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Requirements for personal and professional skills of aviation industry software engineers in the context of professional mobility formation

Requirements for personal and professional skills of aviation industry software engineers in the context of professional mobility formation are considered in the article. A list of required and desirable software engineer's soft skills was made. A list of software engineer positions for which professional mobility is a means of professional activity was defined.

Computerized air traffic control systems have been used for a long time to improve the efficiency and safety of flights, facilitate the work of pilots and aviation personnel, requiring more and more skilled software engineers for aviation industry.

Artificial intelligence is not inferior to the intelligence of the trained person, although the computer, in spite of some shortcomings, has certain advantages over the pilots. For example, it can calculate more event scenarios and choose the best, simulate direction and other necessary parameters for a safe flight. The autopilot cannot be inexperienced or tired. Technologies are constantly being developed. For example, using sensors installed throughout the aircraft, the computer will notice problems quickly and make the right decision. Unfortunately, most of the disasters are due to the slow response of pilots in critical situations. Automatic control systems can help, leaving only one pilot in the cabin to supervise the systems.

To withstand the challenges of modern technological world developers of computerized air traffic control systems have to possess some personal and professional qualities. Software engineering is a branch of science that involves modeling, developing and maintaining software. These processes are the subject of software engineers' professional work. The systematic development and application of techniques, tools and technologies that lead to the creation of reliable software requires understanding design principles and operation of hardware, software and communications.

The integration of a person in the society and professional environment is determined by professional mobility. Insufficient level of readiness for professional mobility reduces business activity, causes lack of self-confidence and impedes professional realization. Professional mobility is an integral part of professional competence and the main personal quality of a successful specialist.

The problem of professional mobility is vital for specialists the field of information and computer technologies. A significant number of people are employed in this area, and the need for specialists in this industry is constantly increasing. High requirements for professional and personal qualities of applicants for vacancies, the need to solve complex problems, constantly master new methods and technologies of software development cause high competition on the information technology market

and the peculiarity of training the specified specialists.

Using the typology of professions developed by Ye. Klimov [3], the activity of a software engineer (a programmer) can refer to such categories as "man - technology", "man - sign system" and "man - man."

Specialists of the "man - technology" category create material things and objects necessary for human environment. They study the nature and the human body, technical and information area; use the acquired knowledge for designing and creating new objects. They should meet different requirements. It is necessary to know the equipment and devices, their operation and application, to find the causes of problems, understand drawings and diagrams which require good memory, logical thinking, spatial representation and the ability to make the best decision in a short period of time. Such specialists have an engineering type of thinking, which is a synthesis of abstract and logical ones. Independence, responsibility, emotional balance, accuracy are the integral qualities of professional activity [3].

Creating and processing texts, documents, charts, formulas, lists and catalogs are tasks that characterize the activity of specialists representing the "man - sign system" category. They deal with conventional symbols and artificial language systems [3]. Programmers write software in one of the programming languages, using such symbols as variables, functions, and procedures. Professionals of this category are constantly engaged in the cognitive activity, learning new technologies by reading huge amounts of technical documentation. Resourcefulness, creativity, professional and intellectual mobility are needed for the specialists of this profession, related to constant solution of specific problems. Sustainability, accuracy, emotional stability, ability to control the course and correctness of mental activity are also important qualities for the category "person - sign system".

Managing groups of people is the main task of specialists who represent the “man – man” category. They are able to listen, understand and sympathize with others, clearly express their thoughts. Observancy and sufficient life experience allow them to evaluate the person's mind, feelings and behavior in a particular situation. A large number of specific tasks require broad and creative mind, the ability to predict consequences of their actions. Benevolence and consideration for people, self-possession and the ability to act in accordance with moral and ethical standards are integral qualities of such specialists [3]. In software engineering, such activity is performed by a project manager and a team leader. They manage teams of specialists involved in software development. Analysts, consultants and system managers are also team workers dealing with people. Knowledge of English, the ability to listen carefully and understand the customer, simply and clearly formulate their thoughts on the project, designed for customers with different technical background are important qualities of software engineers of the category.

Therefore, we can note that professional activity of a software engineer is diverse and depending on the position (a programmer, a developer, a team leader, a consultant, a system analyst, an administrator or a project manager) refers to the defined by Ye. Klimov [3] typologies: "man - technology", "man - sign system" and "man - man".

A future software engineer should quickly adapt to rapid changes in his industry, be engaged in continuous self-education and self-improvement, that is, be ready to

professional mobility. The activity of such a specialist involves writing software for various subject areas that need to be quickly mastered. Knowledge of English is necessary for working in a competitive environment with a large number of business trips, foreign customers and colleagues, writing and studying business documentation. Developing modern software needs teams of professionals, so a software engineer must be a team player, know the basics of psychology and group dynamics, have good business and professional communication skills [1].

Professional activity in software engineering is impossible without professional mobility which is an integral part of professional competence. Readiness for professional mobility enables future software engineers to increase their competitiveness, namely:

- find or change the company and position;
- adapt to new working conditions;
- study new documentation, methodologies and technologies;
- be a good team player and interact with participants of the development process, such as: customers, colleagues, partners, managers, etc.;
- share experience, take part in conferences, make presentations, visit lectures and master classes, write articles, etc.;
- do research work.

Knowledge and skills that a specialist should possess in order to perform his duties are professional qualities that combine theoretical foundations and practical experience. Based on the research of some experts, these are [1]:

- deep knowledge of programming languages;
- skills needed to create algorithms;
- knowledge of operating systems and software architecture;
- software coding and testing;
- software debugging;
- knowledge of software development process methodologies;
- knowledge of English;
- skills needed to create technical documentation, etc.

D. Shchedrolosiev [5] describes positions in a software company as follows: a trainee, a developer, a lead developer, a manager (a team leader), a customer engineer (implementation, maintenance), an architect, an analyst and a project manager.

Based on O. Hurska, the most expected personal qualities that modern IT specialists should possess include emotional stability, punctuality, accuracy, high performance, marginal attention, logical, analytical and creative thinking, ability to react and adapt quickly, readiness for making decisions [2, p. 56].

Knowledge of mathematics, computer science, analytical thinking, good memory and the ability to work with a large amount of information should be combined with responsibility, self-discipline, stress resistance, ability to self-education. An IT specialist is no longer a silent man sitting at the computer like 10 years ago, but a sociable person who is ready for a team work and interactive dialogue with customers. He can't do without good professional knowledge and skills, constant self-improvement. Knowledge of English will help find a promising job in a well-known company. It is important not only to have proper personal qualities, but also to write a good resume and present yourself during the job interview, demonstrate one's

strengths and abilities.

The analysis of the requirements for the professional and personal qualities of all positions that a software engineer can hold and the rapid development of information technology show that such personal quality as professional mobility, that is, the ability to adapt to the new conditions of professional activity, respond quickly to problematic professional situations, readiness for constant self-education and self-improvement, using new methods and technologies of developing and implementing software are required for successful professional activities. A software engineer deals with customers representing various areas such as business, finance, manufacturing, entertainment, education, etc., so he must be a well-educated and versatile person that can quickly master the basics of software application domain. He must have good communicative and organizational skills, be a team player, a non-conflict personality responsible to perform his official and professional duties, have a physical working capacity [4, p. 164]. Being a manager (a team leader, a project manager, a system analyst, etc.), the specialist must know different aspects of professional activity, be able to motivate and organize employees, offer creative approaches to solving problems.

The defined professional and personal qualities of software engineers enable us to assert that professional mobility, readiness for continuous self-improvement and self-education, mastering new methods and technologies of software development, professional communication skills, ability to work with people and a team are mandatory characteristics of a software engineer. Such conclusion was made based on the fact that the interest in traditional development methods gradually disappears, but specialists who constantly master new technologies, respond positively to changes and adapt quickly are constantly in need.

Therefore, professional development of a software engineer is impossible without such an integrative personal quality as professional mobility, which in our opinion is a willingness and ability to adapt to constantly changing conditions of professional activity, the ability to switch between different methods of software development and implementation, readiness to perform various professional duties, constant self-education and self-improvement. Training at a higher educational institution should be oriented towards the formation of readiness for professional mobility as the main component of professional competence and a key personal quality for successful professional activity.

Conducted research allowed us to come to the following conclusion: the peculiarity of software engineering activity confirms the relevance of studying readiness for professional mobility; training at a higher education institution is the basis for high level formation of such interrelated qualities as professional competence and professional mobility. The problem of defining the content, organizational and pedagogical conditions, technologies and the means of forming readiness for professional mobility of future software engineers requires further research, and on this basis - giving recommendations for implementing the given content in regulatory documents, teaching and methodological provision of the educational process.

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