Influence of the Labor Market upon the Forming of Competence of Future IT Specialists

Dmitriy E. Shchedrolosev

Kherson State University, 40 r. Zhovtnya 27, Kherson, Ukraine
dim@ksu.ks.ua

Abstract. The article deals with the professional competence in the structure of the personality of the future software engineer from the point of view of providing a successful career growth.

Keywords: software engineer, career, professional competence.

1 Introduction

Under conditions of rapidly changing technologies, the system of education is required to prepare a large number of IT professionals who possess a certain level of professional competence and personal qualities. Honorary Professor of Griffts University Ian Laue said that university education can no longer provide students with knowledge and skills they need in their professional career because most of these skills are simply not there [7: 67].

Since the state of national information resources and means to activate them identify potential successful development of the state, ensuring its national interests, special significance is attached to training highly qualified specialists in IT technologies that can provide the necessary IT-level of the modern society.

In modern society that is tied with IT, the system of education is required to prepare a large number of corresponding competent professionals. Training in information and communication technology must be flexible enough since professional skills that may be demanded by employers, quickly change over the years that a young person spends in training [7].

Important is the fact that modern programming is collective and individual programmer persons are closely related to their usefulness for the whole team, and therefore require individual skills of teamwork, leadership skills, some knowledge in the field of psychology and management. In our opinion, the feature of a successful IT professional is not a fixed set of knowledge and skills in a particular industry, but the formation of the competences that provide career growth. Building a learning process based on the competence approach is the most effective way for providing specialist training to meet the modern demands of society.

The aim of the article is to define factors that influence upon the formation of the IT specialist's competences and determine possibilities of their forming in the educational system of a university.

2 Analysis of the Latest Researches and Publications

Analysis of specific tasks in a matter of programming and professional skills of programmers at different times were made by psychologists and educators F. Brooks, D. Weinberg, N. Wirth, L. Grishko, A. Dijkstra, S. McConnell, M. Smulson, B. Shneyderman and others.

The question of competence as such was studied by N. Bibik, B. Elkonin, J. Kolomynsky, I. Lerner, A. Markov, P. Myasoid, N. Nechaev, A. Nikiforov, L. Petukhova, J. Raven, I. Rodyhina, M. Skatkin, G. Selevko, L. Khoruzhaya, A. Hutorskiy and others.

The author's experience as a teacher and head of IT department along with the expressed problems of training of future software engineers determined the need for the research, the purpose of which was to define the structure of the professional competence of IT professionals, and write this article.

3 Outline of the Main Research

The problem of competence approach to the preparation of future software engineers makes a clear understanding of not only substance but also the structure and features of professional competence in the field of ICT.

According to the definition in the explanatory dictionary of Russian language, competence is knowledge, credibility, competence is a range of issues, events in which the person has a high authority, knowledge, experience, and range of permissions [12]. Dictionaries give the following definitions of the term "competence": 1) knowledge, credibility; 2) a range of issues, events in which the person has a high authority, knowledge, experience, and permissions [12].

Under the authority we mean the ability and perceived willingness of individuals to implement a system of acquired knowledge, skills and desire to solve actual problems in specific circumstances with certain possibly foreseen consequences and responsibility for their actions. In our view, this definition describes the most successful IT professional competence [6]. L. Petukhova's structure offers personal competence in which the main principle is to separate fundamental entities and entities based on the abilities and personal deposit and the need for appropriate educational environment as a complex of factors, which requires adequate and timely response in the relevant areas and considers major components of competency - its expertise (knowledge, skills, abilities), goals (needs, values, motives, trains, ideals, etc.), quality (the ability to manifest synergy, adaptation, scaling and interpretation, self-development, integration and transfer of knowledge from one industry to another, etc.) [6:60-64].

Considering the professional programmer, scientists (E. Dijkstra [3] M. Smulson [9] B. Shneyderman [13]) distinguish the qualities that are inherent to programmers who are directly associated with the creation of software and human and psychological traits that should be inherent to the programmer.

Analysis of the history of technology and programming languages shows changes in requirements for knowledge, skills, thinking style and professional qualities of the

programmer. The feature of new knowledge in programming is that they are built on new technology, high level of abstraction, sometimes on a synthesis of old knowledge, unlike in medicine, physics, and law, where new knowledge is deepening and refining of the old one.

Under the conditions of rapidly changing technologies, the education is required to prepare a large number of IT professionals who possess a certain level of professional competence and personal qualities. However, training in information and communication technology must be flexible because professional skills that may be demanded by employers quickly change over the years that a young person spends in training [8].

In our opinion, the main factor that determines the success of any project lies in people, programmers in our case. The impact on people in organizations is determined by two main factors: the hierarchical structure of the organization and corporate culture of the organization produced by common values, social norms, and behavior settings that regulate social norms. For a programmer understanding himself as part of the team is vital, which is particularly important in the process of working at a huge project when the development team includes specialists from various fields in order to fully consider all the system capabilities when making any decisions. In order to receive recognition by the partners, achieve high self-esteem, harmonious teamwork, every programmer has to go all the way from simply making money.

Professional activities of a programmer in the company can be classified according to the following:

- Skill level - junior, middle, senior
- Technological direction - Java,. Net, C + + ...
- Role in the project – project manager, analyst, architect, technical leader, developer, configuration manager, quality manager, quality engineer, expert in customer relations

Researching of articles, forums, blogs and personal experience of working with a team of IT professionals indicates that in order to support professional level, a programmer must constantly be aware of many new technologies, new methods to know the solution of certain problems, fully replenish their knowledge and skills. Usually in the first five to seven years it is rather fluent, which is associated with features of age (the human brain easily learns new information at the age of 18-25 years). Further professional career of a programmer has certain characteristics, so graduates have to be aware of their own future prospects straight from the start either to become managers, heads the team of web development, academics, or change specialty.

Training in information and communication technology must be flexible enough since professional skills that may be demanded by employers, quickly change over the years that a young person spends in training.

To determine what competencies and personal qualities are required by the future software engineer for a successful career, we'll consider requirements of today's employer for each step of the career of IT professionals by giving an example of snippet of grades of one international IT company (Fig. 1). The figure offers one of possible variants of roles distribution structure, which can vary from one project to another.

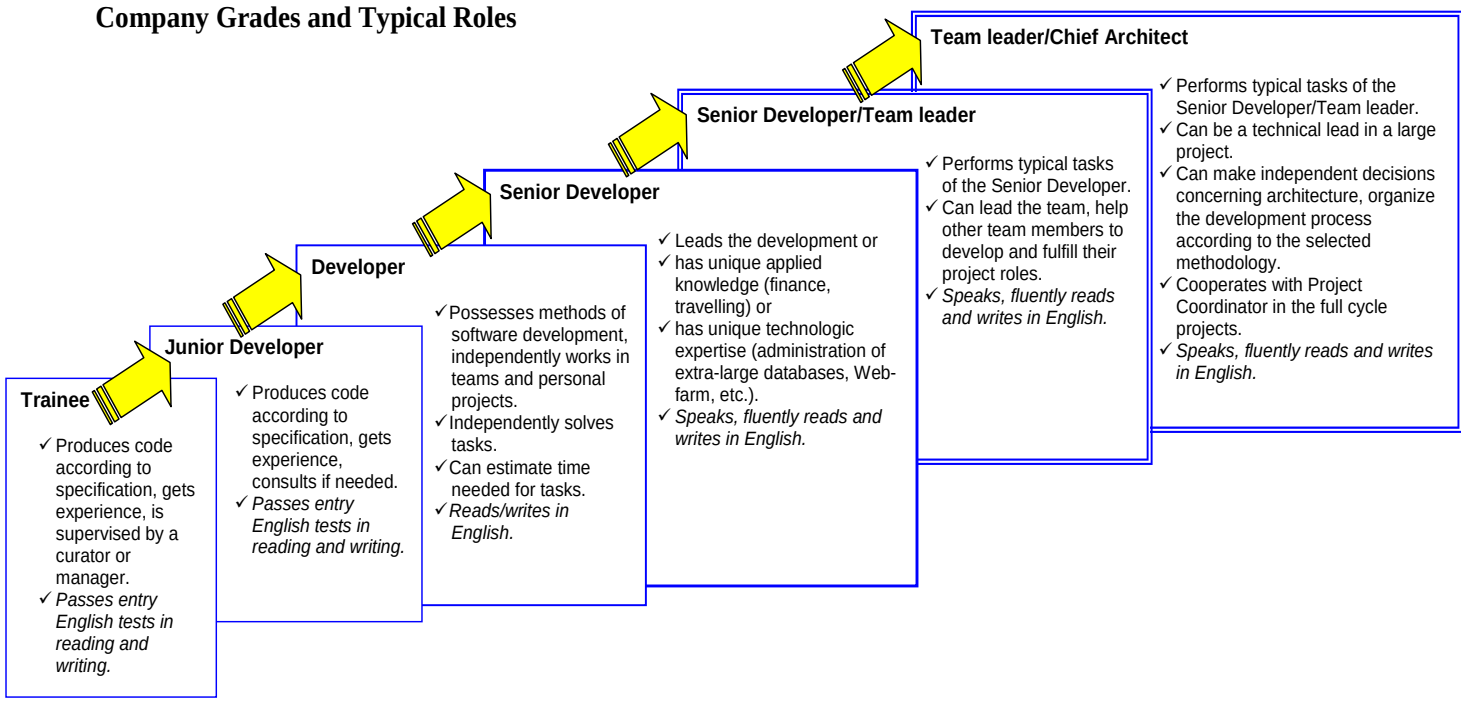

Fig. 6. The steps of career growth of a software engineer in a company.

This scheme does not cover the whole range of specialties in IT industry. Among the most important specialties are: system analysts, requirements engineers, software testers, quality assurance engineers, and some others. The purpose of the scheme is to demonstrate the peculiarities of requirements for various career stages of developer.

As we can see from the figure, the employer at each step separately writes the requirements for English proficiency, personal qualities, and only a few grades deal with certain unique knowledge, for example, applied areas of technological expertise.

Accordingly, under the competence approach, the emphasis should be shifted from learning according to certain state standards of professional knowledge and skills in programming ability to forming an ability to act, make decisions, be energetic in all spheres of public life, educate such skills as teamwork, leadership qualities, responsibility, ability to reflect, capacity for independent learning and mastering new technologies in life, self-education skills, planning, logical and algorithmic thinking, dedication, perseverance, ability to independently make decisions, quickly adapt to new challenges, and a broad outlook on the subject region. In addition, there is a demand for specific knowledge of psychology and management, including project management. An effective mechanism for ensuring high quality learning process is feedback.

Our analysis allowed to consider the components of professional competence in the structure of programming engineer's personality that are required at different steps of professional growth.

Level of graduates must at least meet a minimum level of trainee, novice. Requirements to knowledge that disclose social, personal, scientific, instrumental, general prerequisites for development and professional competence and skills system that reflects their graduate details are spelled out in the industry standard for the specialty "Informatics" [4, 5].

Obviously, the formation of professional competence of programmers should take place throughout the whole period of study at the university while learning the disciplines of each specialty curriculum. However, analysis of the current situation shows that training in computer science is technologically oriented. The professional technical issues should be central in the knowledge base of the programmer, but all aspects of human-computer interaction and the application of programming results are almost completely ignored. Often first-class programmers disregard knowledge in other areas or believe that the level of competence in their field can replace the knowledge of other subjects [1].

A specialist should has a more specific professional thinking, the main characteristics of which are critical attitude to progress, the ability to offer new and a skill of taking into account the impact of all significant internal and external factors that ensure reliable operation of the proposed material.

For the formation of appropriate competencies it is necessary to adjust the content-part curriculum areas in various disciplines related to the preparation of IT professionals and create conditions so that instead of getting a ready knowledge students could gradually develop special skills to self-disclose university disciplines, synthesize information flows necessary for the formulation of knowledge with accordance to the given program.

For example, according to the specialty curriculum of the Informatics specialty, a course in Psychology is studied at the third year in the fifth semester in the volume of

54 hours per semester plus end credits. In our opinion, for the formation of competencies necessary for a successful career the attention of the engineer-programmer should be focused on the following two areas: psychology and management. In the "Recommendations on Teaching Computer Science at the Universities (Computing Curricula 2001: Computer Science)" there is the theme of "Social and professional issues".

Future leaders and managers of teams for the sake of organizational efficiency do not simply have to get knowledge on the course of psychology, but know, for example, that any person belongs to one of three types [11]:

- leader - a man who seeks to manage other people and projects for whom personal success comes first. In the team consisting of leaders only, there will be a constant struggle for power, even the best ideas will not be brought to realization, and exchange of ideas will probably be missing.
- techie - a person who derives pleasure from the process of finding a solution, such as programming, to whom it is not important that there are leaders and subordinates, etc. The main thing is to solve problems. The team consisting only of the specialists of this type will not keep the budget and time, everyone will sit in his corner and solve the task that he likes most and not the one which is necessary at the point.
- friendly - these people pass information and promote the results of other people. According to psychologists, 60% of women belong to this category. The team consisting mainly of friendly people will have fun at holidays, the most pleasant atmosphere, but productivity will be low.

Another feature of the programmer is moving from one project to another. It requires the ability to switch attention. Important modern features include copyright compliance, working with legal software, and quick mastery of a particular subject area. An ability to independently make a decision, quickly adapt to new challenges, a broad outlook in the subject area are becoming the main qualities of a professional engineer and programmer.

Conclusions

Experts in the field of IT are very popular in society, but active development and broad application of technology, a variety of technologies and improvement of software process lead to a very wide range of areas, which in turn demands experts with very different professional knowledge and competence. Therefore, the applied aspects of training, even within one profession, are a very complicated matter. The relevant matter is the mutual enrichment of basic and applied parts of training IT professionals through the active use of ICT in the learning process, distance education and modern techniques that help develop a wide range of competencies.

The feature of programming is the need to solve different types of tasks in a certain subject area and build mathematical models. There are still unsolved problems of harmonious combination of fundamental and applied aspects in the construction of methodical training of future software engineers.

Since it is important for universities to form a competitive graduate, IT specialist, they must pay attention not only to the formation of knowledge of certain fundamental and professional disciplines, but also organize the training process so as to best promote the development of certain personal qualities in students.

Especially important is recognition of the fact that to be a specialist is a process, not a phenomenon, and the aim is not to become at some point a highly skilled programmer in order to learn nothing new anymore.

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