



## **Professional Identity of Applicants and Students in the System of Higher IT Education of Ukraine**

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### **Abstract**

The article considers the methodological problem of forming the professional identity of entrants and students in the transition to a knowledge society. It is shown that the choice of profession takes into account the dynamics of professional development of the individual, associated with the formation of his professional identity and the process of professional self-determination. The analysis of the factors influencing the choice of profession by young people was studied on the example of IT professions. The article lists the most popular IT professions in 2021. In accordance with the trends of interaction between IT education and the IT industry, the trends in the development of higher education in Ukraine and their impact on the formation of professional self-awareness of young people are described. The authors consider the professional identity of the individual as one that develops as a result of his work or educational activities. The paper analyzes the factors that contribute to the formation of the professional identity of applicants. The article proves that the choice of university entrants is a factor influencing their professional self-determination. The choice of the educational program by the entrants is considered as a factor of their professional self-realization, and the formation of the individual educational trajectory of the student is considered as a factor of realization of the "I-concept" at the level of determining professional preferences of entrants. The article analyzes the dynamics of change in the professional identity of entrants and students on the example of training in the speciality "Software Engineering" at different stages of becoming a competent specialist. The dynamics of the development of a student's professional identity from student identification "I–student" to European identity as a condition of integration into the European community is shown.

**Keywords:** educational program, individual educational trajectory, professional self-determination, professional self-realization, professional identity.



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## 1 Introduction

The retraining revolution was one of the key topics discussed at the 2020 World Economic Forum in Davos. This initiative aims to prepare people for the professions of the future for the period up to 2030. 1 billion people need to be trained and retrained as a result of a change in 42% of basic skills by 2030 [1]. Workers must learn throughout life, as the types of skills needed in the job market change rapidly.

Today, higher education institutions (HEIs) have become the most important infrastructure for the innovative development of states and have acquired strategic importance in the formation of intellectual capital. The implementation of the competency approach in modern education requires solving the problem of forming the professional identity of future professionals, which determines the effectiveness of professional activities and creates opportunities for self-realization. Professional identity is related to professional training, acquisition of knowledge, skills and abilities necessary to perform a certain job. Thus, the choice of future profession by entrants is an important and responsible step that directs people to professional development, increase human capital throughout life, the formation of professional responsibility, career planning, the development of creative thinking and more. This means that the period of study at the university can be considered as a material investment in yourself and the brightest experience in the young person's life.

The main questions to which applicants should get the right answers are:

- which profession to choose, what should you pay attention to when deciding on a profession?
- which university to choose, what to look for when deciding on a university?
- how to choose the right educational program or specialty?
- what opportunities will students have by choosing certain educational programs and free educational institutions that implement them?

Having received the answers to these questions, the entrant, thus, will be defined with model of formation of the professional identity.

The purpose of the article is to study, analyze and generalize modern factors influencing the formation of professional identity of entrants and students of promising professions in a key sector of the Ukrainian economy, which will consider the information technology (IT) industry. We will consider the following tasks to highlight the goal:

- analysis of the development of the IT industry and the demand for the IT profession in the labor market of Ukraine;
- analysis of the features and content of educational programs of the Free Economic Zone in the field of IT knowledge;
- identifying ways to form the professional identity of applicants who choose their life path.

The study was conducted on the example of the IT industry of Ukraine. Features of educational programs were considered on the example of the educational program "Software Engineering".



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### 2 Relevant research and publications

Many scientific works of Ukrainian and foreign researchers are devoted to the problem of defining the concept of professional identity, in particular [2 – 15], which represent a wide range of different views on the concept of professional identity. Researchers [2, 3] believe that professional identity is formed in the process of human activity and covers professional competence, development, specialization, self-perception and role behaviour. The works [4, 5] are studied professional self-determination, professional self-awareness and professional development as semantic components of professional identity. The author of [6] defines professional identity as the result of professional self-determination, personalization and self-organization, i.e. as an awareness of belonging to a certain profession and a certain professional community. In [7], professional identity is revealed from the standpoint of the content of labour, labour relations and belonging to the professional community.

The authors [8] propose to define professional identity through the professional role and professional environment that influence the formation of professional identity. The author [9] defines professional identity through the concept of professional "I-concept".

The author [10] interprets the development of a student's professional identity as a process of forming a value attitude to the chosen profession, identifying it with professional activity, joining the professional community, awareness of their professional independence. The study [11] are considered considers the professional identity of the student as a belief in the right choice of profession and a positive attitude towards himself as a subject of educational and professional and future professional activity. The authors [12, 13] consider the choice of profession as a process of professional self-determination, which is determined by the interests, self-esteem, ideals and values of a young person.

Professional identity allows you to navigate in the world of professions and more fully realize the personal potential in professional activities, to analyze the possible consequences of their professional choice. That is why the formation of a positive professional identity in future professionals is an urgent problem. The first step in this direction is the definition of professional goals through the choice of profession, the formation of professional competencies through educational activities and the practical implementation of certain goals through the implementation of professional activities.



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### 3 IT career trends in Ukraine

The field of information technology is one of the most popular in the near and distant future. Due to the global computerization of our lives, more and more companies need specialists in the field of IT technologies. The list of the most popular IT professions in 2020-2021 in Ukraine includes the following professions [14 - 16]:

- programmer is a specialist who develops an algorithm and writes code in programming languages;
- software developer is a specialist who designs, programs, tests, configures and maintains computer programs;
- web developer is a specialist who develops sites, portals, web resources, web services and web systems;
- webmaster - a specialist who is responsible for maintaining the smooth operation of sites and web systems;
- web designer is a specialist who is responsible for the logical structure, the most user-friendly interface and aesthetically pleasing form of information on the site, graphic design of site layouts, individual pages, sections, banners and other elements;
- project manager is a specialist who studies the needs of clients, sets business goals of the project, evaluates existing resources, advises clients, acts as an intermediary between the IT team and the client;
- system administrator is a specialist who is responsible for maintaining the efficient operation of computer equipment, networks and software;
- tester is a specialist who is responsible for researching software, detecting logical errors and defects during its use;
- support service specialist is a person responsible for eliminating problems in the IT infrastructure;
- analyst (business and data) is a specialist who is responsible for researching customer problems, which he draws up in the form of requirements and which are taken into account by developers when creating a software product;
- network technology specialist is a specialist responsible for setting the optimal operation of network components and maintaining the efficient operation of the network system.
- database architect is a specialist who selects technology for data storage, creation and optimization of database queries, design and optimization of database structure, monitors the security of the database;
- cybersecurity specialist is responsible for timely preventive measures to protect the system as a whole and its individual products or effective prompt elimination of the effects of hacking.

Understanding and awareness of their professionally important skills, professional self-determination and direction of personal development are the key to self-identification within the professional space and successful entry of the entrant into the educational IT environment, the structure of which is related to the structure of professional activity.



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Ukraine regularly appears at the top of the world's best software developers - foreign companies come to us for IT specialists. The number of jobs and the total income of the IT industry is growing by 25% annually.

The quarantines imposed to combat the spread of coronavirus infection COVID-19 also affected IT companies, some of which are experiencing difficult times due to reduced orders and layoffs. But some IT professionals, on the contrary, have become even more in demand in the market. According to the site Djinni.com, the greatest demand for specialists in the field of game development. The number of vacancies has almost doubled. The largest number of vacancies in April 2020 was published for Front End developers, testers and PHP developers. There were fewer vacancies for iOS/Mac developers (16%), C++ developers (17%) and DevOps engineers (24%). Accordingly, software developers for the gaming industry, web programmers and C++ programmers experience the least risk [16].

Software products are becoming more sophisticated. Moreover, if now HEI and IT courses mainly train junior programmers, then soon, following the trends, they will teach more business and data analysts and software engineers. According to experts, Ukraine as an IT centre will be popular and visible in the market, as well as more attractive to IT investors than, for example, India. Therefore, applicants who are still in search of their own identity must be aware of their own values and competencies, which will form their acceptance as a specialist in the chosen profession.

### 4 Development trends of higher IT education in Ukraine

The modern paradigm of higher education in Ukraine and in the world is a paradigm of competency-based learning, the output of which should be a competent specialist adapted to the requirements of the industry. The formation of the professional identity of future specialists takes place during the period of study in the HEI when professional self-determination and professional development of the individual is carried out. The authors share the point of view of researchers who believe that the formation of professional identity occurs within the profession. Therefore, an important decision of entrants is the choice of promising professions, the preparation of which will be devoted to the next 4 or 6 (5.5) years of their lives.

Trends in higher education are moving towards online professions. This is primarily due to the coronavirus pandemic of 2020 and the economic crisis. Workers in many professions have lost their businesses and jobs. However, IT workers switched to remote mode and kept their positions. IT specialists are always ready to change the place and schedule of work, they can work from anywhere on the planet.

According to UNIAN, the list of popular areas of higher education in 2021 is as follows [17]:

IT-specialities that require attention, ability to analyze processes, knowledge of English, perseverance. Among the most popular professions are programmer, software developer, web engineer, system architect, system administrator.





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System analytics, which trains specialists who analyze the data of a particular area of the company. Based on this, they create forecasts and recommendations for the development of the industry. This area requires the same professional traits as IT.

Creative design. Every business needs visualization of style, logo, branding of companies, creation of advertising. A creative designer implements ideas that are simultaneously unique, valuable, new and useful.

Content management. The essence of the profession is the creation, placement and promotion of textual content, which is the main source of information and helps to develop any business. These are the professions of copywriter, content editor, content manager, who must be erudite and well-prepared, have a flexible mind and have a wide range of skills, be able to work with a large amount of information.

Online business. The coronavirus pandemic has shown that anyone who can quickly go online and continue their business there, including selling their goods and services, survives economically. Managers, business accounts, marketers belong to this segment of the economy.

### **5 Results. Professional identity development factors of applicants**

Based on the fact that the professional identity of the individual develops as a result of his work, its achievement can contribute to the following factors [18-19]:

- career development, which depends on education, professional aspirations, work experience, job satisfaction, working conditions, etc;
- belonging to the professional community through self-awareness as a representative of a certain profession and the acceptance of human meanings, values, views of the professional community;
- professional certification, which confirms that a person has a certain set of knowledge, skills, abilities;
- professional competence, which combines a system of knowledge, skills, behavior, and is used to increase productivity;
- professional specialization, which is obtained as a result of training in a particular specialty within one profession;
- professional development, which involves the development of verbal and tactile skills necessary for a particular career, or general skills of personal development, preparation for possible changes in technology and practice in the profession, mobility and continuity of education;
- professional ethics, which is implemented through ethical principles and values, decision-making, procedures for resolving ethical issues, codes of professional ethics, etc;
- professional licensing in the form of a permit for certain practices and activities;
- professional standards as a set of certain "specifications" for the minimum level of productivity for professional staff to perform their professional duties;



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- professional supervision aimed at deepening understanding, support for employees, solving problems in the professional sphere in order to improve it;
- self-identity or self-concept.

Consider some of these factors in more detail in terms of professional identity of applicants. Applicants associate the factor of "career development" with the choice of profession. Management of the choice of profession is carried out through the process of professional self-determination, which is directly determined by the interests and abilities of the young person, his self-esteem and desires, ideals and values, emotional attitudes and the level of volitional qualities [12]. Applicants' requirements for choosing a profession may include such concepts as the future occupation, actual employment in the specialty; the desired level of training; desired content, nature and working conditions.

Applicants consider the factor of "belonging to the professional community" as self-awareness of a certain profession and professional community, the importance of future professional activity, acceptance of professional roles and subjective satisfaction with involvement in this professional community.

Professional certification by an entrant is associated with a diploma of a certain freelancer, in which the entrant plans to get a future profession. When choosing a freelancer to obtain an IT profession, you should consider:

- excellent background (mathematics and general technical training);
- guarantee of formation of engineering thinking;
- opportunity to start immediately after training on serious projects;
- the ability to perform research in R&D centers that are developing in prestigious IT companies.

Educational programs (EP) determine professional competencies that must be formed in students during their studies in the HEI. In order to make a conscious choice of EP, it is important for the entrant to analyze the results of accreditation of EP according to the criteria of the National Agency for Quality Assurance in Higher Education [20] on the goals of EP, structure and content, ensuring acquisition of professional and social skills, interaction with IT industry.

The entrant can get information about professional specialization from the educational program on the sites of Independent external evaluation, having been acquainted with a possibility of formation of individual educational trajectories of applicants of higher education based on system of selective disciplines.

Thus, the formation of the professional identity of entrants will contribute to the conscious choice of free education, specialty, and educational program. The prestige and quality of IT education in Ukraine will solve the issue of retaining applicants and students in Ukraine, providing them with quality opportunities for learning and self-realization.



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### 5.1 Prestige and achievements of Ukrainian universities as factors influencing professional self-determination

The prestige of the university and the conviction of the entrant that a university degree will provide a good job is an important factor in choosing a university for study and the first step towards professional self-determination. To determine the prestige of the university, it is advisable to read the ratings of the reputation of universities:

As an example, we present the achievements of the Taras Shevchenko National University of Kyiv, which are determined by the following indicators for 2019 [21]:

- 531-540 place in the World University Rankings;
- 30 positions in QS University Rankings EECA;
- 301-500 positions according to the QS rating on employment of graduates;
- 1st place among Ukrainian universities in the rating of Webometrics Internet presence;
- 1st place among the universities of Ukraine in the consolidated ranking of higher education institutions of Ukraine in 2019;
- the best indicators of publishing activity among Ukrainian universities (16,711 publications in the scientific-metric database Scopus; the Hirsch index is 88);
- the largest volumes of scientific research among Ukrainian universities.

The Dou.ua website [22] presented the ranking of universities for the IT industry, based on the results of the 2020 admission campaign. The Dou.ua rating shows which universities were the most popular and which IT specialities the entrants with the highest competitive score sought to enter. The Ukrainian Catholic University was included in the TOP-5 with a weighted average score of applications for the IT speciality 189.15. Next are Taras Shevchenko National University of Kyiv (175.54), Lviv Polytechnic (175.46), Kyiv-Mohyla Academy (174.04) and Ivan Franko LNU. (169.35). According to Dou.ua, in 2019 Taras Shevchenko National University of Kyiv is ready to recommend 69% of surveyed IT graduates to study IT specialities. Thus, the prestige of the university, according to the results of a survey of students (28%), is a decisive factor in choosing a university to obtain a profession and affects the professional self-determination of the applicant.

### 5.2 The choice of educational program as a factor of professional self-realization of the entrant

The self-realization of the entrant, as the realization of his creative potential, begins with the choice of the educational program (EP) in the HEI defined by him. EP, on the conscious choice of which depends the future of the entrant, is the main document that determines the expected learning outcomes, expressed in terms of competencies, list and scope of disciplines that will ensure the formation of the competencies declared in EP.

For example, consider the goals defined in the EP "Software Engineering" bachelor's degree in higher education, which is implemented at the Department of Software Systems and Technologies of the Taras Shevchenko National University of Kyiv. The goals of the EP are aimed at training highly qualified specialists with deep knowledge in the field of software development processes, able to analyze, predict and manage various components of the





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software development process to solve complex software engineering problems. rational methods and means of solving production problems of IT companies "[23].

The speciality "Software Engineering" of the bachelor's level of higher education in 2021 was announced in 131 HEI. But in each university educational programs in this speciality are unique. For example, the uniqueness of the EP implemented at the Department of Software Systems and Technologies of the Taras Shevchenko National University of Kyiv is characterized by the following factors:

- developed taking into account international recommendations and practices for student-centred learning, takes into account the requirements and features of academic mobility programs;
- takes into account the peculiarities of the development of the speciality and the labour market by involving employers as external auditors of curricula of disciplines in order to confirm their relevance;
- focused on partnerships with domestic and foreign educational and scientific institutions, the private IT sector, scientists and practitioners, provides for participation in international programs to improve the quality of education;
- provides active teaching methods: group projects on real topics, business games, business cases, debates, forums, hackathons, research, internships in leading IT companies;
- involves students in the process of ensuring the quality of educational services through dynamic modification of the content of work programs of disciplines in accordance with trends in the software industry, labour market needs and professional interests of students.

The analysis of the EPs, which are posted on the websites of the HEI will promote the professional self-determination of entrants. The results of the student survey indicate the motives that influenced the choice of speciality and EP. The majority of students (57%) chose the speciality because they are interested in it, ie their professional self-determination was formed during the school period. 29% of students made their choice, focusing on the possibility of successful employment and good earnings. Such entrants identify themselves with the IT community. The choice of 18% of entrants was influenced by external factors, such as the influence of parents.

Professional self-determination and professional self-realization of entrants, which are manifested already in the process of choosing educational programs, indicate a motivational readiness to master future professional activities. If the entrant is aware of the variability of trends in IT and the content of professional activities of IT professionals, and hence the requirements for their continuous professional growth, he will seek an educational program that is harmonized with trends in the labour market and speciality.

For example, EP, implemented at the Department of Software Systems and Technologies of the Taras Shevchenko National University of Kyiv, is harmonized with trends in the speciality, labour market and foreign educational programs by:



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- use of the list of requirements and recommendations of the Junior Software Engineer developed by the IT Association of Ukraine [24];
- taking into account trends in the IT market through the professional standards "Software Engineer" and "Software Development Specialist", which describe the basic requirements for the competencies of graduates depending on the level of qualification [25-26];
- use as a methodological basis of the Curriculum Guidelines for Undergraduate Degree Programs in Software Engineering [27 as an international standard of education in the field of software engineering, which corresponds to the established ideas about the current state and trends of software engineering in the world;
- taking into account the experience of European universities in the framework of the TUNING project and the peculiarities of the educational programs of European and American universities.

### 5.3 "I-concept" factor realization

Modern educational programs provide a student-centred approach. The formation of the individual educational trajectory of the student is a factor in the implementation of the "I-concept" through the realization of the personal potential of students, taking into account their abilities, interests, needs, motivation, capabilities and experience. Implemented through the student's choice of types, forms and pace of education within the proposed EP academic disciplines, methods and teaching aids.

As an example, consider the software engineering EP of the Taras Shevchenko National University of Kyiv, which focuses on current trends in the software industry, takes into account the individual motivations of students through the following specializations:

The specialization "Software and information systems" provides theoretical and practical training for the design, development, testing, and maintenance of software of information systems for various purposes.

The specialization "Software systems of data science" is a response to current market trends, when the analysis of large amounts of data and methods of artificial intelligence are essential attributes of successful forecasting and decision-making. This IT direction is already changing the world of programming, business and users, providing extraction of valuable information and knowledge.

The specialization "Programming of embedded and mobile systems" reflects the current trend of ICT development, aimed at acquiring the skills needed to design, develop and implement applications on different mobile platforms or embedded systems for a specific solution: 4G+ mobile telephony, smart cards, contactless communication, sensor networks, geolocation etc.

The specialization "Computer game programming" is an education for those who like to work in the exciting gaming industry. This specialization will train professionals who will create stunning images and 3D animations, design video games and short films in 2D and 3D.



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The specialization "ERP programming" is aimed at students who present themselves as system integrators who will create and maintain a single automated enterprise management system or its key business processes. Working in integrator companies promises employees significant prospects in terms of career and financial growth.

The student is offered a choice of 5 blocks of 9 disciplines in each and 3 lists of two disciplines. The individual curriculum includes mandatory components of EP and disciplines selected by the student in order to exercise their right to free choice of 25% of the volume of EP. Each student forms the individual curriculum personally. The study of disciplines and practices chosen by the student and included in the individual curriculum is mandatory.

Thus, for the formation of an individual educational trajectory already in the first year, the entrant must form a professional "self-concept" at the level of determining professional preferences.

### 6 Discussion. Dynamics of professional identity

Formation of professional identity according to LB Schneider is carried out in 4 stages: pre-professional (fragmentary and unsystematic knowledge about the world of professions); pre-professional (professional self-determination); information (professional training with professional personalization and professional identity); professional (independent professional activity).

If in the pre-professional and pre-professional stages future students have already been motivated and had an idea of the profession, for example, a programmer, first-year education will be characterized by understanding the professional identity and forming student identity "I am a student". In order to understand what competencies need to be developed in order to successfully integrate into the professional IT environment in the future, the professional preferences of entrants must be transformed into goals, values, beliefs and attempts to form them. To understand the basics of the profession of a programmer already in the first year in EP "Software Engineering" the Taras Shevchenko National University of Kyiv provided disciplines "Fundamentals of Software Engineering", "Fundamentals of Programming", "Introduction to Object-Oriented Programming", "Computer Architecture", "Algorithms and data structures". For students with different levels of training and different talents, a differentiated approach is used, which is expressed in the differentiation of the volume and complexity of educational material, in the selection of tasks for students depending on their abilities and level of knowledge, in helping students by teachers.

The trajectories of professional development and educational trajectories are interconnected and interdependent. The construction of these trajectories necessitates the satisfaction of the individual's need for development, self-development, self-actualization and self-realization in professional life. Professional identity in this sense acts as an integrator of the motives, needs, values of the individual. Individual educational trajectories of study are considered as a condition for individualization of professional development of the individual. As an example of the implementation of individual educational trajectories, we consider the educational program "Software Engineering" for bachelors of the Taras Shevchenko National University,



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which provides students with the right to choose freely 12 of the 48 disciplines offered, according to their motivations, abilities and career preferences.

Awareness of professional identification of the individual as members of the professional community and the experience of self-presentation students master in the process of participating in real projects and competitions. As a result, students acquire professional competencies in the course of mastering competitive tasks and participating in program activities. They create favourable conditions for students studying in the educational program "Software Engineering" at the Taras Shevchenko National University of Kyiv and combine study and practical work in the speciality in IT companies. The formation of students' professional identity is facilitated by gaining experience of professional communication in the process of creative activity in the professional community and the realization of creative abilities in the group of the professional community.

An important factor influencing the formation of students' professional identity is international academic mobility and double degree programs. Harmonization of educational space in the formation of the professional identity of future professionals contributes to ensuring the quality of education, the development of intercultural competence of students. The implementation of international and European educational standards in the system of implementation of state educational policy increases the chances of graduates for a successful professional career. Here is an example of the Taras Shevchenko National University of Kyiv, which has agreements with 42 European universities on academic mobility and a double degree. Almost 100 students of the university annually take part in the international academic mobility program, which contributes to the formation of European identity.

## 7 Conclusion

The question of choosing a profession by young people is a question of choosing their life path. Employment and further career growth depend on how conscious this choice is. Thus, the formation of a positive professional identity in future professionals is an urgent problem.

The analysis of the factors influencing the choice of profession by young people was studied on the example of IT professions. Economic performance indicators show that the IT industry is a key sector of Ukraine's economic development, and the IT profession is a unique opportunity to develop and build careers for young people. The analysis of trends of digital transformation of the economy and society of Ukraine allowed determining the most popular IT professions for 2021 - 2025 and the qualities that applicants for these professions should have. The paper analyzes the impact of the economic crisis related to Covid-19 on the state of the IT industry and the number of vacancies for IT professionals.

For the formation of the professional identity of entrants, it is important to be aware of the development of higher education in Ukraine, particularly IT education, as the formation of the professional identity of future professionals occurs during training when professional self-determination and professional development. For this purpose, the popular areas of Ukrainian higher education in 2021 are considered.



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The authors determine that the professional identity of an individual develops as a result of his work. From the point of view of professional identity of entrants, the factors favourable for its formation are considered, namely: self-identity or "I-concept", career development, belonging to the professional community, professional certification, professional competence, professional specialization, professional development, professional ethics, professional licensing, professional standards, and professional supervision. The first step towards the formation of the professional identity of entrants should be the awareness of their professional preferences. To this end, the paper considers the issues of taking into account the prestige of universities as a factor influencing professional self-determination and the choice of the educational program as a factor of professional self-realization. On the example of the educational program "Software Engineering" the formation of the individual educational trajectory of the student as a factor in the implementation of the "I-concept" and the dynamics of changing the professional identity of the applicant and the student are considered.

Prospects for further research are focused on the development of an information system for computer monitoring of the formation and dynamics of changes in the professional identity of the entrant and student of HEI.

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