

Soft Skills in IT-Education as a Condition of Competitive Ability in Information-Oriented Society

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Abstract—“Soft skills”, such as communication and cooperation skills provide creative solutions to specific professional tasks. These skills let IT specialists be productive in their professional activity and guarantee them competitive advantages on labor-market of information-oriented society.

I. INTRODUCTION

Information-oriented society emerged in the process of the information technology revolution. It consists of productive development and interaction between high-tech solutions and biotechnologies, IoT, virtual reality and cyberdefense, cyclic economics' management, enhancing the intellectual resources and so on.

Modern economies become digital. It takes high-skilled professionals able to beneficially use advantages of information-oriented society. These people should be able for effective work with a huge amount of information and use it in task solutions.

IT-related education sector is fast-growing and challenging. It requires total reboot in all areas each of professional and academic. Every aspect matter: technological revolution, personal values, a moral responsibility, human resources development and human intelligence [1], [2]. That's why we need to make Russian higher education able to compete. Russian universities should adapted to information-oriented society and digital economics. Humanitarian content of IT-education needs to be update due to special attention that is pays today to professional skills such as communication and cooperation.

II. MAIN PART

Starting to analyze the requirements for the content of the modern humanitarian block of technical education, it is necessary to agree on the terms by which we will determine the necessary knowledge, skills that become vital in modern society.

David Clarence McClelland known as originator of “soft skills” term. He is an American psychologist who researched driving forces of personality, motivation and became an author of “skill” term. We have no specific definition for this term in modern scientific literature nowadays. However, there are several different interpretations.

“Soft skills” are:

- social and personal competencies leading to professional success [3];
- human personality, determined by its experience and temperament;
- a certain set of abilities that leads to the understanding of people's own emotions and emotions of another people [4].

A detailed study of this concept is reflected in a large number of scientific papers [5]. However, the purpose of this work is not a detailed analysis of the literature that interprets the concept of soft skills. The main task is to find the most original and modern images and methods of formation of soft skills of future it specialists.

Our attention was drawn to the imaginative and capacious developments made at the World Economic Forum in January 2019. 10 Skills You'll Need to Thrive in 2020 Infographic presented by Guthrie Jensen at World Economic Forum shows us the most complete list of most needed skills in nearest future, such as: complex problem solving, critical thinking, people management, coordinating with others, emotional intelligence, judgment and decision-making, service orientation, negotiation, cognitive flexibility.

1) **Complex Problem Solving.** The skill to see relationships between industries and craft creative solutions to problems that are yet to appear is a must to keep up with AI machines.

2) **Critical Thinking.** People who can turn data into insightful interpretations will be sought after due to the complexity and interconnectedness of various fields like computer science, engineering, and biology.

3) **Creativity.** The quality of randomness and the ability to build something out of ideas is a skill that will pay off now and in the future.

4) **People Management.** Robots may acquire analytical and mathematical skill, but they can't replace humans in leadership and managerial roles that require people skills.

5) **Coordinating with Others.** Effective communication and team collaboration skills will be a top demand among job candidates in any industry.

6) **Emotional Intelligence.** Qualities that relate to emotional intelligence such as empathy and curiosity will be a

big consideration factor for hiring managers of the future.

7) **Judgment and Decision-Making.** The ability to condense vast amounts of data, with the help of data analytics, into insightful interpretations and measured decisions is a skill that will be useful in the information age.

8) **Service Orientation.** People who know the importance of offering value to clients in the form of services and assistance will be in demand as businesses would want to provide solutions to the problems of society.

9) **Negotiation.** The ability to negotiate with businesses and individuals to come up with a win-win situation is a skill that will be needed to survive in affected industries.

10) **Cognitive Flexibility.** The ability to switch between different personas to accommodate the challenge at hand will be successful in combined industries [6].

“Soft skills” term becomes a relevant subject of research in the field of modern education. What requirements a successful specialist should meet? How can we be productive in our professional life? What is more important for creative way of thinking – imagination or knowledge? These questions are very important nowadays because life challenges successful professional every day. These challenges more important for technical employees. It’s because they were educated as narrowly focused specialists not created for the development of personal qualities and broad skills.

The training of a successful specialist today includes the combination and interaction of two types of skills: “hard skills” and “soft skills”.

“Hard skills” – core competence.

“Soft skills” – cognitive skills and behavioral attributes.

According to new, compliant to Bologna process, educational standards in Russia (FSES) “soft skills” consist of cross-functional skills which reflect employee’s social and personal level of mastery of professional activity to build a successful career. In fact, cross-functional skills help working men and women to improve their educational level and come to grips with their professional competencies (“hard skills”).

Nowadays we have a huge amount of new practice-oriented professions. Job market changed. Knowledge is not enough. If you want to be successful, you should be drivenness, creative, mobile and people person. You should not be single-functioned worker. You should do all. Workers should be able to analyze, define strategies and effectively communicate. The ability to adapt is more important than core competence. It makes them adapted to fast moving and frighten “soft” information-oriented World [7].

Job-related experience and personal qualities become more important. This approach forms competence-based paradigm in Russian system of higher education. Actually,

skills represent abilities to effective activity in socially significant situations.

It is important to keep in remember that these skills form by **socio-humanitarian field only**. Learning humanitarian subjects aimed to develop creative way of thinking, to form cognitive skills and communication ways. Cognitive skills are complicated part of personality development. It consists of different ways of information processing. Such as encoding, data handling and so on.

Also, worth noting is self-control which means motivation and goal-setting. At the last but not the least, is intellectual reflection. It means an assessment person's intellectual abilities and preferences, intellectual adaptation to reality; the individual’s potential for selecting, processing, combining information productively and making adequate or unconventional decisions. Cognitive perception mediates the intellectual activity of the individual and determines his creative activity in a developed and productive state only [8].

The purpose of this research is finding the level of fashioning of technical university junior students' soft skills in the process of their studying humanitarian subjects. Faculty members should explore what kind of skills their students have got in school before they start to form them soft skills. Experience has proven that, prospective technical university students want to get and improve their “hard skills” and professional knowledge. They use to think that humanitarian subjects are additional and optional. Only these subjects can form "soft skills"!

Following matrix describes how junior students' soft skills form when they study humanitarian subjects in our university. These skills labeled as “soft skills” in curriculum documents for the moment. Let us try to identify their compliance with what we call flexible skills, which we define as “the expected competence of soft skills”. There are many of soft skills' classifications in scientific literature nowadays. We used classification provided by Musaeva L.I. and Zainullina S.F. as a basis [9].

For the sake of simplicity, we divided these skills for 4 main directions:

- 1) Basic communication skills are the key to interpersonal relationships, personal interaction, and effective emergency behavior and so on.
- 2) Self-management is a key to self-control, time-management and so on.
- 3) Effective thinking skills are the key to process-management that makes life and work more systemacity.
- 4) Managerial skills are what Business Area Directors and entrepreneurs need.

TABLE I. SKILL-SET MATRIX

Discipline	Soft skills pursuant to Federal State Educational Institution of Higher Education	Skill-set
History	<ul style="list-style-type: none"> ability to analyze the main stages and patterns of the historical development of society for the formation of citizenship; team commitment, tolerant attitude to social, ethnic, faith-based and cultural differences; governance and self-study 	Effective thinking skills: system-based, structural, logical thinking, analysis and comparison of events and processes, historical forecasting and arguing.
Philosophy	<ul style="list-style-type: none"> ability to use the basics of philosophical knowledge for the formation of worldview; team commitment, tolerant attitude to social, ethnic, faith-based and cultural differences; governance and self-study 	Effective thinking skills: System-based thinking, creativity, philosophical methodology of the analysis of social phenomena, scholarly and practical endeavor, ability to argue view, self-awareness and self-knowledge skills.
Ethics in business communication	<ul style="list-style-type: none"> ability to use the basics of philosophical knowledge for the formation of worldview; team commitment, tolerant attitude to social, ethnic, faith-based and cultural differences; governance and self-study 	Basic communication skills: building and keeping business relationships, negotiating, making presentations, self-presentation, public presentations, teamwork, client-focusedness.
Theoretical basics of information-oriented society	<ul style="list-style-type: none"> ability to use the basics of philosophical knowledge for the formation of worldview 	Effective thinking skills: system-based analysis of contemporary society its structure and development pattern, thinking outside the box living in information-oriented society using acquired knowledge in professional activities.
Social and ethical problems of information technologies	<ul style="list-style-type: none"> ability to use the basics of philosophical knowledge for the formation of worldview; team commitment, tolerant attitude to social, 	Effective thinking skills: system-based analysis of contemporary society its structure and development pattern, thinking outside the box living in information-oriented society using acquired

	ethnic, faith-based and cultural differences; governance and self-study	knowledge in professional activities. Self-management: Self-development management, planning and goal-setting, reflection, feedback.
Psychology	<ul style="list-style-type: none"> ability to use the basics of philosophical knowledge for the formation of worldview; team commitment, tolerant attitude to social, ethnic, faith-based and cultural differences; governance and self-study 	Self-management: modulation of emotions, stress management. Management skills: time-management, motivation and program control, situational management and leadership, conduct of a meeting.
Russian language and Culture of speech	<ul style="list-style-type: none"> ability to communicate in oral and written forms in Russian and foreign languages for solving problems of interpersonal and intercultural interaction 	Self-management: communication skills, analytical thinking development, systematization and accumulation of knowledge, producing texts of different styles and genres, highlighting the linguistic features of texts of different styles, proficiency in linguistic, communicative, ethical norms

Some problems we have with intelligence as phenomenon. The problem of intelligence lies in the field of a whole complex of social, humanitarian and technical sciences (philosophy, psychology, cognitive sciences, neurosciences, artificial intelligence sciences). However, despite such a variety of scientific approaches to the study of intelligence, there is no single concept of intelligence. In psychology, intellect is considered to be a set of personal thinking abilities which opposes sensual and intuitive cognition. The development of technical sciences has filled the concept of "intelligence" with a qualitatively new content. Intelligence is now considered as the ability of the information system to learn and process information. In other words, intelligence has been understood as a "collective intelligence", a special "digital subject" in a particular information system, capable of purposeful information collection and of self-learning.

From the philosophical point of view, intelligence is understood, first of all, as an individual cognitive activity, the activity of his/her thinking. Therefore, the study of intelligence inevitably refers us to the problem of consciousness.

Attempts to understand and explain the nature of human thinking were made by ancient Greeks. The concepts of Plato and Aristotle are widely known. R. Descartes formulated the problem of psychophysical dualism, in which consciousness was a thinking substance that determines the existence of man, on an equal basis with the bodily substance. Since the XIX century, the problem of the study of consciousness changed

for the sphere of psychological science. Behaviorism acquired a dominant role in this area of research. It negated consciousness as an independent phenomenon giving it the role of a behavioral response to the observed environmental stimuli.

The study of memory phenomenon, the characteristics of the cognitive procedures of encoding and decoding information and speech led American researchers busy with cognitive science in the 1950-ies of XX century to the development of computational models of consciousness. It turned out that human consciousness is not just a reflection of the objective reality and the brain work is only a part of what we call consciousness. Consciousness is the result of human interaction with the outside world, which carries the imprints and memory not only of individual mental processes and acts of behavior but also of various cultural matrices. Cultural anthropology played an important role in identifying this in the United States in the second half of the twentieth century.

As a result of the interaction of psychology, cultural anthropology, linguistics, neuroscience, there is a fairly broad interdisciplinary field of research – cognitive sciences. Of course, this area of research was not theoretical, but rather a systematic empirical, experimental research, specific computational models of consciousness and intelligence. The central hypothesis of cognitive science is that consciousness is best understood as a set of representative structures or mental acts. Most of the works devoted to cognitive science suggest that consciousness is a set of mental representations, like similar structures of computer data.

Cognitive theorists believe that consciousness contains mental representations such as logical judgments, rules, concepts, images, and analogies. Consciousness uses computational procedures such as deduction, induction, matching, analysis, which the computer uses to find, encode, and display information. In a narrow sense, the activity of consciousness was reduced to the activity of the brain. It was also revealed that cognitive sciences were trying to present human consciousness, by analogy with computational models in the framework of the bionic approach. Deep Mind project from IBM can serve as an example of this model.

Thus, from the standpoint of cognitive science consciousness, similar to intelligence, can be considered as a complex cognitive computational model — an informational system that creates and constructs informational space (informational environment) on the mental principle. We will distinguish these concepts.

Global communication, building up the informational society is accompanied by the creation of global and local informational systems. Space and time are ways of structuring them. Therefore, today the concept of information space is associated with new informational technologies, with the processes of informatization in the society. What is the "informational space"? Before defining this concept, we shall define "informational systems". According to the foreign researcher D. Bourgeois, informational systems should be

understood as "computer systems and software that are used to collect, store, process, generate and distribute data" (Bourgeois). In the education system, for example, the information system can act as a studying system that allows you to manage the content and the learning process.

In a global informational (network) environment, informational space is a form of matter existence, and matter is understood as information (data). Information systems are way to structure information; they are the location of the informational space. In this sense, the informational space should be understood as the space of information transmission and interaction of information elements in informational systems of various types.

Informational space is necessary for accumulation, preservation and transfer of information. Among the qualitative characteristics of the informational space there are:

- 1) Length— the distance at which informational objects are available to the consumer of information;
- 2) Volume – the number of information resources included in the informational space of a particular length;
- 3) Density – saturation of an information space with information resources in relation to the creators of information or consumers.

Thus, the informational space includes:

- a set of banks and databases;
- technologies of their maintenance and use;
- informational telecommunication systems functioning and interacting in a certain duration (digital time).

An example of an informational space can be an information environment with structured data, in which digital data acts as physical components of an information space, for example, an educational environment.

The problem of existence and functioning of digital intelligence is particularly indicative if illustrated with the global educational environment. Let us consider the problem of interaction between digital intelligence and the educational environment looking at such a technology as distance learning.

A few years ago, many teachers of higher education expressed doubts about the success of the introduction of distance education and its use in the educational process. The main argument of such skepticism, especially among teachers of humanitarian education, was that distance education, in their opinion, distorted and even destroyed the real process of education. There were concerns that this was the destruction of the classical academic education system.

Skeptics also pointed to the technical difficulties of the introduction of this element in the educational process, the preparation of training programs, large time costs for maintenance. Today, however, we can safely say that distance education is a mandatory element of any higher education institution. On the one hand, the active introduction of distance

education is connected with the development of the technological environment of human existence, and on the other – with a high degree of educational processes' integration in all the world countries in connection with globalization and informatization.

In the information space, the intellect itself acts as a special collective system, a "digital subject", which includes a set of interacting information systems. Moreover, it becomes an indicator of the computer technology development, the content of which is made up by media resources, which are characterized by convergence, digitalization, interactivity. After all, the information space itself is a means of ordering the objects of the informational environment, which is determined by the sets of information resources, technologies, means of their support and transformation.

Monitoring allows revealing soft skills only. It is necessary to create and develop online platform made as online-simulator for studying to train young professional successfully. Students get modelling real practical situations in process of training, such as virtual company management. They make decisions and provide progress report for work. Faculty members rate basic managemental, communicative, system skills of their students that we call "soft skills". This platform lets them go deep into the subject, estimate such soft skills as ability to get on well with people, leadership, operational thinking, ability to analyze huge amount of information quickly and be really into the task for so long, and stay stress-resistant. In the end students, get individual recommendations how to develop their personal and social skills ('soft skills').

New educational methods oriented to growth of intellectual potential of students. It helps to form self-studying skills, consolidate abilities to gather, deliver, hold, systematize, combine and use information for purposes of this situation. This platform's output can be useful for not only students but also government authorities, and Russian academical management. They can use it to create activities for the support and development of student initiatives. Business representatives can use this information to find talented university graduates and employ them.

A significant problem of such distance education from the philosophical and anthropological point of view is the threat of direct communication between the teacher and the student being substituted with virtual relationships. In this case, the problem acquires a broad humanitarian component, since it points to the specifics of human – technology interrelation. So, even the German philosopher of the twentieth century, K. Jaspers, expressed the idea that mastery of technology changes the person in the era of technical development.

III. CONCLUSION

The education system must be predictive nowadays. It should show innovative way of economic progress and moral bearings, path and development prospects of digital economics, find a ways and possibilities to personal fulfilment in new social and cultural reality. University graduates will live in completely different continuum, social and digital space. We need to prepare them to this [10].

"Soft skills" will be more fast-growing than "hard skills" soon. Machines will solve technical tasks. People will solve creative tasks. Summing up what's been said, the formula of the modern world sounds like this: **The Soft World – Flexible manufacturing – Flexible control system – Flexitime – Competitive power – Flexible education**. That's why soft skills make specialists sure that they will be in demand and competitive in information-oriented society.

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