

Management education reform as a prerequisite for stable development of the economy

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ABSTRACT

The article is devoted to priority solutions for launching systemic transformations of managerial education for the technological breakthrough. The basis for the development of such decisions was the scientific direction “Proactive Management in Actively Developing Industries and Economic Sectors”, in which the authors work, and the experience in creating educational products that meet the latest trends, including those that have appeared recently.

The research methodology included analysis of scientific literature on the problems of complex systems development, proactive management and anticipatory training, systematization of educational practices for managers in foreign and domestic universities, conducting surveys of experts – heads of Russian large industrial enterprises, professors and students.

The key reasons for the unsatisfactory state of management education are identified and a set of recommendations for its reform has been developed. Changes in organizational models of managerial education are proposed, the principles of implementing fundamental training and enhancing the humanization of education with a simultaneous increase in the level of knowledge of the scientific and technical foundations of production process are formulated. The conditions of increasing the effectiveness of students’ practical training are considered, the forms of its implementation are determined to ensure the readiness of graduates to work in managerial positions. The results of long-term studies of anticipatory training, from managers at the lower levels to directors of large companies, are carried out. These results were obtained in the scientific and educational center “INZHEK” of the Ural Federal University and tested at various levels of management education (bachelor’s, master’s degrees).

The results of the study are of practical interest to managers and professors of universities, business schools and corporate universities, as well as to top managers of business structures involved in improving personnel training.

KEYWORDS:

management, managerial education, reform, digital economy, scientific and technological achievements, systems thinking, interdisciplinarity, proactive management, anticipatory training, fundamental training, humanization.

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5. EXPERIENCE AND RESULTS OF IMPROVING MANAGEMENT EDUCATION

The basic principle of ensuring the quality of training in the Scientific and Educational Center "Engineering-economical, financial, ecological-economical studies and educational programs in hi-tech industries", Ural Federal University is the priority of scientific research [Gitelman, Kozhevnikov, 2018]. In other words, only those lecturers who are actively engaged in science can become the participants of learning process at the level of modern requirements. Successful realization of this principle was reported by the authors on many international conferences, and the results has been published in numerous articles.

5.1. RELIANCE ON NEW KNOWLEDGE HAS ENABLED THE INTRODUCTION OF ADVANCED TRAINING

The expanded research program of fifteen projects, based on the breakthrough scientific direction "Proactive management in rapidly developing industries and sectors of the economy", allowed to gain new knowledge for timely response to global challenges in the field of technological modernization and digitalization, the creation of industry

4.0, and the training of highly qualified personnel with the necessary competencies. In shaping the research program, the need for new knowledge about trends in the context was taken into account, first of all, in terms of industry scientific and technical achievements and new technologies that change the content of managers' activities and competencies; methods for designing the future and ways to ensure the flexibility and adaptability of complex systems that determine the content, principles and technologies of cutting-edge training; methods for assessing risks in conditions of uncertainty.

The increase in new knowledge allowed to start developing a unique scientific and educational platform for cutting-edge training in the end-to-end system "bachelor's degree-additional professional education-master's degree-postgraduate study – doctoral study", which contains tools for organizing continuous education throughout the professional life of a manager.

The platform, broadcasting the tasks and results of the research program in the global network space, organizes an active creative process. As a result, the quality of education is radically improved through interaction with the academic and expert community of the global ecosystem, as well as the constant updating of content and teaching methods (Figure 5).

The key services of the scientific and educational platform are access to a constantly updated knowledge base, collaboration in scientific publications, formation of breakthrough teams for the development of unique projects,

innovative tours to advanced enterprises, design and correction of the individual track of self-development of a specialist.

The basis for creating the services of the scientific and educational platform is the knowledge base, which contains more than 50 textbooks, 450 scientific articles and 100 projects prepared by teachers and students of the Scientific and Educational Center "Engineering-economical, financial, ecological-economical studies and educational programs in hi-tech industries". The knowledge base allows you to radically restructure the learning process by independently studying theoretical issues and freeing up time to focus on current problems, mastering interdisciplinary knowledge and competencies. There is an opportunity to implement progressive proportions of the educational process: discussions on problems – 20%, research and analysis-25%, design-35%, demonstration of advanced experience -20%.

A number of projects have been prepared in the implementation part of the research program. As an example, we will highlight two of them: the multi-project "New leaders for a technological breakthrough", the project "New Generation Educational products in modular design" [Gitelman et al., 2019]. These projects allow to make a breakthrough in global leadership through the organization of cutting-edge training, the implementation of educational products of increased market value in a modular design, as well as the deployment of large-scale research work involving

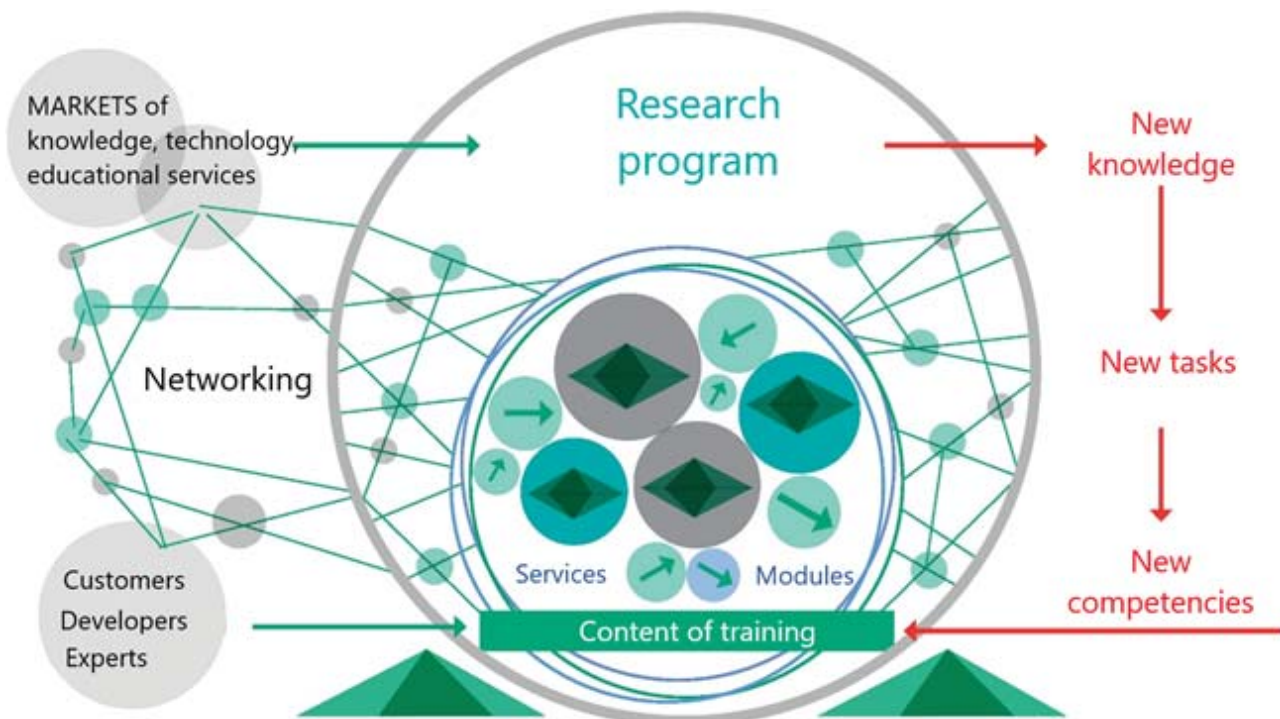
young managers and engineers, teachers and students starting from the bachelor's degree. This approach, implemented jointly with "IDGC of Urals", "Bashkirenergo", "T Plus", and "K Telecom" companies, has actually demonstrated the partnership of science, education and business.

Graduation of a new type managers - innovators with the competencies of conceptual designers of new production and management systems and their implementation into existing production or the one that is being created, puts forward as an urgent agenda the rapid introduction of advanced training. Its key objects are:

- 1) methodology for designing complex systems that are rich in innovative elements and have flexibility and adaptability;
- 2) expected changes in the sectoral context, primarily as a result of global trends in scientific and technological progress;
- 3) forecasts of resource constraints and environmental turbulence: personnel, fuel, technology, financial and currency volatility, etc.;
- 4) environmental restrictions and environmental risks;
- 5) proactive management methods that overcome resource and environmental constraints and stabilize business competitiveness;
- 6) demands on the quality of the human resource and its readiness for change.

The most important object of cutting-edge training, of

Fig. 5. Conceptual representation of the mechanism of the scientific and educational platform



course, this is a proactive management system in the company (organization) [Gitelman, 2020]. Here it is important to show students that the introduction of proactive management based on a fundamentally different model of development management means an intellectual revolution in management, radical changes in its paradigm, methodology, organizational systems and processes.

It should be emphasized that cutting-edge training is impossible without integrating the target research component into the educational process-the constant generation of new knowledge about emerging trends, their nature, and development factors. The training material is focused on innovation management, progressive solutions in the field of engineering and management, as well as the development of the principles and methods of designing the future. Examples of courses that correspond to the ideology of advanced training and are implemented by us in the training of masters are: "Intelligent Production", "Methodology and practice of digitalization", "System Engineering for managers", "Innovative Leadership", "Digital platforms and ecosystems", "Conceptual Design and Visualization".

In general, according to experts, in the educational programs for training managers for the new industry, it is necessary to pay much more attention:

- engineering and technical issues of the industry and its scientific and technical prospects – up to 20-22% of the total volume of the curriculum for bachelors and masters;
- readiness for innovation - 10% of the total volume of the program for bachelors and 14% for masters;

- self-study methods – 13% of the total volume of the program for bachelors and the same amount for masters [Gitelman et al., 2019].

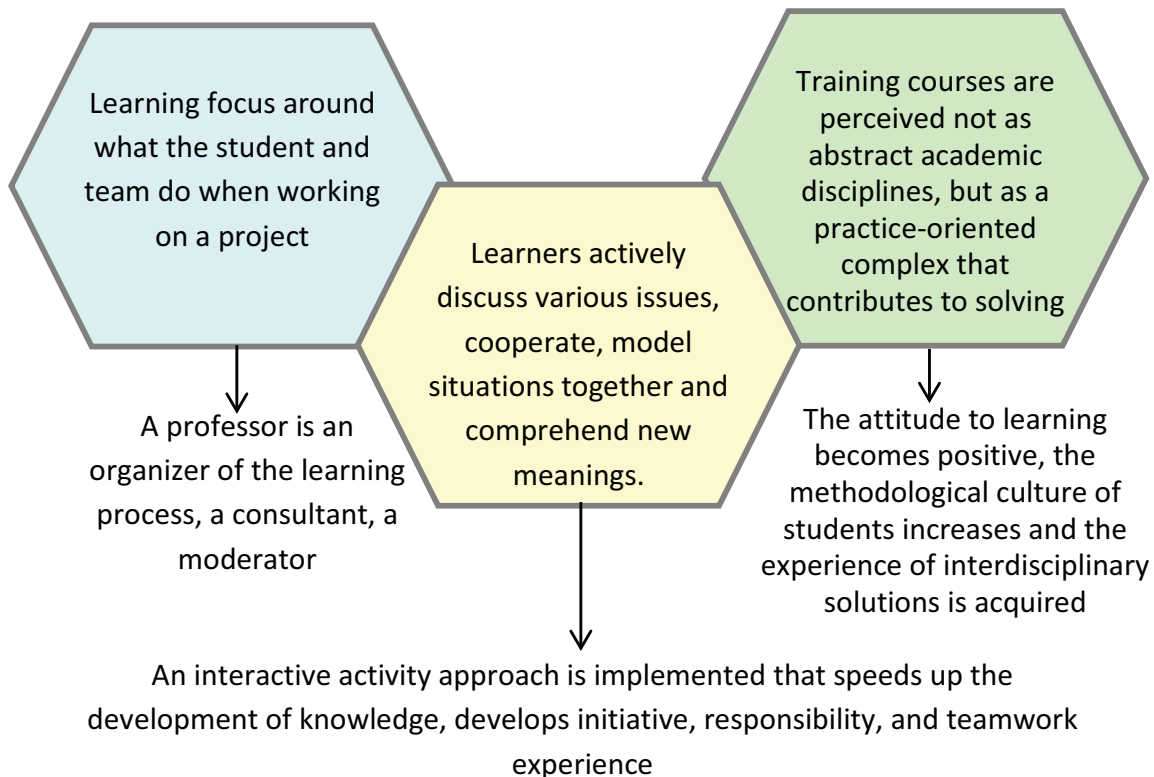
5.2. INTRODUCTION OF THE AUTHOR'S METHODOLOGY THAT IMPLEMENTS THE PARADIGM OF CUTTING-EDGE TRAINING

The paradigm of cutting-edge training provides a method that promotes the involvement of students in research and project work. To this end, the methodology of the ISCT – the original author's method of the integrated system of research, consulting, cutting-edge training and transformative actions was developed [Managers of the new generation., 2014].

The ISCT complex (Fig. 6) includes technologies that algorithmize and at the same time activate the educational process, ensuring its focus on the formation of the necessary competencies. Among the approved author's technologies, we will highlight the following.

1. An incubator of talent and leaders for technological modernization.
2. Game-and-technical complex "GO to the heights of skill".
3. Development of a leadership strategy, combined with cutting-edge training.
4. Preparing the breakout team.
5. Joint innovation arena of the university and business.
6. The conveyor of continuous management education.

Fig. 6. ISCT-model of cutting-edge training



5.3. FLEXIBLE ARCHITECTURE OF THE EDUCATIONAL PROCESS

The ability to quickly reorient educational content to new realities is of fundamental importance for cutting-edge training. For this purpose, the achievements of system engineering in terms of ensuring the agility and resilience of complex systems are used [Hollnagel et al., 2006; Maxwell, Emerson, 2009; Jackson, Ferris, 2013; Walden et al., 2015; Gavrilova et al., 2017]. These system engineering methodologies are actively developing and demonstrate the effectiveness of the modular approach in the restructuring of engineering and sociotechnical systems.

In cutting-edge training, the industry context, trends in the knowledge, technology, labor markets, and, of course, the specifics of business development tasks are considered in specific research projects and topics that change and develop educational content. For example, the master's program is designed as an integrated educational product (Figure 7), containing interdisciplinary modules that correspond to both the scientific direction and the actual problem areas of management activity. At the same time, a knowledge base is formed for each course in the form of articles, monographs, analytics, and empirics, and teaching methods that are radically different from traditional ones are selected.

As a result, in our practice, every interdisciplinary module:

- corresponds to specific topics of the scientific field;
- creates relevant competencies;

- it is sold on the market as a separate product or as part of a larger product namely an educational program;
- it has a powerful service support in the form of a knowledge base, numerous already developed projects, mentoring by business leaders;
- it is built into a specific logic of the conveyor that provides a controlled process of continuous learning and competence growth.

The developed functional composition of the training module (modules in the module) significantly increases the flexibility and elasticity of the architecture of the entire system (Fig. 8). It becomes possible to adjust the content and proportions of the content and types of training activities directly in the learning process, quickly reconstructing it depending on the profile interests and preferences of students.

The elements of the presented technologies were tested during the implementation of the Master's degree program "Strategic Management in the Fuel and Energy Complex" (a joint project with the Higher School of Economics and Peter the Great St. Petersburg Polytechnic University), training of breakthrough teams in the companies "T Plus", "Bashkirenergo" and in training the personnel reserve of the Ural Federal University. These technologies made it possible to focus teams in a short time on solving problems of proactive management, generating knowledge of a proactive nature and implementing projects of strategic importance, which provided accelerated professional growth of participants. For example, since 2016 in UrFU, more than 50% of those

Figure 7. Example of a modular architecture of a master's degree program implemented in the conveyor logic

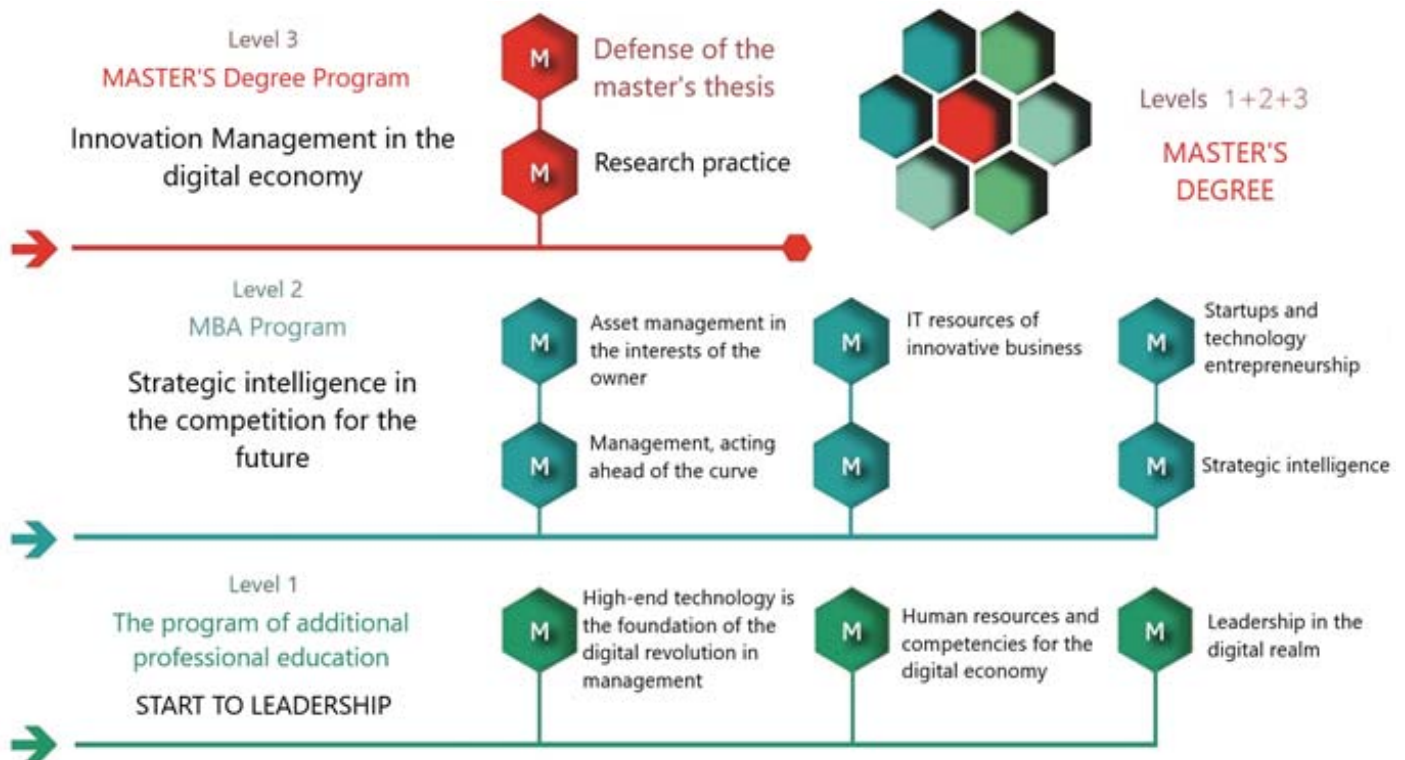
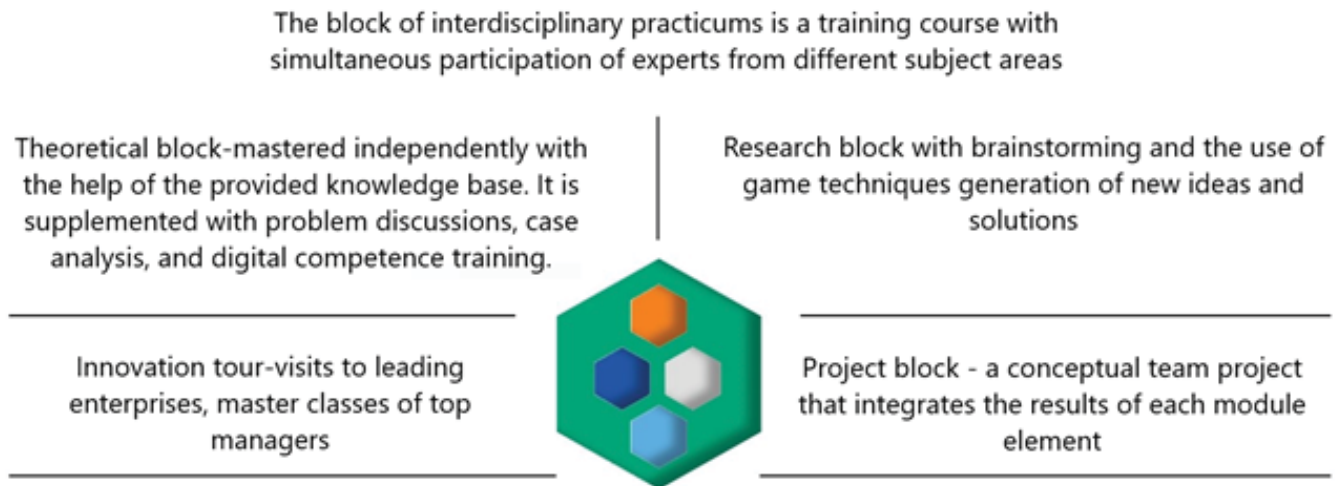


Fig. 8. Functional structure of the training module



who have passed training have occupied senior positions in various institutes and departments; five people have prepared candidate theses on the basis of completed projects.

6. DISCUSSION

6.1. TRANSITION TO NEW MODELS OF MANAGEMENT EDUCATION

Identification of industry areas. The existing direction of "management" in the standards is appropriate for high-tech industries to be divided into several areas of training. For example, this can be done by analogy with the allocation of research areas in the passport of the Higher Attestation Commission in the specialty 08.00.05 "Economics and national economy management":

- Management of industry and energy;
- Management of transport systems and communications;
- Management of construction and engineering infrastructure;
- Management of information technologies, networks, environments and communications
- Management of high-tech services (healthcare, education, socio-cultural sphere), etc.

Of course, this is only one of the acceptable options. It is necessary to have a broad and meaningful discussion in the academic and professional communities, bearing in mind the key idea of this division – impossible to teach everyone together and for all tasks. Perhaps it makes sense to form standards for enlarged groups of industries that are similar in terms of the specifics and complexity of production technologies (mechanical engineering and metallurgy; the petrochemical sector; electricity, heat power engineering and energy-consuming complexes; telecommunications and the IT industry). The main goal of such training courses is to provide

future managers with an understanding of the technological base of production, its impact on economic, financial, and environmental results, the ability to independently deal with specific technologies that they will work with in a short time, as well as to competently organize the process of their improvement and modernization.

Opponents of this approach argue that focusing the training of managers on the industry is impractical, since today there is a blurring of industries as a result of the introduction of supra-industry technologies (digitalization of production, high-speed data processing systems, human-machine interfaces, robotic automation, materials with controlled features, smart environments). Indeed, the processes of implementing supra-industry technologies do occur, and extremely intensively, but that is why it becomes necessary to have a deeper knowledge of technologies, both industry-specific and supra-industry-specific. After all, they need to be docked, and this is a real practical problem. Moreover, when connecting in many high-tech industries, managers at all levels need to have a good understanding of the industry's scientific and technical basis of production and the unique specifics of the markets. In industries with complicated technologies, such as electric power, nuclear, aerospace, oil and gas, transport, engineering and telecommunications infrastructure of the city, the manager will be able to work successfully only by mastering the most complex interdisciplinary interrelationships of technology, economy, ecology, and the human factor.

Changing the level structure of higher management education. The training of managers in accordance with the increasing complexity of management activities is beyond the scope of the bachelor's degree. Thus, it takes six to eight years to train a specialist who develops components of complex systems, including time spent studying at a university, and ten to fifteen years to train a specialist who can develop system-wide solutions and engage in system integration. Moreover, in the latter case, in order to achieve a

high level of qualification, it is necessary to have mandatory work experience in a company that is a world leader in its field [Batovrin, 2010].

The proposed innovations in management education require more serious and purposeful fundamental training, as well as versatile industrial practice, which can be implemented *only in the scope of educational programs of the specialty.*

Increasing the entrance requirements for incoming students. Procedure of admission in management specialist should include not only the consideration of points of the USE, but also the diagnosis of professionally important qualities and an interview, allowing to determine the personal maturity and the presence of qualities corresponding to softskills and creative abilities, which are necessary for the successful formation of professional competencies of the manager.

In the Scientific and Educational Center "Engineering-economical, financial, ecological-economical studies and educational programs in hi-tech industries", Ural Federal University uses monitoring of professionally important qualities of students of managerial specialty, bachelor's and master's degree programs during the entire period of their learning [Isaev, Zainetdinova, 2011; Managers of the new generation..., 2014]. It is aimed at assessing *the characteristics of emotional intelligence and psychological qualities that contribute to the formation of personal maturity.* During the diagnosis, more than forty personal qualities are evaluated,

the results of which are combined into five groups that are of particular importance for management activities: 1) learning ability and self-development activity, 2) general intelligence, 3) motivation structure, 4) features of self-awareness and self-regulation, 5) communication skills. The monitoring results show which of these qualities are indicators of professional success and career growth of managers – leadership, self-esteem, flexibility of intelligence, ambition, etc.

The assessment of all these and other characteristics mentioned above should be carried out in the monitoring mode during the entire training period, with a frequency of once a year. The results of psychological diagnostics will allow you to create methodically equipped individual training tracks, increase the motivation of students to learn and develop a creative approach to management activities.

6.2. STRENGTHENING OF BASIC TRAINING

According to the authors, *fundamental training* is the process of forming a scientific worldview and creating the foundations for a student's scientific understanding of the field of activity and the profession received. Fundamental training is understood as the development of a broad theoretical base and practical skills, integrating into a single system the natural science, humanities and professional components of education with a focus on discussing processes in nature and

Table 6
Approximate structure and content of fundamental training at the first level of management education

Area of knowledge	Topics of fundamental training		
	Methodology of scientific knowledge	Technological bases of industry and inter-industry complex	Conceptual vision of professional activity
Mathematics and Natural Sciences	Higher mathematics and selected fields of natural sciences	Natural-scientific basis of sectoral and cross-sectoral technologies	Mathematical theory of management
Economy	Macroeconomics	Microeconomics	Circular economy
General theory of systems	Systems approach and analysis	Fundamentals of System Engineering	Interdisciplinary connections in management systems
Engineering	Achievements and trends in the technological development of the modern world	Industry-specific and over-industry technologies of high-tech business	Interdisciplinary decisions in high-tech business
Informatics	New trends in the informatization of society and the economy	Information technology and digitalization in business	Digital technologies in control systems
Humanitarian science	Problems, menaces, and prospects of modern civilization	Humanitarian culture of society, economy, and business	Ethical leadership in management

society, as well as the use of scientific methods in solving major problems that need new knowledge and approaches.

One of the main tasks of fundamental training is to build a systematic vision of one's professional activity at the level of knowledge for theoretical understanding of changes in its content and practical solutions to problems of its improvement. In the educational process, it is necessary to provide an understanding of the interdisciplinary relationships between objects and processes in different areas, forming a holistic and versatile vision of the business ecosystem. Without such a holistic understanding of professional activity, a full-fledged system thinking, and therefore methodological approaches to change, cannot be formed.

In management, systems thinking allows to see the place of a managed system in a meta-system (a higher-level system), understand and take into account the interests of all significant stakeholders, identify the level and types of complexity (within the system and in the external environment) and find productive solutions. *System literacy is becoming a mandatory component of practice.* For example, in the master's programs of the Scientific and Educational Center "Engineering-economical, financial, ecological-economical studies and educational programs in hi-tech industries", Ural Federal University, "Energy Business" and "Innovation Management in the Digital Economy", separate courses "System Engineering for Managers" and "Interdisciplinary Industry Relations" are devoted to these issues.

The basis of fundamental training consists of three elements:

- methodology of scientific knowledge;
- technological bases of industry and inter-industry complex;
- conceptual vision of professional activity.

The methodology of scientific knowledge is a systematic representation of the general principles, methods and tools of the research process, the use of new knowledge in professional activities and participation in their formation, which provides the basic conditions for professional readiness for innovation,

its organization and improvement. Understanding the *technological foundations of the industry* is aimed at gaining knowledge about the features and patterns of functioning of specific industries, markets, and industries. *The conceptual vision of professional activity* forms the potential of self-development of the student, the willingness to learn new skills in connection with the ongoing changes in the external environment, which transform the content of the profession.

It is important to note that it is fundamental training that forms the methodological culture of a specialist, creating the opportunity for successful mastery of special disciplines of the training program, as well as the willingness to independently deal with new problems and master new types of knowledge. In addition, its practical significance is that it provides a scientific basis for most professional competencies, the formation of which is completed in the disciplines of specialization.

The fundamental training of graduates of the first level of management education (specialty) in the proposed direction "Management of industry and Energy" can be concentrated on the areas of knowledge shown in Table 6.

Specialized training provides orientation in one of the types of industry business. For example, in the energy sector, generation, networks, energy repair, and energy sales can be singled out as such varieties. Specialized training focuses on the main areas of activity within the company, such as manufacturing, economics, finance, and human resources management. According to the authors, the labor intensity of each of these types of training at the first level of higher management education is distributed approximately as follows: 1) basic training – 50-60% of the volume of the educational program, 2) profiled – 20-25%, 3) specialized – 20-25%.

The master's program should change not less, but in a different direction. If the aim of the first level of higher education is to create a base for management activities in a modern high-tech digital environment, then the master's degree is to develop the manager's self-development and

Table 7
Approximate structure and content of the fundamental training of the management Master's degree

Area of knowledge	Topics of fundamental training		
	Methodology of the scientific approach	The new technology of the industry	Conceptual foundations for the development of the profession
Development of complex systems	Profession and career in the life space	Self-designing business development	Fundamentals of managerial professionalism
Strategic analytics	Trends in the development of technological and social systems	Monitoring and analysis of weak signals	Future research methods
The designing of the future	Organization of applied research and development	Platform markets and ecosystems	Conceptual design

Table 8
Examples of humanitarian training topics for managers

Training courses	Projects	Elective courses
Spiritual culture of humanity New opportunities and threats to the development of civilization Management cultures of developed countries Contradictions of spiritual and technological development Development philosophy	Forecast of cultural and scientific-technological development of civilization Social problems of new information technologies Digital Culture Integration of art and high technology	Technological culture of the modern world The relationship between spiritual and material cultures The highest achievements of world culture Eastern and Western types of cultures Design as business and art Subcultures of the information society

develop his potential for professional growth to the level of a top manager. Therefore, the focus of the Master's degree program is on:

- competencies that provide solutions to tasks that are relevant to the development of enterprises, such as proactive actions, digital resource management, innovative leadership, and teamwork;
- management thinking based on flexible intelligent models, including emotional intelligence, systems analysis, strategic behavior, conceptual design, and visualization;
- using an individual management strategy with a stable system of values and conscious personal meanings, the ability to change paradigms based on a systematic vision of the emergence of new opportunities in their activities, business, company, industry, economy as a whole, and the ability to engage in purposeful self-learning for current tasks.

It is evident that fundamental training continues in the master's program. Its structure is generally the same, but with an increased emphasis on development: methodology of the scientific approach – new technologies – the conceptual foundations of the development of the profession. The basis of fundamental training of masters consists of three areas of knowledge: the development of complex systems, strategic analytics and designing the future (Table 7). The ratio of the labor intensity of each type of training in the master's program, according to our assessment, is as follows: fundamental training – 30-35% of the educational program, profiled – 45-50%, specialized – 25-30%.

6.3. HUMANITARIZATION OF MANAGEMENT EDUCATION

Humanitarian values in the manager's activity perform two important functions: direct his activity to socially significant goals, including development and self-realization, and protect him from negative factors, in particular from the appearance of managerial snobbery, careerism, inadequate ambitions, fear of responsibility, excess or non-use (when necessary) of official powers. Thus, the humanitarization of management training allows you to:

- 1) to form sustainable humanitarian values that determine professional behavior;
- 2) to present a complete picture of the world with an understanding of the current tasks, problems, threats, opportunities and prospects of the economy, individual areas of activity, a particular business in the value-semantic dimension;
- 3) to develop creativity in the approach to professional tasks in their multidimensional understanding from the perspective of the interests of all its participants and stakeholders who share moral values [Probst et al., 2018].

As a result, the manager has his own position in a variety of circumstances of professional life. He is able to set worthy goals, interest employees in them and involve the team in joint activities to achieve them. The development of creativity together with humanitarian values and a holistic worldview provides a result that brings general satisfaction, both to its creators and consumers. On this occasion, Steve Jobs said that “It’s in Apple’s DNA that technology alone is not enough – it’s technology married with liberal arts, married with the humanities, that yields us the results that make our heart sing”¹.

It is very important when mastering the humanities that students understand from the first classes why they are studying the relevant subjects and how the acquired knowledge will be in demand in the profession. Unfortunately, in practice, this provision is often ignored. This can explain the research data, which show that only 19.4% of students understand why they need knowledge in philosophy in their future professional activities, 17.3% - in cultural studies, 25% - in history [Mikhaylov, 2013].

According to the authors, the humanitarization of management education should be based on the students' mastery of the basics of culture and art, as well as on the modern history of the spiritual and technological development of humanity. Culture performs the most important corrective function in the development of science and technology, acting as a mediator in resolving rather acute contradictions between the material and the spiritual. It is in the field of culture that it is possible to reliably determine the value and fate of a particular technical and technological project², as well as any innovation, startup and business project.

¹ Carmody T. Without Jobs as CEO, who speaks for the arts at Apple? 2011. URL: <https://www.wired.com/2011/08/apple-liberal-arts/>.

² Pedagogical encyclopedic dictionary (2002) / Editor-in-chief B. M. Bim-Bad. M.: The Great Russian Encyclopedia.

With this understanding, humanitarization becomes an integral part of the fundamental training of graduates of university programs of management education. The development of the humanitarian block of fundamental training is not a correction and refinement of already used programs of humanitarian disciplines, but the creation of new training courses, which at the moment simply do not exist, at least in management education (Table 8).

The concept and content of humanitarization can be influenced by many factors: the characteristics of universities and even the cities in which they are located, their scientific achievements and methodological developments in the humanities, as well as the level of readiness of students to master the relevant knowledge, values and worldview. All this must be taken into account, but in any case, humanitarian training is aimed at ensuring that a professional manager, and especially a high-level manager, has the moral responsibility of a person to other people, society, and nature.

6.4. CHANGES IN THE ORGANIZATION AND CONTENT OF THE PRACTICE IN THE TRAINING OF MANAGERS

It is much more difficult for a student of a management profile to solve the issue of passing an industrial internship at an enterprise than for another specialty. The activity of an engineer, programmer, economist, or mathematician is working with information, documents, knowledge, and a small amount of communication with other people. The organization of industrial practice for them involves setting a task, providing the necessary information to get acquainted with certain functionality, existing methods and standards of the enterprise, and creating opportunities for the intern to discuss ambiguities with an experienced specialist.

Management activity is significantly different from engineering and economic activity, it consists of 70-80% of interaction and communication with other people: subordinates, colleagues, managers, experts, employees of various fields of activity. In addition, it differs significantly depending on the field of activity and position, even at the same level of management. For example, the nature of the work of the manager of the planning and economic department (deputy head of the department) and the manager of the main production shop (head of the production site) is more different than similar. Therefore, at the enterprise, for those who are engaged in organizing the practice of students – future managers – functional divisions are preferred. They have less communication, fewer decision-making procedures and organization of their execution, but more analytics with well-known algorithms for preparing decision-making.

It is much more difficult to organize a manager's practice in the production sphere, for which it is mainly intended. The activity of a line manager is not just making operational decisions and communicating with other people, but often managing the implementation of decisions made, preparing orders and instructions for performing the necessary actions. It is difficult or even impossible to organize such a practice by delegating part of its functions to the intern by the manager. Here, another form of practice is needed, for example, in the form of the intern's participation in the work of the

manager, which involves relatively constant monitoring of his professional behavior and occasional participation in the discussion of individual issues. But even in this version of industrial practice, there are many restrictions for mastering the necessary experience of managerial activity.

For the head of any industry plays a huge role context, including formalized and non-formalized information, relationships, and preliminary agreements with many partners, the story behind the objectives and expectations of its decision, the interests and perspectives of many people, one way or another engaged in the preparation, adoption and implementation of organizational decisions. To understand the actions of the head and even more so to participate in them, it is necessary to know this context, which is difficult for the trainee to do even partially (for this, the mentor-manager will need to introduce him deeply enough to the course of affairs and familiarize him with a large amount of unformalized information, for which he, as a rule, he has neither the desire nor the time).

The manager who assumes the functions of a mentor experiences a significant additional psychological burden (he must constantly monitor the actions of the ward, explain many details and nuances, reflect more carefully on his behavior, explain the presence of the intern to other employees). In such a situation, the complexity, labor intensity and intensity of the manager's activities increases by an order of magnitude, which most managers, even those with pedagogical abilities, without special reasons and strong motivation, of course, will not agree to.

In general, the production practice of managers should include step-by-step practice in the engineering or information sphere, in the economic sphere and in the field of production management. Such a three-stage organization will provide a full-fledged formation of the most relevant competencies for managers and strengthen the understanding of the interdisciplinary content of management activities.

7. CONCLUSION

1. Managers' knowledge of the latest scientific and technical achievements and technologies becomes the key to successful professional activity and determines the demand for proactive management – an indispensable component of training a new generation of managers to work in conditions of rapid, often chaotic changes and high risks. It is quite obvious that proactive management is impossible without advanced training of specialists. However, the task of organizing such training is not even seriously set. But it is becoming critical for technological breakthroughs and sustainable development.

2. Huge damage to the domestic economy in the context of industrial modernization and the formation of the industry of the future is caused by the statement that has already become a cliché about the excess of training of managers in universities. The managers who are trained by today's universities, for the most part, are not needed in such quality and quantity. At the same time, the shortage of qualified managers with a wide range of competencies – engineering and economic, engineering and management, and especially

digital resource management and proactive actions-will only increase, especially in regions with a high concentration of industry. To train such managers, it is not enough to radically revise the structure and composition of the curricula of educational programs, it is necessary to radically change the approaches to the organization of training.

3. The training of managers in differentiated areas corresponding to different areas of technological development, scientific research, and practical activity should provide for targeted and enhanced fundamental training. It creates the basis for professional development in conditions of uncertainty and forms a systematic thinking, which now becomes not an exclusive ability of unique managers, but a tool for everyday professional activities. In this relation, for high-tech industries, it is necessary to switch to the training of professional managers from bachelor's degree to specialty.

4. The experience of the authors of this work confirms that it is possible to significantly improve the level of management education and move to advanced training only on the basis of a smart partnership of science, education and large innovative businesses within a holistic system focused on constant readiness for change. The uniqueness of this system is that it connects the intellectual resources of the participants in an interdisciplinary project by:

- formation of an agenda for joint innovation activities that meets mutual interests;
- continuous monitoring in the global environment of the latest scientific and technical achievements, industry and over-industry technologies from the point of view of the feasibility of their implementation in specific practices;
- cutting-edge training that provides new knowledge and competencies to players competing for the future;
- effective communication in a complex environment characterized by uncertainty and constant growth of new knowledge;
- activation of the innovation process and its synchronization with the development of human resources and building up the intellectual capital of all the subjects of the partnership.

The reform of management education, taking into account the challenges facing the country, should be implemented as soon as possible. Great hope in this regard is placed on the projects of world-class scientific and educational centers, the creation of a network of which is one of the priorities of the national project "Science".

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