without having a good command of the corresponding tools. During the transition from extensive growth to innovative development, the lack of preparation of domestic management for the implementation of innovation using modern methods of training and development begins to manifest itself. Assistance in mastering these methods is a key task for the government, business and the education system now that there is a wealth of foreign experience on this topic. However, just as well, the domestic experience is ready to be used by involving experts in teaching relevant subjects.

One of the key issues discussed in the paper was the attitude of innovation specialists towards future competencies and skills and search for the most effective methods of their training and development. Creation of a "Roadmap" for adapting the system of professional training of innovative personnel to changing conditions should solve these issues.

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FORESIGHT KOMPETENCJI MENEDŻERA INNOWACJI

Streszczenie: W obecnych warunkach stworzenie modelu kompetencji menedżera innowacji wydaje się ważnym zadaniem naukowym i praktycznym zapewnienia innowacyjnego rozwoju gospodarki. Identyfikacja przyszłych potrzeb w zakresie kompetencji pozwala systemowi edukacji na wszechstronne dostosowywanie procesu doskonalenia zawodowego innowacyjnej kadry oraz zwiększanie konkurencyjności programów edukacyjnych. Niniejszy artykuł podsumowuje i analizuje istniejące modele kompetencji i umiejętności w oparciu o analizę bibliometryczną opublikowanych prac oraz analizę treści dokumentów w dwóch wiodących bazach danych Scopus i Web of Science. Badano kompetencje zawodu menedżera na niższych i średnich szczeblach zarządzania zaangażowanego w działalność innowacyjną, w tym: ocenę komercyjnego potencjału innowacji; planowanie operacyjne i organizacja zarządzania działaniami innowacyjnymi; zarządzanie wszystkimi etapami projektu innowacyjnego; współpraca z partnerami na rynku innowacji; kontrola działań promujących innowacje na rynku itp. Zaproponowano podejście do kształtowania modelu kompetencji menedżera innowacji w postaci uporządkowanej listy pięciu grup: kompetencji zawodowych, funkcjonalnych, cyfrowych, społeczno-kulturowych i poznawczych. Artykuł wykorzystuje metodologię foresight do określenia przyszłego zapotrzebowania na kompetencje i obszary profesjonalnego szkolenia innowacyjnego. Autorzy analizują potencjał metodologii foresightu i badania przyszłości w rozwoju kompetencji zarządzania innowacjami. Przede wszystkim podjęto próbę oceny poziomu wykształcenia i znaczenia w praktyce menedżerów 61 kompetencji poprzez szeroko zakrojone ogólnopolskie badanie ekspertów ds. innowacji pracujących w kazachskich firmach. Badacze rozważają nowoczesne metody szkolenia i rozwijania

kompetencji menedżerów innowacji. W tym celu badanie zostało uzupełnione o wywiady pogłębione.

Słowa kluczowe: menedżer, działalność innowacyjna, kompetencje, umiejętności, trendy, badanie przyszłości, foresight.

创新经理能力的远见

摘要:在当前形势下,创新管理者胜任力模型的建立,已成为保障经济创新发展的一项重要重要的科学现实任务。对未来能力需求的识别使教育系统能够精心调整创新人才的专业培训过程,提高教育项目的竞争力。以下论文基于对已发表作品的文献计量分析和Scopus和Web of Science这两个领先数据库中的文档内容分析,总结并检验了现有的能力和技能模型。研究了从事创新活动的初级和中级管理人员的管理专业能力,其中包括:评估创新的商业潜力;创新活动的运营规划和组织管理;管理创新项目的所有阶段;与创新市场的合作伙伴合作;控制促进市场创新的措施等。以五个组的有序列表的形式提出了一种形成创新经理能力模型的方法:专业、功能、数字、社会文化和认知能力。本文使用前瞻性方法来确定未来对专业创新培训的能力和领域的需求。作者分析了前瞻性方法论和未来研究在创新管理能力发展中的潜力。首先,通过对在哈萨克斯坦公司工作的创新专家的大规模全国调查,尝试评估61种能力的管理人员在实践中的培训水平和重要性。研究人员考虑了培训和发展创新经理能力的现代方法。为此,本研究补充了深入访谈。

关键词:经理, 创新活动, 能力, 技能, 趋势, 未来研究, 远见