

# Role of personal qualities for efficiency of education and employment of specialists in the IT sphere

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**Abstract**—The problem of an insufficient number of IT specialists in Russia is planned to be solved, first of all, by increasing the number of the students enrolled and also by improving information competence of the whole population from students to elderly people. Ways of realization of this strategy are stated in the “Digital Economy of Russia” programme in the section “Human Resources and Education”. During the research conducted it was found that nowadays only a third of graduates of higher educational institutions specialized in IT actually work in the IT industry. Remaining graduates are either forced to train for a new profession or to work in other industries. The reason for that is the discrepancy of individual and personal qualities of the students studying information technologies and requirements of specific professions (due to peculiarities of activity) and employers. Results of the held psychological testing showed that the most part of students gets the education not corresponding to their personal potential. In these conditions it is impossible to create a high quality personal trajectory of their development. For obtaining significant effect from implementation of the “Human Resources and Education” programme it is necessary to introduce obligatory psychological testing of personal qualities of high school students and entrants. It is recommended to enroll entrants in the concrete directions of education taking into account these personal qualities.

**Keywords**—personal qualities, specialists in the IT sphere, Digital Economy of Russia, programme “Human Resources and Education”.

## I. INTRODUCTION

With emergence and development of digital economy the sphere of information technologies is getting an increasingly significant role in modern society. At first it was computerization, and now it is digitalization which promptly extends its influence on the most different areas of life [1-4]. Therefore the professions connected with information and digital technologies remain among the most important and highly paid not only in Russia, but also in other developed countries of the world. According to the forecast of Alexey Kozyrev, the Deputy Minister of Communications and Mass Media, for TAdviser SummIT, by 2024 Russian demand for IT specialists will have become 10 times more than the number of IT graduates of higher educational institutions in 2017. Consequently in 2018 the Digital Economy of Russia programme was supplemented with “Human Resources and Education” direction. Within this direction it is planned to increase number of the students enrolled at universities in the sphere of IT from 60 thousand students in 2019 up to

120 thousand students in 2024. This way the Russian Federation intends to make up for staff shortage of the qualified specialists capable of working in the digital economy conditions.

On the other hand, not all graduates of higher educational institutions who got an education in the sphere of Information Technologies, Internet, Telecom work in the relevant sphere. And it happens against the lack of the IT sphere specialists! According to surveys conducted by the Russian company HeadHunter in 2017, only 33% of graduates of the educational institutions studying Information Technologies, the Internet and Telecom work according to the specialty got. They are on the ninth place in rating of graduates who work in the sphere corresponding to their education (the first place in this rating belong to lawyers, 81% of students who have studies law work in this sphere). 34% of graduates of IT higher education institutions have found a job in adjacent specialty, another 30% work absolutely in other sphere, and 3% found it difficult to give the exact answer [5]. This statistics reflects the insufficient level of career guidance of entrants. At the time of enrollment many school students have no idea about specifics of professional activity of different specializations in the IT sphere, about necessary professional competencies and personal qualities. As a result, the education which is not corresponding to individual and personal opportunities of students does not give them the chance to fully realize their personal potential.

Under the conditions of digital economy the modern graduate–specialist to be effective shall not only possess sufficient knowledge of information technologies and be aware of the main models of their application. They shall acquire necessary competencies of the 21<sup>st</sup> century, including critical and creative thinking, initiative behaviour and responsibility, adaptability, innovative and, enterprising thinking, emotional intelligence [6-8]. All set of competencies can be conditionally grouped in 3 blocks. Digital competencies concern advanced and effective use of information and communication technologies for work, rest and communication. Initiative and enterprising competencies are abilities to turn the ideas into actions through creativity, innovations and risk assessment and also abilities to plan and manage projects. Social competencies [9] or Soft skills are abilities to build cross-cultural network communications (social and professional), to study and promote self-improvement, etc. [10].

Tasks of the “Human Resources and Education” direction in the “Digital Economy of Russia” national programme comprise ensuring all-round development of the person in the new digital environment, identification of talents and providing people with personal paths of development within educational institutions and beyond them. For this purpose it is essential to strengthen work on psychological diagnostics of youth. Timely identification of individual and personal features of the person will help to define the sphere of future vocational training which is most suitable for the person more precisely. It will allow graduates to realize completely their professional and personal potential after employment in the sphere of IT technologies. The effect of the maximum payback of the means invested into education of specialists in digital economy will be reached countrywide.

## II. OBJECTIVE AND METHODS

Objective of this research is identification of psychological features of young people aged 18-19, which are necessary for employment and building up the career in the IT industry. During the research the following tasks were set and solved: 1) an aggregate of the social and personal competencies and psychological qualities required for various professions in the sphere of information technologies was defined; 2) there were revealed psychological qualities of young people at the age of 18-19 years which conform to requirements imposed on specialists in IT industry; 3) there were specified spheres of possible employment of the students who study informatics, programming languages, BIM, basics of design and express interest in IT industry. For the solution of tasks set the author used methods of the critical analysis of scientific sources and information from the available websites on employment, psychological testing, methods of intellectual search.

The list of competencies was made on the basis of analysis of the websites on job search. They provide with open information about requirements of employers on the IT industry specialists. Also, there is a number of researches which mark out necessary skills and abilities which are to define competence of the specialist in the industry of information technologies [11-12].

For assessment of individual and personal qualities of students there was used the test of the personality “16 personalities” [13] which is based on the theory by Myers-Briggs. This technique was not chosen accidentally. It most fully reflects the features and other professionally significant qualities which we pointed out. This method has a rich world history of application in professional orientation testing. Annually more than 2 million people fill out the questionnaire of Myers-Briggs Type Indicator. In the USA up to 70% of graduates of high schools undergo typing the personality using MBTI to choose their future profession. MBTI is also widely applied in business, in particular, in a number of the large western companies. Main applied functions of the Myers-Briggs Type Indicator include:

- self-knowledge and personal growth;
- career development and career guidance;
- education and drawing up curriculum.

## III. RESULTS

At the first stage requirements imposed on personal qualities of the IT sphere specialists were analyzed. The analysis of results of the assessment of employees in the IT companies revealed the psychological features of IT specialists distinguishing them from specialists in other functional spheres. The IT specialists

- have analytical thinking, good memory and ability to work with a large amount of information;
- are more independent, self dependent, aim high and try to reach their goals without fail;
- are self-sufficient: freedom in decision-making is necessary for them;
- are sure that they differ from specialists of other departments;
- have high level of responsibility, loyalty and tolerance;
- are inclined to intellectual work and work with abstract problems;
- have low communication skills, low empathy and aspiration to leadership;
- try to plan everything in advance;
- prefer predictability to changes

However, increase in a range of the professions arising in the IT industry expands a circle of requirements imposed on specialists in this sphere [14]. Along with the classical list of IT professions (a programmer, a system administrator, a specialist in technical support of the software and hardware, etc.), the digital economy generates a set of the professions aimed at ensuring interaction of information technologies with people. Therefore, social and psychological competencies and communicative skills of specialists are becoming more and more demanded [15].

According to the results of the analysis of vacancies on the websites SuperJob and LinkedIn, TOP-20 of the most often mentioned and demanded qualities include responsibility, communicability, mobility, attentiveness, independence, ability to work in team, resistance to stress, creativity, working capacity, carefulness, openness, sense of duty, initiative approach, punctuality, commitment, motivation, organization, ambition, vigor, pro-active attitude.

At the second stage of research we studied individual and personal qualities of students.

149 students of 1 course specializing in the Informatics and Computer Facilities and Information Systems and Technologies participated in the poll. According to the results of testing, students were divided in 4 groups differing in traits of character, communication, behavior at a workplace and also work approach in principle.

Nearly a half of students (69 people – 46%) belong to the group “*diplomats*”. They constantly show creativity and curiosity, dedication and enthusiasm in work. What is more, they have developed skills of communication with people due to their ability to empathize and understand human

emotions. Their weaknesses are that in stressful situations they show the increased emotionality and their ideas often are impractical, also they quickly lose interest in aimless and monotonous work.

The group of “analysts” is made by 21% of all the respondents. They have the following features: fast strategic mind, well developed abstract thinking, openness to the new ideas and also efficiency, high self-confidence at a workplace. Weaknesses are arrogance and distrustfulness, intolerance to the rules and recommendations limiting their creative freedom. In the course of work they can become cool and unemotional in relation to other people.

The group of “sentinels” (19% of students) demonstrates the developed call of duty. Their patience, diligence, the need for maintenance of a constant order at a workplace make them responsible specialists and performers. Their weaknesses are the shortage of flexibility in unknown situations, difficulties with division of “personal” and “work” situations, tendency to be overloaded with work, problems with expression of emotions.

The group of “explorers” included only 14% of students. Their main features are the susceptibility and watchfulness, well developed imagination, practicality of the generated ideas. They boast constant optimism. It makes them irreplaceable during crisis situations in work. On the other hand, they possess “spirit of rivalry” and obstinacy. These qualities can serve as catalysts of conflict situations. Fast loss of interest in routine work and tendency to adoption of risky decisions can become obstacles to successful performance of production tasks.

At the third research stage we compared requirements of employers on the IT industry specialists and individual and personal features of each group of students. The received results are presented in Table 1.

TABLE I. RESULTS OF COMPARISON OF PROFESSIONS OF THE IT INDUSTRY, REQUIREMENTS OF EMPLOYERS AND TYPES OF THE PERSONALITY.

Professions	Requirements of employers	Type of the personality	Subtype
system engineer network administrator IC programmer HTML designer PHP programmer DB developer	assiduity, sense of duty, watchfulness, carefulness,, compliance with an established order; creativity and leader abilities are not required	sentinels	(all subtypes)
programmer specializing in Python, C++ Java, IOS, Android,.. Web-programmer SEO-specialist Web-analyst information security specialist	analytical and strategic thinking, ability to see overall picture of the situation, managerial skills, lack of fear of the new ideas	analysts	(all subtypes)

screenwriter of computer games Flash-animator 3D-generalist product designer Web-designer FrontEnd-developer 3D- animator	creative approach to daily work, ability to cooperate and work in a team, big degree of creative freedom, relative independence in decision-making and a way of performing activities	diplomats	campaigner mediator
link-manager; sales specialist		explorers	adventurer virtuoso
			entrepreneur entertainer
head of department mentor		diplomats	protagonist advocate

#### IV. DISCUSSION AND CONCLUSION

Main types of professional activity to which training of bachelors in the Information Science and Computer Facilities and Information Systems and Technologies directions at Moscow State University of Civil Engineering are oriented are automated design of buildings and constructions, automation of management systems [16]. “Classical” traits of IT specialists are the most demanded for these specializations. These qualities include assiduity, sense of duty, watchfulness, carefulness, compliance with an established order. “Sentinels” and “analysts” demonstrate these qualities in the greatest measure. However, only 20% and 14% of students respectively make up these groups. Thus, in general, the received results confirm statistics received by the HeadHunter company: personal qualities of 34% of students correspond to the specialty being studied. Hence, it is possible to assume that their further professional activity will follow the direction of preparation. The biggest group – “diplomats” has other qualities connected rather with creative professions and execution of administrative functions. These are creativity, curiosity, the developed leadership and communicative skills. Domination among the polled students of “diplomat” type of the personality brings these students in risk group. For successful employment they will be forced to get additional education or to search for work in other industries.

This fact shows relevance of conducting testing of professionally significant personal qualities in high school or before enrollment in higher educational institutions. Having an idea of their individual personal potential, entrants can orient better in variety of professions in the IT industry and enter such university, choose such direction of preparation which will reveal their talent to the fullest and will correspond to an individual trajectory of the job promotion in this sphere. “Diplomats” and “explorers” can find work in similar professions: Web designer, Flash-animator, FrontEnd-developer; “sentinels” will be most successful as DB developers and network administrators, IC programmers; “analysts” – as the CEO of the IT company, the Web analyst, the information security specialist.

It is necessary to continue work on differentiation of the professional and psychological qualities necessary for different specialists in the IT industry, especially for currently appearing professions and types of activity. This knowledge should be reflected in professional standards [17] and become the basis for professional competencies which will be mastered during the educational process. This work is to define the list of the subjects and educational

technologies [18-20] which are the major contributors to mastering the necessary competencies. Only in this way it is possible to build personal trajectories of student development taking into account their interests, abilities and tendencies and to train specialists in new professions which are predicted to be in mass demand in the next 15 years.

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