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BASIC COMPETENCIES

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In the context of the emerging digital economy, the world of work and education are becoming more coordinated. The State and economic actors manage human capital codified as professional and basic competencies. The theory of basic competencies can further enhance the effectiveness of these processes. It anchors a methodology for identifying and building competencies. Besides, it ensures they are gradually, sustainably and continuously developed at all education levels.

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TABLE OF CONTENTS

PREFACE.....	5
INTRODUCTION.....	11
Chapter 1. ECONOMIC NATURE OF COMPETENCIES.....	18
1.1 Axioms of the Theory of Competencies	18
1.2 General Notion of “Abilities”	24
1.3 Classical Methods of Objectifying and Acquiring Abilities	30
1.4 Labor’s Function.....	34
1.5 Emergence of Competencies.....	42
Chapter 2. COMPETENCY PROFILE.....	47
2.1. Notion of Competency	47
2.2. Social Status and Structure of Competency.....	54
2.3. Object of Competency-Based Activity	61
2.4. Means of Competency-Based Activity	69
2.5. Motive of Competency-Based Activity.....	76
Chapter 3. SYSTEM OF COMPETENCIES.....	81
3.1. Basic and Professional Competencies	81
3.2. Methods for Defining the System of Basic Com- petencies	91
3.3. Episteme of Modern Culture	96
3.4. List of Basic Competencies.....	104
3.5. Matrix of Basic Competencies.....	116

Chapter 4. INTEGRATION OF THE NOTION OF COMPETENCY INTO PEDAGOGICAL CULTURE.....	125
4.1. Competencies and Pedagogical Culture.....	125
4.2. Birth of Pedagogical Interest in the Inner Man in the Early Industrial Age.....	131
4.3. Developing Abilities through Learning during the Second Industrial Revolution.....	138
4.4. The Third Industrial Revolution and the Codification of Abilities.....	146
4.5. Grounds for Competency-Based Education.....	153
 Chapter 5. COMPETENCY BUILDING AND ASSESSMENT	 159
5.1. Didactic Framework of Competency-Based Education.....	159
5.2. Blended Learning: a New Competency-Based Paradigm.....	168
5.3. National Framework of Basic Competencies.....	179
5.4. Operative Competency-Building Management.....	187
5.5. Object-Centered and Activity-Based Approach to Assessing Basic Competencies.....	191
 CONCLUSION.....	 195

Preface

The translation of this book into English and the time that has elapsed since its publication in Russian in early 2020 let us see its entire content in a new light, assessing the earlier research more accurately. Time and translation revealed extra overtones of the research contents. So the idea came to write a preface and express the main idea of the book, saying in plain language why this book is necessary.

As a scientific notion, competency appeared in linguistics (N. Chomsky) in the 1960s, hereafter — in management. Since that time, the interest in competencies has invariably been on the rise. The number of scientific studies in linguistics, management, economics, pedagogy and psychology grows. Today, there are plenty of scientific directions that differ in their approaches to building and assessing competencies as the components of human capital. These areas are developing under the strong influence of national cultures, historical economic relations and scientific traditions. Within half a century, two flagship approaches to this problem have taken shape: behavioristic and functional. They are often referred to as the American and European ones.

The behavioristic approach was developed in the United States. D. McClelland and R. Boyatzis defined its basic principles. According to this approach, human behavior is studied and differentiated. The identified characteristics (they are called competencies) are necessary for effective work. The most effective performers are analyzed; the differences between them and the less successful ones are revealed. “Competency is an underlying characteristic of a person which results in effective and/or superior performance in a job.” (R. Boyatzis). Applying the behavioristic approach in practice requires that individual competencies be assessed, competency models for a given type of job

developed, and a correspondence between a person's competence and the job itself established. Competencies as characteristics of behavior can be shaped through learning.

The functional approach appeared in the UK in the 1980s. In contrast to the American one, it emphasizes, in the first place, job analysis rather than people's behavior. The core of the EU approach to competencies implies professional standards that set requirements for the performance and the knowledge and skills required for a particular job. With that, competency is associated with an employee's ability to perform to the standards expected by the organization.

Both approaches are clearly practice-oriented and define the necessary conditions for managing the processes of effective work performance. They also practically and historically shape the modes of scientific thinking in the field of competencies. Today, the behavioristic and functional paradigms define the standards for researching the problem of competencies, patterns of setting and approaching scientific problems and ways of acquiring new knowledge. Though, as modes of scientific thinking, as research programs, they are not sufficiently effective and pose challenges for the systems of competencies and qualifications to be further developed. In studying and applying competencies, there are some issues caused by behavioristic and functional approaches.

The first problem dwells in the very notion of competency. Usually, competencies imply skills and attitudes responsible for human behavior and necessary to perform well at work. This classical view allows for associating competencies with knowledge, skills, personal qualities, attitudes, values, behavioral models, motives, social roles — all that is necessary for a person to interact with other people and nature effectively. In this broad sense, the very notion of competency becomes clouded. As you know, “to define is to limit” (Oscar Wilde). For identifying

the notion of “competency” scientifically, one should make a distinction between “competency” and the closest notion of “skill” in the first place. This is not done yet. Whenever it comes to competencies, skills come up; basic competencies are often defined as “soft skills.”

Making competencies identical with skills is not as harmless as it may seem, especially for the development of education. To transmit systematic knowledge and shape skills based on the knowledge gained is a traditional learning goal. If competencies can be equated with skills, then there is no need for a qualitatively new education system. Education workers keep declaring competencies being constructed. With that, the organizational structure of learning, its main technologies and content alongside pedagogical relations remain as they had been long before the term of competency came into being. Education continues to build skills, but employers need competencies. As a result, most of them are dissatisfied with the quality of workforce training. A skill gap is growing, with about a billion people involved nowadays. It reached the point that several well-known American companies eliminated the diploma requirement for job seekers.

However, the major concern that entails a new paradigm of scientific thinking does not lie in science or education. It is purely economic. The issue of competency becomes economically significant when the industrial economy turns into a post-industrial one. At present, a historical transition from the post-industrial economy, whose beginning was marked by the Third Industrial Revolution (according to the classification by K. Schwab), to a new type of economy based on the technologies of the Fourth Industrial Revolution is in progress.

These technologies, including robotics, artificial intelligence, the internet of things (IoT), biotechnologies, etc., rule out the possibility of using man as part of production processes. Man transcends technologies, specializes in creating new industries,

managing their operations, development and integration with other production systems, culture, society and nature. Possessing skills is no longer sufficient for this kind of work. Man becomes an actor of competent (creative, independent, responsible, value-based, personal growth-oriented) activities aimed at creating goods sought-after by other people. A person should be readied for such socioeconomic activities. An emerging new-world economy entails the need for an activity-based paradigm of competency-based thinking. To underpin the paradigm theoretically is an overarching objective of our research.

The activity-based paradigm of competency-based scientific thinking provides a clear separation of the notions of “skill” and “competency” from the very start. The skill is the applied knowledge. Skills can be complex, involving simpler skills, motivational factors, knowledge and attitudes. But all skills have one generic trait historically formed in the environment with the social division of labor. While exercising one of his skills, man does not create any object that would have some social value, bear significance for others and satisfy their material, intellectual, aesthetic and other needs. Reading and lathing skills, driving a car, thinking critically and others are important for socialization. These skills are also necessary for the social division of labor. Although, when being applied, they do not produce goods consumable by other people. The skill is the ability to perform a certain socially useful action. The idea of a “man of skill” usually implies “a person capable of doing something real and useful.” Having said that, we often ignore the fact that the industrial economy and social division of labor have objectively changed the production processes. As a result, the labor of modern man has largely lost its integrity.

Competency, unlike skill, is the ability to perform a productive, relatively completed activity. “There is no such thing as an objectless activity” (A. N. Leontiev). Competencies show

in activities aimed at creating a particular object that meets people's needs. Mastery of writing is a skill. This skill-based ability to create artistic images and incarnate them in texts is a type of information competency.

The distinction between skills and competencies is simple and fundamental. Competency-based activities performed either independently or together with other people aim at creating a particular object. The latter can be alienated from the process of activity, objectively evaluated and included in the system of social relations meeting other people's needs. A skill is an action, a realizable ability to apply knowledge; it does not create concrete benefits by itself. Skills are instrumental. In this light, they are pivotal and can be integrated into various productive activities as specific actions. Any competency includes, but is not limited to, knowledge and skills (experience in applying knowledge).

The activity-based paradigm does not come up against the other two — behavioristic and functional. Each one is necessary. Classical paradigms are suitable for regulating labor and education in the modern environment, with the post-industrial economy still dominating. Socially reinforcing a new-type economy, effectively and safely applying and developing technologies of the Fourth Industrial Revolution entails modernizing social institutions, first of all, education and the qualification assessment system, through the activity-based paradigm.

It has a more general, integrative character against the behavioristic and functional paradigms. Competency-based scientific thinking in the context of the Fourth Industrial Revolution can no longer be confined between behavior and the workplace. Human behavior is situation-dependent, and workplaces and job requirements change rapidly. Sustainable throughout life, a man's character defines human subjectivity — the ability to perform activities conditioned by culture, social relations and basic economic processes. The behavioristic and functional paradigms

can be seen as special cases of the activity-based paradigm applied to a specific manufacturing environment. When this environment dramatically changes at times, then the simple idea that being a good worker merely suggests playing one of the social roles based on the ability to work falls into place. This ability becomes a basic characteristic of human personality when a man performs conscious productive creative and responsible activities.

Developing the theory of competencies in the activity-based paradigm is a complex scientific and important socioeconomic task. We have only tried to determine the algorithm to tackle this task. To come up with a solution, which is extremely important for a new type of economy, should be a matter of great concern to the entire scientific community.

INTRODUCTION

Competency became an economically significant category in 1973 when David C. McClelland's article "Testing for competence rather than for intelligence"¹ was published in *American Psychologist*. In the article, he argued that traditional academic aptitude tests, subject knowledge tests, school levels and diplomas could predict neither efficient performance nor success in life. Having come to these conclusions, McClelland began to seek methods for determining "competency variables" that could help predict with certainty the level of performance and would not depend (or if they do, then at least to a lesser extent) upon racial, gender and social factors. In his opinion, competencies are more reliable criteria for success in work and life. They determine the worker's basic qualities and stand close to their motivation, abilities and behavior. McClelland particularly emphasized three basic competencies: fellow feeling (empathy), self-discipline and initiative. He argued that workers without competencies had less occupational satisfaction, were slower to advance and more likely to lose their jobs when downsizing. These competencies play a significant part in work activities and are also applicable to life at large. Those who have them tend to be good citizens. McClelland believed that while competencies were, to some extent, innate qualities, they could be developed through coaching and learning. A worker, if not effective enough, can be motivated to enhance the required competencies.

The competency emerging as an economic value reflected a true-to-life gap between the learning outcomes and new labor standards requirements. In the mid-20th century, digital information began merging with industrial technologies. The process soon turned into one of the overriding factors shaping a new type

¹ McClelland, D.C. (1973), Testing for competence rather than for intelligence, *American Psychologist*, 28, 1-14

of economy, namely the post-industrial economy. The value of human capital was skyrocketing. The driving forces behind economic development were undergoing substantial modification. Workers' personal qualities, their ability to perform productive activities and readiness to tackle real socioeconomic problems became the driving factor of production. However, both basic and vocational learning goals — transmitting systematic knowledge and building skills and abilities — remained unchanged. In the industrial age, having a certain amount of knowledge and a particular skill set was sufficient to prove one's professional qualification. With the transition to a new economic system, technologies and labor relations become more complicated, international differentiation of labor deepens, tertiary (service-producing) industries prevail, digital information technology incorporates itself into all economic and social processes, both national traditions and cultural values are seen as one of the conditions for industrial efficiency. Economic challenges are no longer purely economic. They integrate with politics, culture, social life, ecology, and ethics. Possessing particular professional skills and the knowledge of some scientific disciplines is no longer sufficient to meet them. Besides, there should be an understanding of the integrity of socioeconomic reality, rational interdisciplinary techniques to meet challenges in different conditions, strong motivation for performing activities, personal responsibility for both the activity in progress and its outcomes.

In fact, David McClelland's article was one of the first signals of employers' growing distrust in the education system. Over the past half-century, the situation has become even more complicated. The problem of human resources for the fast-growing post-industrial economy has not been solved yet. The business remains unsatisfied with the quality of training in the formal education setting. A survey conducted by McKinsey's global

management consulting firm revealed discrepancies between assessing the quality of education by teachers (it is mostly positive) and employers (it is mostly negative).

The mismatch between the learning outcomes and economic needs leads to difficulties in finding sufficient staff with the required skills. This problem is known as the skills gap. “One of the primary reasons reported for skill gaps is experienced not due to a lack of employees but to the failure of their knowledge and competencies to meet their occupation requirements. According to the OECD, with the current global labor force of 3.5 billion, the competencies of every third worker in the labor market are either excessive or insufficient to perform their job. This so-called skills mismatch already affects every second employer. Today, 1.3 billion people are not immune to skills mismatch, and by 2030 it will spread to more than 1.4 billion workers».

The studies conducted by the Russian Union of Industrialists and Entrepreneurs (RSPP) in 2016-2019 showed that “under-staffing was in the top three most pressing business challenges. According to Rosstat, after graduating, 31.3 percent of university graduates and 40.5 percent of vocational school graduates do not work in their degree field. Today, the high formal educational potential of the population is not fully capitalized. Russia has the lowest GDP per capita among the countries with high coverage of higher and secondary vocational education. Education does not meet the labor market needs by a third and in some sectors by two-thirds.”²

On the business side, the lack of confidence in formal training forces the development of corporate training systems that allow for selecting employees and shaping their professional skills. Companies create methodological, organizational, motivational and other conditions for their employees’ development. They pay for staff training courses, seminars, corporate training,

² <http://old.rspp.ru/viewpoint/view/988>

internships, etc. Corporate training improves the qualification of many an employee, delivering knowledge and shaping their skills, both being necessary to accomplish the company's objectives. However, its main advantage — acquiring skills to achieve specific production goals in real time — comes with some limitations. For example, training that simulates work situations does not reflect all the complexity of the problems that arise in business processes. Individual behavior patterns of highly competent and efficient staff members are not always transferable or replicable. Even with a well-established buddy system, on-the-job training will not be effective without prior theoretical training and a general professional outlook. Particular tasks and projects stimulate and shape necessary skills in practice. Though, in business projects of high importance, the cost of an error may be far too high. Corporate training efficiently fine-tunes the competencies at hand to the optimal state for a particular job. However, it can not replace formal basic and vocational education as well as personal development and socialization that occurs in childhood, youth, and later years and lays the foundation for human subjectivity. Not unimportant is the fact that business, organizing corporate training, pays double price. In the beginning, its taxes support basic and vocational education, practically paying for under-trained employees who do not meet its real needs. It is then forced to spend a lot of time and money on retraining and additional training for its own employees.

There is a growing understanding among employers hiring recent graduates that the current knowledge- and skill-oriented education system does not ready students for productive activities in the modern world, and even less so in the world to come. This understanding emerges at the very beginning of the post-industrial era. The solution to this problem is seen in the implementation of the competency-based approach.

Since 2009, the competency-based approach has been implemented in the Russian system of vocational education and training. Over the last ten years, education has been building competencies identified through quite a reliable method of functional analysis of production processes that are consistent with employers' requirements. Nevertheless, employers still lack confidence in the quality of staff training and do not trust diplomas. Thus, in August 2018, the fifteen major US companies, including Google, Apple, Bank of America, IBM, announced that a diploma of vocational or higher education is no longer a prerequisite for job seekers.³

Along with pointing out the lack of professional competencies, employers are increasingly aware of the lack of so-called "soft" skills among graduates. One of the reasons why educational outcomes cannot be aligned with employers' expectations lies in defining and building basic competencies. Much has been done in recent years to improve the quality of vocational education. A methodology for identifying professional competencies has been developed and tested, mechanisms for managing the competency-building processes have been set up, a system of independent qualification assessment has been created, etc. However, the question of how to build and assess basic (general, universal) competencies remains open.

The socioeconomic value of basic competencies is high. The studies conducted in 16 European countries reported that 93% of employers view them as no less important than an employee's professional competencies.⁴ At the same time, there is no scientifically grounded methodology for defining basic competencies. The functional analysis of a specific work activity applied to identify professional competencies fails to work sufficiently well when involving basic or universal human abilities.

³ <https://www.glassdoor.com/blog/no-degree-required>

⁴ <https://www.pro-personal.ru/article/7811-soft-skills-klyuch-k-karere>

At the core, the latter ones are basic competencies. There is still a lack of understanding and agreement on their structure, system, methods of determination, and evaluation technologies. The lack of fundamental scientific knowledge about basic competencies prevents setting up an effective system for building and developing them. Basic competencies, in other words, basic human abilities, mirror a personality structure shaped by contemporary economic activity and public life. There cannot be many of them, and they must be resistant to external changes and systematically interrelated. In practice, there are many completely different lists of basic competencies, making no distinction between competencies per se and skills, personal qualities and knowledge. Expert communities identify competencies arbitrarily, preliminarily developing neither methodology, theory, nor technologies to identify, build and assess them.

With no coherent theory and scientifically sound criteria (a list of competencies) making basic competencies understandable to everyone and shared by educational and business communities, basic education can participate neither in the national human recourse management nor develop a personality through building and exercising the ability to perform productive socially significant activities. Meanwhile, there is no doubt that basic competencies — basic (universal) human abilities — are continuously built and enhanced throughout a lifetime, starting from childhood. They dwell in the spheres of thought, behavior, values, motivations, attitudes to oneself, others and the world. They cannot be built over the course of short-term specialized programs. Such programs can only enhance some or other basic competencies, taking into account the conditions of particular work activity.

It is necessary to consider that professional competencies do not work without basic ones. Competency per se is a human ability to perform effectively. It is always embedded in the structure of human personality. The system of competencies reflects

the structure of human subjectivity. The latter has a layer directly integrated into work processes and marked with professional competencies. There are deeper layers, which are codified through basic competencies. They can be regarded as a kind of meta-competencies. They serve as a framework for professional competencies, bind them into a single system, and largely determine the effectiveness of their acquisition, development, and application. With no scientifically sound, socially sustainable system for ongoing building and developing basic competencies, the quality of vocational training remains at a level that does not meet employers' requirements.

Developing further the national system of qualifications and competencies requires a scientific and technological approach to basic competencies. It will ensure coordination between the world of work and education, markedly improving vocational training quality and outcomes. In turn, the rates and volumes of human capital accumulation will be increasing as well.

CHAPTER 1. ECONOMIC NATURE OF COMPETENCIES

1.1. AXIOMS OF THE THEORY OF COMPETENCIES

Competencies are the subject of scientific research and have been employed in economic and education management for more than half a century. Over this time, extensive, albeit largely contradictory, experience has been accumulated in developing various competency models and assessment techniques. Although there are numerous scientific studies on this matter, there is yet no theory of competencies that would combine basic and professional competencies in a single categorical system. Moreover, there is no theory to describe competency-building technology shared by business, scientific and educational communities. The need for such a theory has always been recognized, but the hard factors for bringing it to life are only emerging today.

The competency-based approach emerges, is being shaped and implemented in the post-industrial economy. It is deeply in-built into the economy. The post-industrial economy makes competencies updated. The degree of economic development objectively determines the extent of theoretical insight into them. Complete scientific knowledge of the competencies is only achievable if the post-industrial core potentials are unleashed at the historical moment of transition to a qualitatively new state. This is happening today: the digital economy is replacing the post-industrial one.

A modern post-industrial economy is a game-changing and final stage in industrial economy evolution. The rapidly developing digital computing and the Internet and their widespread use in all socioeconomic activities underlie the transition. The technologies and economic relations, both going digital but remaining industrial in their core, have succeeded in enhancing labor productivity

and management efficiency, automation and robotization of individual technological systems, deep integration of science and production (“knowledge economy,” “innovative economy”), the widespread use of big data in economy and management (“information economy”), significant growth of the material well-being and free time, and, as a result, the expansion of the service sector.

Human capital — the totality of realizable abilities needed for productive economic activities — becomes the driving factor for production. The processes of accumulation, development and application of human capital have to be managed. In response to this need, national and corporate competency management systems (competencies — codified abilities to perform productive activities) come into being. In the post-industrial economy, a culture of competency-based thinking is shaped, and the foundation for competency management is laid.

The post-industrial economy emerged during the Third Industrial Revolution⁵ with the advent and rapid spread of digital computing while not sacrificing underlying industrial technology. The upcoming digital economy is based on fundamentally new production technologies deeply integrated with artificial intelligence. It has the capacity to completely liberate humans from manual labor as a means of earning and provide exponential growth of production efficiency and its individualization. With that, man will be able to specialize in conceptual management, creativity and control. The digital economy is deeply integrated with culture, nature, education, art, science and other forms of social consciousness and activities. With human capabilities radically expanded by artificial intelligence, human overall and professional competence becomes an overarching factor for the digital economy’s effective and safe functioning. As the digital economy approaches, the importance of competencies is skyrocketing. This economy

⁵ According to Schwab’s classification (Schwab. K. The Fourth Industrial Revolution. Moscow, 2018).

cannot function effectively, and the underlying technologies cannot be applied safely unless there is a sufficient amount of high-quality human capital. As for the latter, its initial accumulation occurs during the post-industrial economy.

Competencies become pivotal in codifying and managing the processes of human capital accumulation, development, and application. Setting up a single national system of competencies and qualifications is a prerequisite for developing further the digital economy. The idea behind this system is to ensure the gradual and sustainable development of both basic and professional competencies over a lifetime, with man and society managing the competencies. To tackle this task, a general theory of competencies should be developed. Firstly, all previously accumulated experience in implementing the competency-based approach should be conceptualized. It is necessary to summarize everything that has already been done and thought through since the 50s of the last century. And this should be done so that the fundamentals of the theory of competencies are clear and evident to everyone interested in this problem. Simplicity and clarity are the first requisite for achieving public agreement on competencies having key economic importance.

Nothing in science is simpler or more fundamental than axioms — statements, due to their obviousness, shared by everyone. Axioms are the basic elements of scientific theory. They should be consistent with each other and practice in the broadest sense. They should be convenient to work with when building a theory. Their content should include a minimum number of initial concepts. Let us define and dwell on the axioms of the competency theory.

Axiom 1: *“Competencies are abilities.”*

Axiom 2: *“Competencies are economically demanded abilities.”*

Axiom 3: *“Competencies are socially marked abilities.”*

Competencies are abilities. The competency-based approach is built and implemented in the activity-based paradigm. At the core, competency is the ability to act, solve problems, understand, know, create, achieve, behave in a certain way. Specific forms of competencies and their titles come later, but it is always the human ability to do something that is present in the first place. All categories and types of competencies come out of it. This axiom also underlies the competency assessment system. The assessment assumes that man must prove his ability to act. Presenting knowledge and certificates is no longer enough. It is necessary to organize and demonstrate one's ability to work (to perform a succession of operations based on the applied knowledge) with an object in a real and/or simulated environment.

Axiom 1 is elementary and obvious. But, having accepted it, we must answer the question: are all human abilities competencies? Apparently not. Then we would need a basic principle, also elementary and consistent with practice, which would allow us to confidently differentiate abilities into competencies and others. This brings forth the second axiom.

Competencies are economically demanded abilities. The issue of competency arises in the wake of new requirements advanced by employers. They are increasingly in need of proactive, creative, responsible employees who can independently and effectively approach problems in changing socioeconomic conditions. An indicative set of those abilities is called competence; it lays a solid foundation for the social mandate for education. Neither the State, nor society, nor education per se need any competencies. They stem from a special type of economic activity called post-industrial. Its main productive resource is human capital — a system of abilities realized through work activities. The reason for competencies to emerge is pragmatic: a shift in the balance of capital types and the possibility of obtaining greater profits from investing in human capital.

Axiom 2 reflects the real and only reason for competencies to emerge and provides an objective basis for defining them. Competencies, being economically realizable abilities, have their own real object. At the beginning of the activity, this object appears as a goal; it becomes a product at the end of it. This product should be alienated from the activity and then integrated into the system of socioeconomic relations. It should also be vital for both the person who created it and other people; it should have a certain social value. Any competency is realized and assessed through the product it creates. Competency, both professional and basic, cannot be unproductive. In that case, it falls out of the economic relations (real or potential) and loses its productive significance and status of competency while still remaining one of the human abilities.

The economy lays the foundation of a society. Due to the great importance of competencies for today's economy, the State, education, and science are concerned about implementing the competency-based approach. A social need arises to manage the processes of competency building, development, and assessment. The content of the third axiom gives a method for managing competencies.

Competencies are socially marked abilities. To single out economically important abilities from a multitude of human abilities, they have to be labeled as competencies. Science, education, and business determine what abilities are competencies within a given economic setting. Competencies featuring economically important abilities form the basis of educational standards. They are grouped into various corporate models of competencies and serve as tools for managing the human capital movement and for coordinating the world of education and the world of work. The State supports those processes in terms of formal education. With various social actors combining their effort to build, develop, and implement competencies, the socioeconomic

system for managing abilities is gradually taking shape. It offers everything necessary for work, life and personal growth and shapes the strongest motivation: a man who possesses and continuously enhances competencies is fully engaged in self-realization. Moreover, he is guaranteed to achieve success, recognition, well-being, and satisfaction from work seamlessly blended with his internal and external life.

The three axioms bring about the simplest conceptual framework for the theory of competencies. They answer three crucial questions:

- 1 *What is competency?* Competency is the human ability to act or perform for the sake of creating something.
- 2 *Why do competencies arise?* Competencies are born in an economy based on human capital. In this case, the human ability to perform productively yields the greatest profits.
- 3 *What are competencies for?* Competencies are social markers by which those abilities that are economically important under given conditions are singled out from the multitude of abilities. Labeling is essential for public management of abilities.

1.2. GENERAL NOTION OF “ABILITIES”

The notion of ability is a fundamental category for the theory of competencies. Abilities are special human qualities (personality factors) that condition an internal climate for personal growth through performing certain activities. They take shape through interaction with culture and the outer world.

Not all human qualities are abilities. Only those that are directly responsible for performing activities successfully. For example, such personal qualities as indifference, dreaminess, cruelty and short temper are not seen as abilities because they are not instrumental in performing activities. The main criterion for identifying abilities dwells in their activity-related nature. According to this criterion, they also differ from the human body's vital functions regulated by biological systems of various organizational levels in interaction with the environment and in line with genetic programs. Vital processes run unconsciously and constitute human organic nature, essentially indistinguishable from the nature of animals.

There are many different types of activity. Performing any activity requires a particular set of consciously acquired abilities. The pace of personal promotion in a particular field of activity is an objective overall indicator of individual abilities. Personal knowledge, dispositions and skills also attest to their availability. Abilities determine the ease, pace, solidity and depth of knowledge acquisition and skill-building, with the further possibility to transfer them for dealing with new challenges under changing conditions.

Although abilities find an objective basis in activities, everyone shapes and exercises them in one's own peculiar way. To that end, the abilities a person acquires through socializing integrate themselves with human innate, inborn potential, which forms the organic basis for building and developing them. People

are not born with abilities; they only have natural dispositions. The latter ones depend upon structural features of the organs of movement and senses, the brain and nervous system as a whole, and other functional characteristics of the organism, including the nervous system characteristics: the rapidity of the formation of nerve connections and their strength, attention span, mental capacity, the specifics of auditory and visual perception, motor response, etc.

Abilities do not belong to humans by birth. Everything that is humane man acquires over a lifetime, starting from birth through socialization, learning and labor. Even such a seemingly natural feature as walking upright is not transmitted genetically. The child learns to walk on his feet, and this ability is built imitatively in the activities organized by parents. Even though the human body itself is the product of a long-term evolution shaped by labor and cultural development, and the body's organic properties make for acquiring abilities fast, man cannot build them unless he is involved in organized activities. For example, the anatomical structure of the infant's organs of speech is already formed to master articulate speech, but the speech ability does not develop without communication. The child's biologically developed brain does not shape their thinking; it occurs only through language and involvement in a cultural product. All human abilities are social. "The human abilities that distinguish man from other living beings constitute the nature of man, but in turn, the very nature of man is a product of history," asserts S. L. Rubinstein. "Human nature is shaped and changed in the course of historical development as a result of human labor activity."⁶ To develop a proper human attitude toward the world, the individual must master all the properties objectified in the products of labor and cultural products created by previous generations.

⁶ Rubinstein S. L. Fundamentals of General Psychology: in 2 vols. - M., 1989. - Vol. 2. -P. 127

A. N. Leontiev systematically addressed the development of human psychic abilities by assimilating social and historical experience. “Throughout human history,” he says, “humanity has developed the greatest spiritual powers and abilities. In this respect, millennia of social history have yielded infinitely more than millions of years of biological evolution. Achievements in developing human abilities and qualities were accumulated and passed from generation to generation... Even in the ordinary material industry, we can observe the objectified human abilities, or objectified human essential powers, embodied in external things. Be noted that this refers to human psychic abilities... The real and most immediate to man world which determines human life is the world transformed or created by human activities. However, as a world of social objects embodying human abilities that take shape through evolving social and historical practices, this world is not presented directly to the individual. And as such, it confronts each individual as a task.”⁷

Man’s vital task, which actually makes men human, is to acquire his own human nature (human essence) and abilities and then implement and shape them. Throughout history, culture determines the ways to tackle this task. Human abilities become objectified via people’s material and spiritual activities. The products of these activities are preserved by culture. Representatives of each new generation acquire the abilities shaped by previous generations through socialization, education and work, shape them via activities, and, in turn, embody their enhanced abilities in new cultural forms. A new generation acquires abilities through object-based activities. Historically, this has been the socially organized process of development, transmission and acquisition of abilities from generation to generation, from man to man. Reproducing activities on an expanded scale is inherently human and

⁷ Leontiev, A. N. *Problems of the Development of the Mind*. Moscow, 1981. – P. 370 - 372

takes place in culture. In fact, in a general sense, culture is a historically shaped space of abilities objectified in the objects of activities. This is how the proper human — inorganic, cultural — way of accumulating, developing and inheriting useful forms of organizing life and behavior in the world is formed. “The spiritual and mental development of individuals is the product of an extraordinary process — the process of acquisition. It does not exist in animals, nor does the opposite process of objectifying their abilities in the objective products of their activities.”⁸ Before abilities become man’s personal property and a structural part of human subjectivity, they exist in culture, being created and shaped by previous generations throughout social practices. “We can say that each individual learns to be a human being. To live in society, it is not enough for him what nature gives him at his birth. He has yet to master what has been achieved throughout the historical development of human society.”⁹

A. N. Leontiev defines two critical elements for individuals to assimilate achievements of humanity’s historical development: the object of activity and communication. The object, an objective form of culture, “captures the socially developed modes of performing operations with a given object.” In object-based activities, “the individual reproduces historically shaped human abilities and functions” and acquires the abilities that are objectified in a particular object. Communication “as part of joint human activities, i.e., the form of “direct collective action,” is the second prerequisite for acquiring abilities. The communication-driven activity performed to reproduce abilities is focused not only on the object but also on another person (ultimately, on himself) and is organized as a social activity.

Abilities are inherently social. They dwell in culture and social relations as objectified forms of activities and are acquired by

⁸ Ibid. P. 374

⁹ Ibid. P. 417

the individual. Human morphological features make for building certain abilities. However, the abilities per se are acquired only through activities, starting with the simplest ones. For example, anatomically, the human eye is not much different from the monkey's eye, but their visual perception abilities are completely different. The monkey "perceives the stick in one moment, in one visual field." The child, on the other hand, "can voluntarily and actively move his attention, reconstructing his perception and thereby freeing himself to a great extent from subordination to the structure of the visual field given to him." The child's field of attention combines "the picture of a future situation made up of elements of the past and the present sensory field" and "embraces not one perception but a whole series of potential perceptions, forming a general successive dynamic structure spread over time... The monkey must first see the stick to pay attention to it; the child can pay attention to see it."¹⁰ As described by L. S. Vygotsky, a fundamental difference in the visual perception process stems from the child's speech activity which mediates the said process. Alongside this, the child's ability to carry out sign operations reorganizes his sensory field.

Human abilities are culturally conditioned. Depending on the situation of acquiring a particular ability, it can have completely different forms of implementation. Thus, the ability to understand the same text, even within the same literary language, may differ considerably from one person to another. People do not acquire abilities until the latter ones are shaped by technology, social relations and social norms of behavior. For example, the newly emerged ability to network owes its appearance to computer networks, platforms and online services designed to build, reflect and organize social relationships on the Internet. This ability is enhanced through modern forms of doing business on the Internet, particularly advertising sales in social networks that

¹⁰ Vygotsky, L. S. *Pedagogical Psychology*. M., 1996. – Pp. 434, 435.

financially support their functioning. Another ability — the information handling ability — differs significantly between the generations formed in the industrial age and those born in the information society. The same applies to other human abilities: living in a global, multicultural world, working with computers, etc. Man acquires all of them only if their structures have already been shaped historically and have achieved social maturity for being transmitted to humans through socialization, education and professional activities.

1.3. CLASSICAL METHODS OF OBJECTIFYING AND ACQUIRING ABILITIES

All abilities are historically built via activities, embodied in material culture and acquired by new generations. Man, performing productively, develops and objectifies abilities in various forms of culture, makes them available to contemporaries and generations to come if those abilities have a particular value. In activities dealing with already created material cultural forms in which abilities are objectified, the reverse process occurs, i.e., *de-objectification of abilities*. The process of utilizing human abilities and embodying them in the persistent forms of material culture shall be named the objectification of abilities. Objectification is a key instrument for developing abilities. Through objectification, abilities are alienated from the subject of activity, are objectified and become available to others.

Objectification (from lat. *objectivus* — objective) suggests acquiring an objective form of existence, transforming the internal into the external, the ideal into the material, the subjective into the objective. Acquisition implies shifting from the external side of activity to the internal one, transferring the inherent content of the object under study from the world of objective forms of culture into the realm of individual life and consciousness, accepting as one's own what is created by others. In the processes of de-objectification (acquisition) and objectification (realization) of abilities, a culture is created. As a result, human personality takes shape, develops and fulfills personal potential (subjectivity), and the individual acquires their human essence.

There are three classical forms of activity that have existed since the beginning of human history. They help acquire and objectify abilities: *speech, behavior, and work experience (object-based practical activities)*. They correspond to the forms of objectification and acquisition of abilities. We shall present them as a table and dwell on them.

The modes of activity that help acquire and objectify abilities	Forms of objectification	Modes of acquiring
Speech	Language construct	Communication. Education
Behavior	Act (action)	Social interaction. Socialization
Work experience (object-based practical activities)	Product of labor	Production and consumption

Speech is a process of human communication through language constructs formed under rules known to all participants. Using linguistic means gives rise to thinking — the internal side of speech activity. The content of thinking is objectified in the forms of the spoken and written languages. The objectification of thinking in oral speech forms is unreliable. The written language is more time-independent. With its emergence, culture arises. Objectification, as a process, and culture, as a form, create that realm of man's interaction with the world, which S.L.Rubinstein defined as “consciousness based on an awareness of being” — the objective realm where the psychic dwells, the reality of man's psychological life involved in the interaction with other people. Exercising human abilities results in creating cultural objects. These objects, especially the texts in the spoken and written languages, become a means of communication. The latter suggests the exchange of information, experiences, abilities and results of

the activities. Texts also constitute the core content of education. In the learning process, the students de-objectify (acquire) abilities objectified in the forms of culture.

The second technique of objectifying and acquiring abilities is behavior — human interaction with the social and natural environments mediated by the internal (physiological, psychic, mental, spiritual) and external (locomotory) sides of human activity. A core behavioral element is an act. The act is performed in social reality and shaped by various actors of activity. Thus, it acquires significance only in particular cultural contexts. Although a word can also be an act under certain circumstances, the act itself goes beyond mere speech. “Man commits an act with his whole life,” says M. M. Bakhtin. The act represents a personally motivated form of behavior resulting in an independent choice of goals and ways to achieve them. As an act of free will, the action depends on knowing the difference between good and evil, accepting values consciously, including man’s moral self-determination. In actions, man proves himself as a person to himself, another person, society, future generations and the world at large. Actions objectify human abilities and create events. Through attitudes towards events provoked by the actions of others, we express attitudes towards their objectified abilities. Social interaction within the confines of a given event and in the context of a particular culture allows for acquiring abilities.¹¹ Social engagement is a combination of acts a person commits by himself, his attitudes to the actions of others and his participation in forms of collective behavior.

¹¹ Not all actions are socially approved. Accordingly, not every human ability embodied in action can be accepted or approved by others. However, saying that this action is wrong, we always see a better way of acting, i.e., we seek and want to acquire the ability to act differently. To that end, any action opens the door for acquiring abilities.

The third classical technique of objectifying and acquiring abilities implies object-based practical activities. The practical activity is the process of manufacturing products of labor and services that meet certain needs. Products of labor and services embody those human abilities that were utilized to produce both. Being directly related to the need, products of labor and services are always in demand. Furthermore, the abilities objectified in them undergo the de-objectification through active consumption in the world of production, science, creativity and other activities. With that, the results of past labor resolve into the means of performing new activities.

1.4. LABOR'S FUNCTION

Abilities develop throughout history. Also, the techniques of objectifying and acquiring them can be supplemented by new ones, as new productive forces take shape, and both labor and social relations change qualitatively. The development of activities, primarily economic, naturally expands the system of objectification and acquisition of abilities.

A new, post-classical technique of objectifying abilities — the labor's function — emerges simultaneously with capitalism, an economic system of production and distribution of material goods based on private property, wage labor, freedom of enterprise, legal equality, the social division of labor and machine production. The labor's function is a succession of labor actions. It stemmed from the division of labor in a particular production process. The historical prerequisite for the labor's function was machine production. It began with the first industrial enterprises in the second half of the 18th century. The use of machines in production necessitated social division and cooperation of labor. "The machinery, says K. Marx, as an instrument of labor, acquires such a material form of existence that calls for replacing manpower with elemental forces and accepted rules derived from experience with the conscious application of natural science Machines... can only play their roles through direct socialized and communal labor. Hence the cooperative character of the labor-process is, in the latter case, a technical necessity dictated by the instrument of labor itself."¹² The division of labor suggests that workers perform their specialized activities while being involved in collaborative production processes. It features the separation and codification of individual types of work. The entire production process is divided into special labor functions performed by workers. Each

¹² Marx K. Capital. Critique of Political Economy. Vol. 1. Moscow, 2012. – P. 404.

worker is temporarily assigned one or more labor functions. To perform them, one needs to possess appropriate abilities.

The labor's function is an extraordinary form in which abilities are objectified. Performing labor functions may not result in creating a product of labor suitable for meeting particular human needs. Before the advent of industrial production, this was impossible: manual labor had to create use-value. The peasant's and the artisan's abilities were expressed and assessed solely by their labor outcomes, which were always material and intended for direct consumption. For creating a product of labor, it was necessary to perform all the technological operations, none of which had any independent social value. With the social division of labor, individual labor functions acquired technological (essential for advanced manufacturing), economic (they are paid for) and social (one or more labor functions perform effectively determine professional demeanor) significance. The worker does not directly create the final product, participating only in one stage of the overall production process. The worker's objective is to perform a high-quality labor function through which particular human ability is realized. The labor's function has an independent value. It is the human ability to perform productive activities in their purest form.

The distinctive nature of performing labor functions is conditioned by a significant change of activities caused by machine production. The advent of the machinery — an autonomous, self-operating device for converting energy, materials and information — breaks new ground for objectifying and acquiring abilities.

Abilities are always embodied and acquired through activities with a specific object involved. From the advent of civilization to the 19th century — the onset of the industrial age, there were only two types of objects in human history that people worked with: *objects of manual labor and objects of intellectual labor*.

Objects of manual labor: tools, devices, equipment, premises, etc. A man applies them to change, as desired, the forms and processes of nature (inorganic and organic). Objects of intellectual labor: signs, symbols, legal norms, artistic and philosophical works, religious traditions, scientific theories, etc. People employ them to organize social life and develop forms of social consciousness (science, art, philosophy, law, etc.). In line with the two types of objects, there was an opposition between manual and intellectual labor and a division into classes and social strata in society.

People engaged in manual labor used to acquire abilities through communication and direct practical experience. The simple organization of manual labor did not require systematic learning. Those engaged in intellectual work — politicians, clergymen, scientists, artists, etc. — would face a more complex challenge of maintaining social order and developing public consciousness. Their activities were text-bound. Basic and special education came to the fore for settling social woes, framing laws, creating artistic and philosophical works, and developing new scientific theories. Without gaining systematic knowledge and acquiring the necessary basic skills (reading, writing, counting, mastering various speech styles, etc.), it was impossible to work with texts and acquire the abilities objectified in them. There were schools and universities for these social groups. Their representatives did not engage in manual labor and did not acquire the necessary abilities to perform it. The education they received was scholastic. To that end, the text was everything — an object, a tool and a means for objectifying, developing and acquiring abilities.

In 1769, an event occurred that significantly enhanced human abilities and made a start for a new mode of acquiring them: James Watt invented the steam engine. A new type of object of labor appeared. It did not belong to those that had existed before. It could not be created by improving the tools previously

used in agriculture and the domestic craft industry. It required a new mode of rational thinking — experimental natural science. The latter dates back to the 17th century and gives birth to modern science. For the first time, experimental natural science combined theory and practice in systematic, rational thinking. The new scientific thinking complemented and developed the logical traditions of Greek philosophy and medieval scholasticism through working with real and idealized objects. The study of material nature revealed the truth through observation, experiment and reason armed with mathematical methods. Galileo was the first scientist who laid the groundwork for the experimental method and proclaimed the need to link science with production. Since then, science and technology have supported each other's development. Thus, the steam engine suitable for industrial use owed its advent to the emergence of classical mechanics in the 17th century. In turn, production regularly required more advanced steam-driven machines. Scientists began to look for possibilities to increase their effectiveness. Joseph Fourier's "The Analytical Theory of Heat" appeared in 1822, and Carnot's work "Reflections on the driving force of fire and machines capable of developing this force" was published in 1824. A new field of scientific knowledge — thermodynamics — originates from these works.

The steam engine paved the way for the technologies of the First Industrial Revolution. Railways, machine tools, steamships, steel mills, weaving factories and other objects and means of labor changed the system of creating and distributing goods, built a new infrastructure for transport, communication, agricultural and industrial production. In this industrial infrastructure, the mode of acquiring and developing abilities changed markedly. Previously, this was done through manual or intellectual labor. The advent of the steam engine brought about a new method that combined science with production, the physical form of trade tools

with systematic scientific knowledge, offered new opportunities for activities, opened the door for transforming nature and creating values and benefits. The opportunities and abilities that the new method helped objectify kept growing and improving. Both education and participation in production activities became essential for acquiring abilities. Whereas in the past, abilities were acquired either through handling physical objects or working with texts, the steam engine became the first object of activity that required both. A new era in developing abilities began when working with the tools of manual labor called forth the ability to read texts. In contrast, text-bound activities lost their former self-sufficiency¹³ and resolved into a prerequisite for addressing the practical challenges.

Science and practice combined in machine production alongside the social division of labor required systematic, rational knowledge and practical skills to perform labor functions. Skills were exercised in the mass production system. Systematic education was required to acquire relevant, mainly scientific, knowledge. That was how the system of mass vocational education and training came to life, and the notion of “qualification” emerged. The latter characterized a readiness to perform activities, knowledge and skills necessary to exercise certain labor functions.

The labor’s function became a new form of objectifying and vocational training — a new form of acquiring abilities. Both the

¹³ Truth is no longer attained by studying and comparing the texts of ancient and medieval thinkers, as medieval scholasticism assumed. The attitude towards knowledge, the text, the book changes. In the Middle Ages, the book was a treasure trove of knowledge. In the early modern period, the text became one of the tools for revealing the secrets of material nature alongside experience and mathematical models. If necessary, one tool of rational thought (text) was easy to replace with another. Hence, scientific criticism and falsifiability, or refutability, of scientific knowledge emerged.

labor’s function and vocational training were born under conditions of machine production, the social division of labor and capitalist relations. Labor functions can complement the table of activity modes, forms of objectification and modes of acquiring abilities.

The modes of activity that help acquire and objectify abilities	Forms of objectification	Modes of acquiring
Speech	Language construct	Communication. Education
Behavior	Act (action)	Social interaction. Socialization
Work experience (object-based practical activities)	Product of labor	Production and consumption
Machine production	Labor’s function	Vocational training

The social division of labor diversifies abilities and objectifies them in labor functions whose succession shapes the production process. Under capitalism, most people who do not have private property turn to sellers of their labor power. The classical definition of the latter was given by K. Marx: “By labor power or the capacity to work we understand the combination of physical and spiritual faculties that exist in the living personality of the human being, capabilities which he sets in motion whenever he

produces any use-values.”¹⁴ The worker sells his ability to work. The higher the quality of this commodity, underpinned by the worker’s qualifications, the higher its value. The worker must effectively perform certain labor functions; otherwise, he will lose the means necessary for life. He is forced to acquire knowledge, master skills and enhance them through his work. Market relations stimulate these processes. The worker is constantly at risk of losing his job. Competition, economic crises, changes in production processes or dissatisfaction over working conditions force him to change his jobs, qualifications and develop and enhance his abilities.

The industrial age creates conditions for new abilities to emerge and be acquired. Scientific knowledge is quickly transformed into technological innovations, and production processes with new labor functions are continuously created. Each labor’s function requires new knowledge and skills. Changes in technology can occur within a single human life, forcing even experienced workers to master new, more knowledge-intensive and sophisticated labor functions and continuously develop their abilities to perform productive activities.

Industrial production calls for ongoing professional development. The State and the education system provide the necessary opportunities. Vocational education and career training/retraining facilitate the rapid transmission of knowledge and skill-building. Skills are further enhanced in the workplace. The time required for acquiring abilities shrinks markedly. For each workplace, special qualification requirements are defined. The employer establishes the requirements which are known to all potential employees. Accordingly, a person evaluates his abilities and, if necessary, takes an educational program, acquires additional knowledge and builds skills, fills in the missing components of professional experience, i.e., brings his real abilities in line with

¹⁴ Marx K. Capital. Critique of Political Economy. Vol. 1. Moscow, 2012. - P. 211.

the qualification requirements. With the social division of labor, human abilities become a subject of reflection and the object of purposeful activity aiming to enhance them. These human activities are driven by the desire for benefits obtainable through holding a particular position.

The economy is not the only one that stimulates the development of abilities. A pivotal role belongs to the diversification of goods and services for personal consumption provided by various industries: tourism, food, fashion, construction, etc. In the consumer society, manufacturers have an incentive to create new products and services. High consumer standards motivate citizens to continue their studies, work hard and enhance their skills to earn money.

1.5. EMERGENCE OF COMPETENCIES

Competencies arise from the need to perform complex labor functions. These functions qualitatively change over time and call for acquiring special knowledge and mastering abilities and skills, differentiated by levels of depth and consistency as well as by the nature of their application. Work activities become more and more sophisticated during the entire period of the historical development of machine production. The permanent scientific and technological revolution, qualitative changes in industrial technologies, the international division of labor, the rapid growth of information and scientific knowledge, the development of education and its integration with the world of work set new requirements for qualifications. On the other hand, this also sets the stage for acquiring new knowledge and building the required skills.

Continuously developing the existing and mastering new labor functions helps sustainably develop human abilities to conduct productive economic activities. Simultaneously, as the speed of technological changes increases, modifying human activities and the way of life, the internal, personal dimension of work surfaces, gaining more economic value. Permanent acquisition of new knowledge and skills, development of work activities, the necessity to solve non-trivial production tasks and job rotation provoke thinking. All this also fuels the evolution of languages, communications, creativity, both life and professional attitudes, values and motivations.

The variety of types, modes, methods and conditions of professional activities a worker performs throughout his active life entails developing his mental structures associated with those activities. And so it has always been the case, but in an innovative economy, the nature of work changes much faster. It requires enhancing basic (universal) human abilities permanently. In turn,

abilities ensure that new labor functions are better mastered and performed. Human subjectivity¹⁵ — the system of inter-complementary human abilities for self-determination, creative activities, independent systematic thinking, rational behavior, embracing innovations, performing work activities effectively and freely shifting from one type of activity to another — becomes a significant economic driver. With an insufficiently developed subjectivity, man can not quickly acquire and better perform new labor functions. Man, as an employee, ceases to meet the ever-changing requirements and becomes less effective. Basic (universal) human abilities become just as economically important as the abilities to perform certain labor functions. They represent a sort of meta-abilities that ensure productive activities in an innovative economy. When employers recognized the need for basic (universal) abilities, the notion of competency entered labor relations, science and personnel management.

The attitude to subjectivity as an overarching economic factor in an innovative economy makes its codification necessary. Codification is carried out in a system of competencies. The codification of basic (universal) human abilities — competencies — rests on some criteria: 1) abilities should fit the needs of the economy, 2) work processes, as an environment for utilizing and assessing abilities, should run massively and be reproduced regularly, 3) professional approval and recognition of particular abilities by employers as relevant and normative. The codification of basic (universal) human abilities was secured in scientific researches, models, sets of competencies and later — in professional and educational standards.

¹⁵ A. N. Leontiev defined “subjectivity” as a system of human activity-based abilities in his work “Activity. Consciousness. Personality” (1977). This notion was synonymous with that of personality, which he articulated as a “hierarchy of activities.” Subjectivity suggests the human ability to be responsible for personal behavior, work, life and act independently, purposefully and reflexively.

When only emerging, competencies were defined as basic (universal) human abilities that played a pivotal role in a given economic environment. Although the conception of “basic competencies” was not yet in wide circulation (it came up later due to the division into basic and professional competencies), competencies were seen as specific and universal personality traits.

In 1974, the results of the study of social workers conducted by McClelland and Dailey were published¹⁶. They identified factors that directly determine high-quality work: confidence that others can change their behavior; sensitivity to problems and the ability to define them; the ability to achieve realistic goals in working with clients; resourcefulness in finding the ways to meet client requests; persistence in finding solutions; the ability to achieve your goal even under stress; and the ability to organize teamwork. As can be seen, the abilities that ensure social workers’ effectiveness are universal in nature and applicable to all areas of work. Only the term “client” refers to social work, but all services are provided for clients/customers.

In 1982, the Richard Boyatzis book “The Competent Manager: A Model for Effective Performance” was published. It defines 19 managerial competencies: efficiency orientation (the desire to do something as best as possible); proactivity (the intention to take action aimed at completing the task); the aspiration to influence; self-confidence; logical thinking; conceptualization; leveraging social influence; positive attitude (trust in people); accurate self-assessment, etc. Among those competencies, there is none relating to the ability to accomplish specific work objectives. All of them are important and applicable to the entire range of production issues, both existing and possible.

In his book “Competence in Modern Society” (1984), John Raven provides a comprehensive list of competencies “necessary

¹⁶ McClelland D.C. and Dailey C. Professional Competencies of Human Service Workers. 1974. Workers. Boston: McBer & Co.

at work and in everyday life.” “The qualities that people need to develop,” he classifies as follows: “1. *Human resources; types of competence related to the system of values*. This will include initiative, leadership, a propensity to analyze the work of organizations and society as a whole, and the ability to use their findings in choosing a strategy for their behavior. 2. *People’s perceptions and expectations about the way society functions and about their role in that structure*. Under this heading, we will combine people’s perception of themselves, their way of analyzing the work of organizations, their unique role and the role of others in the work process, adequate ideas about the organizational climate that promotes innovation, responsibility and development rather than leads to stagnation, and the ability to manage their behavior in the light of their ideas and found guidelines. 3. *Adequate awareness of the terms that describe relationships between people within organizations*, such as leadership, decision-making, democracy, equality, responsibility, accountability and delegation of responsibility.”¹⁷ J. Raven defines 37 competencies, and all are of universal nature. “It is more important,” he says, “to identify, develop and measure the generic characteristics associated with effective behaviors than to single out and endlessly document specific behaviors. It is worth focusing on *people* who perform well in different situations, not just on the tasks themselves; the latter ones are too fleeting and unstable.”¹⁸

The world of modern business also gives an impetus to define competencies primarily as basic (universal) human abilities (basic competencies) to perform productive activities. Thus, Sberbank’s corporate competency model contains only six competencies: 1) problem-solving and systematic thinking; 2) customer-centered attitude; 3) managing results and responsibility; 4) innovation; 5) team-building and team-play; 6)

¹⁷ John Raven Competence in Modern Society: M. 2002. – P. 24

¹⁸ Ibid. P. 16

self-management.¹⁹ The significance of all these competencies goes far beyond the banking sector. The State Corporation “Rosatom” competency model is similarly built: 1) systematic, strategic thinking; 2) planning and organizing activities; 3) teamwork; 4) result-oriented performance; 5) leadership; 6) effective communication; 7) change control (focus on innovation).²⁰ Obviously, business is interested in employees with well-developed basic (universal) human abilities to perform activities. Business corporate models define those abilities as competencies. At their core and technically, they are basic competencies. J. Raven expressed this principled position, shared by scholars and employers alike: “It is worth focusing on people.”

Therefore, the employee’s subjectivity is codified in the systems of basic competencies, initially called simply competencies. As soon as an agreement in defining basic (universal) abilities significant for a particular field of work is reached, these abilities become basic competencies and are included in educational standards. Other abilities — the abilities to perform labor functions — turn to professional competencies. Thus, the system for codifying human abilities that play a pivotal role in the post-industrial economy and a division of competencies into basic and professional have historically emerged.

¹⁹ <https://2016.report-sberbank.ru/ru/results-overview/employees/studying-programs>

²⁰ <https://docplayer.ru/28273847-Korporativnaya-model-kompetenciya-goskorporacii-rosatom.html>

CHAPTER 2. COMPETENCY PROFILE

2.1. NOTION OF COMPETENCY

Competency is a human ability, but not every human ability is a competency. Until the mid-20th century, this notion, in its scientific meaning, did not exist. The necessity for that notion came into play in the post-industrial economy. This economy needs only specific, not all, employees' abilities directly responsible for building human capital — the primary driving force of economic growth.

Every person has a variety of abilities, but not all of them can be defined as competencies. Competency is a special type of human ability. Competency should be distinguished from feelings (ability to feel), knowledge (ability to know), abilities or skills (ability to do or perform) and personal qualities (ability to be proactive, disciplined, courageous, etc.).

Competency is a culturally conditioned, codified, object-centered, definable, motivated human ability to acquire, transform and apply knowledge and skills to address complex practical and theoretical problems for creating a work product with an objective value.

Let us dwell, one by one, on the essential characteristics of competency that this notion contains.

Competency is a culturally conditioned ability. All abilities are realized in culture. Man acquires them through activities with objects of culture. Culture can be viewed as a way of inter-generational transmission of abilities. Culture is based on the processes when one person objectifies his abilities as the product of his activity, and another person acquires those abilities by performing his activities (language, work, education, etc.) with the same product created by the first person. This method ensures the ongoing development of abilities both in the history of

humanity and human life. Man acquires ready-to-use abilities via communication, socialization, and education. Then he utilizes and develops the acquired abilities in professional activities and objectifies them in his work products. Then he makes the already enhanced abilities available to others. Culture preserves all abilities and passes them down from generation to generation, from person to person.

Competency is a codified ability. Codification assumes that of all the abilities preserved in culture, some — those that have a certain socioeconomic significance — are reflected in particular texts: professional and educational standards, educational programs and other documents drawn up by the professional, expert, including scientific, communities, educational management bodies and other interested parties. The process of codification standardizes abilities. It determines their structure, develops the rules and regulations for building and applying abilities, and divides them into categories, groups, etc. The codification of abilities stems from the fact that work processes massively and regularly reproduce them alongside the public recognition that abilities are pivotal for the economy and society. Codification is crucial for managing the processes of acquisition, accumulation, development and effective use of human capital.

The first two characteristics of competencies — cultural conditionality and codification — are necessary but not sufficient. They are not limited to competencies only. Culture preserves all abilities. Some of them, such as skills, are amenable to codification. The following two characteristics help to single out competencies as special-type abilities.

Competency is an object-centered ability. Any ability is the ability to act, to be active. But not every ability has its own object. Precisely this quality — having a specific object of activity — is a crucial feature of competency and the main criterion for identifying some but not all abilities as competencies. Suppose

the object of activity can be virtually and/or mentally alienated from the process of activity, included in the system of social relations and perceived by others as a boon (a good). In that case, it represents the object of competency-based activity. Defining such an object shows that competency is at play.

Not all, but some professional competencies clearly illustrate the way of identifying the object of activity. The teacher's ability to "design educational programs (PC-8)"²¹ is a competency since its object — the educational program — is objective and socially significant (has value for others). However, "readiness to interact with participants in the educational process (PC-6)"²² is not a competency since its object is not identified.

Basic competencies, in parallel with professional ones, also have their own object of activity. We have yet to determine the distinct features of such an object. Obviously, if some abilities fall within a separate category defined as competencies, there should be uniform rules for all competencies within this category. Above all, having an object of activity is pivotal for all of them. Suppose we think of a given basic competency but cannot identify the object of activity based on this particular competency. In that case, it is not a competency but one of the human abilities. Take critical thinking as an example. It is often referred to as a competency. Undoubtedly, for a person living in an information society, this ability is critical. But is it a competency? The ability to question incoming information does not create anything of its own. If the information that comes from outside withstands criticism, the person accepts it; if not — discards it. Nothing that would have an objective nature and matter to others can be created through critical thinking. The ability to think critically plays a pivotal role in many basic and professional competencies and

²¹ Federal state educational standard of higher education in training 44.03.01 pedagogical education (bachelor's level). <http://fgosvo.ru/news/8/1583>

²² Ibid.

is embedded in them as a necessary skill. In contrast to skill, the object of competency is objective; i.e., it exists as a form of objective reality that embodies a particular human ability. Competencies are object-centered, and skills are instrumental.

Competency is a definable ability. The codification of abilities is not an end in itself but a prerequisite for managing those abilities that are of economic importance. It is management that ensures the swift growth of human capital and the intensive development of the post-industrial, and in the short term, the digital economy. Effective management is unfeasible without a reliable system for assessing the quality of human capital formalized in the lists of competencies. Both professional and basic competencies should be definable. As to professional competencies, this task is accomplished. The current independent qualification assessment system helps determine whether an employee possesses the required competencies and assesses their level. Basic competencies are so far defined only indirectly through the assessment of qualifications in general. There are no simple and reliable procedures for identifying a particular basic competency and assessing its level.

An assessment becomes objective only when applied to the product of the activity. Based on the objective results of the activity, both the processes and competencies (abilities) involved are adequately evaluated. This rule applies equally to both professional and basic competencies. For all competencies, the objectively existing object of activity should be identified, clearing the way for defining competencies.

Competency is the ability to acquire, transform and apply knowledge and skills. The knowledge and skills necessary for performing activities are clearly seen in the structure of competency. Educational programs, professional and educational standards decide for the required knowledge and skills. To that end, any competency-based activity has two sides. The internal

side of activity dwells in human consciousness and is codified as systematic knowledge. The external and physical side of activity consists of skills utilized in the actual work process. Knowledge and skills are deeply interconnected: the skill is the applied knowledge. A competent person performs consistently and rationally, applying systematic scientific knowledge. Since the knowledge gained is integrated into one's consciousness, one can update the competency-specific knowledge system, changing the succession of actions-skills, if necessary. A competent person knows what information is needed, where and how it can be obtained, how it should be applied under certain conditions and transformed in new situations.

Competency is a human ability to address complex practical and theoretical problems. The nature of today's world realities makes problems more complicated. The transition from a post-industrial to a digital economy, the ubiquitous use of digital technology notably changes the environment for activities. Even today, in the most advanced areas of the economy, education, science and art, activities are performed in a mixed reality that connects the real (physical) and virtual (digital) worlds. The digital Internet-driven reality absorbs the information accumulated by humanity and virtually turns into a digitized culture (digital semiosphere). It is integrated with the economic reality, whose actors, using digital technologies, get direct and operational access to vast arrays of information collected earlier and currently being created. A digital economy that transforms information²³ into goods and services is taking off. Digital industrial technologies, bringing radically new productive opportunities, demand new human abilities or competencies. Facing a task under these conditions, man must tackle it in the dimensions of culture and nature, society and industry, theory and practice, the past and the

²³ Information is the order of symbolic and/or material elements that matter to people.

future. The competency-based approach is designed to build and shape human abilities to productively address complex problems in a globally mixed digital reality.

Competency is the ability to create a product of labor with an objective value. In the beginning, the object always exists as a goal of the activity. While performing the activity, the actors direct their efforts towards the object of labor, pursuing their goal through the means and working conditions. At the end of the process of activity and as its result, the created object emerges as the work product. Competency is the ability to perform productive activities that always result in creating a specific product. The latter is sought-after by others because it has a certain value for them. This product can be easily alienated from the activity itself and its actors and integrated into social relations. Then, the product alienated from the activity continues to exist independently in social relations. The work results take a particular physical and symbolic form (text, image, product, service, etc.), embodying human abilities to perform a given productive activity. Their (results) objective existence makes those embodied abilities available to other people.

Competency is a motivated ability. Two conditions are necessary for a motivated activity: it should be free and productive. Human abilities are not achieved independently of each other. Man acts as a subject, and human subjectivity is codified within the system of basic and professional competencies. Some of them are more relevant under given conditions, others — less. Their configurations may differ, but they always work as a single system of abilities centered on a specific object. In economic reality, the state of competent subjectivity shows in a man who can individually address complex problems, take responsibility for work processes and results of work and take action under uncertainty. Mixed reality allows for choosing a behavioral option from many possible ones. Competency-based activities

are as free as full of responsibility. The motive is a generalized image of the object that is valuable to man and determines the nature of human activity. As long as a competency-based activity is free, responsible, based on personal conscious choice, aimed at creating a product that objectifies human abilities and reflects human personality, it is motivated.

2.2. SOCIAL STATUS AND STRUCTURE OF COMPETENCY

In a strict sense, man does not possess competencies but only the ability to perform. When someone is said to be competent, it suggests that their ability to address problems effectively in some areas is proven and generally recognized. Furthermore, it means their activities are productive, and the results of those activities meet expectations and the established standards. The notion of competency is similar to a mark of distinction. A given community marks those human abilities seen as most significant under specific conditions from this community's perspective. With competencies, the State, corporation, educational organization and others mark essential human abilities and assign particular social and economic values to those abilities. Competency can be viewed as a social index. It characterizes the significance of a particular human ability (employee, citizen, student) for the community. It also shows the stage of development of the indexed ability against the generally accepted requirements secured by professional and educational standards of different levels, corporate models of competencies, reference books, lists of competencies, national qualifications framework, etc. Based on indexing results, each useful ability is assigned a set of keywords that reflect its content and purpose.

Indexing ensures the ordering and systematization of the socially approved human abilities. It applies not only to competencies. It is one of the most essential and ancient social management functions: it supports social order, strengthens the social organizational structure and puts into a recessive state those human abilities that opt for destabilizing social life. The problem is that a person has many different abilities and continually acquires new ones. Among them, there are also destructive ones that disintegrate society, destroy social and personal life.

Historically, religion was the first technique to manage human abilities. For the first time, it forms clear ideas of the good and the evil, what is good and what is bad for man, what is right and what is wrong, with the norms of behavior stemming from these ideas. The system of religious prohibitions separates the required and useful abilities from the unacceptable ones: “Thou shalt not kill.” “Thou shalt not commit adultery.” “Thou shalt not steal.” “Thou shalt not bear false witness against thy neighbor” (Deut. 5: 6-21). Further, constructive abilities are marked by a degree of importance. For example, the New Testament defines the human ability to love God and another person as essential²⁴. This one is more significant than others, including the ability to speak truthfully, to the point, and naturally²⁵. Abilities are codified in religious texts, and a religious organization manages them.

The second socially organized mode of ability management is the law. The law comes to the fore later than religion, simultaneously with the State. The rules of law are codified in legal acts. The power of the State guarantees the observance of the rules. The object of legal regulation is the system of social relations within which abilities are exercised. Depending on how they are displayed, the state authorities provide the ability management. The state control of abilities ensures the social order adopted in a given jurisdiction. Like religious commandments, legal norms are both permissive (e.g., property rights — the ability to acquire, retain and dispose of particular goods) and prohibitive. The individual is free to exercise those abilities to perform activities that

²⁴ “Jesus said to him: you shall love the Lord your God with all your heart and with all your soul and with all your mind. This is the first and greatest commandment. The second one is: you shall love your neighbor as yourself. Upon these two commandments hang all the Law, and the Prophets” (Matthew 22:37-40)

²⁵ “But let your communication be, Yea, yea; Nay, nay: for whatsoever is more than these, cometh of evil.” (Matthew 5:37)

do not violate the established social order — “everything that is not prohibited by law is permitted.” Legal and religious modes of managing abilities coexist and complement each other. Often in history, their relationship has evolved into a theocratic state. In addition to the religious way of governing consciousness and behavior, the State actively forms and widely uses its secularized counterparts — morality and ideology.

In the mid-20th century, another mode of controlling human abilities began to take shape — the economic one. In fact, economic activity per se has always been, along with education and culture, the most enabling environment for acquisition, development and objectification of abilities. However, shaping a socially organized management system requires that economically important abilities are codified, and an ability assessment system is introduced. Codification rests on specific texts: in religion, they are scriptures; in law, they are laws. Competencies are economic instruments for managing human abilities. They help describe all currently central abilities in a rapidly changing labor market. Alongside that, competencies help model, systematize and index abilities — classifying them by the stage of development and degree of socioeconomic value. Competencies started becoming pivotal for codifying abilities in the 1990s. The competency-based approach offers the possibility to coordinate the world of work and education and provide pedagogical support for enhancing abilities through teaching and learning.

Unlike in religion or the legal field, managing abilities in an economy is absolutely free of any form of coercion. The currently central abilities are codified in the systems of competencies, then included in educational standards and curricula and further assessed by independent organizations. Everyone can get full information about the competencies required to perform the activities they are most interested in. Everyone can acquire or shape those competencies through the appropriate training.

With the competencies required, anyone can get the ideal job, reach durable economic prosperity, receive social recognition and acquire self-esteem. Their absence objectively prevents a person from being who they want to be. The choice remains theirs. A high-quality standard of life motivates a person to acquire, achieve and shape abilities. Man personally defines these high-quality standards and can rise to them under favorable conditions created by the State, employers and the education system interested in enhancing human potential.

Competency-based economic management of abilities opens up new possibilities for productive social behavior. A person driven by a natural desire for success, well-being and self-realization purposefully acquires those abilities that correspond to his dispositions and have some socioeconomic value. This way, he becomes highly aware of his current and potential abilities. Since the post-industrial and digital economies are evolving at an accelerated rate, and people are forced to rapidly change jobs and acquire new qualifications,²⁶ acquiring new abilities becomes an ongoing process, purposefully carried out throughout life. Economic management of abilities builds strong motivation to construct, implement and enhance competencies and accumulate human capital.

The current system of ability management has evolved historically. Starting in the 1990s, the system came into being — developing competency models, decomposing competencies (the

²⁶ “The research conducted by The Foundation for Young Australians found that in developed countries, today’s young people can have more than 17 jobs in five different industries in a single generation. Many of these jobs don’t exist yet, and those that do will be quickly and radically changed by technology.” (Heather E. McGowan). <https://zen.yandex.ru/media/id/5ad5b41c168a91ec30f80620/chto-esli-buduscee-raboty-nachnetsia-so-starshei-shkoly-5cc8882d7dea6f00b30d8596?fbclid=IwAR0JeYfvZnyXEDkVLhqCcc78Hfgs3aJdhtvXfnawb521Vs-5JIVslkWkXB-A>

core components of competencies) in educational standards, setting up competency assessment systems. Nevertheless, in general, the system remains fragmented. It does not include basic education; competency models are not linked; there is no continuity in developing competencies. There are no scientifically based methods for determining the structure and compiling lists of basic competencies. Addressing these issues will mean moving the system of managing abilities to a new stage of development. Its distinctive feature and, at the same time, the most pivotal challenge to meet is to shape a single space that will integrate education, economy and culture for the ongoing gradual and sustainable development of basic and professional competencies throughout human life. The high-priority task resides in defining a single (overall) structure of competency. It implies a sequence of core components that reveal the internal structure of competency together with a general technique of utilizing a human ability to perform productive activities.

Basic and professional competencies, as unique competencies, clearly have a common macro-structure and common principles of building and assessing them. Competency is the ability to perform a specific type of activity. It is built, enhanced and manifests itself through activities. It is the activity that is a single base for all competencies. Observing this obvious fact, one could argue that activities and competencies share the same overall structure.

As the basis for defining the structure of competency, we take the psychological theory of activity developed by A. N. Leontiev.²⁷ He defined activity as “a unit of life mediated by mental reflection, by an image, whose real function is to orientate the subject in the objective world.” Each such recognizable “unit of

²⁷ Other researchers may prefer other theories. Positively, this will contribute to the qualitative development of scientific thinking. There is no truth in the choice of methodology. It manifests itself only in the scientific results to which the initially chosen theoretical framework leads.

life” has its “structure, its internal transitions and transformations, its development.”²⁸ Its macro-structure shows the commonality of the organization of different types and modes of activity: [*need — goal*] — [*actions and operations*] — [*object — result*] of activity²⁹.

Human need awakens the activity. As a result of “encountering” with the relevant object, the need is perceived as a goal and “can direct and regulate the activity.”³⁰ These components — the need and the goal — act as a motive for performing activity. Actions and operations can be classified as “the means of activity.” They are understood as the “goal-object” relation and formulated as a task. This task dictates the actor to find, select, set up and implement a system of actions and techniques to achieve the goal. In the “object-result” categorical pair, the notion of “object” has a broader meaning. It plays a pivotal role in the composition of the entire activity. In the beginning, the object exists as a goal. Later, it emerges as an objective product (result) when the activity is complete. On this basis, the components “object-result” can be defined by one notion — “object of activity.” Thus, the minimal required macro-structure of activity consists of three critical components:

MOTIVE — MEANS — OBJECT.

Hypothetically, it is safe to say that this is the sought-for macro-structure of competency. The challenge now is to reveal it meaningfully.

Competencies are codified abilities. They are instrumental in managing the processes of building (acquiring), assessing and implementing socially significant human abilities in an economy. Competencies come to the fore in three main areas: education

²⁸ Leontiev, A. N. Activity. Consciousness. Personality. Moscow, 1977. — P. 82.

²⁹ In this model of the activity structure, the components similar in meaning appear in square brackets.

³⁰ Ibid. P. 87

(competency building), management (managing human resources), and economy (enabling competencies). Accordingly, to be converted into a competency-based format, the overall structure of activity should be described in terms of pedagogy, management and economy. This structure should be technologically simple, understandable and applicable to the mass practices of education and social and economic management. It should be convenient for both teachers and specialists involved in the assessment of qualifications and competencies.

2.3. OBJECT OF COMPETENCY-BASED ACTIVITY

As A. N. Leontiev asserts: “The main, or, as they sometimes say, constitutive, characteristic of activity is its object-based nature. In fact, the very notion of activity implicitly contains the notion of an object of activity. The expression ‘objectless activity’ is devoid of any meaning. Activity may seem objectless, but the scientific investigation of activity necessarily requires defining its object.”³¹ Competency — the realizable ability to perform activities — must have its own object. There is no objectless competency, just as there is no objectless activity. The truth of this provision is justified not only by classical theories of activity but also by the nature of contemporary labor and stable trends in its development.

Competency emerged both as a notion and an instrument of human capital management. On a new technological basis, it launched the historical reclamation of that form of labor that directly aimed to form use-value and finally culminated in creating a product intended for public consumption. This form of labor was the case in the pre-industrial age when the craftsman and peasant labor would result in the final work product. In the time following, capitalism, machine production, and the social division of labor resulted in a worker performing one or more labor functions. Those functions themselves did not lead to creating any useful product. With technology evolving and labor functions becoming more sophisticated and continuously updating in the post-industrial economy, workers’ abilities were intensively developing. To that end, the labor process shifted its focus to its final product. This was no longer manual labor (as in the pre-industrial age) or simple industrial labor (reduced to performing labor functions by individual workers). With labor getting more sophisticated and each worker’s growing involvement in the final

³¹ Ibid. P. 84.

product with use-value, this tendency manifested itself and became the subject of scientific comprehension in the late 1970s. Alvin Toffler explores the nature and implications of this tendency in his book “The Third Wave”³² (1980).

The post-industrial economy is shaping a new way of product manufacturing. Mass flow-line manufacturing is replaced with producing targeted small batches of products for a given customer and manufacturing products at a specific buyer’s request. “Huge changes in the techno-sphere and info-sphere have come together, changing the way of product manufacturing. We are rapidly moving beyond traditional mass production to a complex mix of mass and non-mass products. The ultimate goal of this effort is now clear: only custom manufacturing through a seamless continuous process under ever-increasing direct customer control.”³³ Individual production initiates a “shift of activity away from the production sector to the production-consumption sector... Production-consumption involves direct contact with things and people.”³⁴

Creativity gains in importance, the demand for unskilled labor, which does not require distinct and regularly updated abilities, markedly decreases. “The work is becoming less repetitive, less fragmented, with each worker doing a somewhat larger, rather than smaller tasks. Flextime and self — pacing replace the old need for mass synchronization of behavior. Workers are forced to cope with more frequent changes in their tasks and a blinding succession of personnel, product changes and reorganizations. Thus, Third-Wave employers will increasingly need men and women who accept responsibility, who understand how their work dovetails with that of others, who can handle ever larger tasks, who adapt swiftly to changing circumstances and who are

³² The term “third wave” refers to post-industrial society.

³³ Toffler A. The Third Wave. Moscow, 2002. - P. 308.

³⁴ Ibid. P. 612

sensitively tuned to the people around them... Third-Wave firms need people less programmed, faster to rise.”³⁵ A new creative employee is born, whose creative abilities are applied not only in the world of work but also in his own life, socialization, personal and spiritual development. Material motivation is increasingly giving way to self-expression through activities. Professional activities become the primary vehicle for human self-actualization and self-development. In turn, controlled processes of personal growth and basic (universal) human abilities development act as driving forces in productive economic activity. “The growing differentiation of products and services reflects the growing diversity of actual needs, values and lifestyles in Third Wave society... While our activities are becoming less interchangeable, people’s behavior is also changing... They come to their jobs with a keen awareness of their ethnic, religious, professional, sexual, subcultural and individual differences.”³⁶

The post-industrial economy “involves direct contact” of the manufacturer “with things and people.” It also creates an enabling environment for achieving human abilities to perform productive activities and for objectifying them (abilities) in the objects of labor. Through the social division of labor, the industrial economy differentiates the production process into separate labor functions performed by workers. In the post-industrial economy, the opposite trend is gaining strength: work is becoming more complex and responsible, requiring non-standard behavior and creative thinking. Performing labor functions by a worker, who is neither involved in the overall production process nor takes any personal responsibility for the quality of its final products, is gradually becoming irrelevant. Under the social division of labor, human labor begins to be seen as man’s conscious and personally significant contribution to the common cause of manufacturing the object (goods or services) of labor.

³⁵ Ibid. P. 607.

³⁶ Ibid. P. 377.

The post-industrial economy shows the tendency to strengthen the connection between the worker's labor and the final result of the manufacturing process — the product. The latter is a boon (a good) to people and is included in the system of social relations. In the transition to the digital economy, this tendency is gaining even more strength. The digital economy is driven by the technologies of the Fourth Industrial Revolution:

- New computational quantum technology;
- Blockchain and distributed registry technology;
- The Internet of Things (IoT);
- Artificial intelligence and robots;
- Advanced materials;
- Additive manufacturing and multi-dimensional printing;
- Biotechnology;
- Neurotechnology;
- Virtual and augmented reality;
- Geoengineering;
- Space Technology.³⁷

These technologies shape stable trends of economic growth, liberating a person from performing individual labor functions. Man becomes a competent actor responsible for the entire process of manufacturing the object of labor. We shall consider in detail the technologies mentioned.

Automation and Robotization. The development of robotics and autonomous self-managing production systems capable of performing complex physical and information operations allows for the complete replacement of manual labor. Over a medium-term horizon, autonomous factories with robots performing all technological tasks will emerge. Moreover, working conditions (temperature, production floor, the air chemical composition, etc.) will not be restricted by human capabilities. In closed

³⁷ Schwab, Klaus. The Fourth Industrial Revolution. Moscow, 2018.

manufacturing cycles, machines will be able to create other machines. Man is physically driven out of direct production. Cyber-physical systems are capable of providing in-process control. Humans rise above production processes, have absolute control over them, make strategic decisions and develop those processes.

Creative Economy. Man is being driven out of direct manufacturing processes but not leaving the digital economy. Instead, humans occupy the digital economy's unique sector — creative economic activity or the knowledge economy. It features a high degree of uncertainty and complexity of the challenges to address, an ever-growing need to generate new knowledge, conceptual management, system design, the leading role of technology and discoveries in various fields of activity.

Virtual Reality. The digitization of all spheres of life and activities leads to big data on real-life processes shaping a new — virtual — dimension of the world. Since databases have a common digital format, unlimited volumes of digital information reflecting real multi-quality objects and processes can be transmitted, analyzed, compared and processed automatically at high speed. Virtual reality opens the door for modeling stand-alone processes, entire areas of nature and complex social phenomena and processes. The wide use of computer networks and artificial intelligence systems brings about control systems for complex biological, social and economic activities.

The Internet of Everything (IoE). The Internet is rapidly evolving from computer networks to the Internet of Things (IoT) (a network of physical objects with built-in technologies for interacting with one another and the environment) and further on to the Internet of Everything (IoE). Besides things and human-to-human communications, it includes processes, data and human-to-machine and machine-to-machine communications. It transforms information into actions and creates a third

world.³⁸ Everything that exists on Earth and is mediated by labor and thought is consistently brought together into a single intelligent system. With that, man, society and humanity specialize in strategic value-based responsible management.

Network Culture. Network communication technologies are changing the structure of society, the way people live, their attitude towards work, leisure and consumption. The Internet empowers full-fledged and successful integration into the digital economy, granting this opportunity to free workers — freelancers and entrepreneurs. Their number is growing steadily. A qualitatively new attitude to production and consumption is being formed. In the information society, consumption becomes meaningful and personalized. The consumer participates in production, customizes goods and services to meet their individual needs and suit their tastes. Moreover, the consumer can finance businesses that aim to create new goods and services. Traditional hierarchical management systems give way to new ones: Holacracy (a network of self-organizing teams that develop the general rules of activity and address the common issues by adding up individual capabilities), Agile management (flexible project management, free creativity of project participants), Teal organizations (or “living organizations” based on coaching and self-managing activities, goals and values, and performing their mission in the world), etc. The network society is actively developing horizontal management structures, personalized services and communities that bring together work, creativity, communication, leisure and education in a single space of productive and socially significant self-realization.

³⁸ The first world is a natural one, organic and inorganic, pre-existing, and existing regardless of man. The second world is an artificial one. It is culture (in a broad sense, as the semiosphere) created by humanity’s activities on the Earth. The Internet of Everything (IoE), integrating the first and second worlds, can become the third world, self-organizing through digital technology and artificial intelligence.

A New Attitude toward Work. The traditional attitude toward work as the possibility of making a living makes room for a new perception. Specializing in creative economic activity and conceptual, value-based strategic management contribute to a man considering work as an opportunity for his personal growth, a way of fulfilling his purpose and the reason for his existence in the world.

Thus, already in the transition from a post-industrial to a digital economy, humans are largely driven out of direct manufacturing processes. The qualifications associated with performing individual and simple labor functions are dying out. Everything that can be algorithmized is performed by automation. In a developed digital production system, man can no longer be a functional element performing a labor's function for purely technological reasons. The parameters of digital production (speed of operations, nanoscale processes, the accuracy of each action and many others) leave far behind human physical capabilities. As a labor force, man becomes inefficient. He begins to face completely different challenges. Production processes function autonomously. With that, there is a need to design, manage, evaluate their effectiveness and practicality, take measures in case of deviations from the established parameters. There is also a need to continually enhance those processes and complete other tasks conditioned by smart production systems that function in society, culture and nature. In the digital economy, man's focus shifts to strategic and responsible management. Man controls the processes of creation, distribution and consumption of goods necessary for life, personal growth and society. Man creates objects of labor (products and services), manages complex technological processes and performs creative activities that machines cannot perform.

Free and responsible economic activity is not reduced to performing certain labor functions. The digital society provides considerable room for acquiring abilities objectified in culture.

Digital education significantly speeds up the process of acquiring abilities. In turn, the digital economy calls for exercising various human abilities to perform productive activities.

The digital economy frees labor from the need to repeat monotonous operations, establishes a direct connection between man and the object of labor. The competency-based approach that emerged in the post-industrial economy's depths is a prerequisite for developing the digital economy. The object-centered nature of competency reflects one of the key characteristics of digital economic activity — managing the processes of creating objects of labor for public consumption.

2.4. MEANS OF COMPETENCY-BASED ACTIVITY

Means of activity refer to what a person applies to the object of labor to transform the said object and change its nature in line with the goal to be sought. They are of two types: tangible and intangible. Tangible means include tools and other things that man applies to source materials and working conditions: premises, lighting systems, transport, etc. Intangible means include knowledge, databases, abilities, skills, experience, employees' motivation, information technology, etc. To produce something, three fundamental components must be involved: matter, energy and information. The first two underlie the material means of labor, and the third one lies at the core of non-material means.

The question of means is crucial for building competencies and, in general, for managing abilities in an economy. The means of activity must be available to work with the object. They neither have consumer properties nor relate to the product but are designated for the activity per se. They are the real possibilities of activity and the materialized forms of human subjectivity. The importance of means in organizing activities is so high that the very nature of activity depends upon not what is produced but how it is done. The mode of production determines the quality of both the activity and its product, including social relations. The object of activity is relatively stable and changes only with the rise of new societal needs. On the contrary, the means of activity are continuously evolving. The development of science, technology, art, politics, and other forms of social activity ensure their refinement throughout history. With that, the means of activity determine the state of society and real social capabilities.

The object of activity constitutes a competency, contributing to its certainty, integrity, realism, effectiveness and social significance. The competency content includes those means of activity that are necessary for working with a given object and

have already been developed by public practices. These means are transmitted and assimilated by the subject of education through the learning processes.

In the search for an answer to what types of means fall within the structure of competency, it is the historical way of shaping human abilities which plays a pivotal role. All the abilities, before man acquires them, exist in culture. Some abilities are codified as competencies. This category of abilities is historically the most advanced. Each competency has its own object and aims to create a socially significant product. Competency is a mode of full-fledged productive activity. All other abilities are equally important but less developed; having no object makes their nature rather simple. Competency is the highest and most complex form of both organizing activities and objectifying abilities.

As we said earlier, there are four fundamental forms of objectification: language construct, product of labor, labor’s function and act (action). The correspondence between the forms of objectification of abilities and the types of means of competency-based activities is shown below.

Forms of objectification of abilities	Types of means of competency-based activities
Language construct	Systematic scientific knowledge
Product of labor (manual and intellectual) Labor’s function	Skills
Act (action)	Choosing a method for creating a product (of activity) from several possible options

Performing activity requires, first of all, fluency in languages and knowing their structures. Competency-based activities are complex and need the knowledge to be performed. To that end, working with a specific type of language construct, viz. scientific texts that contain systematic, rational knowledge, assumes paramount importance.

The second type of means of competency-based activities is the skill. It is human readiness to perform the required actions and operations. Skills are codified in professional and educational standards, educational programs, qualification reference books and other documents.

The third type of means of competency-based activity is the act (action) as a form of objectification of abilities. Today's work activity in a mixed reality provides ample opportunities but requires considering plenty of factors and conditions. Its effectiveness is increasingly dependent on the actor of activity. Production processes, continually becoming more sophisticated, give work variability. The goal can be achieved in different ways, and the responsibility for choosing the most effective way falls on the employee.

To characterize the means of competency-based activities, it is worth considering the experience of creating the National Qualifications Framework (NQF) — one of the modern tools for connecting the world of work and the realm of education. In Russia, it was developed in 2010. “Similar to the European Qualifications Framework (EQF), the NQF includes descriptors: breadth of authority and responsibility, the complexity of activities, knowledge-intensive activities, which at core feature basic competencies corresponding to a certain level of qualification.

The indicator “breadth of authority and responsibility” determines the overall competence of the employee. It is associated with the scale of the activity, the cost of a possible mistake, including its social, environmental, economic and other consequences. Also, it suggests assuming leadership in professional activities (goal setting, organizing, performing control, motivating performers).

The indicator “complexity of activities” sets requirements for skills. It depends on some aspects of professional activity: the diversity (variability) of techniques to deal with professional challenges, the need to choose or develop those techniques, the degree of uncertainty and the unpredictability of the unfolding work situation.

The indicator “knowledge-intensive activities” sets requirements for knowledge employed in professional activities. It depends on the volume and complexity of the information used, the innovative nature of the applied knowledge and the degree of abstractness (the ratio of theoretical to practical knowledge).”³⁹

Let us correlate these indicators of professional activities with the forms of objectification of abilities and types of means of competency-based activities.

Forms of objectification of abilities	Types of means of competency-based activities	Indicators of activities (according to the NQF)
Language construct	Systematic scientific knowledge	Knowledge-intensive activities
Product of labor (manual and intellectual) Labor’s function	Skills	Complexity of activities
Act (action)	Choosing a method for creating a product (of activity) from several possible options	Breadth of authority and responsibility

³⁹ Blinov, V. I., Sazonov, B. A., Leibovich, A. N., Batrova, O. F., Voloshina, I. A., Esenina, E. Yu., Sergeev, I. S. National Qualifications Framework of the Russian Federation. Moscow, 2010. – P. 2 – 3.

Let us focus on each of the types of means of competency-based activities one by one.

Systematic scientific knowledge. Using sign systems (languages) and sign sequences (texts) for communication with people and machines is a key driver of activities. Without communication, there can be no activity. Language constructs empower information handling (storage, accumulation, transmission, processing) and enhance thinking. Of all linguistic means, systematic scientific knowledge is of particular instrumental importance for competency-based activities. Only systematic scientific knowledge can translate a real-world problem into a reasonable task whose solution is technologically advanced. Scientific knowledge has predictive power. It describes and explains the problem as the totality of phenomena that occur naturally and have a single unifying origin. This knowledge is verifiable in practice. It is always possible to find a correlation between theoretical provisions and real-world processes and refine the theory if necessary. In general, scientific knowledge underlies cognitive activities, including competency-based ones. Knowledge is easy to transmit (the high-priority task of education), present and objectively assess (the current assessment system for qualifications and competencies). Thus, systematic scientific knowledge can be classified as a means of competency-based language-type activities. Systematic knowledge is correlated with the indicator “knowledge-intensive activities,” which determines the volume, complexity and innovative nature of the knowledge used.

Skills. The actor of activity should be able to translate his knowledge into actions, i.e., have skills. Skills are shaped through education and work activities based on the knowledge gained. They determine the way of performing actions in standard and changing conditions. Skills-actions form an object-centered activity. The activity can be simple, involving one or more skills, or complex, requiring many different skills. The indicator “complexity of activities” characterizes skills.

Knowledge is acquired, and skills are built through the learning process as necessary means of activities. Both (knowledge and skills) are also objects of assessment in current systems for assessing competencies.

Choosing a method for creating a product (of activity) from several possible options. The indicator of professional activity or “responsibility” defines “the need to choose or develop” different “techniques to deal with professional challenges” due to the uncertain conditions of activities and the “unpredictability of the unfolding work situation.” It also includes “the cost of a possible mistake, including its social, environmental, economic, etc. consequences.” Choosing a mode of object-based activity out of many possibilities is, in essence, an act. An act is a conscious action that leads to a definitive result, in which man realizes his free will through conscious goal-setting and choosing means to achieve the goal. The structure of action always includes a motive, goal, object, means — their application, result — its assessment. At the core, the structure of action coincides with that of activity. So far, the notion of act (action) has not been used in the world of work. However, in today’s environment, production activities can be carried out in different ways, using various technologies and diverse scientific and ethical grounds. Of all possibilities available, choosing a mode of object-based activity becomes not only a privilege but also a duty to perform, with the actor responsible for the choice.

Thus, to perform competency-based activities, the actor should apply the three following types of means:

1 *knowledge*,

2 *skills*,

3 *a mode of activity consciously chosen from several possible options.*

Scientific knowledge, skills and modes of activities comprise the main means of competency-based activities. The following table illustrates this.

Types of means of competency-based activities	Central tasks	Application
Scientific knowledge	Shaping an internal (mental) side of activity. Activity modeling.	Thinking
Skills	The applied knowledge, translation of the internal into the external, combination of theory and practice.	Practical activity
Choosing a method for creating a product (of activity)	A choice is an act that reflects the human personality and enhances personal growth. Consciously taken responsibility for the consequences and effects of the activity.	Social relations

2.5. MOTIVE OF COMPETENCY-BASED ACTIVITY

The object proves the fact of competency and defines its overall structure. Means give substance to the process of activity and technologically organize it. Motivation, on the other hand, is entirely responsible for competency release.

The importance of motivation is so high that it underlies the competency-based approach. In 1959, R. W. White's psychological review "Motivation reconsidered: The concept of competence" was published. His research showed that more effective employees differ from less effective ones not in knowledge but a higher level of self-awareness, self-regulation and more developed social skills.

J. Raven prioritizes motivation in his book "Competence in modern society" (1984). "The main task of psychologists, teachers and managers," says its author, "is to focus their efforts on evaluating motivation. Motivation is primarily determined by personal values, social and political beliefs and opinions, as well as a person's ideas about what place he and others occupy in society and its constituent organizations. Further analysis shows that it makes no sense for psychologists to evaluate abilities in isolation from values, perceptions and expectations."⁴⁰

The motivation that inspires actions determines their intensity, direction and stability. It represents the human ability to meet human needs through activity. Motivation takes the shape of a complex set of motives. The subject feels and realizes his need as a special emotional experience of lacking what he wants. At first, it causes negative emotions due to the feeling of the incompleteness of existence. Then, as he obtains the material or ideal objects required to make up for the current state of affairs, positive emotions arise. Needs are sources of activity. They are responsible for the selective perception of the world and human behavior in

⁴⁰ Raven John. Competence in Modern Society: It's identification, development and release. Moscow, 2002 – P. 2, 8.

life. Following the needs, a person's consciousness focuses on those objects that meet his needs. No one will willingly work if the goal of activity has no personal value.

Any activity is motivated. In olden times and today, a man works to earn a living and meet, first of all, his own needs and the needs of his family in food, housing and security. Higher-order needs are built on top of the basic ones. They suggest communication, recognition, cognition, self-actualization and many others. The post-industrial economy markedly changes priorities in the realm of motivation. In developed countries, physiological needs (food, water, drink, housing) and security needs (health, personal security, stability) are guaranteed by the State. Citizens meet their needs with no excessive stress. Human motivation shifts towards higher-order needs: social (belonging, cooperation, social connections, recognition, etc.), cognitive (to know, understand, explore, etc.), aesthetic (order, beauty, harmony, etc.), related to self-actualization (self-expression, setting and achieving goals, developing abilities, etc.). The changing nature of work plays its role as well. The division of intellectual and manual labor is growing away, production processes are becoming more sophisticated, human responsibility for the results and consequences of activities is increasing, and requirements for the quality of human capital are continually growing.

Building higher-order needs is a task as important as building abilities. "It should be emphasized once again," writes J. Raven, "that competence includes more than just abilities. In the past, educators and researchers treated this motivational component with even greater disdain than the ability factor. But it is the motivation that should serve as a reference point in defining and evaluating competence."⁴¹ In precise terms, competency is readiness (ability + motivation) for a given activity. A man may

⁴¹ Raven John. Competence in Modern Society: It's identification, development and release. Moscow, 2002 – P. 100

be capable of doing some work, but he is not willing to do it due to a lack of proper motivation. If he is forced to take on a job that does not meet his current needs shaped by his already accumulated experience of life and work, it is guaranteed that he will not perform it well.

The growing trend of customer-driven individualized production, consumption and objectification of abilities in productive activities is reflected in the notion of “mass uniqueness” defined in the report of the Boston Consulting Group (BCG). “The challenge of mass uniqueness is the need to form a totality of individual ways of personal and professional realization in the ecosystem created by the State, the employer, the education system and the employee.”⁴² In today’s context, more and more people consider work as a way of self-realization. They want to work with full dedication, consciously approach their professional development, choose different career paths throughout life and unlock their personal and professional potential to the fullest. For them, life, work, education and culture make a single space for personal growth. Most people have no intention to avoid work. They want to grow personally, do good and work in an environment that shapes their abilities and meets, besides physiological, higher-order needs. They seek to objectify their abilities in the products of their work and receive recognition.

As to the motivation of competency-based behavior, the same principle that determines abilities at large applies; it is the principle of acquisition: man acquires motivation. Physiological and security needs arise when the body comes into conflict with the environment. It may result in hunger, thirst, fear and bring other

⁴² Mass uniqueness. A global challenge in the fight for talent. https://docviewer.yandex.ru/view/16709361/?page=1&*=BMMaH81icbQ2MmmfePt27A6%2B-6kt7InVybcI6lnhLW1haWw6Ly8xNzAwMTA4ODU5MzMzMzMyNTI4MDAvMS4yIiwidGl0bGUiOiSVVMgQkNHIE1hcyBVbmIrdW0gQXVndXN0IDE3LnBkZiIsIm-5vaWZyYW11IjpmYWxzZSwidWkljoiMTY3MDkzNjEiLCJ0cyI6MTU2OTQ4M-DA3NjQ1OCwieXUiOiI5NTM4Mzc4NTMxNTU0MTlyODkzIn0%3D

negative emotions. In turn, it generates hyperactivity in animals and humans. Competency-based behavior is not characteristic of animals. Moreover, even with humans, it requires a high cultural level and considerable economic, social and cultural experience. Only the highest organizational levels of work activities can initiate such behavior. In this case, man is driven by the need for self-discovery, creativity and development. This is only possible if the motivation for competency-based activity is centered on and appreciates the activity per se.

Attitude is instrumental in building motivation for human behavior. V. N. Myasishchev defines attitude as a conscious, selective, experience-based psychological connection of the subject with various aspects of objective reality expressed in his actions, reactions and experiences.⁴³ Attitudes play a pivotal role in personal growth. Acquiring stability and significance, they make for the character of human subjectivity. Motivation is built through shaping attitudes.

In the first place, the competency-based approach focuses on the value-motivational sphere of human personality. D. McClelland, R. Boyatzis, J. Raven, L. Spencer, S. Spencer et al. define competency as a motivated ability and emphasize the value component. John Raven views “inner motivation characteristics associated with personal values” and “perceptions and expectations related to social functioning and man’s role in society” as the critical components of competence.⁴⁴ L. Spencer-Jr. and S. Spencer deem “I-concept, tenets, values or the self-image” as the most important components of competence.⁴⁵

If a man accepts and follows behavior patterns, it usually means that he works for a living, exchanging his labor force for money. His motivation lies outside the labor process. Suppose

⁴³ Myasishchev, V. N. *The Psychology of Attitudes*. Moscow, 1995. – P. 16.

⁴⁴ John Raven *Competence in Modern Society: It’s identification, development and release*. Moscow, 2002. - P. 9.

⁴⁵ Spencer, L, Spencer, S. *Competence at Work*. Moscow, 2005. – P. 3

one can choose a mode of the activity or participate in making such a choice. In that case, labor itself becomes an act, i.e., a conscious action performed on the ground of moral self-determination. Committing an act, man asserts his personal identity. The created product (material/tangible or informational) objectifies human abilities and becomes valuable for others. Given this, the worker's personality gains in social importance.

Labor and its products are the most powerful regulators of social relations. To enter into relationships with other people, a person must create something with a value embodied in a material form: making a speech, committing an act, creating a product, etc. People are treated not as human beings but as objective forms of their activities: thought, speech, work, household, social and others. In turn, other people's attitudes determine the nature of one's attitude towards oneself. By creating products of labor, a person builds the entire system of attitudes towards other people, society and himself.

When one can choose a mode of activity out of several possibilities, labor acquires the essential features of the act. In that case, work activity becomes the main form of individual self-realization. It requires conscious and free self-determination and imposes on the man full responsibility for the quality, consequences, effects and results of labor. As an act, labor shapes man's sustainable and responsible attitude towards the object of labor and, through it, towards others and himself. Moreover, it serves as a powerful motivator for free activity through which a person creates his personality.

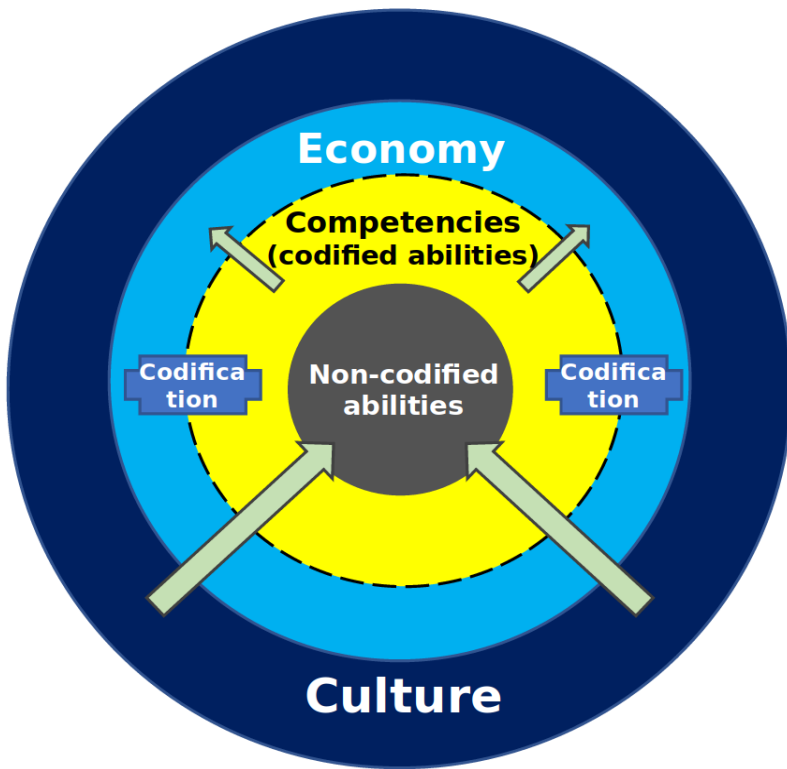
CHAPTER 3. SYSTEM OF COMPETENCIES

3.1. BASIC AND PROFESSIONAL COMPETENCIES

Abilities are objectified in culture and acquired by man throughout a lifetime. They are diverse, and the levels of their historical evolution vary significantly. Those that are of great economic importance are defined as competencies. Their structure is codified, their implementation is stimulated, and they are purposefully developed in education and labor processes.

Not all abilities become competencies under given socio-economic conditions. In regards to the real economy, the abilities preserved in a culture that man acquires are redundant. Culture and man are endowed with far more abilities than necessary to exercise modern forms of economic activity. This phenomenon — excess abilities preserved in culture, acquired and shaped by people compared with those most sought after in production processes and defined as competencies — is a prerequisite for effective and sustainable labor development. Suppose there is a window for quick and high-quality change in technological processes. In that case, there will always be people capable of implementing these opportunities due to their qualities, which, perhaps, even yesterday were not in demand. Culture provides for diversity and the continuous enhancement of human abilities and, thus, social advancement, technological progress and economic growth.

Access abilities allow for dividing them into codified and non-codified ones. Codified abilities are known as competencies and are in demand for economic activities. Possessing competencies must be proven in practice, confirmed by the assessment of qualifications and adequately documented. Non-codified abilities are of no interest to employers for the time being. For a rapidly developing economy, codified abilities are relevant, non-codified ones are potential. Their balance in the context of economy and culture can be shown as the following model.

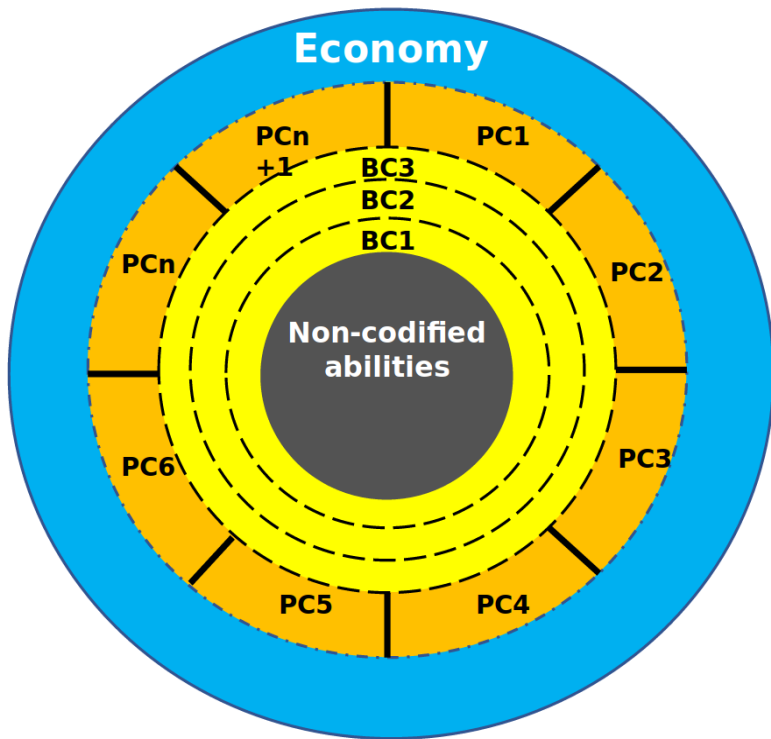


The model of cultural conditionality and economic differentiation of human abilities

All abilities are culturally conditioned and inherently available to be acquired in socialization processes, which run freely in life and are difficult to regulate. In the post-industrial economy, the attitude towards abilities has fundamentally changed: some are codified as competencies. A system of social

and economic management of abilities (competencies), including education, is beginning to take shape. Yet, most of the abilities remain free from codification and social management. Human subjectivity, which includes all human abilities, acquires a two-layer structure. The outer layer of subjectivity is codified, deliberately developed and evaluated. The inner one remains free from codification, with the possible negative manifestations of its constituent abilities being held back by the State, morality and religion.

The two-level approach becomes the principle of organizing not only subjectivity as a whole but also that part of it, which consists of codified abilities. Indeed, competencies are divided into two groups: professional (often referred to as hard skills) and basic (universal, general, etc.; often referred to as soft skills). The epithet “hard” for professional competencies is justified because they are necessary for working with real-world objects under specific conditions. Such abilities, defined as professional competencies, must be reliable and of special-purpose (task-orientated). Only in this case can they be directly integrated into technological processes. To symbolically represent another group of competencies, the epithet “soft” works well. It suggests pliable (embeddable in different professional competencies and taking their forms), fluid (flowing from one type of professional activity to another), smooth (ensuring the smooth-shifting between “hard” — or professional — competencies). Basic competencies are immediately adjacent to that inner or core part of subjectivity in which non-codified abilities reside. These “soft” competencies form a kind of connective tissue between professional competencies and the uncontrolled core of human subjectivity. Let us picture a model of differentiation and integration of basic (BC) and professional (PC) competencies.



The model of differentiation and integration of basic and professional competencies

A single competency, as the whole system, has a two-tier structure determined by its nature. Like any human ability, competency has two sides. An external side is linked to and exercised in the real-world practical activity. Like any human ability, competency has two sides. An external side is linked to and exercised in the real-world practical activity. An internal side is rooted in human subjectivity and offers the possibility of achieving a given ability. N. Chomsky was the first one to have drawn attention to this. This fact underlies the theory of competencies.

The scientific notion of “competency” “was revealed in his work “Aspects of the Theory of Syntax” (1965). “It has already become quite clear,” says N. Chomsky, “that if we are ever to understand how language is used or acquired, then we must abstract for separate and independent study a cognitive system, a system of knowledge and beliefs that develops in early childhood and that interacts with many other factors to determine the kinds of behavior that we observe; to introduce a technical term, we must isolate and study the system of linguistic competence that underlies behavior but that is not realized in any direct or simple way in behavior.”⁴⁶ To highlight the subject of scientific research, N. Chomsky reveals the meaning of linguistic competence through its semantic opposition to another notion — linguistic performance. “We thus make a fundamental distinction between *competence* (the speaker-hearer’s knowledge of his language) and *performance* (the actual use of language in concrete situations). Only under the idealization set forth . . . is performance a direct reflection of competence. In actual fact, it obviously could not directly reflect competence.”⁴⁷ In its original scientific meaning, competence (linguistic competence) refers to a specific fundamental object residing in “mental reality and underlying everyday behavior.” This object comprises a system of intellectual abilities, knowledge and beliefs, getting shaped up “in interaction with many other factors.” It is observed when it manifests itself in the forms of actual behavior, even though it is not realized “in any direct or simple way in behavior.” Competency — the perceived ability to perform a specific type of activity — dwells in the realm of human consciousness and is not fully reflected in the empirically observed processes and products of this activity. The pivotal question that was of interest to N. Chomsky and later laid the foundation for the competency-based

⁴⁶ Chomsky, N. Language and Thinking. Moscow, 1972. P. 15

⁴⁷ Chomsky, N. Favorites. M. 2016. — P. 67.

problematics was how the language ability (the ability to perform the activity), which is freely exercised in infinitely diverse forms and processes of speech (labor and productive behavior in general), originates.

The activity has a binary structure⁴⁸: *competence* and *performance*. The system of competencies, which is a manageable part of subjectivity, has the same structure. Some of the competencies fall within the scope of “*competence*,” while others — within the scope of “*performance*.” The former ones are called basic competencies. The former ones are called basic competencies. They are responsible for the human capabilities necessary for performing productive activities. The latter ones are professional competencies. They manifest themselves through applying certain abilities for problem-solving. *Performance* is about mastering, applying, acting. It refers to making concrete and correct decisions based on experience and practice. In contrast, competence refers to the ability, per se, expressed in a human willingness to tackle any problem within a given range of phenomena. Competence is the primary causal realm. The real empirically observable forms of behavior originate from it. *Competence* makes up the foundation for performance.

Professional competencies are based on basic competencies. The latter ones determine the effectiveness of the former ones in the world of work. Basic competencies form an internal, personal side of practical activity that markedly influences the forms and processes of productive activities. “We attach — John Raven emphasizes — special importance to the individual: his values, types of competence, ways of thinking and general forms

⁴⁸ A. N. Leontiev describes this fact in terms of psychology and gives it primary importance: “The external and the internal side of activity share the same overall structure. The discovery of the commonality in their structures seems to be one of the most important findings of modern psychological science” (Leontiev A. N. Activity. Consciousness. Personality. M., 1977. — P. 101).

of behavior... We argue that common ways of thinking, typical manifestations of feelings and sustainable behavior have a significant impact on any situation.”⁴⁹

Professional competencies say almost nothing about the human capability of pursuing production objectives in an environment where the tasks are constantly changing. The system of basic competencies describes the totality of abilities to perform practical activities. Of course, due to the extreme complexity of human subjectivity, only its outer layers defined as basic competencies can be codified. But even this is enough to manage (self-manage) the development of subjectivity. Basic competencies allow the individual and society to manage labor activity to a certain extent, partially understand and regulate the processes occurring in it, thus enhancing labor efficiency and self-development.

Basic competencies provide a stable basis for applying professional competencies in a rapidly changing socioeconomic environment. They become socially sought-after when a person is forced to deal with complex challenges and master new skills, requiring various professional competencies, through work processes. In the modern world, the volume of information doubles every three years, more than half of the list of professions is updated every seven years. On average, man changes the type of professional activity 3-5 times in a lifetime.⁵⁰ In the future, the speed of these processes will only accelerate. In working life, some professional competencies are periodically changed to others. At the same time, basic competencies, relative to professional ones, remain stable. They are shaped in childhood, preserved and built up in the following periods of life. In their unity, basic

⁴⁹ Raven John. Competence in Modern Society: It's identification, development and release. M. 2002. – P. 24

⁵⁰ Europe needs better jobs for better-matched skills – Cedefop survey | Cedefop <http://www.cedefop.europa.eu/en/news-and-press/news/europe-needs-better-jobs-better-matched-skills-cedefop-survey>

competencies provide a stable basis for human behavior. They build the very ability to master new professional competencies promptly, effectively managing one's own behavior.

The uniform rules for codification, building and assessment are equally applicable to basic and professional competencies. The very nature of competencies underlies the first rule. That is, competencies are forms of organizing activities. Activities cannot be objectless; therefore, all types of competencies must have their own objects.

The *topological* principle helps bring out the object of basic competency. As is known, topology is a branch of mathematics that explores the properties of space that remain unchanged for all its changes. Topology studies the phenomenon of continuity, i.e., the properties of a geometric object or space that are preserved under continuous deformations. The object of basic competency has a topological character and retains its certainty despite any qualitative changes.

The topological method is applied to define the object of basic competency, and the generalization method — the object of professional competency. Consider, for example, one of the teacher's competencies: "The ability to design educational programs (PC-8)".⁵¹ The object of this professional ability — the educational program — is designed by generalizing from the various programs implementable in the educational organization. The logical operation of generalization assumes that by eliminating the type features (programs in mathematics, history, other subjects, extracurricular activities, etc.), the concept of a broader scope and less specific content is found — the educational program as such. The objects of all professional competencies are of a generalized nature. With that, their qualitative

⁵¹ FSES HE (Federal State Educational Standard of Higher Education) for training 44.03.01 Pedagogical Education (bachelor's programs). <http://fgosvo.ru/440301>

features are invariable. In the term of “educational program,” the word “educational” is not replaceable with the word “computer” because it would be a completely different professional competency.

The method of determining topological properties is, in a sense, an extension of the method of generalization. Topologization is a logical operation of ultimate generalization. It facilitates finding a notion that preserves its certainty under qualitative changes in its generalized forms. For example, the object of basic competency — readiness for theoretical thinking — is a theoretical model. The ability to model real and possible processes is one of the basic (universal) human abilities required to perform today’s socioeconomic activities. It applies to various objects of professional activities: an educational program — a model of the educational process, a computer program — a digital device model, a business project — a business cycle model, and many others. The object of basic competency — the theoretical model — retains its special significance and value for the economy, no matter what qualitatively different forms it may take in the real activity.

The competency of “readiness for theoretical thinking” characterizes the ability to create theoretical models of real and possible processes and objects and apply them to tackle research, project, production and other tasks. Theoretical models may differ qualitatively: mathematical, physical, pedagogical, economic, computer and others. But suppose a person has built the theoretical thinking competency. In that case, he can simulate various objects and processes in the economy, science, education, art and other fields in different ways. The theoretical model (ideal object) is topological.

The competency of “readiness for theoretical thinking” plays a pivotal role in modern socioeconomic processes. It allows for modeling holistic objects and processes in the unity of internal and external relationships, identifying their inherent patterns

through mental experiments and managing their development. This competency is necessary for managing complex economic systems integrated with social and natural structures that undergo rapid and profound changes. This ability is universal, applicable in any field of activity.

Topological objects of basic competencies provide a purposefully built and definable ground for performing specific types of professional activities. A single essential basis of professional competencies shapes an opportunity for transmitting knowledge, skills and experience from one area of professional activity to another and maintain a high level of employee competence for conceptually new problem-solving. With a working knowledge of universally valid methods and modes of productive activities and the ability to practically apply them while exercising professional competencies, the well-built basic competencies exclude the situation when the actor of activity runs into an issue for which he cannot come up with the solution.

Generalizing the features of basic and professional competencies, we will formulate their definitions.

Professional competency is a culturally conditioned, codified, object-centered, definable, motivated human ability to acquire, transform and apply knowledge and skills and perform labor functions in specific fields of professional activities.

Basic competency is a culturally conditioned, codified, object-centered, definable, motivated human ability to acquire, transform and apply knowledge and skills of methodological nature (the knowledge about a particular topological object and the ability to work with it) to deal with the professional and personal challenges.

3.2. METHODS FOR DEFINING THE SYSTEM OF BASIC COMPETENCIES

Basic competencies reflect the inner layer of human subjectivity. This layer can be formalized under the given conditions of the historical development of thinking, social relations and technologies. It is manifested and implemented through human activities. Subjectivity is holistic and inseparable from the individual. Likewise, basic competencies will be efficient only in a given system that ensures personal self-realization through activities. Stand-alone basic competencies are defined on the ground of object-oriented and topological principles. For identifying a whole array of required competencies and connections between them, additional methods are needed. The sequence of such methods constitutes an algorithm for building a system of basic competencies.

The first well-known and widely used method suggests *monitoring the demand for competencies*. It suggests an extensive sociological survey of specialists and representatives of various organizations to determine what they consider to be the key competencies, both basic and professional. This approach is based on the analysis of professional requirements and helps prioritize competencies for a specific area of professional activity. The TUNING project, implemented in 2001 in the European Union as part of an educational project under the same title, can be an excellent example of the approach mentioned. A questionnaire survey of more than nine hundred employers, more than five thousand graduates, and about one thousand professors from one hundred universities was conducted. As a result, basic and professional competencies were identified and systematized.

Monitoring the demand for competencies provides a relatively complete picture of different social groups agreeing on a choice of competencies required. All the survey participants

search for and find the answer to what competencies employers need today. The strength of this method — direct knowledge of economic reality — is also its disadvantage in a rapidly changing socioeconomic environment. Such awareness often becomes obsolete before it comes into play. Competencies must be included in the education system and incorporated into educational standards. Once they are approved, time is needed to develop educational content and assessment tools. It takes several years to build the competencies of future professionals. When those professional employees come to their workplaces, they will be expected to have different competencies. Monitoring the demand for competencies provides a clear view of mainly today's reality. Besides, sociological surveys are not entirely reliable when referring to the deep structures of personality responsible for human subjectivity and incorporated into basic competencies.

Monitoring the demand for competencies should go along with *expert analysis of the further socioeconomic and innovative development (foresight method)*. This method helps build forecasts of significant economic growth processes and technological development, using them for defining competencies in the mid-and long-term horizons. Competencies are economic categories. They reflect those forms of subjectivity that play a pivotal role in the production and are the measurement unit of human capital. The foresight method is about studying the state of the economy and economic development prospects. At the present stage, the historical transition from the post-industrial to the digital economy is critical. A systematic scientific analysis of current and prospective socioeconomic processes is required to define basic competencies that ensure both this transition and the effectiveness of the emerging digital economy. What is the digital economy? How does it differ from the post-industrial economy? How does the nature of work, social relations and communications change in a digital society? What is the nature of digital reality? These and many

other questions are still open. Answering these questions should provide an understanding of what human labor will be like in the digital economy. This piece of information can become one of the grounds for building up a system of basic and professional competencies.

Basic competencies are shaped in broad sociocultural contexts throughout a lifetime. Man acquires basic abilities to perform activities. These abilities are objectified in culture and built up by activities of previous generations. Intellectual, behavioral, communicative and language abilities take shape over the centuries. They are enhanced through the activities of individuals and embodied in culture. They are transmitted and acquired not as quickly as professional competencies. Universal human abilities, some of them are codified as basic competencies, take their form through social activities under the influence of a given cultural and historical environment. Each epoch fashions world-views, value systems and determines the nature of motivation, forms, methods and content of human thinking and behavior alongside communication technologies, labor, information handling and many other factors that markedly influence and build human subjectivity in a lot of ways. They should be taken into account when developing a system of basic competencies. For doing so, another method is to be applied — *the analysis of the modern cultural epoch*.

History is divided into different successive and co-existing cultural and historical epochs. Each of them provides different opportunities for organizing activities along with acquiring and implementing abilities. The cultural epoch is a relatively stable historical formation. Cultural influence on human abilities (how one thinks, acts, lives, works, perceives oneself, etc.) is decisive. Scientific analysis of the modern era can provide the necessary knowledge about the system of basic competencies that are crucial today and do not lose their relevance in the historical perspective.

The fourth method is the method of *functional analysis of activities*. It has two levels of application: general and object-oriented. At the first level, one can analyze the overall structures of activity, define its components and establish the links between them. One can continue with other actions enabling theoretical modeling of a given activity through employing data from various science fields. Scientific knowledge about the activity per se not only leads us to a rational understanding of the structure of competency but also enables us to model their system, meaningfully revealing the connections between basic competencies.

The second object-oriented level of the functional analysis of activities sees heavy use in defining professional competencies. It implies disintegrating a given production process into distinct labor functions. For each, the professional standards set out the labor actions, as well as the knowledge and skills that ensure their implementation, whereas the educational standards for vocational and higher education define the corresponding professional competencies. Employing this method at its object-oriented level to directly define basic competencies has critical limitations. They arise from the fact that the analysis of concrete work processes does not reveal basic competencies but only their distinct manifestations in a given work situation. In a particular working context, the topological nature of the object is not defined. Therefore, basic competencies are revealed only through their distinct features. Nevertheless, the functional analysis of activities implemented at its object-oriented level is also necessary for defining basic competencies. As soon as the list of competencies is developed through the three methods mentioned above alongside the general understanding of activity structure, the need to facilitate its initial testing arises. Basic competencies underlie professional competencies. Therefore, it is critical to measure their efficiency in real work processes with the professional competencies being exercised. The functional analysis applied to the object-based

activity directly links basic and professional competencies under real-life working conditions, enabling to specify and update the fixed list of basic competencies.

Four methods — monitoring, economic analysis, culturological analysis and functional analysis of activities backed up by the object-oriented and topological principles — complement each other and open up a possibility of defining the system of basic competencies. None of them in itself makes for developing an effective and relatively complete system of competencies. Together, they exclude the limitations inherent to each method. Their combined application enhances the functionality of each of them.

3.3. EPISTEME OF MODERN CULTURE

Of the four methods for defining basic competencies, the culturalological method has not yet been used. Therefore, the existing lists and models of basic competencies are ill-found because they are not backed up by the profound connection between economy and culture. This connection largely determines the possibilities and ways of economic growth. Basic competencies or basic (universal) human abilities do not exist in isolation from each other; together, they reconstruct the codified structure of human subjectivity. Within this structure, any given ability is born, determined and functions. While being reconstructed through the system of basic competencies, the structure of subjectivity takes form throughout history and depends on objective conditions and forms of labor, life, thought, social relations and, more generally, cultural content.

Subjectivity or the ability to perform activities takes shape through the historical transition from one cultural epoch to another, following the qualitative changes in production technologies. It is evident that human subjectivity in the middle Ages, with dominating religious worldviews and feudal relations when production was carried out in simple forms of handicraft and agricultural labor, is qualitatively different from the type of subjectivity shaped by industrial society. Machine production, the social division of labor, wage labor, vocational education and the dominance of the scientific worldviews radically changed the nature of the activity, reshaping its mental and physical sides. The emerged labor's function enables to alienate the ability to work from the actual work process. Abilities to work have come to be viewed as independent (self-valuable) and universal (applicable to different technological processes) entities. Vocational education and training purposefully build and assess abilities. Possessing abilities gives a man a social status represented

by professional qualification. Both industrial and post-industrial types of production alongside the entire economic management system can be at play only in the cultures of modern and contemporary history. These cultures rest on scientific rationalism, objective truth, human personality and rights, ongoing technological development, etc.

The culturological method of defining basic competencies primarily aims to develop their system. This system cannot be improvised. The contents of culture, labor and social relations in the industrial and post-industrial ages establish the links between competencies, group them out, decide for the logic of transitions from group to group, from one competency to another, define the specific composition of competencies that reveals a general nature of the activity. To reveal this idea in the general possible manner, we will need a fundamental culturological notion to take a long view of industrial and post-industrial societies' history and identify the underlying conceptual structures.

The notion of competency is born in linguistics under the powerful influence of structuralism, an interdisciplinary direction in the social sciences of the 20th century. Structuralism looks into the logic of origin, functioning and development of complex objects of human culture, such as language, thought, myth, soul, etc. One of the most prominent representatives of structuralism in philosophy, Michel Foucault describes in his work "The Order of Things: An Archaeology of the Human Sciences" (1966) the principled systems that, being formed consistently throughout history, determine the forms of thinking, behavior, social relations, theories and sciences in each period of European history. Foucault terms them "epistemes" or "historical a priori." He further contrasts them with traditional historical knowledge, which systematically reflects past events, not looking into the conditions that made them happen. Episteme is a historically conditioned, hidden, deep-seated structure of a given cultural epoch

that shapes the forms of “over and above individual” behavior, hierarchies of practices, fundamental language codes, models of perception, modes of knowledge production.

In Modern European culture, Foucault identifies three epistemes: Renaissance — 16th century, classical — 17-18th centuries, and modern — from the early 19th century throughout to the present. They differ in the character of relations between “words” and “things.” In the Renaissance episteme, words and things are identical and in immediate correlation with each other. They constitute a sort of single text that can be studied as a continuation of nature. Scientific rationalism underlies classical episteme. The former deprives words and things of close similarity⁵² and connects them through thinking in the realm of perceptions.⁵³ Rational thinking, using identities and differences within specialized scientific languages, seeks to create universal orders. Each science creates its own picture of the world, its own system of knowledge, which connects things and words in the forms of scientific concepts and theories in a unique way. The decline of the classical episteme is associated with the emergence of new cognitive objects — life, work, language. Their laws are irreducible to the laws of logical thinking. These newly emerged objects serve as “transcendental factors” or an environment for synthesizing various scientific concepts for perceiving nature, man, and consciousness. The contemporary episteme creates a conceptual realm where transcendental objects — life, work, language — underlie the possibilities for developing knowledge and activities.

The episteme of modern culture is structured by the categories of life, work and language. It helps comprehend the notion of competency as a form of thinking, behavior and ability management. And the reason is that a special human attitude

⁵² “Question everything” (Descartes)

⁵³ “I think, therefore I am (exist)” (Descartes). Let us add to this: I think, therefore, I give a chance of existence.

toward work, language and life, which was not typical of previous historical epochs, comes to the fore in the contemporary episteme. “Seeking to define himself as a living being, a man discovers his own beginning only in the depth of life that had begun before him; seeking to understand himself as a laboring being, he identifies the rudimentary form of labor only within such human time and space that are already subordinated to society and its institutions; finally, seeking for self-obtainment as a speaking subject beyond any already established language, he is always confronted with the possibilities of a language already unfolded... In the beginning, it is above all the way any man — every human being — can connect himself with labor, life and language that have already begun.”⁵⁴

The realms of work, language and life have always existed before and regardless of a particular person. And he always faces the need to “enter” those realms. It is always done through socialization. But why does Foucault consider this a global problem of today? As a matter of fact, the existence of modern man is unstable. In previous epochs, man used to enter the realms of work, language and life (social and cultural), taking a definite place in it. The situation rarely changed within a human lifetime. In the industrial and post-industrial eras, it has undergone dramatic changes. Man is periodically “thrown out” of these realms, facing the need to return to them on new terms. Moreover, changing places in the realms of work, language and socio-cultural life becomes the norm of modern life. Man is acquiring a taste for changing career, languages, forms of thinking, shifts in the cultural environment, personal and social life. The concepts of human existence as personality, subjectivity, self-actualization, self-development and “nonadaptive activity” (V. A. Petrovsky) can exist only in the contemporary episteme. Alongside

⁵⁴ Foucault M. *The Order of Things: An Archaeology of the Human Sciences*, Moscow, 1994. P. 351

this, man can find the meaning of being in continuous development through professional activities, languages, communications and social practices. At the same time, there is a risk that constant changes can destroy human life. To prevent this from happening, modern culture is shaping an economic approach to the management of abilities. Competencies are instrumental in stabilizing fundamental instability, being the means of adjusting to social and personal changes.

Permanent scientific and technological progress, ongoing and accelerating innovative development of the economy force a person to move from one place of work to another, raise his qualification or acquire a new one. Every significant change in the nature of work “pushes” man out of his comfort zone, requires new knowledge, skills and abilities. If a person can quickly master the missing competencies, then integration into a new job will not be a problem and ensure further successful professional growth. The competency management system, which comprises their building, enhancing, applying and assessing, makes job insecurities constructive. It creates an environment for continuous and efficient work with the object of labor, which undergoes ongoing qualitative changes.

Man finds the language he needs alongside the mode of thinking (forms of social consciousness) and the culture derived from this language. Man’s task is to integrate into the realm of language through socialization and master language features. The modern realm of language is different from that of previous eras. Globalization, a multicultural world and an information civilization have led to the fact that man lives in dense layers of different languages constantly evolving. He frequently experiences the need to master new languages (natural and artificial) in a dynamic multilingual space. The human mind views language as an object. With that, the language per se becomes instrumental in solving critical issues of work and life. It becomes a means of

activities. “Ultimately, language does not imply what one sees, but rather what one does or experiences... Language is “rooted” not on the side of perceived things but the side of the acting subject. The very origin of language, perhaps, should be sought in will and power... They speak because they act... As an action, language expresses the full depth of will... Language neither an instrument nor a product but a continuous activity — not “*ergon*” but “*energeia*,” as Humboldt said.”⁵⁵ Language as an activity triggers thinking and all its products. Thinking is not only expressed but also exercised in the language (L. S. Vygotsky). One of the critical features of the post-industrial and digital economy is that thinking, being objectified in sign systems and both processes and products of language activity, becomes a real productive force and is in demand in practice. This understanding of thinking comes to the fore only through the attitude toward language as an originaive activity or “*energeia*.” It implies the fundamental human ability to operate sign systems (languages) of different types and sign sequences (tests), helping create new information objects (any sequences of symbolic and/or material elements that have meaning). In fact, the notion of “competency” reflects this “energetic” capacity of language-thinking. Competency formulates this capacity as the universal human ability to acquire, transform and apply knowledge and skills for problem-solving and creating objects of a particular type.

In the contemporary episteme, in an environment where language and thought turn into activities, the attitude toward life also changes. “In the thinking of the 19th century,” says M. Foucault, “for the first time in Western culture, life becomes free from the Universal Laws of Existence... Life becomes the driving force that, going beyond all real-world and possible things, on the one hand, helps identify them and, on the other hand, relentlessly

⁵⁵ Foucault M. *The Order of Things: An Archaeology of the Human Sciences*, Moscow, 1994. Pp. 314, 315.

destroys them with the violence of death.”⁵⁶ Human life has never been limited by its biological time. But in today’s environment, this existential process of transcending corporeality is already taking on an entirely new scale and, most importantly, is being technologized and economically supported. Life reveals itself in many dimensions — natural, social, cultural, intellectual, spiritual, past, present, future, personal, non-personal, etc. It becomes an object of care, labor, responsibility, perception and improvement. The man begins to treat life (his own, other people’s, society’s, nature’s) as a project to explore, understand, preserve and improve its forms. The economic system of ability management supports this desire to live like a human being and give life to everything surrounding humans.

The economy based on human resources is concerned with the individual’s development. Man can work productively and responsibly provided that he is free to give full play to all his vital forces. High-quality work and the management of complex technological systems no longer require separate skills but a coherent system of basic and professional competencies in which human subjectivity is manifested and realized. In life, the system of competencies economically ensures that human abilities that form the structure of human personality and shape the space of human non-biological life are continuously acquired, enhanced, implemented and objectified (others can acquire them). A competent person is also competent in life. Health consciousness is one of the priorities of the competent person’s activities. Environmental issues more and more often prevail in organizing his work. Labor per se serves him as a condition of life and a quintessential means of improving the quality of his life. The priorities of modern man lie in the realm of life. With the greatest effort of all human forces, he avoids an “improper existence” (M. Heidegger) and strives for his own life as the best possible.

⁵⁶ Foucault M. *The Order of Things: An Archaeology of the Human Sciences*, Moscow, 1994. P. 303.

Life, work and language are transcendental objects that form the underlying structure of human thinking and behavior in the industrial and post-industrial era, defined as the episteme. The system of transcendental objects-notions reflects the nature of modern man's subjectivity and his ability to perceive, think and act as well as to acquire, enhance, implement and manage his abilities in the form of competencies. This system can also be used as the basis for the target system of basic competencies.

It should be noted that specifically life, work and language as the pivotal notions on which modern education can be based were used in the Report "Learning: the Treasure Within" to UNESCO of the International Commission on Education for the Twenty-first Century chaired by Jacques Delors (1997). It emphasizes "the crucial role of education in the development of the individual throughout human life" and defines four fundamental principles of education: to learn to know, to learn to do, to learn to live together, to learn to live.⁵⁷ According to the authoritative Commission, modern competency-based education should be based on three imperatives: to perceive/know (thinking), to do (labor/work), and to live (life).

⁵⁷ Learning: the Treasure Within: Report to UNESCO of the International Commission on Education for the Twenty-first Century. UNESCO Pub., 1997 – pp. 13, 22, 23.

3.4. LIST OF BASIC COMPETENCIES

The list of basic competencies — the system of codified basic (universal) human abilities required in today's economic activity, taking into account its development prospects — is a crucial element in human capital management and coordination between the world of education and the world of work. The list includes a whole array of basic competencies structured in line with the episteme of modern culture. Drawing up the list is the work of large expert communities aiming to harmonize different social actors' interests and capabilities. This work is easy to organize if there is a simple, clear, scientifically sound methodology for defining basic competencies and building the system of competencies.

In science, the method is more important than the result. The availability of a research method — a mode of intellectual work — guarantees the objectivity and general validity of scientific provisions. It allows other researchers to follow the specified path, achieve the set result and ensure that the knowledge gained is accurate from their own experience. The method is not only needed for drawing up the list of basic competencies. It is also a prerequisite for the steady operation of the entire ability management system. In an innovative economy, the list of basic competencies should be periodically updated and its structure revised as cultural codes change. If we have an available methodology for drawing up the list of competencies, it should not be a problem. By introducing new competencies and modifying existing ones according to well-known rules, we can ensure the continuity, consistency, logical redefinition and effectiveness of their composition in the new socioeconomic conditions.

The starting point for defining a system of basic competencies is a diversity of various perspectives, formulations, lists and models of competencies. They all create a sort of “chaos of competencies” realm. Representatives of business, education, science and various groups of experts have their own ideas of

competencies. They all formulate their ideas and define the number of competencies in the way that they consider correct. In such conditions, the lists and models of competencies do not agree with each other. There is neither continuity in their development nor a clear distinction between competency, ability, skill, personal qualities. There is no rational understanding of the structure of competencies and the differences between basic and professional competencies. For harmonizing the worlds of work and education, the “chaos of competencies” that we observe today must be transformed into an orderly “cosmos of competencies” in which the fundamental and well-known laws of activities apply. The list of basic competencies serves as a basis for the “cosmos of competencies” and sets the ground rules for determining the structure of competencies (basic and professional). This list is further translated into educational standards and educational programs.⁵⁸

To organize the “chaos of competencies” realm, one should apply the first method for drawing up the list of basic competencies — monitoring the demand for competencies. This method may include various procedures and technologies to obtain and analyze information for defining the key-value competencies in a given socioeconomic environment. Conducting sociological surveys is possible. Or building a permanent system for collecting and analyzing information. For example, the Agency for Strategic Initiatives (ASI), as part of the Digital Economy

⁵⁸ “Chaos of competencies” also has a positive meaning. It must be overcome and put in order, but it will always persist as an area of uncertain meanings and new possibilities. The reason for the chaos of competencies dwells in the rapid development of the economy and society at large. The surge of technology creates new human abilities and an environment for implementing them in productive activities. Any newly emerging socially and economically demanded competency first springs up in a free form in the “chaos of competencies” realm. Only then is such competency codified by the strict rules and included in the system of the economy’s ability management.

of the Russian Federation program, proposes developing and implementing a Basic Competency Model (BCM) for the digital economy, which is seen as a system for identifying, storing and systematizing information on the competencies that are in demand in the emerging digital economy. BCM is a “model for foreseeing competencies, skills, and knowledge based on the data obtained from labor markets, training systems and the frameworks that people use today.”⁵⁹

To compile a sample list, we used the results of the monitoring. We collected, analyzed and systematized already available lists and models of basic (universal, cultural, etc.) competencies, which in one way or another reflect the opinions of different social groups and the economic interests behind them. After collecting the maximum number of lists, we optimized their contents, removing repetitive competencies and merging similar wordings into one. Then it was necessary to separate the basic competencies from the abilities, skills, personal qualities, traits, human capabilities. For this purpose, we used two techniques: defining the object and assessing its topological nature. We excluded those whose objects could not be defined from the complete list of competencies⁶⁰. Then the object of each competency was “tested for topological strength.” Mentally, we qualitatively changed its nature. If its original essence (certainty) remained unchanged, we codified it as an object of basic competency.

⁵⁹ The basic model of competencies of the University 20.35. <https://ntinews.ru/news/unti/bazovaya-model-kompetentsiy-universiteta-20-35-privyazana-k-navykam-professiy-budushchego-.html>

⁶⁰ For example, the ability to analyze and synthesize is not a competency. We cannot identify an objectively existing and socially significant product of the activity, which can embody this ability, be alienated from the activity itself and become a boon (a good) to other people. This is just an important skill.

The next step of compiling the list of basic competencies involves the culturological method. It allows you to see the broad sociocultural contexts of the organization of activity, including economic, over a long historical time and, on this basis, build up their system, classifying basic competencies. The conducted culturological analysis allowed us to conclude that from the 19th through the first decades of the 21st century, basic (universal) human abilities were built, enhanced and implemented in the space of culture, which has three dimensions: thinking, life, work. Three fundamental notions (transcendental objects) of the contemporary episteme set the boundaries of three principal groups of competencies: the group of “Thinking” competencies, the group of “Work” competencies, the group of “Life” competencies. Each of the competencies defined earlier corresponds to one of these groups, which allows us to structure their list in the logic of modern culture.

Subsuming the previously defined competencies under a given group may result in deficiencies in the contents (a partial or incomplete filling-in of one or another group, irregularity and unequal importance of groups). When the systematization has been carried out, the following question rightfully arises. Is the list of available competencies sufficient to reveal the content of modern and future-oriented activities within the scope of each transcendental object? Probably not, for the reason that the competencies already grouped out were identified through monitoring, and the predictive capability of this method is limited. For making the list of future-oriented competencies more accurate, foresight methods come to the fore, primarily those that identify fundamental historical objective laws of development in technology, economy and science. Applying these methods helps identify new basic competencies or, no less importantly, update the content of previously defined competencies substantially. We now illustrate this with the example of two competencies:

- Readiness for theoretical thinking — research competency. The topological object — a theoretical model (an idealized object);
- Readiness to learn, apply and create languages — language competency. The topological object — a sign system (code).

Research competency is on the current list of competencies. Its available description boils down to the ability to acquire and apply new information by posing problems, making hypotheses, conducting research and running experiments. Strictly speaking, as the ability to acquire new systemic knowledge with objective value, this competency is primarily a professional one. In today's conditions, its scope of application is markedly expanding. All people should be able to apply scientific methods in their social and economic activities. To define research competency as basic, it is necessary to point out the most critical aspect of modern scientific activity, which is in demand in the post-industrial and digital economy.

Our 20-year study of the methodological foundations of pedagogy⁶¹ in the context of the historical development of the methodology of other sciences allows us to highlight the key trend in the development of modern scientific thinking — the transition from empirical to theoretical thinking. It began with the advent of theoretical physics in the 1930s. The most crucial feature of scientific-theoretical thinking is creating theoretical models (ideal objects) and mentally experimenting with them to gain new systematic knowledge, which must then be validated empirically. The Elkonin–Davydov system of developmental training virtually proved that this ability could be developed in younger students despite the apparent complexity of theoretical thinking.⁶² Finally,

⁶¹ Danilyuk, A. Ya. *The Theory of Integrated Education*. Rostov-on-don, 2000. Chapter 2. Empirical and Theoretical Thinking in Pedagogy.
Danilyuk, A. Ya. *Educational Activity*. Book one. *Sphere of Meanings*. Moscow, 2016. Part two, § 1.2. Empirical and Theoretical Pedagogy.

⁶² Davydov, V. V. *Theory of Developmental Learning*. M., 1996.

analyzing the Fourth Industrial Revolution⁶³ technologies, one can confidently predict the gradual liberation of humans from manual labor as the form of performing routine operations directly in the production process. Man increasingly focuses on the competent, creative, responsible management of automated and robotic production processes with built-in artificial intelligence systems. In such management, theoretical modeling grows markedly in importance. It implies the ability to recreate natural, social, cultural and technological processes in their integrity, from their inception to completion, based on systematic scientific, including multi-scientific, knowledge. It also takes into account their consequences and effects, as well as links with other processes.

Thus, in the historical transition from the post-industrial to the digital economy, three influential trends in thinking over the last hundred years are coming together. These trends are 1) emphasizing theory in science, 2) building theoretical thinking via education, 3) seeking after human ability to model complex objects and processes aiming to manage holistic production systems efficiently. It indicates that the content of research competency (readiness for theoretical thinking) should be revealed through creating and applying theoretical models (idealized objects). Research competency becomes basic. The nature of work in the digital economy shapes the necessity for every person to build it.

In a traditional sense, *language competency* implies mastering a given language system and knowing its peculiar workings. Alongside this, it shows the ability to build grammatically correct sentences, use the rules for interpreting linguistic expressions and express one's own thoughts orally and in writing.

⁶³ Schwab, Klaus, The Fourth Industrial Revolution. Moscow, 2018.

To reveal the new content of language competency and define the corresponding topological object, one should consider characteristic features of the modern information economy. Information is stored, transmitted and processed in sign systems of various types. Language competency in the information society and knowledge-based economy is not reduced to proficiency in one or more literary languages. This competency shows the ability to work with sign systems of various types efficiently. With that, the topological object of competency is a sign system for storing, transmitting, and processing information. The nature of work with sign systems depends on the peculiarities of the digital economy and the need to differentiate between the functions of artificial and natural intelligence.

To determine the fundamental difference between human intelligence and existing artificial intelligence systems, we referred to the notion of “intelligence” (“intellectual behavior”) from Lotman’s article “The phenomenon of culture.” The key idea is that “no thinking device can be single-structured and monolingual: it must include multilingual semiotic formations. A prerequisite for any intellectual structure is its internal semiotic heterogeneity.”⁶⁴ The intellectual process runs as a translation of the text (certain information) from one language to another and vice versa. This results in a relatively new text which meaning is not identical to the source text.

Human intelligence uses different languages (sign systems) and does regular translations between them. Artificial intelligence (AI) can operate with big data and perform complex algorithmized operations with information objects. But AI cannot create new meanings by itself since it works (performs all

⁶⁴ Lotman, Y. M. Selected articles in 3 volumes. Vol. 1. Articles on semiotics and typology of culture. Tallinn, 1992. P. 36.

operations) using only one language — the programming language. Only human intelligence can do semantic translations using various sign systems.⁶⁵

Building and enhancing the ability to translate information from one sign system to others constitutes today's content of language competency. Language competency, as a basic one, does not boil down to proficiency in some literary languages. It is necessary but not sufficient. The competency essence dwells in the ability to do regular semantic translations from one language to another. The purpose of those translations suggests getting new values and discovering new meanings. In this sense, language competency is, in fact, intercultural competency. Its topological object is a sign system or a code. Encoding information is the process of translating it into another language. Proficiency in language competency implies the ability to work with codes. To that end, man can choose from existing codes, improve them or create a new code (sign system). Utilizing the newly created code will lead to discovering new meaning. In this sense, basic language competency allows for efficient human interaction with AI systems. These systems can perform algorithmic operations and process big data, but they cannot yet create new contents and meanings. This work is for human intelligence.

The sample list of basic competencies given in the table stemmed from the consistent application of the monitoring of the demand for competencies, the culturological and foresight method. The latter is based on good knowing the patterns of development of the main processes in economy, science, and technology.

⁶⁵ A simple test can prove the identity of artificial and human intelligence. Take the testable AI system. Offer the AI system to read (recognize) a small text. Then enter the command: translate this text into the language of images and make a picture that conveys the meaning of the source text. After this operation is performed, give a new command: translate the drawn picture into the original language of the source text. Suppose the source and final text will have similar meanings, and the latter will also contain new, additional meanings, being relatively new against the source text. In that case, the testable AI is similar to human intelligence. Such AI is capable of creating new meanings.

Basic competency		Object of activity
The group of «Thinking» competencies		
1.	Readiness to learn, apply and create languages — <i>language competency</i>	Sign system (code)
2.	Readiness for decision-making — <i>managerial competency</i>	Decision
3.	Readiness for theoretical thinking — <i>research competency</i>	Model (idealized object)
4.	Readiness for productive information processing — <i>information competency</i>	Information object
The group of «Work» competencies		
5.	Readiness for learning throughout life — <i>educational competency</i>	Education and self-education programs
6.	Readiness for teamwork — <i>social competency (social problem solving)</i>	Group (Team)
7.	Readiness to develop, improve and implement projects — <i>project competency</i>	Project
8.	Readiness to create products of labor — <i>work competency</i>	A product and a service
9.	Readiness for socially responsible entrepreneurship — <i>entrepreneurial competency</i>	Business process
The group of «Life» competencies		
10.	Readiness to preserve and strengthen health - <i>health-protecting competency</i>	Health
11.	Readiness to maintain the balance of living systems while implementing modern technologies — <i>environmental competency</i>	Ecosystem

All basic competencies are formulated through readiness, defined as motivated ability. A person may have the ability to do something, but either not doing at all or doing it badly with no proper motivation. Motivation is of paramount importance in the processes of building, enhancing and achieving abilities. It can be indirect and direct. A widespread version of indirect motivation is to work for a living, for a livelihood. Direct motivation manifests itself as the actor's natural interest in the object of activity. It suggests creating, applying and developing this object with its further integration into social relations. This interest is possible if the actor considers labor as the primary way of self-development. Personal subjectivity is embodied in the product of labor, acquiring an objective value for others. Such productive work meets personal needs for self-realization, recognition, respect, belonging, cooperation, creativity, self-knowing, etc.

Objects of activities are crucial components in the list of basic competencies. The formulations of competencies may be different, but they always imply the ability to work with the corresponding object. Without an object, there is no activity, and there is no competency as a motivated ability to perform productive, conscious, responsible, independent activity. The objects of basic competencies are topological.

All basic competencies are divided into three groups. Language (thinking), life and work have always been present in history and determined human behavior. However, from the 19th century, their cultural and social status started changing markedly. They have become transcendental objects. In other words, they turned into the most critical objects of activities. The historical process of their formation as transcendental objects reaches its apogee these days, with modern technology underlying it.

Most modern devices and business processes have built-in artificial intelligence (AI) technologies. These technologies are a powerful tool for optimizing economic activity. Human-made

intelligent systems increasingly perform functions that only humans could perform previously. With AI developing rapidly and its systems being applied on a mass scale, thinking, as a realizable productive ability, goes far beyond the limits of the human brain and body. Equally, rapidly developing neurotechnologies help interpret brain processes and expand the possibilities of mental activities. AI, digital and neurotechnologies are shaping an extraordinary global technological reality — the Internet of Things. It is where human thought enhanced by AI is integrated with the processes of social production and management. Humanity is already dealing with separate forms of intellectual technological reality. There is a clear tendency for them to become increasingly integrated. In the run-up to this, the ability of individuals and social groups to interact productively and safely with AI becomes one of the most critical activities. This ability is so significant that a whole group of “Thinking” competencies is required to unlock its content.

Modern technologies are also changing attitudes to work. Automation, robotics, AI and the Internet of Things shape a stable and growing trend of humans moving out of the immediate production process. A man more and more specializes in organizing production processes: modeling and creating those processes, managing their functioning and development as well as distributing benefits created. Production as a whole becomes the object of human activity. What is more, production is continuously developing and periodically changes qualitatively. An employee in the digital economy is responsible for the entire production and must be competent in all its processes: from giving birth to a project idea to creating a complete product or service and bringing this product to the consumer. Work in its integrity becomes the sphere of human responsibility.

Speaking of activities, we should not forget that their actor — man — is a living being. With that, performing activities is possible only in a living system. Life offers incontestable

grounds and is a prerequisite for any activity. State-of-the-art technologies make life an object of activity. Living systems at various levels, from the human body's cells to the Earth's ecosystems, consist of self-organizing living elements that exchange matter, energy and information between themselves and the environment. The power of today's technologies is so great that they really affect these exchange processes. Technologies enter into living systems, integrate into them and regulate the processes that occur in them. The specific type — biotechnologies — has the potential to improve existing and create new living systems. Life is technologically regulated, and humanity, willingly or not so, assumes responsibility for the state and continuation of life. Everything that man produces, from thoughts and words to goods and services, in one way or another, affects the state of living systems, from the cells and organs of the human body to the ecosystems where man lives and works.

Thought, work and life are priority sectors of today's activities and human responsibility, requiring systemic human competence. They define the overall structure of basic (universal) human abilities and the principal sections of the list of basic competencies.

3.5. MATRIX OF BASIC COMPETENCIES

Lists are the most common form of presenting competencies. They can be as simple as checklists. The competencies are listed in them, and their sequence is arbitrary. The more complex lists suggest that the competencies are grouped out, and some connections between them are established. R. Boyatzis was the first one to have done it. He argued that it is impossible “to understand the content of a managerial competency by evaluating it alone or even as part of a cluster but outside the context of other competencies.”⁶⁶ R. Boyatzis proposed a model of relationships between competencies in a cluster (“primary relationships”) and between clusters (“secondary relationships”). In complex lists, competencies cannot be rearranged because this leads to a violation of their linkage. Regardless of whether the list is simple or complex, it results from a description of some activity, the nature of which must be taken into account and reflected in the proposed system of competencies. For example, in educational standards and vocational and higher education programs, the list of competencies is defined by the relevant type of professional activity.

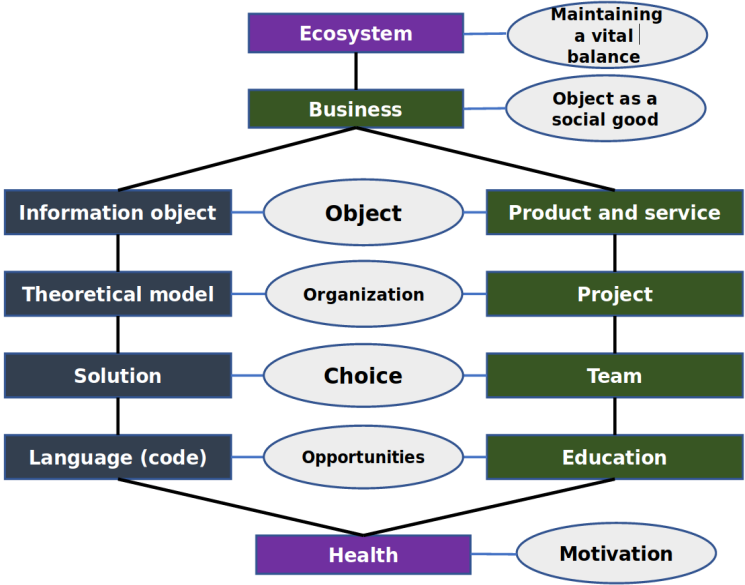
The system of competencies is necessary to reconstruct the structure, conditions, and nature of the activity. Any activity has two dimensions. One is object-based, focusing on the object and the outer world (what is done and how something is done). Another one is subjective (who does something and why one does something), centering on the subject (actor) of activity and his world reflected in a given activity. Listing the competencies is sufficient to reconstruct the object-based (external) side of activity. The list defines what objects are included in a given activity and what means (knowledge, skills, etc.) are involved. The subjective (internal) side of activity reveals itself through the linkage established between the competencies of the list. Competencies reflect the principal

⁶⁶ Boyatzis, R.E. *The competent manager: a model for effective performance*. New York: Wiley. 1982. P. 191.

organization of activities for the exercise of different abilities (competencies). Systemic relationships between competencies help determine the technique the actor applies to perform a given activity. The *matrix of competencies* captures relationships between competencies. It⁶⁷ answers the question: why and how does a man act under given socioeconomic and cultural-historical conditions?

The *matrix of basic competencies* is a system of relationships between the competencies included in the list of basic competencies. It reveals the core structure of human subjectivity shaped by cultures of modern and contemporary history and sought-after by the post-industrial and digital economy.

Let us introduce it.



Matrix of basic competencies

In the matrix, basic competencies are identified through their objects. At the core of the matrix, as well as subjectivity, is health. Alongside ecology competency, whose object is

⁶⁷ The word “matrix” comes from the Latin “matrix” - the root cause.

“ecosystem,” health-protecting competency belongs to the group of “Life” competencies. The four competencies on the left make up the “Thinking” group. The four competencies on the right and one at the top belong to the “Work” group.

Four ovals in the central part of the matrix indicate the connections between the corresponding competencies from the “Thinking” and “Work” groups. Each relationship has its own content and reveals the meaning of the competencies that it connects. The three ovals on the right side of the matrix capture the meanings of the respective competencies. The sequence of notions inside the ovals determines the general logic for excising subjectivity:

Motivation is the key to boost activity.

But motivation alone is not sufficient. There should be opportunities to perform activities. Acquiring abilities that have been objectified in culture generates opportunities.

Once possessing abilities, one needs to make a choice and give specific direction to the chosen activity.

When the goal is set, one needs to organize activities. Competency-based activities result in creating a specific product of labor, such as an information object, product, or service.

The created product objectifies personal abilities. It is equally important that both the product and the personality reflected in it be socially significant and perceived as a boon (a good) by others. For tackling this task, the created product must be incorporated into social relations (for acquiring a real value and, possibly, becoming a social good). This task calls for the necessity to possess entrepreneurial competency.

The created product exists objectively and has a real impact on its environment. It must not disrupt existing and possible life cycles, maintaining a vital balance in

the environment in which it will be embedded. For that reason, the product's creator should possess environmental competency.

Let us dwell in detail on the process of acquiring and exercising human subjectivity.

Motivation. A prerequisite for activity is human life and health. The principal basic competency underlying all other competencies is a readiness to preserve and strengthen health. The latter is defined as the dynamic balance between the body with its functions and the environment. Whether labor is forced or free, creative or routine, its driving force and the ultimate goal are preserving life. The body's equilibrium with the environment is invariably disrupted. Man is forced to seek food, shelter, medicines, and other means to restore the biological balance. Often, all his work aims at earning a livelihood to support his family's life and health, including his own. As soon as basic needs are met, work begins to be seen as the primary way of self-realization. The concepts of life and health become broader. One begins to consciously care about the social, mental and spiritual dimensions of life. Readiness to protect health — the balance between individual human existence (physical, mental, social, spiritual) and the environment (natural, social, cultural) — is a powerful motivator of human activity.

Health-protecting competency is the only competency that is partially conditioned by human biological nature. All other basic competencies dwell in the realm of culture and social relations. Let us look into them in pairs, also revealing the content that is shaped by their relationship.

Language (code) — [opportunities] — education. Readiness to learn and use natural languages, as well as to learn, use and create artificial languages, is a prerequisite for acquiring all other abilities preserved in culture. Language is not only a “door” to culture. It is culture itself, functioning as a complex organized realm

of texts in different languages, as a semiosphere, by Lotman's definition. Thought and communication, all productive work with information is expressed and done by linguistic means. It occurs at the borders of different languages. The notion of "code" captures this fact. Language and code mean the same thing — a system of signs. Using the notion of "code" to express the essence of language competency carries an additional semantic load. Coding is a translation of information from one sign system to another. Mastering a code (sign system) suggests that a person is fluent in at least two languages and can translate information from one language into another, extracting the contents and meanings. Coding is one of the most crucial functions of thinking. Mastery of codes — the ability to translate from one language to another and vice versa — proves that a person possesses language competency.

Sign systems open up opportunities for a person to acquire the abilities to think and perform activities. These opportunities are realized in the system of formal, non-formal and informal learning throughout a lifetime. Managing and self-managing the acquisition of abilities suggest that ongoing education, co-occurring through various activities, is codified. Forms of such codification are educational programs of different types and kinds. A person can choose from a wide range of educational services offered on the market, upgrade them according to their needs and create new ones, using the vast possibilities of digital information technology.

Language and educational competencies are the basic (universal) abilities that enable one to acquire all other abilities. The first one belongs to the "Thinking" group, the second one — to the "Work" group. Together (acquiring knowledge, learning and thinking in order to build and enhance abilities), they define the available opportunities for performing activities and exercising human subjectivity through those activities.

Decision — [choice] — team. There comes a time when it is necessary to switch to productive activities and realize certain abilities from among many. Then one has to make a decision and choose from different possibilities of activity. The ability to make choices is a particular competency defined as readiness for decision-making. The choice is based on values and preferences, suggests defining the goals, means and conditions for every possible strategy of activity. It also requires taking into account the risks and consequences of accomplishing the goals. Making a choice, the actor mentally simulates the entire process of activity according to two or more options for its implementation. The actor's competency manifests itself and can be defined as the ability to simulate and evaluate various strategies of activity and make a rational choice, preferring the best possible under given conditions. With that, this basic competency is not reduced to only modeling possible processes. By deciding to engage in a given type of activity, a person assigns a corresponding character to his subjectivity for the duration of the activity and, in part, for the rest of his life. The decision made leads to the significant enhancement of some man's abilities and the properly directed development of his subjectivity.

For the most part, the decision-making process occurs in the realm of thinking, communication and values. Setting forth a goal is insufficient; it is necessary to find and attract much-needed resources for accomplishing the goal. Pivotal among them are human resources. Goals are achievable only through the joint human activities, resulting from combining their abilities under the social division of labor. Entering the realm of labor relations, man continues to make choices. He looks for and finds a social group in line with his tasks; he chooses people whose subjectivity is in harmony with the desired direction of his own subjectivity development; he attracts resources to work together. The goal can be attained only in the system of public relations. As a rule,

it is achievable through teamwork, where a team is a social group united by joint activities and common values. A person can integrate into an existing group or create a new one. With that, he is always guided by his own interests (the choice made regarding the prospects for exercising his subjectivity). In one way or another, he always forms or participates in creating a community of people united by a common goal. The human ability to teamwork, building teams, and managing them to tackle various socially and personally significant tasks makes personal socialization successful. It yields wide opportunities to implement and develop professional competencies. A team can be seen as a compact temporary optimally structured purposeful form of the social organization of competency-based activities, strengthening any team member's abilities and making their implementation possible.

Theoretical model — [organization] — project. When a goal is set, and a person is integrated into a social community conducive to developing his abilities, he gets the opportunity to carry out his plan, provided the goal shifts from the subjective (belonging only to him) to the objective (shared by others) reality. The goal is what one wants, the end result of one's projected activity. To get what one wants, one needs to have systematic, rational and possibly accurate knowledge about the desired object. The highest form of rational reflection of an object is a theoretical model. It helps reconstruct complex objects and phenomena in the unity of their external and internal relationships, emergence processes, development and transformation. Competency-based activities aiming to achieve the goals begin with building a theoretical model.

Without analytical modeling of the object of activity, it is almost impossible to attract resources to achieve the goal. Building a communication space is also a condition for joint activities. It is based on ideas shared by all actors in relationships. These

ideas reflect the content of the object of activity. Only perceiving those ideas, actors consciously and voluntarily join the activity. All participants in relationships refine and accept the theoretical model — the ideal object of activity — in the communication space. They then move on to finding resources, planning and implementing activities in real-time. They create and implement a project — a rationally organized set of processes and tasks to carry out in a set time to obtain results that meet predetermined requirements. Project competency determines the ability to rationally organize the processes to achieve the goals set, including the ability to manage time, knowledge, skills, motivation, material assets, social relations, and other resources.

Information object — [object] — product and service. Activity is centered on its object, and the very meaning of performing an activity is to create that object. Modern technologies, and even more so technologies of the future, liberate humans from performing certain labor functions and allow them to create or consciously participate in creating real-world objects with new, pre-modeled properties. These can be an information object in the form of text, image, symbol, computer program, etc., as well as a product or service. Man always strives to create something real that matters to other people and embodies his abilities. Productive work meets human needs in self-realization, recognition, knowledge, personal growth, creativity, etc. The post-industrial and digital economies create sufficient conditions for this. Both economies need a well-developed human ability to work with information productively and create tangible products of labor and various services.

The object as a social good. Readiness for socially responsible entrepreneurship is put into practice through productive activities. A competent actor produces or participates in the production of a real-world object. One seeks to create a good that objectifies one's subjectivity. Performing productively, man

inevitably faces the question of the real value of the created product. Only others consuming the product can answer the question. Firstly, the product must be incorporated into social relations, including economic, and brought up to the consumer. The product must be not only personally but also socially important and in demand by others. In this case, it can be exchanged for other goods. A competent person is a potential entrepreneur who creates new objects. When they are included in the process of exchange of goods, he becomes a real entrepreneur,⁶⁸ participating in or organizing business relationships.

Maintaining a vital balance. What man creates begins to live its own life in the system of social relations and nature. With mass and individualized (infinitely diverse) production, the products of labor are integrated into living systems and significantly impact the processes taking place in them. Performing activities, the actor must take and bear responsibility for other people's lives, society, humanity, nature and the Earth.

⁶⁸ An entrepreneur, according to J. Schumpeter, is an innovator who searches for and implements innovations that provide an opportunity to generate profits above the industry average. This is feasible if the profit comes as a result of the innovations implemented. With that, monetary profit is only one of the forms of obtaining benefits in exchange for created products and services.

CHAPTER 4. INTEGRATION OF THE NOTION OF COMPETENCY INTO PEDAGOGICAL CULTURE

4.1. COMPETENCIES AND PEDAGOGICAL CULTURE

Competencies are the most important notions that determine the nature of contemporary education and its outcomes, targeting economic development alongside ability-building that ensure the successful socialization of students and their productive socio-economic activities. Competencies are incorporated into educational standards. They are instrumental in coordinating the requirements of the labor market and educational outcomes. Implementing the competency-based approach requires systematic scientific knowledge about the structure of competencies, technologies and conditions for building them, new modes of educational activities with fresh educational content, and new pedagogical relations that contribute to developing student abilities. This type of knowledge, along with the experience of its application, constitutes a unique competency-oriented pedagogical culture. It can be defined as a state of pedagogical thought and practice that ensures that basic and professional competencies are built and enhanced at all education levels continuously and sustainably. Pedagogical culture rests on the professionalism of educational workers. First of all, this suggests a readiness to organize pedagogical relations that enhance student abilities.

The competency-oriented pedagogical culture has been consistently shaped over the past decades under the strong influence of the State, society and business, all of them imposing new learning outcomes requirements. Numerous scientific studies have contributed significantly to promoting this culture. So has the system of skill enhancement for teachers, implementing programs on various aspects of understanding and building competencies.

The notion of “competency” borrowed from linguistics, psychology and economics came into the pedagogical tradition and played a pivotal role in developing competency-oriented pedagogical culture. To address this task is to draw a parallel between competency and one of the principal pedagogical notions.

The first step towards integrating the new notion into the existing and historically shaped pedagogical thought was to make it identical with the fundamental pedagogical notion of “skill.” When the competency-based approach was only beginning to take shape in a learning environment, such a decision seemed natural and even the only possible one. In the world of work, competency is what ensures the effectiveness of work. It employs intellectual resources and practical experiences for performing professional activities successfully. In education, the skill means the knowledge applied in a case study or a quasi-real situation. Drawing a parallel between these two notions immediately provided a clear definition to teachers. Competency is “the basic ability and readiness to apply the knowledge, skills and generalized techniques acquired through the learning process to real-world activities. Competency is applied knowledge.”⁶⁹ Making the notions of competency and skill identical in purport became possible due to their common key characteristic of “applied knowledge.” Competency is defined as a complex, integral skill that encapsulates simpler skills. Competency implies the state of human subjectivity that helps apply a certain content obtained through learning, self-education, and socialization to deal with practical issues.

Identification of the notions of “competency” and “skill” stems from the similarity of meanings, which immediately makes a new notion pedagogically recognizable and the process of building competencies technological. It takes to strengthen the practical

⁶⁹ Asmolov, A. G. How to design universal learning activities in primary school: from action to thought: a teacher’s guide. Moscow, 2008 – P. 13.

component of learning and create an enabling environment for students to apply the knowledge gained for tackling real-world problems. This approach meets the expectations of employers. They expect the employee to be able to successfully address production challenges by employing systematic knowledge.

Understanding competency as the applied knowledge and manifestation of skills fits a new notion into the fundamental pedagogical tradition that traces back to the European rationalism of the 17th century. Scientific knowledge, which is the core content of education, is instrumental and used to approach theoretical tasks and settle practical issues. “Knowledge is power” (F. Bacon). Power or force is known to be a measure of directional influence on an object, consciously aiming to alter its nature. Rational knowledge is realized in thought and physical action. In pedagogy, this action is referred to as a skill if this skill (action) is brought to a state of automatism.

Applied knowledge has always been defined as a skill in educational sciences. Back in the 30s of the last century, S. L. Rubinstein characterized knowledge as a rational connection between a person and a practical activity. To know, he argued, is to be able to do and possess. “The substantial assimilation of knowledge is a central part of the learning process... In the process of assimilating knowledge, there are several closely interrelated moments, or sides, such as: becoming familiarized initially with the material or *perceiving* it in the broad sense of the word, *understanding* the material, working purposefully to *consolidate* it, and, finally, *mastering* the material in the sense of being able to operate in different conditions, applying it in practice... True mastery also suggests acquisition, the ability to work with the acquired material approaching various tasks that may arise when using the knowledge gained for theoretical and practical purposes. The teacher should take into account and envisage the need for such mastery of knowledge throughout the entire

teaching process.”⁷⁰ In the classic textbook of didactics, published in 1957, we read: “Knowledge, when applied in practice, is related to skills. Skill is an acquired human readiness for practical actions performed consciously and based on the knowledge gained. Skills are related to the content of knowledge... Skill is applied knowledge.”⁷¹ In the Soviet didactics of the 1970s – 1980s, the theory of skill-building was distinctly developed. The skill-building was viewed as a process of mastering the methods of activity: “Methods of activity that students come to master become their skills and abilities... If one compares assimilation of methods of activity and assimilation of knowledge, it is easy to see that the mastered method of activity is the knowledge applied in the right situation.. After all, there are no skills, and they can not be built without knowledge: before consciously doing something, one needs to know what, how and why to do it. Thus, applying knowledge entails its assimilation at a new level.”⁷² Even at that time, the narrow classical approach to skills only as applied knowledge was revised. Skills began to be seen as “complex structural formations that include sensory, intellectual, volitional, creative and emotional qualities of the individual that ensure achieving the set goals of activities in a changing environment.”⁷³

Making competency identical with complex skill automatically introduces a new notion to the classical, traditional KAS-learning (knowledge-abilities-skills). Teachers know well what skills are. If competency is a complex skill, it can be built employing those methods and modes of teaching and learning that have been shaped in education throughout centuries,

⁷⁰ Rubinstein S. L. Fundamentals of General Pedagogy. SPb. 1999. – P. 502, 503, 507.

⁷¹ Danilov, M. A., Esipov, B. P. Didactics. Moscow, 1957. – P. 125, 126.

⁷² Didactics of High School: Edited by M. N. Skatkin. M., 1982. – P. 144, 145.

⁷³ Myleran, E. A. Psychology of Building Basic Vocational Polytechnic Skills. Moscow, 1973. – P. 16

the well-developed ones. This dramatically simplifies both understanding and building competencies. The competency-based approach has been implemented for about two decades now. However, fundamentally new educational technologies for building, presenting and assessing competencies have yet to emerge. Precisely as before introducing competency-based standards, teaching still aims to transmit knowledge and build skills wrongly (not entirely justifiably) called competencies. The educational outcomes have not notably improved, and employers' mistrust of formal education has not diminished.⁷⁴ We have to pay with the quality of education for the easiness in the interpretation of competency.

It is necessary to define competency through another pedagogical notion not related to the KAS (knowledge-abilities-skills) tradition to turn things around. The notion of "ability" can make a difference. Seeing competency as the human abilities to perform full-fledged, productive and independent activity aimed at creating a particular object with objective value, i.e., value for others, can change the game. This kind of activity consists, among other things, of a succession of actions (skills) but not reduced to them.

The identical meaning with "ability" helps incorporate the notion of competency in a humanistic, person-centered tradition. This sets an entirely different goal for competency-based education — to enhance student abilities to perform productive activities comprehensively and harmoniously. Enhancing personal abilities has always been the core of humanistic pedagogy. Abilities are objectified in culture. Man acquires abilities through activities, including education. Accordingly, education focused on building and enhancing abilities begins to borrow from cultural models.

⁷⁴ The research conducted by the Russian Union of Industrialists and Entrepreneurs (RUIE) shows that the personnel shortage has been among the top three most acute problems for business in recent years. According to Rossstat, after graduating, 31.3 percent of university graduates and 40.5 percent of vocational school graduates do not work in their degree field. Education by a third - and in some sectors by two-thirds - does not meet labor market requirements" (<http://old.rspp.ru/viewpoint/view/988>).

Educational learner-centered content, as E. V. Bondarevskaya notes, “should include everything that one needs to build and develop one’s own personality.”⁷⁵ The structure of human personality and socially significant abilities codified as competencies pave the way for developing both new educational content and new types of pedagogical technologies. The competency-based approach in humanistic pedagogy can give a powerful impetus to the development of contemporary education and science.

The humanistic tradition in pedagogy was formed in the 19-20th centuries under the powerful influence of the industrial revolutions. Due to the profound changes taking place in the economy and social relations, the need to enhance human abilities through education arose. To establish the correlation between the evolution of technology and the economy at large, on the one hand, and education and pedagogical thought, on the other hand, throughout the 19-20th centuries, an authoritative and widely recognized concept is required. The one that reveals the laws of industrial development throughout the period under review. The well-known concept of industrial revolutions by Klaus Schwab may serve the purpose. The point being, that “over the past 250 years, there have been three industrial revolutions. They have transformed the way human beings create value and have changed the world. In each, technologies, political systems and social institutions all co-evolved, changing not just industries, but how people saw themselves, related to one another and interacted with the natural world.”⁷⁶ This concept can establish a logical connection between the historical transformation of economic activities and the growing pedagogical interest in abilities over the past two hundred years.

⁷⁵ Bondarevskaya, E. V. Person-centered approach as a technology for modernization of education. <https://www.sites.google.com/site/kniznaapolkavmk/bondarevskaa-e-v-licnostno-orientirovannyj-podhod-kak-tehnologia-modernizacii-obrazovania>

⁷⁶ Schwab, K. The Fourth Industrial Revolution. Moscow, 2018. – P. 20

4.2. BIRTH OF PEDAGOGICAL INTEREST IN THE INNER MAN IN THE EARLY INDUSTRIAL AGE

The First Industrial Revolution started in Britain's textile industry. In 1769, J. Watt invented the steam engine, which became the primary source of energy for industries. In 1771, the first weaving factory was established. In 1812, the first steamship was launched, and in 1831, the first railway was built. After the factory opening in 1820, steam engines became widely used. This accelerated the development of metallurgy, the coal industry, and high-speed vehicles. Great Britain became the "workshop" of the world, producing half the world's industrial output. Europe entered the industrial age.

During the First Industrial Revolution, on the cusp of the 18th and 19th centuries, Pestalozzi discovered a psychological dimension in education. He saw the development of human abilities as the vital task of education. Everyone needed to develop mentally, physically, and morally, to improve their human nature.

The idea of the harmonious development of human abilities did not appear to be new. It was known in Antiquity. Plato defined the Greek pedagogical ideal by the term "kalokagathia." It suggested a harmonious combination and behavioral manifestation of external (physical) and internal (mental and intellectual) abilities of a legally free man. Combining two key meanings: kalos or beautiful and agathos or good, the humanistic pedagogical tradition was restored during the Renaissance, this time for all human beings.

Pestalozzi continues the humanistic pedagogical tradition and opens a new dimension in it. He approaches the task of developing abilities through education, embracing their application and improving work activities. "The surest way to create educational institutions for poor children is to consider the actual abilities of the younger generation to work productively and

connect such educational institutions with production... An institution that educates for industry develops a variety of abilities and skills needed by industry, and such an institution cannot be mono-directional.”⁷⁷ In 1806, in his work “On Public Education and Industry,” Pestalozzi extends the principle of combining productive labor with training to an entire education. He defines it as a universal method of elementary education: “Elementary education, preparing for industry, makes the comprehensive human development a task of professional training. While traditional training for industrial activities tends to result only in earnings, sacrificing to it the ennobling of man, elementary education for industry knows no other way to professional activities than through the integral development of all human potential, since only under this condition can the ennobling of man be achieved... It is quite sure that there is no proper completed elementary education, except that achieved by combining industrial training with intellectual upbringing and moral education in their entirety.”⁷⁸ For Pestalozzi, the possibility of new education and pedagogical thought lies in the idea of “combining educational tasks with industrial activities at a very early stage.”⁷⁹

At the turn of the 18th and 19th centuries, pedagogical humanism, which established the need for human cultural and moral development, found economic grounds. Industrial labor, in combination with educational means, acquired the status of a pedagogical method. It began to be seen as a real opportunity to develop abilities and achieve a quality of life that corresponds to

⁷⁷ Pestalozzi, I. H. Letters of Mr. Pestalozzi to Mr. N.E.Ch. on the Education of Poor Rural Youth. /J. A. Comenius, D. Locke, J.-J. Rousseau, I. G. Pestalozzi. Pedagogical Heritage. M., 1989. – P. 306, 310.

⁷⁸ Pestalozzi, I. H. On Public Education and Industry. /J. A. Comenius, D. Locke, J.-J. Rousseau, I. G. Pestalozzi. Pedagogical Heritage. M., 1989. – P. 315, 320.

⁷⁹ Pestalozzi, I. H. Letters of Mr. Pestalozzi to Mr. N.E.Ch. on the Education of Poor Rural Youth. /J. A. Comenius, D. Locke, J.-J. Rousseau, I. G. Pestalozzi. Pedagogical Heritage. Moscow, 1989. – P. 307

one's natural dispositions and efforts. This approach is efficient only if industrial labor yields new opportunities for developing abilities that are unattainable under the conditions of agricultural and craft labor, including:

- the social division of labor,
- the emergence of a new type of tools that combine material production and systematic scientific knowledge,
- wage labor that allows for changing jobs and types of professional activities,
- availability of sufficient free time,
- raising material standards of living, etc.

There is a more general reason for the birth of a pedagogical interest in abilities in unity with the possibility of acquiring, applying and developing them in the industry. This reason is associated with one of the central pedagogical concepts — the concept of nature-aligned learning. There are two interpretations of this concept in educational science. Comenius gave the first one; Pestalozzi did the second. By comparing and combining these different interpretations, one can genuinely comprehend why humanism took on an economic dimension. It also showed how some foundations of modern rational thinking took shape in the 17–18th centuries. Later, in the second half of the 20th century, they manifested themselves as competencies in science, education, and management.

John Amos Comenius was the first one who worded the principle of conformity to nature in his main work titled «The great didactics.» It states that in organizing the learning process, one must follow the same objective laws that prevail in external nature and manifest themselves in nature's perfect forms and harmonious processes. It is necessary to “imitate nature when creating the art of didactics... The order that we wish to make the universal idea of art — to teach everything and to learn everything — must be borrowed from nothing else than the instructions of

nature.”⁸⁰ Conformity to nature in education implies “imitating nature.” Man is part of nature and obeys its universal laws, which operate both in the world of plants and animals and in the realm of work and social relations.

This approach was in keeping with the spirit of its time. Comenius was a contemporary of Descartes. His “The great didactics” in Latin was published in 1638, and Descartes’ “Discourse on the Method of Rightly Conducting the Reason and for Seeking Truth in the Sciences” was published in 1637. In the 17th century, the foundations of natural science — experimental sciences about nature with the wide application of mathematics — took form. The goal of natural science is a rational study of material nature and obtaining systematic scientific knowledge about natural objects, phenomena and processes. Comenius’s pedagogy was evolved in the paradigm of natural science thinking of the time. With that, it did not lose its traditional Christian character.

Comenius builds his system of upbringing and training based on empirically observable age characteristics. Though, the complex inner man remains unfathomable to him and other scientists of the 17th century. Sharing the rationalism of his time, the educator sees the world at large, education and man as a mechanism: “For, just as the great world itself is like an immense piece of clockwork put together with many wheels and bells, and arranged with such art that throughout the whole structure one part depends on the other, and the movements are perpetuated and harmonized; thus it is with man. The body is indeed constructed with wonderful skill. First of all comes the heart, the source of all life and action, from which the other members receive motion and the measurement of motion. The weight, the efficient cause of motion, is the brain, which, by the help of the nerves, as of ropes, attracts and repels the other wheels or limbs; while

⁸⁰ Comenius, J.A. Selected Pedagogical Works in 2 vols. Vol. 1. M., 1982. – P. 318.

the variety of operations within and without depends on the commensurate proportion of the movements. In the movements of the soul the most important wheel is the will; while the weights are the desires and affections which incline the will this way or that.”⁸¹ In the spirit of the time, the inner man was plainly seen as a mechanism similar to other mechanisms. On the contrary, the outer world was perceived in all its richness of forms, processes and states. The man was capable of observing and exploring this world. It was suitable for acting and living. In this realm of material nature dwell the meanings of education. “To properly train young people,” Comenius says, “is... to reveal the ability to understand things... how they come from themselves and what they are in themselves.”⁸²

A different approach to education began to take shape at the turn of the 18th and 19th centuries. A century and a half after the publication of “The great didactics,” Pestalozzi attaches new importance to the principle of conformity to nature in education. According to him, education and upbringing should be built in line with the peculiarities of human nature, the laws of its development, student inclinations and abilities. “I am trying to psychologize the instruction of mankind” — this is how Pestalozzi defines his method principally. “Self-knowledge is central to all learning. Self-knowledge, however, is essentially twofold: 1. It is the knowledge of one’s physical nature... 2. It is the knowledge of one’s inner independence, awareness of one’s will to achieve personal well-being, individual understanding of the duty to remain faithful to private views.”⁸³ Psychologization leads Pestalozzi to the concept of elementary education. “The idea of elementary education... is nothing else than the idea to develop and shape

⁸¹ Ibid. P. 277.

⁸² Ibid. P. 355.

⁸³ Pestalozzi, I. H. *The Method. The Aide-Memoire Pestalozzi* / J. A. Kimenskii, D. Locke, J.-J. Rousseau, I. H. Pestalozzi *Pedagogical Heritage*. M., 1989. — P. 322, 331.

dispositions and forces of the human race in conformity to nature ... True nature-aligned education in its very essence causes the desire for perfection, the desire to enhance human strength.”⁸⁴ According to Pestalozzi, conformity to nature implies organizing education in such a way that would ensure the harmonious development of all the learner’s dispositions — moral, intellectual and physical. The educational content and the system of its organization should be subordinated to the tasks of developing learners’ abilities. Pestalozzi lays down the fundamental basis of the new pedagogical thought. He pioneers the pedagogical culture entirely focused on the individual. This culture sees the highest educational objective in developing human subjectivity — abilities — through various learning activities organized pedagogically. The approach that Pestalozzi worded could well lay the grounds for today’s various models of competencies: “ Not only does a man need to *know* the truth, but one must still *be able* to do what is *right* and *willing* to do it.”⁸⁵

Comenius and Pestalozzi are the founders of modern pedagogy that defines contemporary scientific thinking in education. They laid down the principle of nature-aligned education as two consistent ideas. Conformity to nature, according to Comenius: education rests on the laws of material nature. It transfers the totality of knowledge about nature so that people could act rationally and apply the knowledge gained to achieve their goals. Conformity to nature, according to Pestalozzi: education should reflect the inner man and ensure the comprehensive development of human abilities through productive, primarily economic activities. A single pedagogical task unites the two different ideas. This task suggests teaching a human being to act consciously, realistically and productively. To that end, one should know the

⁸⁴ Pestalozzi, I. H. The Swan Song. / J. A. Comenius, D. Locke, J.-J. Rousseau, I. G. Pestalozzi Pedagogical Heritage. M., 1989. – P. 357, 358.

⁸⁵ Pestalozzi, I. H. A Memorandum to Parisian friends about the essence and purpose of the method. / J. A. Comenius, D. Locke, J.-J. Rousseau, I. G. Pestalozzi Pedagogical Heritage. M., 1989. – P. 338.

world and have self-knowledge, including one's natural disposition and abilities, along with the ability to apply knowledge. Besides, one should have experience in addressing issues, achieving goals and developing the required abilities.

Successively articulated by Comenius and Pestalozzi, the paradigm of conformity to nature underlay educational science and determined the basic structure of pedagogical thought throughout the entire industrial era. However, the two principles of conformity to nature were separated. Mass education was entirely focused on the transfer of knowledge about natural and social environments. Its possibilities for building and enhancing student abilities were quite limited. Rare educational organizations based on humanistic pedagogy made an alternative to mass schooling. In theory and practice, it had not been easy to integrate the two approaches into one educational system before a competency-based approach emerged.

The post-industrial society offers conditions for combining two ideas of conformity to nature. The competency-based approach helps consider activities simultaneously in two dimensions: *performance* and *competence*. Comenius's principle of conformity to nature paves the way for shaping one of the sides of subjectivity through education: the ability to know things as they are and the readiness to act rationally in the material world. *Performance* — knowledge and subjectivity, both taken as a whole, the implementation of human abilities. To that end, for applying knowledge, skills and abilities, one must acquire and enhance them in the first place. In fact, Pestalozzi's principle of conformity to nature phrased this objective. The human personality and subjectivity, per se, become the object attracting pedagogical attention. After Pestalozzi one hundred and fifty years onward, Chomsky defined the generated experience to perform human activities as *competence*. The internal side of activity takes form within the realm of competence. Enhancing competence by building competencies becomes one of the primary concerns of mass education.

4.3. DEVELOPING ABILITIES THROUGH LEARNING DURING THE SECOND INDUSTRIAL REVOLUTION

The Second Industrial Revolution took place “between 1870 and 1930... The radio, telephone, television, home appliances and electric lighting demonstrated the transformative power of electricity. The internal combustion engine enabled the automobile, the airplane and, ultimately, their ecosystems — including manufacturing jobs and highway infrastructure. There were breakthroughs in chemistry: the world got new materials, such as thermoset plastics, and new processes... From sanitation to international air travel, the Second Industrial Revolution ushered in the modern world.”⁸⁶ Over the Second Industrial Revolution, a new wave of pedagogical interest in the internal side of human activity grows. The learning process aimed at enhancing student abilities reshapes the educational content in a certain way.

Pestalozzi introduced the psychological dimension of the principle of conformity to nature into pedagogy. This was a big step in developing scientific thinking, which largely predetermined the further development of pedagogical culture. At the same time, however, perceiving the inner man or the human psychological world as an object of pedagogical activity remained at the level of its time and kept the most general character. Pestalozzi speaks about intellectual independence and the comprehensive development of human mental faculties, the importance of harmonious physical development, and, of course, about morality and moral education. At the turn of the 18th and 19th centuries, it was merely impossible to unveil the system of basic abilities within the boundaries of education in any other way. Although the term “psychology” for the science of the soul in its modern sense was first used by Rudolph Goclenius as early as 1590, it was only in the 19th century that this science began gradually taking shape. It

⁸⁶ Schwab, K. The Fourth Industrial Revolution. Moscow, 2018. – P. 21

was happening by carving out the relevant pieces of knowledge from philosophy, medicine, biology and other sciences and integrating them into a separate scientific discipline. When a wealth of knowledge about man is accumulated in various sciences and systematized in pedagogy, the door opens to fill the ideas of basic abilities with content and set out the goals to enhance them through education. The first to realize such an opportunity was K.D. Ushinsky.

In 1868 and 1869, half a century after Pestalozzi, he published two volumes of his work titled “Pedagogical Anthropology.” He made the first attempt in history to open up the child’s nature through the prism of educational objectives by methodically using knowledge from various sciences. He fills the psychological dimension of pedagogical thought discovered by Pestalozzi with knowledge from “a wide range of anthropological sciences.” These sciences study “the physical or mental nature of man,” among which he counts “human anatomy, physiology, pathology, psychology, logic, philology, geography, statistics, political economy and the history of religions, civilizations, philosophical systems, literature and arts.” Their pedagogical significance lies in the fact that “all these sciences present, compare and group the facts and those combinations of facts that show the properties of the subject of education, i.e., the man.”⁸⁷ For developing human potentials and abilities, it is necessary to have a systematic scientific knowledge of their forms, contents and processes. “If pedagogy wants to educate a man in all respects,” says K.D. Ushinsky, “then it must first get to know him in all respects as well.”⁸⁸ The first volume of “Anthropology” “systematizes knowledge from various sciences (human physiology, psychology, logic, philosophy, political economy, history, etc.), aiming to

⁸⁷ Ushinsky, K. D. *Pedagogical Anthropology*. In 2 vols. Vol. 1. Moscow, 2017. – P. 14

⁸⁸ *Ibid.*

thoroughly uncover the process of “becoming conscious,” starting from simple initial sensations to complex mental forms. The second volume is about analyzing psychophysiological features of the emotional and volitional spheres of the individual. Also, K. D. Ushinsky intended to conduct “an analysis of those spiritual particularities that make up the distinctive feature of human mental life.” In the third volume, he planned to systematize the knowledge about human psychophysiological activities necessary for education.

Systematization of knowledge from various sciences, as K. D. Ushinsky believed, helps disseminate knowledge among teachers. “”The study of man in all the manifestations of his nature with a special application to the art of education” should be the goal of pedagogical faculties. His anthropological approach was enlightening: it is necessary to equip the teacher with systematic scientific knowledge about the child’s nature, and they will build the educational process on that basis. K. D. Ushinsky deemed teachers’ professional thinking critical in ensuring that the learning process was in keeping with human nature. He believed the system of professional teacher training should be aimed at shaping teacher thinking.

K. D. Ushinsky quite fully defined the anthropological approach for his time. However, his works did not provide a systematic scientific justification for developing the educational content that would enhance human abilities. The time for tackling this task comes later.

John Dewey was the first educator to start methodically restructuring the educational content both theory and in practice. He intended to align the learning process with the child’s interests and abilities. He directly linked the need for deep reforms in education with the ongoing economic and social changes. Developing abilities required a new school. Dewey believed that the objective historical prerequisite for it was the industrial revolution

of the 19th century. It resulted in the emergence of a world market. Alongside this, colossal factory centers were built, cheap and fast means of transportation and distribution of products were developed. The political borders were either erased or moved. The population in cities amassed, science and production interconnected.⁸⁹ These processes necessitate a “radical change in the way education is set up.”⁹⁰ They also determine the general approach to meeting this challenge in a rapidly developing socio-economic environment and the entailing uncertainty. “With the advent of democracy, Dewey said, and modern industrial development, it became impossible to foretell definitely just what civilization will be twenty years from now. Hence it is impossible to prepare the child for any precise set of conditions. To prepare him for the future life means to give him command of himself; it means so to train him that he will have the full and ready use of all his capacities; that his eye and ear and hand may be tools ready to command, that his judgments may be capable of grasping the conditions under which he has to work, and the executive forces be trained to act economically and efficiently.”⁹¹

Dewey considers the content of education as a driving force behind developing abilities. In his opinion, the learning process should be aimed at building skills for independent creative thinking, tackling life problems, gaining knowledge about ways of action and enhancing self-study and self-development. His “instrumental” pedagogy rests on an understanding of learning predominantly as play and educational-labor activities. To that end, each learning activity must become an instrument of cognition, a way of grasping the truth and accumulating life and cultural experience. Dewey defines his teaching creed, “I believe that true

⁸⁹ Dewey, John *The School and Society*. Moscow, 1925. P. 7,8.

⁹⁰ *Ibid.* P. 10.

⁹¹ Dewey, John. *My Pedagogic Creed*. // *On the Way to the New School*. 2002, №3. <http://altruism.ru/sengine.cgi/5/7/8/7/9>

education occurs when a child's abilities are awakened by the demands of the social situations in which they find themselves. These demands force the child to act as a member of society."

⁹² Enhancing abilities becomes the goal of education. With that, the student is not a passive object of pedagogical efforts but an active actor concerned about their own abilities. "The only way to teach a child to live in existing conditions is to create an environment where he can fully master his abilities."⁹³

Dewey's approach to developing abilities to the level of free mastery specifies two issues. Addressing them ensures achieving the goal set out. Those two issues are as simple to pose as challenging to resolve: 1) teachers, students and other actors concerned should know the abilities they need to develop; 2) education should be structured so that the educational content aligns with those abilities, ensuring their development.

A prerequisite for teachers to embrace the first challenge is a new structure of the learning process. As Dewey defines, the learning process "has two sides — one psychological and one sociological; and that neither can be subordinated to the other or neglected without evil results following. Of these two sides, the psychological is the basis. The child's own instincts and powers furnish the material and give the starting point for all education."⁹⁴ Education should begin with an understanding of the child's capabilities, interests and habits. Dewey holds the child's interests as pivotal in signaling "growing powers and abilities." He defines them as emerging abilities. Constant and careful monitoring of interests is one of the primary objectives for the teacher. This observation is essential but not sufficient for managing the ability development pedagogically. All actors concerned should

⁹² Dewey, John. *My Pedagogic Creed. // On the Way to the New School*. 2002, №3. <http://altruism.ru/sengine.cgi/5/7/8/7/9>

⁹³ Ibid.

⁹⁴ Ibid.

be aware of and able to work with abilities as with pedagogical objects. To that end, abilities “must be translated into terms of their social equivalents — into terms of what they are capable of in the way of social service.”⁹⁵ Note that Dewey here actually anticipates the notion of “competency,” which will emerge only in half a century, clearly indicating its social meaning. Competencies are abilities that are “translated into terms of their social equivalents” with a clear understanding of their socioeconomic and personal significance.

A deep restructuring of the content of education will help resolve the second issue. Traditional education does not directly develop basic abilities due to the standard subject-based organizational structure. Subject matters reproduce the contents of the related sciences (physics, mathematics, etc.), arts (literature, music, etc.) and activities (sports, labor) at a certain methodological level. Before Dewey, didactics had one goal — transmitting systematic knowledge and building skills and abilities in a sequence of lessons. Undoubtedly, traditional schooling with a sequence of lessons influenced student abilities development (as many other factors in the socialization process). Still, the objective of building abilities went beyond the capabilities and interests of classical didactics. Dewey defines the child’s abilities as the source material and the starting point of education. He puts the process of building and developing abilities at the center of pedagogical science. This approach changes the idea of the content and forms of organization of the learning process. Dewey believes that the right reference point for the learning process “should not be science, literature, history, or geography but the child’s social activity.” “There is, therefore, no succession of studies in the ideal school curriculum... The progress is not in a succession of studies but in the development of new attitudes towards, and new interests in, experience”. The problem

⁹⁵ Ibid.

of the general teaching method is not so much a systematic distribution of knowledge to acquire but “comes down to the question of the order in which the development of the child’s abilities and interests occurs.”⁹⁶

In the 20s-30s of the 20th century, W. Kilpatrick, J. Dewey’s disciple and follower and the founder of the project method, implemented the fundamental principles of education (accumulating and enhancing the experience, exercising abilities and interests, building the educational content in the logic of the ability development, learning by “doing,” etc.). Kilpatrick basically denied the need for curricula alongside the class-and-lesson system focused on the transfer of ready-to-use knowledge with no relation to abilities, real interests and the contents of children’s lives in view. He suggested building education as a process of a child’s activity performed in the social environment to enhance the individual experience. According to the project method, students had to organize the learning process independently or with the teacher’s lead. For that reason, they had to choose the forms of project activities. Performing the chosen activities, they would acquire the necessary knowledge.

Schools of a new type, organizing the child’s activities and focused on enhancing their individual experiences and developing their abilities, were actively created in the period leading up to the end of the Second Industrial Revolution. In 1907, the first Maria Montessori school was opened in Rome. It was based on the ideas of free education, humanistic pedagogy, and the child’s psychological, physical, and social development. In 1907, R. Steiner wrote the essay “The Education of the Child in the Light of Spiritual Science.” In 1919, the first Waldorf school appeared. Waldorf pedagogy rests on the principles of anthropocentrism (the child’s needs and abilities underlie their education), harmony in the development of the human will, body, feelings, and

⁹⁶ Ibid.

intelligence and heuristics (ready-made rules and decisions are not imposed on children; instead, they are free to draw conclusions and set the rules themselves). Learning and upbringing go through gradual emotional and intellectual development towards the education of the will. In Soviet Russia, in the 1920s, there was an experiment in the transition of primary and secondary schools to programs of integrated education that implemented the project method.⁹⁷

⁹⁷ It looks symbolical that the method was discontinued in 1931, at the same time when the Second Industrial Revolution came to a close.

4.4. THE THIRD INDUSTRIAL REVOLUTION AND THE CODIFICATION OF ABILITIES

The Third Industrial Revolution is associated with the advent of digital information technology. “Around 1950, breakthroughs in information theory and digital computing began. These technologies formed the core of the Third Industrial Revolution. As before, the industrial revolution was driven not by technology itself but by its impact on economic and social systems. The possibility to store, process and transmit information in digital format has reformatted most industries. The labor and social relations of billions of people have changed radically.”⁹⁸ The massive use of information and communication technology accelerates globalization, the global division of labor and cooperation. It provides a significant increase in productivity, growing needs, free time available, the advent of a system of education ongoing throughout life and integrated into the world of work. A post-industrial economy is replacing the industrial one. The new trends suggest that the production of services prevails over the production of goods, and human capital becomes the leading production resource. Technological processes become more sophisticated and frequently updated; a fundamentally new type of technology emerges; the need to consider social, cultural, environmental and other factors in the production processes becomes urgent. All this puts forward higher requirements for workers to meet. The post-industrial economy yields new opportunities for the development of scientific thinking. The education system tackles the task of managing the development of abilities.

In the early days of the Third Industrial Revolution, a so-called Noam Chomsky’s (an American linguist, the author of the initiating ideas) or cognitive (for the first time the connection between linguistics and cognitive psychology was established)

⁹⁸ Ibid. P. 21

revolution took place in linguistics. In 1957, N. Chomsky's work "Syntactic Structures" was published. It had a great influence on the development of the science of language. It brings the ideas of a universal grammar, which hypothetically includes a set of rules and principles inherent in all human languages. This grammar differs radically from the well-known grammars of literary languages studied in schools. Traditional grammar studies the rules for building and using language constructs. N. Chomsky points to the existence of a deeper sphere of language activity — linguistic competence. It underlies the ability to speak a particular language per se and mothers all known forms and processes of speech production.

N. Chomsky discovered the sphere of linguistic competence — the sphere of language activity where all its natural observable linguistic forms and speech processes originate. This discovery triggered the systematic and rational study of competence through various sciences. The idea of universal grammar served as a definite indication that this realm is strictly organized. Like traditional ones, universal grammar has its own constructs and rules for building them, stable forms of meaning and special laws of historical evolution. Competence — the internal dimension of language activity — is amenable to grammatical codification. However, not only language but also any other activity has an internal mental side, in which the processes of reflection, awareness, thinking, modeling, decision-making, etc., occur. Accordingly, and following the example of universal grammar, the internal side of activity can also be codified and further applied to organize activities and develop human abilities. Extending the ideas of competence and universal grammar to all human activities paved the way for the competency-based approach. Specialists in various fields (linguistics, psychology, pedagogy, etc.) began to codify the sphere of competence (the internal side of activity) and single out some stable forms or competencies within the sphere of competence.

Competency is a codified ability. For that reason, it is instrumental in building, enhancing, and applying abilities in practice. The codified abilities dwell in the internal, psychic side of activities. This is where these abilities are born, built, enhanced and interact with other abilities. Just as an activity exists in the unity of its internal and external sides — the spheres of competence and performance, so man's abilities must be manifested, exercised and developed in the forms and processes of his real-time behavior. Owing to the fact that the internal, psychic side of activity becomes a subject for scientific thinking, and the abilities themselves are marked and integrated into the sphere of socioeconomic management, contemporary education gets an opportunity for the targeted shaping of abilities.

Almost simultaneously with N. Chomsky, in the early 1960s, studying the development of the child's psyche through the learning process, D. B. Elkonin and V. V. Davydov implemented a psychological and pedagogical codification of the realm of thought, highlighting a unique intellectual ability — the ability to think theoretically. Before them, educators talked about thinking in general and its operations: analysis, synthesis, generalization, induction, deduction, etc. For the first time in the realm of education, D. B. Elkonin and V. V. Davydov defined two qualitatively different thinking abilities — empirical and theoretical, related to different activity levels. Theoretical thinking operates with ideal (idealized) objects, or theoretical models, that have no analog in sensual empirical knowledge. The category "theoretical thinking" helps codify the deep internal side of human thinking activity — competence — the realm where thinking abilities themselves are generated, implemented into practice and known as forms of empirical thinking.

Children (as well as adults) cannot build the ability to undertake theoretical thinking unless they are involved in specifically organized activities (educational or scientific). On the contrary,

the child develops the ability to think empirically before school and only enhances this ability through traditional schooling. “The traditional school cultivates in children only one type of thinking, at one time carefully described by formal logic — empirical. It is characterized by a worldly, utilitarian attitude to things, and therefore it is alien to theoretical evaluation and theoretical understanding of reality. Empirical thinking has its own unique types of generalization and abstraction and particular ways of conceptualization, which prevent children from fully mastering the theoretical content of knowledge, more and more penetrating the contemporary school... Cultivating empirical thinking in school is one of the objective reasons schooling has little effect on students’ overall mental development and enhancement of their mental faculties... The essence of theoretical thinking suggests a distinctive human approach to understanding things and events by analyzing conditions of their origin and development. Wherever students study things and events employing that approach, they begin to think theoretically”.⁹⁹

The codification of abilities helps create educational systems that ensure ability building and enhancement. Thus, the linguistic competence introduced by N. Chomsky underlay the methods and standards for studying native and foreign languages in Europe. The wide acceptance of linguistic competence in education resulted in the document “Common European Framework of Reference: Learning, Teaching, Assessment” developed by the Council of Europe in 1989-1996. For building the ability to undertake theoretical thinking, new techniques for subject-based teaching were developed and combined into the system of developmental learning of D. B. Elkonin and V. V. Davydov.

A clear understanding that abilities do not exist separately but only as constituents of human subjectivity that integrates them, as well as the need for a comprehensive application of

⁹⁹ Davydov, V. V. *Theory of Developmental Learning*. M., 1996. – P. 5, 6

different competencies in addressing economic problems, introduced various lists and models of competencies. In parallel, since the 1970s, psychology and pedagogy have been developing an approach to the holistic interpretation and shaping human subjectivity.

In the second half of the 20th century, the nature of personality becomes central in psychology. By the mid-1970s, A. N. Leontiev completed the development of the general theory of activity. He sees “activity — consciousness — personality” as a single concept of human existence in the world, which determines possible manifestations of man’s activity in nature and society and the nature of his attitude to himself. The personality is expressed, shaped and developed through activities, setting out the direction and giving the content to those activities. A single continuum of consciousness connects personality and activity. The level of abilities (achieved, being achieved, and possible to achieve) to perform activities regulated by man’s consciousness and self-consciousness is, in fact, his personality. Man acquires his personality, just like its constituent abilities, through the processes of activity. “Man is not born but, rather, becomes a person... Human personality is “built up” or created by the social relations that the individual enters into through his activity.”¹⁰⁰ A. N. Leontiev analyzes the overall composition of human activities. “The initial “units” of psychological analysis of personality” are “activities.” It is activities, “and not actions, not operations, not psychophysiological functions or these functions blocks” that characterize the “personality per se.”¹⁰¹ Personal relationships are practiced through “the totality of diverse activities” organized in a certain way. “In the course of a subject’s development, his discrete activities enter into hierarchical relationships among themselves... Hierarchical relationships of the activities characterize human personality. The

¹⁰⁰ Leontiev, A. N. Activity. Consciousness. Personality. Moscow, 1977. — P. 176 – 177.

¹⁰¹ Ibid. Pp. 183-184.

peculiarity of hierarchical relationships is their “detachment” from the body’s condition. These hierarchies of activities stem from their own development, and they form the core of the personality.”¹⁰²

Functionally, personality is a hierarchy of activities. Externally, in social and natural reality, these activities are achieved and embodied in actions, objects, means, processes and products of labor, social relations and language constructs. Internally, in the sphere of competence, where personal involvement is observed, these activities are born and built as abilities to perform activities. By reaching the point at which codification becomes possible, abilities acquire a stable form of competencies. The hierarchy of competencies forms a codified core of personality (a matrix of basic competencies), becoming actual under given socio-economic relations.

In the Third Industrial Revolution, the scientific understanding of human abilities reaches integrity. The codification of abilities allows for the targeted ability building through education. Lists and models of competencies are reproduced in educational standards and programs. A new humanistic trend that arose in pedagogy was based on the idea of personality and its formation in educational activities. In the late 1970s and early 1980s, V. S. Ilyin proposed a new approach to building the content of education in tune with the structure of personality.¹⁰³ In the 1990s, numerous concepts of person-centered education by different schools of thought (E. V. Bondarevskaya, V. V. Serikov, S. V. Kulnevich et al.) emerged in the wake of this idea. They were united by a profound comprehension of the need to organize such an education, which would be aimed at student

¹⁰² Ibid. Pp. 186-187.

¹⁰³ Ilyin, V. S. *The Formation of the Student’s Personality (Integral Process)*. Moscow, 1984.

development, self-development and personality build-up. With that, each student would realize his interests and opportunities and implement his abilities, consciously assimilating value-based orientations and diverse experiences of constructive activities.

Person-centered education is a new stage in the historical development of humanistic pedagogical culture. In the tradition that comes from Pestalozzi, it has always been about developing one or another ability or abilities per se. The person-centered approach shifts the semantic accents of pedagogical thought. “Orientation to the patterns of personal development when designing and implementing the pedagogical process — this is what the term “person-centered education” should really mean.”¹⁰⁴ Human abilities fit into the human personality structure. Along with the concept of personality, humanistic pedagogy incorporated the idea of integrity and subjectivity. Personality began to be thought of as a personified Universum of abilities built and developed through educational activities and implemented in various types of work and social activities.

¹⁰⁴ Serikov, V. V. Personal Development through Education. Moscow, 2013. – P. 69.

4.5. GROUNDS FOR COMPETENCY-BASED EDUCATION

The semantic identification of the notions of “competency” and “ability” introduces the modern competency-based problematics into the bicentennial humanistic pedagogical tradition. This tradition originates from Pestalozzi and gets a powerful urge to develop with each new industrial revolution. Viewing competency as an ability reveals the fundamental pedagogical meanings which this notion acquires in the context of the humanistic tradition of modern and contemporary history. We see those pedagogical meanings as categorical grounds. Historically, they are formed within the bicentennial humanistic pedagogical tradition; we have only taken them out of the tradition. For that reason, categorical grounds have an objective character and are pivotal for building the entire system of competency-based education. The grounds give new objective (stemming from the history of education and pedagogy, economy and technology) meanings to education. They also provide an ultimate understanding of the necessity to build student competencies.

Ground 1. ***Competencies — codified abilities — cannot be built if education is not involved.*** This statement does not apply to all human abilities. They all are assimilated through socialization, communication, work, life experience, etc. However, competencies are abilities of a special kind. Their codification occurs in the post-industrial economy, but as uniquely structured abilities, they emerged much earlier, in the early industrial age and machine production. The invention of the steam engine and subsequent technological development suggest integrating production and science, labor and systematic rational knowledge. When Pestalozzi in the early 19th century talks about the need to combine learning with industrial labor, he is, in fact, proclaiming the historical birth of an education in which systemic knowledge is

combined with productive activity. That was the first pedagogical response to the industrial economy's objective need for a new type of education.

In the industrial age, science becomes a direct productive force, and scientific knowledge materializes in technology. Accordingly, a worker acquires the ability to work productively only when, to a varying degree, he assimilates the scientific knowledge objectified in technology and can apply it as skills. Even simple industrial labor requires some professional training. Scientific and technological advances steadily strengthen the scientific content of technology and initiate its rapid updating. The worker must acquire new knowledge and skills. In response, learning becomes an ongoing process that takes place throughout life. The processes of getting ready for work in an innovative economy are becoming more sophisticated and extremely dynamic. To better manage those processes, the notion of competency has been introduced, relating the knowledge gained and skills acquired to the object of work activity. Forms and types of education can be very different: formal, informal, corporate, on-the-job training, etc. The very principle of competency-based training remains unchanged: mastering systematic knowledge and acquiring relevant skills through performing activities with real-world objects.

Ground 2. *Basic abilities — basic competencies — are built starting from primary school age.* When we talk about competencies as such, without specifying their type, then, as we have seen above, we always refer to basic (general, universal, etc.) competencies. They correspond to basic abilities exercised through thinking, behavior, relationships, values, attitudes, etc. This fact underscores their importance. Basic competencies — basic abilities to perform productive activities — underpin professional competencies. In reality, the latter ones never manifest themselves in pure form (as exclusively professional

competencies) because they are always carried out by a particular person who has a unique set of basic abilities and implements them in one way or another through all his actions.

The importance of basic competencies is not in the slightest doubt. However, the current practice of competency-based education is organized so that their formation begins with vocational education. Basic education is not involved in the process. Basic abilities to perform activities that shape the core of human personality cannot be built through vocational educational programs alone. Such an approach virtually ignores the most favorable periods for developing basic human abilities as childhood, adolescence and youth.

Basic abilities should be consistently built through education starting from primary school age. The humanistic pedagogical tradition, which is entirely focused on developing abilities, addresses the basic education system in the first place. Here rather than elsewhere, starting from primary school, the processes of building basic abilities — basic competencies — begin. Vocational training can only enhance them. Professional activities can promote the development of abilities in one direction or another. Setting up an effective system for building and developing competencies requires coordination not only between education and labor but also between all the levels of formal education.

Ground 3. *Abilities (competencies) are built and developed through object-based activities.* If we see competency as the ability to perform a given activity, we must also accept that it always has its own object. At the core, competency is the ability to work with a particular class of objects: study, model, transform, create, improve, apply, integrate them into a specific system of connections and relationships, etc. The object constitutes the activity. “There is no such thing as an objectless activity,” says A. N. Leontiev. The defined object is the first sign of activity.

Thus, when competency arises as a scientific notion, its object is clearly defined. N. Chomsky introduced the notion of linguistic competence to solve one simple yet fundamental problem of language: using a limited set of linguistic signs for building an infinite number of meaningful linguistic expressions. In search of an answer to this question, a particular scientific tool — linguistic competence — is created. It refers to the ability of the subject to build language constructs and put meaning into them. A language construct is a real symbolic object that the speaker (writer) creates and the listener (reader) works with (extracting contents).

Building competencies through education always involves working with a specific object, real-world and/or symbolic. When defining competencies, having a generalized (professional competency) or a topological (basic competency) object is crucial.

Ground 4. *Abilities (competencies) are systemically linked to each other and, in their unity, form a hierarchy of activities that reflects the core of human subjectivity (personality) amenable to codification.* If competencies are identical to skills, they can be presented in numerous lists and models without tracing internal links between them. In this case, the question of their systematicity is irrelevant. But if competencies are codified abilities, then one should thoroughly consider the nature of their reciprocal relationships. Human abilities do not exist separately from human beings. Not all human abilities become competencies, only those that are involved in productive object-based activities and linked to each other by the unity of human consciousness, self-awareness, behavior and life. A. N. Leontiev defines personality as a hierarchy of activities. In the context of competency-based problematics, personality can be defined as a hierarchy of realizable (proven) abilities to perform productive activities. To that end, personality becomes objectified through the results of those activities.

The competency-based approach opens up a real opportunity to achieve the goals of person-centered education. The system of basic competencies reflects the overall structure of personality tuned with prevailing economic and sociocultural conditions of the historical development of activities. Decomposing basic competencies through the educational content and implementing technologies for building them makes for person-centered teaching. However, it is not a question of building a personality with predetermined characteristics. Firstly, all human abilities cannot be codified. Secondly, the content of competencies (codified abilities) and their system are constantly improving due to the development of social relations and production technology. Thirdly, it is open education that builds competencies, and man is free to choose among them, just as being free to choose educational programs and services. A free attitude towards competencies rests on strong motivation: having competencies guarantees personal well-being, successful socialization and productive self-realization.

Ground 5. *The content of competency-based education rests on the principle of conformity to nature that unites both meanings originally given to it by Comenius and Pestalozzi.* Transmitting knowledge, building skills and developing abilities should be seen as a single goal of competency-based education. The principle of conformity to nature underlies it. Among all the principles of competency-based didactics, this one is pivotal.

According to Comenius, the principle of conformity to nature suggests that education should provide systematic knowledge of the outer world, i.e., the world outside the human body. It is a prerequisite of activity: objective “knowledge of things as they are in themselves” and the ability to act rationally in the real world applying the knowledge gained. To ready for a conscious and productive life and activities performed in nature (organic, inorganic, social), education must function according to the laws

of nature, be nature-aligned. Pestalozzi reveals the second critical meaning of this principle. “Not only does a man need to know the truth, but he must still be able to do what is *right* and *willing* to do it,” he says. In order to be willing to do and do, possessing the necessary knowledge and skills, the nature of the activity must be in accord with the abilities, motives, dispositions and needs of the actor who performs the activity. Man must be taught to act in line with his human and individual nature. For that reason, education must be tuned with human nature.

As seen, the principle of conformity to nature that unites its two meanings is logical and integral. Practically, it implies that the content of competency-based education should be organized on two levels: 1) the traditional subject-based system that transmits systematic scientific knowledge and builds skills, and 2) a new complementary content organization focused on building abilities (competencies). Let us look at how this is possible in the next Chapter.

CHAPTER FIVE. BUILDING AND ASSESSING COMPETENCIES

5.1. DIDACTIC FRAMEWORK OF COMPETENCY-BASED EDUCATION

The top-of-mind concern of education is a simple question that children often ask before they have completely lost the desire to go to school: What is the purpose of learning? This crucial question connects learning and life. Personal meanings and learning objectives can provide possible answers. In a post-industrial society, the competency-based approach helps achieve general agreement on learning goals due to the convergence of economic interests and humanistic pedagogical tradition. This goal implies a harmonious, comprehensive building and developing human abilities to perform productive activities. Accordingly, the vital question of education and life can be answered. The purpose of learning is to acquire and continuously improve human abilities (competencies). Exercising them when performing productive, creative activities, including education, develops human personality and helps people socialize successfully. When the answer to the question about the purpose of education takes a socially and personally acceptable form, another question arises: What should be taught? It is a professional-pedagogical matter and the core question of didactics — the content of education.

Much depends on the content of education: the modes of teaching and learning, teaching methods, technologies for learning, mechanisms for managing the quality of the learning processes and outcomes, the nature of pedagogical relations. Didactics — the science of the practical organization of teaching and learning — is needed primarily to rationalize the principles and methods for selecting a given educational content from the content of culture alongside the modes of presentation and techniques that enable students to assimilate the chosen content.

Didactics does not seem to be a complicated science due to the simplicity and conservativeness of historically shaped methods for selecting and transmitting education content. The educational content is organized within a given subject matter, course, module, discipline, practice¹⁰⁵. The main form of presenting the content is a study topic. Each topic is mastered during one or more training lessons. The process of transmitting content is methodically organized in a specific sequence: 1) presenting new knowledge, 2) explaining new knowledge, 3) acquiring new knowledge solidly and consciously through building skills — abilities to apply knowledge to deal with the practical issues and tackle theoretical problems, 4) managing and assessing the level of the knowledge gained. This is how the learning process is organized. Classic KAS (knowledge-abilities-skills) didactics answers the question: What should be taught? — in the following way: KNOW, UNDERSTAND, APPLY.

Didactics, which focused on transmitting knowledge, acquiring it solidly and consciously, building skills and abilities, was not questioned until the 1970s. In a textbook published in 1957, this crucial point is still unshakeable: “The content of education... implies the system of knowledge, abilities and skills that students must acquire in the process of learning.”¹⁰⁶ However, twenty years later, didactic thinking changed dramatically. By the mid-1970s, M. N. Skatkin, I. Ya. Lerner, V.V. Kraevsky developed a brand new approach to the content of education. From the perspective of progressive didactics, it had to include four mandatory components: “1) a knowledge-based system concerning nature, society, thinking, technology and methods of activity... 2) a system of general intellectual and practical skills and

¹⁰⁵ Hereafter in the text, the term “subject matter” will be applied for curriculum elements.

¹⁰⁶ Danilov, M. A., Esipov, B. P. Didactics. Moscow, 1957. — P. 45.

abilities that underlie many specific activities... 3) experience of creative activity, its main features, which were gradually accumulated by mankind in the process of development of social and practical activities... 4) experience of emotional-volitional attitude toward the world, each other, which, together with knowledge and skills, is a prerequisite for beliefs, ideals, and for building the personal system of values”.¹⁰⁷ The four-component content structure (knowledge — skills — creative activity — emotional-volitional value-based attitude) significantly expanded the traditional two-component structure (knowledge — skills). In the 1970s, new didactic thinking emerged. It formulated a different answer to the question: What should be taught?: THINK, ACT, CREATE, DEVELOP.

What processes, running in education, pedagogy, and social relations in the second half of the 20th century, required new didactic thinking? We can identify the key factors that brought it about.

The first and most pivotal is the post-industrial economy. Soviet pedagogy was deeply aware of the connection between the development of education and the economy. According to scientists, “the requirements of production ultimately determine the goals and content of education.”¹⁰⁸ Digital computing underlay the Third Industrial Revolution. Basic education in the USSR responded to this important economic trend long before the advent of personal computers. The first electronic computers appeared in the USSR in the 1950s. Experimental work on studying the basics of programming in the pre-professional training of computer programmers in high school began in 1959. In 1961, the Ministry of Education of the RSFSR approved the

¹⁰⁷ Didactics of High School: Some Problems of Modern Didactics. Edited by M. N. Skatkin. Moscow, 1982. 2nd edition — Pp. 102, 103.

¹⁰⁸ Danilov, M. A., Esipov, B. P. Didactics. Moscow, 1957. — P. 45.

first official programming training program for schools with advanced mathematics study. In fact, the informatization of basic education began in the 1960s. It kept advancing in the following decades. With the advent of personal computers, the content and methodologies for studying all subject matters went digital. Education was embedded in the post-industrial economy through the study and application of digital computing.

In the second half of the 20th century, the requirements for education changed, and the educational content markedly expanded. The law “On Strengthening the Ties of the School with Life and Further Developing the System of Public Education in the USSR” was adopted in 1958. That was the first legislative attempt to align basic with vocational education and the realm of education with the world of work. This law initiated an active and widespread application of inter-subject communications in education. In the period of the 1960s-1980s, intersubjectivity became pivotal in the development of education. Attempts were made to give it the status of one of the principles of didactics. Inter-subject communications notably expanded the boundaries of the content of education. The learning process shifting into inter-subject areas opened up the door for applying knowledge in conditions that differed from those in which it was acquired. Proficiency in one subject matter could help tackle problems in other subject matters and comprehend interdisciplinary practice-oriented challenges.

Intersubjectivity was not the only way to shape the initial experience of creative activities. In the “Didactics of High School” (1975), the teaching methods, other than intersubjectivity, included problem-oriented presentation, the partially-search or heuristic method, the research method. Even traditional reproductive learning became more widely understood: not only

reproducing and repeating knowledge but also mastering the modes of activities that help acquire knowledge. At the same time, the technology of Elkonin-Davydov's developmental learning, aimed at shaping theoretical thinking in students, was being developed and tested. In his article "School Should Teach to Think" (1964), E. V. Ilyenkov formulated the innovative requirement for education of that time. Later, V. V. Davydov concretized this categorical imperative of pedagogy of the second half of the 20th century: "School should teach to think theoretically." The rapid development of post-industrial economy, informatization of education, strengthening its links with production, expanding the content of education, mainly due to interdisciplinarity, mass application of active forms of learning, focused on the development of thinking, application of knowledge in practice and mastering the modes of activity required new didactic reasoning, reflecting the major trends of economic, technological and scientific development.

Developed by M. N. Skatkin, I. Ya. Lerner, V.V. Kraevsky, the four-component structure of education content (*knowledge — skills — experiences of creative activities — an emotional-volitional and value-based attitude to the object of activity*) can be viewed as the primary conceptual framework for competency-based learning from the height of modern reality. Implementing such a didactic structure in the learning practices can ensure building abilities to perform productive activities. At the core, it already contains all the necessary components of competency-based learning.

Creative activity, like competency-based activity, is always productive. It has an object (what we want to create) — a focal point of the activity and a product (what we have created) that objectifies the actor's particular abilities. A feature of creativity that brings it closer to competence is the ability to act efficiently in situations with a high degree of uncertainty. Such activity entails

creating something new and aims to tackle theoretical problems and deal with the practical issues productively and unconventionally.¹⁰⁹

Performing activities requires means. In the creative competency-based activity, the means are knowledge, skills and abilities — integral components of human capital. When acquired solidly and consciously and applied correctly, they become instrumental in performing activities, including education.

The third necessary component of activity is a motive. Not only should a man know and be able to, but also be willing to do what is right. This component — emotional-volitional value-based attitude toward the world, other people and the object of activity — is also built through education. Acquiring this attitude “regulates the correspondence of human activities to human needs and, in turn, expands those needs, the system of values, the motives of activities, i.e., all manifestations of the emotional attitude towards activities, the products of activities, and people.”¹¹⁰ As motivated abilities, competencies cannot be built and exercised without a value-based personalized attitude towards the object of activity. Nor can they be built without strong-willed efforts that trigger and support the entire process of real-life activities. Building a value-based emotional volitional component of rational behavior tied in with each competency is a prerequisite for competency-based learning.

¹⁰⁹ “We can also talk about such features of creative activity as seeing a new function of the object., independently combining known techniques to perform activities into a new one., seeing the structure of the object., alternative thinking, i.e., seeing possible solutions to a given problem and different ways of tackling it., developing a game-changing new technique to address the problem”. (Didactics of High School: Some Problems of Modern Didactics. Edited by M. N. Skatkin. M., 1982. — P. 107).

¹¹⁰ Didactics of High School: Some Problems of Modern Didactics. Edited by M. N. Skatkin. M., 1982. — P. 102.

As seen, the four-component structure of education content, if implemented, can ensure building competencies at all learning levels. It reconstructs the overall structure of competency-based activity by didactic means: *motive — means — object*.

The didactic concept of the four-component content of education was developed in the 1970s. It is known and studied in all teacher training colleges and universities. Could it be implemented, there would be no problems introducing competency-based educational standards. Contemporary education would ensure comprehensive development of each student's abilities and acquire a clearly defined person-centered character. But this humanistic ideal is yet to be achieved. However, the State and business have been calling for developing abilities (building basic and professional competencies) for at least two decades now. Basic and vocational education transmits knowledge and builds skills but does not build value-based emotional and volitional attitudes, nor provides the experience of creative activity systemically and on a large scale. This shows the core didactic problem when it comes to implementing the competency-based approach. Today's organization of the learning process fails to convey the educational content in the unity of all four components. There is an apparent contradiction between the competency-related requirements and real educational resources confined by the traditional school system.

The content of education is presented and acquired through a study topic. Within its boundaries, the learning process is carried out, and concrete learning objectives are pursued. The content of each study topic is defined, methodically worked out, and includes a system for assessing learning outcomes. Within a subject matter, study topics are arranged sequentially, and a transition to a new study topic is a transition to new content. The study topic is mastered through a standard methodological cycle: presenting a given content to students — organizing the learning process — building skills (the applied knowledge) — controlling

the knowledge gained and the skills built (presenting the assimilated learning material back to the teacher). When learning a new study topic, the cycle is repeated.

As a dominant mode of presenting and assimilating educational content, the study topic is essential for understanding the critical problem of contemporary education, viz. its low efficiency in building competencies. Often, talking about educational content, we mean content at large, a kind of cultural experience transmitted through a multitude of knowledge, skills and abilities. This understanding is justified only at the level of abstract didactic thinking. In practice, the concrete content of education falls within the study topic. The study topic¹¹¹ is related to the previous and subsequent topics, suggesting the sequential presentation of the subject matter content. A study topic — a unit of content — can also be linked to study topics in other subject matters. In this case, one refers to inter-subject content that emerges at the borders of study topics in processes of their integration. All said above brings forth one fundamental provision: *the content of education makes practical sense only when implemented through a study topic*.

Each study topic has a time limit: one or more lessons. During this time, it is easy to deliver the traditional two-component structure of the content, including knowledge and skills. Indeed, the teacher has the opportunity to present and explain new material, organize student work on addressing standard tasks, which entails building initial skills, repeat new material to consolidate it, check the homework, work on mistakes that are inevitable at the beginning of skill-building.¹¹² With the traditional

¹¹¹ The word “theme, topic” comes from Greek. Θέμα means the subject, the theme, the thesis that form the basis of a given, as a rule, complex text that has meaning.

¹¹² The typical structure of a school lesson provides: 1)organizing the beginning of the lesson (2 min.), 2)checking homework (7 min.), 3)learning new material (20 min.), 4)initial consolidation of knowledge to build skills and apply knowledge (9 min.), 5)summing up the lesson (4 min.), 6)information about homework (3 min.).

organization of the learning process, it is possible to deliver knowledge and build skills. On the flip side, there is no chance of shaping creative experience and acquiring a value-based emotional and volitional attitude towards the subject of knowledge and the object of activity within the study topic. There is just no time for that. On a system level, the school workings allow for acquiring only two components of content — knowledge and skills — out of four critical ones for the full-fledged organization of competency-based learning. Even active modes of learning — projects, educational research, inter-subject and practice-oriented research objectives, etc. — cannot approach the problem since there is no possibility of systematically applying them within each study topic.

The lack of efficiency in building competencies within the formal education system does not stem from didactic thinking. Everyone understands what the content of competency-based education should be like. Everyone wants to work productively, implementing the requirements of educational standards. However, the actual structure of the learning process does not provide the physical possibility to fulfill this mission. There is an obvious contradiction between progressive pedagogical thinking, focused on developing human personality and abilities (competencies) sought-after socially and economically, and the actual organization of the learning process, shaped in the early industrial age for mainly transmitting knowledge and building skills. It is impossible to provide an enabling environment for developing student subjectivity and building their competencies, not changing the entire educational system.

5.2. BLENDED LEARNING: NEW COMPETENCY-BASED PARADIGM

Competency-based education is a new type of education. Its goal is to achieve qualitatively new educational outcomes — building human abilities to perform productive activities. The real need for such education arises in the post-industrial environment and increases as it moves towards the digital economy. These economic formations not only call for competency-based education but also offer new digital information technology, practically enabling the new way of teaching/learning. Competency-based education is a prerequisite and product of the digital society.

Building competencies requires that the learning process go digital. It should provide:

- Practically achieving the humanistic pedagogical ideal — enhancing every student's abilities harmoniously and comprehensively, building their abilities to perform productive activities (competencies) in line with their personal choice for further successful socialization and self-realization through professional activities.
- Efficiently implementing the principle of conformity to nature in education. This principle provides 1) transmitting systematic scientific knowledge of the world, building skills — the applied knowledge, organizing the learning process aligned with the laws of nature, society and culture (conformity to nature as per Comenius), 2) developing student abilities and organizing the learning process aligned with human nature and the laws of development of human consciousness, activities, personality (conformity to nature as per Pestalozzi).

- Comprehensively delivering educational content within each study topic: acquiring systematic knowledge, building both skills and experiences through performing a creative activity, shaping an emotional-volitional-value-based attitude towards the object of activity, the knowledge of which is absorbed through a given study topic.

Transmitting knowledge and building skills is pivotal for competency-based education. It underlines the need to preserve the fundamental traditional school workings within a digital school: subject matters, study groups, the teacher's direct supervision, the system of training sessions, etc. Apart from that, new modes of learning compatible with traditional ones are required. Technologies of the post-industrial economy provide an enabling environment for the new modes of learning to emerge alongside additional education opportunities: digitizing educational content, using multimedia widely, the learning process partially moving to digital reality, significantly expanding the range of available educational services, organizing networked educational and pedagogical communities, using active learning modes, providing unlimited access to additional educational resources. The most promising form for integrating traditional learning with the new opportunities offered by the digital society is blended learning.

Blended learning environments are a mix of online learning and teacher-led, face-to-face classes. The word "blend" suggests mixing different types of elements to improve quality. Blended learning implies combining traditional subject-based classroom learning with distance learning based on the latest digital technology. Through "blending," the learning process alternates between electronic and traditional, independent and collaborative (joint), structured and unstructured, classroom learning and

extramural training. M. Horn and H. Staker give it the following definition: “Blended learning is a formal educational program (meaning any program that aims to improve the level of education) in which a student learns at least in part through online learning, with some element of student control over time, place, path, and/or pace.”¹¹³ This technology has been widely used since the book by C. J. Bonk & C. R. Graham “Handbook of Blended Learning” was published in 2006. There are about 40 training models of this type. One of them is Inverted Learning: students watch short online video lectures at home, study theoretical work material independently, and all the classroom time is allocated to check the knowledge gained and perform practical tasks together. Another model is Station Rotation. It involves dividing the class into groups based on types of learning activities: teacher-led, on-line training and project work. During the lesson, students move from station to station and work at each station. A similar model is Laboratory Rotation: some classes are held in a regular classroom. Then for one lesson, the students move to a computer lab and work individually in an online environment.

Blended learning has several distinct advantages. It helps combine modern digital educational technologies and traditional teaching methods, not changing the usual tenor of school life. Students can choose the training material and control over time, place and pace of training, building educational routes. All this contributes to enhancing the skills of planning and self-regulation and increases student responsibility for quality learning outcomes. With such an organization of the learning process, the teacher is free to choose the teaching material, techniques, methods of control and assessment. With online testing, the time for checking student progress is reduced.

¹¹³ Horn, M., Staker, H. Blended Learning. Blended: Using Disruptive Innovation to Improve Schools. San Francisco. 2015. – p. 62. http://imc-yal72.ru/images/1_4.pdf?fbclid=IwAR3dBqHYi33mSYaqOcukb0rH7gLSvgjzfabN3sKVr-mUAp3KFvdOL3m1QCK

All existing models of blended learning contribute to improving the traditional school system. However, the potential of blended learning is realized only marginally. The underlying reason is that this advanced learning activity still falls within classical didactic thinking focused on transmitting knowledge and building skills. Blended learning is not intended for building competencies. We will call this type of blended learning that includes all known models *learning based on knowledge reproduction*.

To unlock the full potential of blended learning, we must first stop seeing it as a stand-alone innovation, one of the models for organizing the learning process. Blended learning can be defined as a new way of organizing the learning process, an alternative to the traditional one. For that reason, the overall meaning of the concept of “blended learning” should change. In blended learning of reproductive type, the word “blended” implies combining and alternating traditional and electronic learning modes. But another possible meaning can be expressed by the words “mixed reality.” It points to a new type of reality where physical and digital objects complement each other and interact in a real-time mode. Physical and digital realities exist in parallel and are synchronized. In mixed reality, all processes run as continuous translations of information from physical reality to symbolic (digital) one and vice versa.

The concept of “mixed reality” gives a fresh look at the system of blended learning. Blended learning occurs in two parallel and synchronized educational realities: the digital reality and the reality of collaborative (joint) learning in an educational facility. The most important didactic tasks are distributed among them. Digital reality transmits knowledge and builds skills, mainly through distance learning. Collaborative learning occurs in an educational facility and aims to build creative experience and shape an emotional value-based attitude towards the material

being reviewed/studied (object, process, phenomenon). Each study topic pedagogically synchronizes the two realities and ensures full content-mastery through competency-based training. We will call such an organizational structure *competency-based blended learning*.¹¹⁴

Competency-based blended learning is a learning process running in pedagogically synced (within each of the successive study topics) digital reality and the reality of collaborative learning, which is teacher-led and occurs in an educational facility for transmitting systematic knowledge, building skills, gathering creative experience and shaping an emotional volitional and value-based attitude towards the material being reviewed/studied (object, process, phenomenon).

Competency-based blended learning assumes that the student, relatively independently and outside the educational facility, assimilates the new material, which contains knowledge and skills related to a particular study topic, choosing a convenient time, space, pace of learning and level of complexity. In the educational facility, creative experience and an emotional value-based attitude towards the material being reviewed/studied (object, process, phenomenon) take shape through collective real-life teacher-led learning. This becomes feasible through applying active learning modes: business games (modeling scientific, cultural, social and other activities), analysis of specific situations — case-study (collectively reflecting on real-world problems that require knowledge on the study topic), brainstorming (producing new ideas, meanings, information that expands the content of the study topic), educational and research activities (identifying contradictions between knowledge and

¹¹⁴ The theoretical foundations of competency-based blended learning, its conditions and technologies are presented in the book “Digital Education.” (Danilyuk A. Ya., Faktorovich A. A. Digital Education. Moscow, 2019). Here we will describe only general approaches to digital education applicable for modernizing basic and vocational education systems.

ignorance, defining the scope of one's knowledge, formulating problems that expand knowledge), project activities (managing the future on the basis of the knowledge gained and mastered), solving non-standard problems (searching for new algorithms for the knowledge-driven operations of the mind), etc.

Certain technical conditions are required to implement this approach. Competencies can be built only in a high-tech digital educational environment. The latter eliminates barriers between discrete subject matters, between theoretical training and practice, between the contents of education, economy and culture. Digital is a universal tool for developing a competency-based blended learning system.

Firstly, the entire educational content should be digitized and hosted on specialized educational platforms. Further, the digitized educational content is didactically organized as digital integrative learning modules (DILM). Each DILM corresponds to a specific topic of the subject matter. One DILM — one study topic. Modules are stored on the platform and delivered to the student's workplace.

The primary didactic objectives pursued through DILM modules feature acquiring systematic knowledge on the study topic and building corresponding skills. With that, the self-study goes independently and in online learning mode. The core question is: how can online learning guarantee that new knowledge is acquired and skills are built at a high level of consciousness and reliability? To tackle this problem, each DILM must meet the following didactic requirements:

- extensive use of multimedia and multi-layered teacher auditory accompaniment;
- the built-in system of inter-subject communications;
- equipping the DILM modules with an artificial intelligence system;
- availability of tools for working in social networks.

Extensive use of multimedia and multi-layered teacher auditory accompaniment. The DILM contains new learning material on a given topic that the student must absorb. With traditional schooling, this usually occurs in the classroom (lecture hall). The teacher delivers, presents and explains new learning material. These processes can be algorithmized and embedded in the DILM. The content of the study topic is quantified (semantic segmentation). It stays available in two versions: as a teaching text (fragments of textbooks, manuals, lectures) and as a teacher's presentation. Since each student has their own peculiarities of perception and thinking, the teacher's auditory accompaniment (teacher's explanation of the learning material) should be multi-layered. Several variants of explanations based on different methodological techniques are developed for each topic. The student chooses a suitable option or combines different ones. Also, the structure of the DILM module offers a broad spectrum of multimedia visuals. It transmits information in various ways: text, sound, animated computer graphics, footage. This makes the content imaginative, aesthetic, dynamic, story-driven, and, ultimately, accessible and exciting.

The built-in and open system of inter-subject communications. A system of inter-subject communications is built into the DILM at the stage of its development. It will enable the student to independently reflect on the knowledge gained and apply it beyond the scope of the subject matter being studied. Inter-subject communications enhance conscious assimilation of "cross-cutting" notions, heighten interest in the content of training, activate students' minds and contribute to the restructuring of the logical structure, methods and techniques of learning. They are one of the methods for implementing a competency-based approach. Transferring knowledge from one subject domain to another develops competency-based thinking as the ability to see the general in the particular and analyze the particular from the

perspective of the general, to apply knowledge and skills to approach complex interdisciplinary practice-oriented problems. The teacher's auditory accompaniment also supports student's independent work.

Equipping the DILM modules with an artificial intelligence system. Although it has started relatively recently, using artificial intelligence (AI) in educational systems has already become one of the leading trends in the development of educational technologies. Many intelligent learning systems have now been developed. Among them: "Thinkster Math"¹¹⁵ (an intelligent service for teaching mathematics), "Aleks"¹¹⁶ (an intelligent system for teaching mathematics and science in schools, colleges and universities on an interdisciplinary basis), "Cognitive Tutor"¹¹⁷ (blended learning curricula, Carnegie Learning Inc., based on MATHia software, adapting learning material to the interests of students), etc. Special mention should be made of the Squirrel AI Learning platform.¹¹⁸ It has become a breakthrough in the field of intelligent learning systems. In its digital space, the content of each subject matter was turned into learning elements (about 30 thousand for each subject matter). It provided a chance to individualize the learning process for every student. It also worked well in differentiating teaching methods according to students' abilities. The system uses more than 500 such techniques. It can reconfigure knowledge maps depending on the mistakes students make, determine causes of mistakes and build individual educational trajectories. Squirrel AI helps develop creative abilities by selecting, in tune with student interests and capabilities, learning material from the database, containing more than

¹¹⁵ <http://get.hellothinkster.com/>

¹¹⁶ <https://aleks.com>

¹¹⁷ <https://www.carnegielearning.com/products/software-platform/math-ia-learningsoftware/>

¹¹⁸ <http://squirrelai.com/>

four hundred thousand video files and more than eleven million questions. Applying AI systems for organizing learning resonates with personalized learning. AI systems help automatically analyze the learning process on many parameters and consider individual student characteristics providing support, monitoring and assessment. Educational systems supplemented with AI can raise students' motivation, consider their emotional state and analyze teaching methods vs. learning progress balance by various quality criteria. They ensure achieving the necessary learning outcomes for some students and in-depth training for others, tracking each student's progress, offering tools to improve the quality of learning processes and outcomes. AI is successfully used in contemporary education. Using AI in the DILM will help each student assimilate a new study topic independently and productively and will offer flexible and personalized learning.

Availability of tools for working in social networks. Social network communities support the study of new topic material. The current website “Brainly” serves as a good example.¹¹⁹ Students can ask questions that arise as they acquire new knowledge and practice skills and get answers from those who have experience in understanding and applying this knowledge. Brainly also helps students find the solution on their own. In its virtual spaces, there are expert communities on various academic subjects and affinity groups. Each DILM provides network communication. Students can interact in a convenient time-space mode, exchange views on various aspects of the study topic, discuss difficulties in understanding a particular issue and help each other with their studies. Network learning-oriented relationships, technically easy to organize in a digital environment, fully implement the concept of peer learning, also known as the Bell-Lancaster system of mutual instruction. It suggests that older and faster

¹¹⁹ <https://brainly.com/>

students (monitors) under a teacher's direction conduct classes with the remaining students, helping them assimilate the knowledge they have already mastered.

As seen, applying modern digital educational tools can help each student acquire knowledge and build skills relatively independently. At the first level of blended learning, the learning outcomes are automatically checked, processed and delivered to the teacher. At the next stage, the learning process changes its modes and methods. The student comes to class (study group) prepared and joins the teamwork through active learning modes. The latter ones aim to build creative experience and shape an emotional value-based attitude towards the material being reviewed/studied (object, process, phenomenon) in real-life interaction with other students and teachers.

The entire process of competency-based blended learning comprises three types of learning activities. At the initial stage of studying the topic, the student develops *reproductive activity*. It involves the ability to know, understand, reproduce and apply learning material for problem-solving. At the level of applying inter-subject communications, the activity of interpretation takes shape. The forms of this activity can be comments (interpreting and presenting knowledge in a new perspective), generalization (the scale change in considering knowledge), conclusion (disclosing cause-and-effect relationships), analogy (delivering the content under study as a metaphor, image, model), etc. *The student creative activity* is shaped through real-world teacher-led joint activity. It involves an intensive manifestation of cognitive interests while collectively searching for solutions to problems and creating new information.

The formation of creative activity is pivotal for competency-based education. Such activity includes the characteristics of actions that are at the higher levels of the taxonomy of educational goals established by Anderson and Krathwhol: analysis

(breaking the whole into parts and describing how the parts relate to the whole), organization (drawing up schemes and diagrams showing the place of a phenomenon or process in its environment), attribution (determining authenticity or falsity, identifying specific features), evaluation (expressing an opinion based on criteria and standards), verification and criticism (searching for criteria, determining the best method of proof), creation (integrating parts into a new whole, presenting arguments supporting a new structure), generalization (using several hypotheses to explain the phenomenon, process, creating an alternative criteria-based hypothesis), presentation (creating a multimedia presentation to present the research, writing an article), production (creating a product of activity).¹²⁰

Competency-based blended learning delivers content and builds all the components necessary for developing abilities to perform productive activities. These components are *the object* of activity revealed through creative experiences, *motivation* built through shaping an emotional-volitional-value-based attitude towards the object being studied and the means of activity — knowledge, abilities, and skills.

¹²⁰ Anderson L.W., Krathwhol D.R., Airasia P.W. Taxonomy for learning, teaching and assessing: a revision of Bloom taxonomy of education. N.Y.: Person Education, 2003. 336 p.

5.3. NATIONAL FRAMEWORK OF BASIC COMPETENCIES

Competency-based blended learning enriches the content of education. It becomes pivotal in building and developing abilities to perform productive and creative activities. However, blended learning lacks a rational and shared understanding of what kind of competencies (abilities) should be built. The goals of competency-based education are historically shaped by the economy, culture and social relations. They are objectified, codified and put on the most important documents of the education system.

Currently, in Russia, lists of competencies are included in the Federal State Educational Standards (FSSES) for vocational education. This is justified when it comes to professional competencies. The latter ones are identified by the method of functional analysis of production processes. Depending on the nature of these processes, groups of professional competencies are highlighted in the corresponding areas of training. Basic (universal, culture-universal) competencies are another matter. Functional analysis of activities alone is not sufficient to define them.

Their nature determines the requirements for managing the process of building basic competencies. Basic competencies are basic (universal) socially significant abilities to perform productive activities. These abilities reflect the overall codified structure of human personality, which is in demand under given socio-economic conditions. They are built in childhood and developed continuously and sustainably throughout man's life through socialization, education and work. These abilities are codified as basic competencies in a post-industrial and digital economy for managing human capital and, above all, aligning the world of work and the realm of education. Education in its relation to the economy should be described as a single system for developing competencies that employers seek. First of all, this applies to basic competencies that underlie professional ones and determine

the efficiency of productive activity performed under changing conditions and in different professional areas. To build and develop basic competencies continuously and sustainably, it is necessary to manage the outcomes of the entire system of formal and non-formal education. The current FSES contribute to doing this only for certain levels of education.

So far, there has been no managerial solution that would help coordinate requirements for the outcomes of basic and vocational education, various levels of vocational education, formal and non-formal education. Thus, article 10, the Federal Law on Education in Russian Federation, states that “the education system includes: 1) Federal State Educational Standards... and educational programs of various types, levels and (or) orientation; 2) organizations engaged in educational activities...; 3) federal state bodies and local authorities of the subjects of the Russian Federation engaged in public administration in the field of education” and other bodies, organizations and associations. As can be seen, there is no element in the system, which would set the requirements for the competency-based outcomes for the education system. As a result, education does not provide continuous and sustainable building of basic competencies that employers seek after and that facilitate each student’s productive personal growth. To address the challenge, a new element responsible for managing basic competencies should be introduced to education. This could be the ***National Framework of Basic Competencies***.

The National Framework of Basic Competencies (NFBC) should guarantee the continuous and sustainable development of competencies at all education levels, including extended educational programs. It should set up the basic rules for building and assessing them. Expert communities develop and refine the Framework through the science-based methodology for defining basic competencies. The central part of the Framework contains a system of interrelated basic competencies (with the indicated

topological object of each competency), which codify human subjectivity particularly relevant in current socioeconomic and cultural conditions.

Not only does the NFBC serve to decide what basic competencies are pivotal for the modern economy in light of its long-range development, but it also is instrumental in building and assessing basic competencies at all education levels. To perform this function, it is necessary to decompose topological objects. Specifying a topological object of basic competency involves defining its multiple constituent generic object. Let us take information competency as an example.

Information competency implies a readiness to work productively with an information object. In reality, there are multiple carriers of information: artistic, religious, political and other types of texts, symbols, images, programs, databases, news feeds, TV programs, graphic objects, etc. They are qualitatively different, but all have a common and immutable property — the property of being an information object. This is their topological property. The range of objects united by the notion of “information object” rests on the unity of their functions: to accumulate, store, transmit information and provide opportunities to understand, comprehend, apply, create, disseminate information in a social, intellectual and technological environment.

The NFBC specifies the topological object of each basic competency by highlighting its constituent generic objects¹²¹. This makes for selecting the content and tools necessary to build and assess basic competencies. An indicative list of basic competencies, detailing topological objects and their constituent generic objects, can be presented as follows.

¹²¹ The generic object presents one of the forms in which a topological object manifests itself in the concrete contexts of activity.

	Basic competency	Topological object	Constituent generic objects of the topological object
The group of «Thinking» competencies			
1	Readiness to master, apply and create languages — <i>language competency</i>	Sign system (code)	Languages: literary (Russian, Tatar, English, etc.); sciences (mathematics, physics, biology, computer science, historiography, literary studies, etc.); art (painting, fiction, dance, etc.); artificial languages (computer programming, international auxiliary languages), etc.
2	Readiness to make decisions — <i>managerial competency</i>	Decision	Decisions: intuitive; judgment-based; rational; strategic; tactical; operational; individual; collective, etc.
3	Readiness for theoretical thinking — <i>research competency</i>	Model (idealized object)	Models grouped by field of application: educational, scientific, game, simulation. Time-adjusted models: static, dynamic. Models grouped by scientific fields: physical, mathematical, historical, etc.

The group of «Work» competencies			
4	Readiness for productive information processing — <i>information competency</i>	Information object	Types of information objects: text; symbol; image; program; database; graphic object, etc.
5	Readiness for learning throughout life — <i>educational competency</i>	<i>Education and self-education programs</i>	<i>Formal and informal education programs: learning; self-learning; professional development; public work; physical development; healthy lifestyle; aesthetic development, etc.</i>
6	Readiness for teamwork — social competency	Group (Team)	Groups (Teams): learning; scientific; production; sports; artistic and creative; club (by interests); network communities, etc.
7	Readiness to develop, improve and implement projects - project competency	Project	Projects: innovative; investment; educational and training; research; educational and research; mixed projects, etc.

8	Readiness to create products of labor — <i>work competency</i>	A product and a service	Material goods: food, clothing, housing, cars, materials, etc. Services: transport, communications, health, science, education, culture, public services, advertising, trade, etc.
9	Readiness for socially responsible entrepreneurship — <i>entrepreneurial competency</i>	Business process	Business processes: basic (related to the production of goods or services); auxiliary (personnel management, financial management, logistics management); control (corporate management, quality management, strategic; planning processes, etc.); startups, etc.
The group of «Life» competencies			
10	Readiness to preserve and strengthen health — <i>health-protecting competency</i>	Health	Health: physical; social; mental; spiritual; emotional.

11	Readiness to maintain the balance of living systems while implementing modern technologies - environmental competency	Ecosystem	Natural ecosystems. Artificial ecosystems (human-made and capable of existing only with human participation): agroecosystems (related to human economic activity); technoecosystems (related to industrial activities); urban ecosystems.
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The correlation of the topological object with its constituent generic objects reveals how the basic competencies work. Approaching various tasks, including professional ones, a person possessing a basic competency understands and employs the fundamental properties that unite all the generic objects that constitute the topological object. Having learned to work with one of them, the person can quickly master others. Thus, for a person who has built information competency, any text (scientific, artistic, educational, or other) is an information object. Possessing an information competency helps him work productively with qualitatively different texts and information objects of other types. He is confident in transferring the means of this particular work, such as knowledge, skills, modes of activity, values and attitudes, from one situation to others, including those that are entirely new to him. Since information objects are at play in all activities, basic competencies facilitate efficient information processing under any changes in professional activities or working conditions.

Decomposing the topological objects of basic competencies is crucial for building them through various educational programs. The competency-building process has to be orchestrated at all learning levels in the conditions of digital competency-based blended learning. To that end, the NFBC is instrumental in building basic competencies continuously and sustainably.

The Framework sets the levels of basic competencies, tuning them with the learning levels.

The level-based approach requires identifying indicators (descriptors) to provide a differentiated description to what degree each basic competency is built up at different stages of ongoing education. These descriptors can be knowledge, skills, creative experience and an emotional and value-based attitude towards the object of activity, with their further decomposition for each level of each basic competency. When developing the NFBC, the descriptors used for “qualification levels for the development of draft professional standards”¹²² can also be applied (adapted): authority and responsibility, the nature of skills, the nature of knowledge.

The NFBC coordinates education and the world of work in terms of basic competencies. The Framework facilitates their ongoing gradual and sustainable development throughout human life. It also identifies the necessary conditions for building and assessing basic competencies at all learning levels, including extended education programs. Together with their objects, the basic competencies set by the NFBC for different learning levels determine the content of educational standards and programs.

Building basic competencies at the levels corresponding to the levels of basic education is mandatory for all citizens of the Russian Federation due to the compulsory nature of basic education itself. Building necessary competencies at subsequent levels (through vocational education) is more flexible. Employers and educational facilities decide at their sole discretion which competencies from the NFBC and at what level of their development are necessary to successfully perform a given type of professional activity.

¹²² Order of the Ministry of Labor dated 12.04.2013 No. 148n “On approval of qualification levels for the development of draft professional standards.”

5.4. OPERATIVE COMPETENCY-BUILDING MANAGEMENT

The National Framework of Basic Competencies represents a system-building component of strategic human resource management — the crucial resource of the post-industrial and digital economy. The managerial actors are the State, business, scientific, educational and other communities concerned about developing and implementing competencies. Their coordinated activities ensure the ongoing and sustainable development of competencies throughout human life. The NFBC sets key socioeconomic and educational goals-outcomes (basic competencies) and defines the right tools (objects, levels and descriptors of basic competencies) for achieving them. The system of basic competencies defined by the NFBC is time-stable. It reflects not only the current state of the economy and technology but also the key trends in socioeconomic development and cultural codes that take form throughout history and shape the “over and above individual” forms of thinking and behavior. The system of basic competencies also reflects personal abilities that are most developed historically, sought-after in the economy and built through learning.

Strategic human resource management opens the door for operative competency building management. A direct link between those two managerial levels comes forth when the competencies defined by the NFBC are decomposed in educational standards and educational programs, and the requirements for their outcomes are set out. Operative management will play a pivotal role because competencies are built through real-life learning processes with teacher-students and student-student interactions. The actors are school teachers, educators of colleges and universities, management personnel of educational facilities, etc.

Obtaining sufficient and real-time information about the controlled object — competency — building processes — is critical for the management. It is feasible only in a high-tech

digital educational environment. Such an environment features the digital content of education hosted on an educational platform. With that, the learning process takes the form of competency-based blended learning. Educational content is organized as a sequence of digital integrative learning modules (DILM). Within each DILM, content components and teaching processes relevant for learning are marked according to predetermined rules. In a digital educational environment within the core curriculum, content and teaching techniques are available for all educators and managers. A subject teacher is aware of what is studied in other subject matters. Cross-curricular linkages are easy to establish, offering challenging tasks to students. They can address them with the knowledge they have gained while learning various subject matters and the skills they have built through performing practical activities. In the digital space, the entire content of education becomes pedagogically manageable.

The Digital Principal Educational Program (DPEP) could become the central object and tool for operative competency building management. It presents a digital analog of the existing principal educational programs with fundamentally new opportunities for learning activities. The DPEP is hosted on a computer platform and facilitates building and assessing competencies at a given learning level. Educational standards set forth the goals, objectives and intended learning outcomes for the DPEP. In terms of basic competencies, this is done in line with the NFBC. The content of the digital educational program is organized at two levels: disciplinary (subject matter) and interdisciplinary (inter-subject).

The disciplinary level maintains the current system of subject-centered education. Traditionally, content is organized within subject matters. They are managed through the curriculum, a document defining the list of subject matters, their sequence order and the amount of study time. The same principle is applied

in the digital education space. On top of that, the possibility of modular-integrative organization opens up. It ensures transmitting the content of each study topic in full and in the unity of all four content components: knowledge — skills — creative experiences — emotional and value-based attitude towards the material being reviewed/studied (object, process, phenomenon). Modular organization and blended learning facilitate the implementation of the competency-based approach within discrete subject matters.

Interdisciplinary content can stay sustainable and provide a full-fledged pursuit of learning objectives only in a digital educational environment.¹²³ Interdisciplinary (competency-based) content is managed via a *digital map of competencies*. The map represents a digital dynamic model that describes the processes of building, developing and assessing competencies through all subject matters and practical activities included in the principal educational program. The digital map includes passports of competencies. Each passport contains complete information on those pieces of knowledge, skills, the experience of the activity and values that build a concrete competency. Alongside this, the map indicates what subject matters to study and what techniques to apply for building a given competency, including the amount of study time and the succession of studies. It also shows how competencies develop in the course of mastering the principal educational program. It should not be a problem to generate and

¹²³ The attempts to shape this approach had been made before. In the USSR in the 1980s, the so-called “coordinate grids of inter-subject communications” were introduced in the school system. The teacher had to indicate what inter-subject communications were set up and applied when studying a given topic under the curriculum. Their number was large and constantly growing. In a paper-based learning environment, the teacher should present the learning material and organize its assimilation in a manual mode. For that reason, there is no physical possibility to deliver inter-subject content during a lesson.

update the digital map and make it function. For that purpose, the content of education should be digitized, marked and hosted as a set of DILM modules on the platform. The rules for data exchange between all DILM modules should also be set out. In this case, most of the work on drawing up a digital map of competencies can be automated.

The digital map of competencies provides a complete picture of competency-building processes, both basic and professional, through diverse subject matters that fall within the principal educational program. It also shows links between different competencies and their generic objects. It provides real-time coordination between different parts of the curriculum for competency-building. The digital map is available to educators and managers. They can obtain complete information about the processes running within all subject matters in real-time. They can also see what contribution each subject matter makes to enhance the overall competency-building process. Comparing the quality of real processes and the required outcomes, it is easy to make the necessary pedagogical and managerial decisions to improve the effectiveness of competency-based learning.

The digital map of competencies allows employers to assess the quality of personnel training in a particular educational facility. They can make suggestions for improving the quality of training and building the required competencies of potential employees. In the event of new technologies, changes in production conditions or the need for updated qualifications, such proposals can be quickly introduced and implemented through the content of educational programs. In fact, employers become equal managerial actors in real-time competency-building processes alongside teachers and heads of educational facilities.

5.5. OBJECT-CENTERED AND ACTIVITY-BASED APPROACH TO ASSESSING BASIC COMPETENCIES

One of the management functions is control. It establishes a correlation between the learning outcomes and the requirements for meeting educational standards. Pedagogical monitoring is used to carry out diagnostics of the learning process and identify achievements and challenges. Students are motivated to assimilate learning material at a higher and stronger consistency level while preparing for assessment activities. Forms and types of assessment activities depend on organizational modes of the learning process. Historically, they were shaped to address the challenges of subject-based learning mainly aimed at transmitting knowledge and building abilities and skills. Most assessment tools are designed through a disciplinary approach and do not imply assessing a real product of activity. With no such a product, learning achievements are assessed by comparing the obtained results with particular standards or previous diagnostics results. In competency-based education, this approach is ineffective.

Competencies cannot be built within discrete subject matters. The principal educational program is responsible for building competencies with a certain level of their development. The content of all curriculum elements should ensure developing the abilities to perform productive activities. Subject-based forms and types of assessment are not sufficient to assess competencies, both professional and basic. Any attempt to apply those forms and types under new conditions causes exponential growth in the cost and complexity of testing/measuring and organizational/technical procedures. For that reason, low-quality management in competency-building possesses is observed.

Competencies are integral complex characteristics of human activities, reflecting the developmental level of human basic and professional abilities. They can be adequately assessed only

through activities that bring up real-world problems, searching for methods and tools to deal with them. These activities also involve applying the knowledge gained and the skills built to tackle new tasks; they combine thinking and practical actions to create a product of activity in material and/or symbolic form. The competency-assessing process may include an assessment of learning achievements since competency-based education incorporates a subject-based training system. But the critical indicator showing that the competency is built is the objectified product of the activity, which can be alienated from the process of activity and assessed objectively.

The independent qualification assessment facilitates the development of a new approach to assessing competencies methodically and practically. Among its fundamental principles: integrative nature (creating conditions for the manifestation of an overall readiness to apply knowledge and skills, perform the necessary labor actions that ensure the performance of labor functions) and objectivity in the assessments (assessment based on diagnostic criteria that are objectively significant for the quality of performance and recognized by any expert). The assessment process is organized in real production conditions and/or conditions simulating real activities. As a rule, it consists of two parts: theoretical and practical. The object of the evaluation is “the product created by the test taker; the process conducted by the test taker; the product and process of his activity simultaneously... *The product of activity* can be either a material or intellectual result of human labor (object, service, idea, etc.). Once the characteristics of the created product and the conducted process match the benchmark, this shows the test taker’s readiness for performing the corresponding labor function.”¹²⁴

¹²⁴ Leibovich, A. N., Faktorovich, A. A., Perevertaylo, A. S., Lushnikov, S. A. Development and Application of Assessment Tools for Professional Examinations. Collection of methodological recommendations. – M. 2017. – P. 10

The approach time-tested through the independent qualification assessment can be taken as a basis for assessing basic competencies. Basic competency is the basic (universal) ability to perform productive activities. It always aims at creating a specific object with useful properties. The object can be material (product), non-material (service) and/or symbolic (text, image, program, etc.). The NFBC defines a topological object and its constituent generic objects for each basic competency. In educational standards, the objects of basic competencies are thoroughly specified. In educational programs, the necessary academic content is selected for each subject matter. Under these conditions, it is not difficult to assess to what extent the competency is built up. For example, the assessment procedure for the competency “readiness for productive information processing” may involve creating a real product (a scientific or teaching text, an artistic image, a graphic object, etc.) under specified conditions that simulate a given real-world activity, a complex practical problem that entails creating this product.

The approach under which the processes and results of activities are assessed in the conditions closest to reality can be called object-centered and activity-based. The NFBC sets up a relatively stable system of basic competencies. The topological object is defined and further specified through multiple generic objects of activities for each competency. The activities centered on these objects constitute the content of assessment procedures. Centrally managed integrated diagnostic systems (simulators) should be created and placed on platforms to organize the assessment process. Digital simulators (training devices) simulate activities with objects of basic competencies under various conditions, at different levels of independence and responsibility, with varying degrees of human readiness. Artificial intelligence systems are embedded in them. Their content and processes are regularly updated according to the requirements for learning outcomes and the latest technologies.

The number of digital simulators corresponds to the number of basic competencies set up by the NFBC. All educational facilities and HR departments can be connected to digital simulators. Individuals interested in checking the level of their basic competencies can get access to them as well. Digital diagnostics that recreate activities in virtual, mixed and augmented realities can provide a reliable assessment of productive basic (universal) abilities.

Conclusion

Further development of the competency-based approach is aimed at improving the system of the economy's ability management. Such a system includes a national framework of basic competencies, competency-based educational standards for all levels, an independent assessment system for qualifications and competencies and organizations that ensure building and developing competencies through education. It can be seen as a social technology for building and developing human capital — a major resource of the post-industrial and a key driver of the digital economy. It should provide:

- efficient accumulation, reproduction and application of human capital codified through competencies throughout society and the national economy at large;

- free access to high-quality human capital for all economic actors;

- comprehensive and harmonious development of human abilities to perform productive activities as per personal choice.

Although this system originates in a post-industrial economy, its real purpose is to promote a new economic formation. The modern economy stimulates the development of productive human abilities (competencies). Still, the efficient ability (competency) management coordinated adequately at all levels — individual, corporate, national — is the technology of the future. The new quality of human capital is unattainable without a new type of education — digital and competency-based. The deep integration of already available human capital management techniques with the latest digital educational competency-based technologies, which are yet to be developed, is one of the most critical drivers of the emerging digital economy.