

The information system for the selection of a study direction and skills development in the field of information security

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Abstract. The decision to pursue a particular profession is a challenging one for students, as they lack familiarity with the world of professions and have no prior experience in the workforce. This stage of life is crucial, as the wrong choice of career path can result in individuals being compelled to engage in an activity that they do not enjoy or, alternatively, necessitating a change in the type of activity. In the article, the authors present an information system designed to facilitate students' familiarity with various types of activities within the field of information security. The system, which is implemented as a web application, incorporates educational materials presented in multiple formats, including standalone thematic lectures in text or video format, virtual laboratory exercises, and courses of disciplines. The training material includes tests to assess the level of mastery of the material and a list of competencies with an indication of the percentage of mastery that will be assigned to a competency after successful learning of the material. During the learning process, the information system periodically offers the student additional materials that will increase the level of mastery of this or that competence, broaden the outlook, and help make a decision about the choice of future profession. As a result, the student will be able to make an informed decision about the choice of future profession, based on his/her interests, preferences, organization of his/her mental abilities and individual character traits.

1 Introduction

The decision to choose a profession is a complex and responsible issue that should be approached thoughtfully and responsibly. It is important to make well-considered and well-founded decisions that will have a significant impact on the adult life of each person. It is of the utmost importance to choose a profession that will be in demand on the labor market and in the future. At the same time, the profession should ensure both self-fulfillment and financial well-being. An unreflective approach to choosing a profession can result in a mismatch between a person's abilities and the chosen specialty. This can lead to students

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spending years studying in a field that ultimately proves to be incompatible with their interests and abilities.

In such cases, students may over-rely on memorization, lose motivation, and realize that their chosen field of study does not match their long-term career aspirations.

In the contemporary era, the domain of information security is becoming increasingly pivotal, as there is a persistent surge in the number of attempts to obtain confidential information globally, including an uptick in the prevalence of cyber threats and cyber-attacks. A dearth of requisite knowledge and expertise in the field of information security can precipitate grave consequences for enterprises. Awareness of the importance of information security processes allows management of enterprises to prevent the leakage of confidential information, reduce the likelihood of the realization of threats, and reduce material and reputational losses. At the same time, the labor market has a shortage of qualified specialists in the field of information protection, which represents a significant challenge for state and commercial enterprises.

As a result, information security professionals are in demand. A quality education in information security contributes to the competence of professionals. The demand for information security specialists remains high, which makes this field attractive for employment. However, it is important that future specialists enter educational institutions for this specialty consciously, understanding the peculiarities of professional duties and their abilities and desire to master this specialty.

2 Statement of research problem

It is difficult for a schoolchild to make the right choice before entering a university or other educational institution to acquire a future specialty, because he is not familiar with the world of professions.

It is even more difficult for an adult to find his vocation and radically change his life if the choice of specialty in adolescence was unsuccessful [1, 2]. As a result, most of the graduates of educational institutions, especially universities, in the future do not connect their lives with the sphere of activity corresponding to the chosen specialty; do not work in their specialty.

It is also possible that initially he was not acquainted with the information containing the number of vacancies, the level of wages in this industry. It must be understood that, as a rule, a young specialist will have a lower salary level. A graduate of the school does not understand the future specialty, its specifics and field of activity. As a result of such an unreasonable choice of specialty, the student masters the program and studies the disciplines mechanically, loses interest in learning and realizes that he does not like this specialty.

The choice of a profession is further complicated by the fact that career guidance does not fulfill its main function - familiarizing the student with modern professions and the requirements of employers, identifying the student's personal characteristics, comparing his desires and capabilities, and determining the profession suitable for the student [3, 4].

Subjective, objective and social factors influence the choice of a future profession. Subjective factors include abilities for a certain kind of activity, cognitive or professional interests, temperament and character of a person. At the same time, it is the personal characteristics of a person, such as volitional qualities, self-esteem, self-awareness, adaptability, etc., that are especially important when choosing a profession [4]. Objective factors include health status, level of training, knowledge about the features of professions. Social factors include the social environment, home conditions, and educational level of parents.

K.M. Gurevich identifies three types of professions based on the requirements they impose on individuals [5]. The first type is that of professions in which a healthy person can achieve success. The second type is that of professions in which only some people can demonstrate their performance. The third type is that of professions that require full dedication to achieve a high result. In this type of profession, employers impose certain requirements on the personal characteristics of a person, requiring 100% professional suitability.

In the article [6], the author describes the features of traditional professions, such as teachers, doctors, and modern ones, for example, top managers, lawyers, and politicians. This is done in order to provide an introduction to the profession in question.

The range of career guidance methods is quite extensive, and the efficacy of their application depends mainly on the individuals for whom they are used. The efficacy of career guidance techniques is contingent upon the age of the individual in question and their specific needs and personal characteristics.

The first group of career guidance methods is educational methods, which are divided into profессиograms, reference literature, and information retrieval systems.

Professiograms are succinct descriptions of professions that delineate the principal characteristics of production processes and professional tasks, as well as the medical, physiological, and sanitary characteristics of working conditions. They also include lists of indications and contraindications, as well as the requirements of professions to the individual characteristics of people. This method of career guidance is not particularly effective for schoolchildren and is more suitable for adults.

Reference books are specialized publications that present the characteristics of professions in a more concise and accessible format than that of profессиograms. Information retrieval systems facilitate the optimization of searches for professions, educational institutions, and job opportunities. These searches can be conducted through electronic databases, advertisements, visits to educational institutions and enterprises, meetings with specialists in specific professions, and "fairs" of professions.

The second group of career guidance methods is comprised of psychodiagnostic techniques. These include special tests designed to determine an individual's professional interests, as well as their personal characteristics, abilities, and motives. This group of methods encompasses a range of tools, including interviews, questionnaires, psychophysiological examinations, and special simulators.

It is of paramount importance to recognize that the most optimal outcome in a multitude of circumstances can be achieved through the utilization of a diverse range of strategies. Consequently, the most efficacious approach to vocational guidance is one that integrates these methods.

Common mistakes that schoolchildren make when choosing a profession [7]:

- Inability to analyze one's own intellectual and physical abilities, inclinations, and talents. It may be beneficial for schoolchildren to become acquainted with the work [8], in which the author proposes a novel concept of self-realization through the integration of natural talents and personal passions.
- The influence of the popularity and prestige of the profession, without consideration of personal interests.
- A lack of awareness about the world of professions, ignorance of the characteristics of professions, and a tendency to choose professions based on superficial factors are all contributing factors to the current state of affairs.
- The decision to pursue a particular profession is often influenced by the opinions of friends, parents, or family members.
- A comparison of the academic subject with the corresponding profession.

In [9], the authors conducted research that revealed the relationship between the values of parents and children, as well as the similarities and differences in their value systems. Concurrently, parents participate in decisions regarding their children's future professions, considering their values. The work [10] is devoted to the study of factors from the family environment of adolescents that have a decisive influence on the process of choosing their future professions.

Schoolchildren have several ways to choose a profession:

1. Pass a test to identify a propensity for a particular field of activity. However, as a rule, the results of the test are obvious, and the students do not learn anything new about themselves.

2. Pass professional tests, the purpose of which is to gain practical work experience and identify schoolchildren's inclinations to work in a particular specialty. However, in practice, professional tests are not very effective and rarely contribute to the choice of profession. This is explained by the fact that the participants are not given the opportunity to truly test themselves in the profession, as this is essentially impossible due to their lack of the necessary knowledge and skills. Additionally, it is challenging to sort through all the options of interest.

3. Communication with representatives of any profession or visits to enterprises where they work are often ineffective in providing a comprehensive understanding of the profession in question. Such events often fail to fully capture the objective qualities and features of the profession, limiting their ability to provide a complete picture.

4. It is recommended that students engage in work related to their field of study during their leisure time. This approach allows them to gain a deeper understanding of their chosen specialty, but it requires a significant investment of time and may not always be feasible due to employers' reluctance to provide work opportunities to students in a real-world setting.

In order to make the right choice of a future profession, a student should be acquainted with as many specialties as possible, evaluate his abilities and compare them with the requirements of the professions. This will allow him/her to accurately determine his/her interests and consciously choose a specialty, specialization, type of activity and educational institution. At the same time, it is believed that the main problems of students in choosing a profession are low awareness of the variety of specialties and their peculiarities, inability to assess their interests and abilities.

The article presents an information system that enables applicants to become acquainted with various specialties and areas of training in information security. It also provides detailed information about the fields of activity. Furthermore, it allows applicants to assess their capabilities and interest in these fields as they master or familiarize themselves with the proposed theoretical materials, practical works. Ultimately, it enables applicants to make a conclusion regarding which profession in the field of information security suits them psychologically and emotionally, and which specialty they should associate with.

3 The purpose of the information system

The proposed information system is implemented as a web application and contains educational material presented in the following formats:

- Individual thematic lectures in text format or video materials.
- Virtual laboratory work.
- Full courses of disciplines.

Each educational material contains tests or assessments designed to evaluate the extent to which the student has mastered the material. Additionally, a list of competencies is

provided, indicating the percentage of mastery that will be assigned to the corresponding competency upon successful completion of the material or the course by the student.

Upon their initial visit to the site, students are presented with a selection of educational materials pertaining to a range of specialties. This initial choice is typically influenced by a number of factors, including the results of their parents' educational endeavors, the guidance provided by their schoolteachers, their own visits to training centers, the professions or hobbies of their parents, and the interests of their friends and peers.

During the training, the information system periodically offers the student additional materials that may be useful to him. These materials are designed to assist the student in:

- Developing a similar interest.
- Increasing their level of competency in a specific area.
- Broadening their knowledge in a particular field of study, which may inform their decision about future career paths.

A prospective student is afforded the option to cease studying the selected enlarged group of specialties at any time and transfer to another, in accordance with their personal motivations and interests. Upon successful completion of the study of the enlarged group, the student is offered the opportunity to transition to the next level, where they may select and commence familiarizing themselves with a particular specialty or direction of study within the studied group. In the process of mastering the chosen specialty or direction of study, the student is also afforded the opportunity to cease their studies and select another specialty. Thus, the student may consciously move between groups, specialties, and areas of study based on their personal interests and preferences, gradually approaching the sphere of activity that best corresponds to their ideas about a suitable profession.

Consequently, the prospective student, having identified certain interests and ideas about his future profession, studies the information embedded in the information system. By the time the student submits documents to the educational institution, the student will have received the following benefits from training with the proposed information system:

- A list of expanded groups of specialties that piqued his interest, accompanied by the percentage of mastery of the relevant competencies.
- A list of specializations or areas of study that were of interest to him, along with the percentage of mastery of the relevant competencies.
- A list of competencies, accompanied by the percentage of their development.
- A list of the topics studied, the knowledge acquired, the skills and abilities that have been mastered, and the percentage of development for each.
- Recommendations for choosing a specialty or direction of study for admission.

4 The structure and mathematical model of the information system

The proposed information system employs an educational approach that encompasses a methodology from the particular to the general. The student is presented with texts that align with his interests and, if he so chooses, is given the opportunity to demonstrate his comprehension of the material through an assessment. At the same time, the educational value of the proposed system is not contingent upon the achievement of specific goals. The student is free to pursue his interest in a particular area of knowledge and to expand his intellectual horizons.

The information system is structured into the following modules:

1. The knowledge acquisition module.
2. The module for obtaining skills and abilities.
3. The testing module.
4. The module for collecting statistics for each user.

5. The module of recommendations for choosing topics and disciplines for study.

6. The module of recommendations for choosing a specialty/direction of study.

The knowledge-acquisition module is delivered in the format of text or video lectures, accompanied by questions designed to assess the extent of knowledge gained and the level of proficiency attained in the relevant competencies.

The module for obtaining skills and abilities is implemented as a virtual laboratory, wherein students are required to conduct research in accordance with the task. Additionally, questions are attached to the laboratory to assess the knowledge acquired and competencies mastered.

The testing module is implemented in the form of computer tests comprising a variety of question types, including alternative questions, questions with a choice, and questions with unambiguous sign models.

The student may employ a number of methods to identify individual topics or disciplines for study. These include keyword searches, searches for favorite authors or universities, and following the recommendations of the information system.

The information system monitors the learning trajectory and offers recommendations based on the following considerations:

1. Continuation of studies in previously initiated disciplines.
2. Continuation and completion of studies in a specific specialty or field of study.
3. Study of the next specialty or direction of study from the selected expanded group of specialties.

Let there be a finite set of specialties or directions of study of length $L : |S| = L$.

Specialties or directions of study are characterized by many disciplines $|D| = N$, set of competencies $|K| = M : S = \{D, K\}$.

The information system is open and can be expanded continuously by the authors. The teaching and assessment materials are evaluated by experts, resulting in a set of parameters being assigned to each discipline.

Figure 1 presents a graphical representation of the proposed information system model. Figure 2 depicts the model of a particular user of the information system.

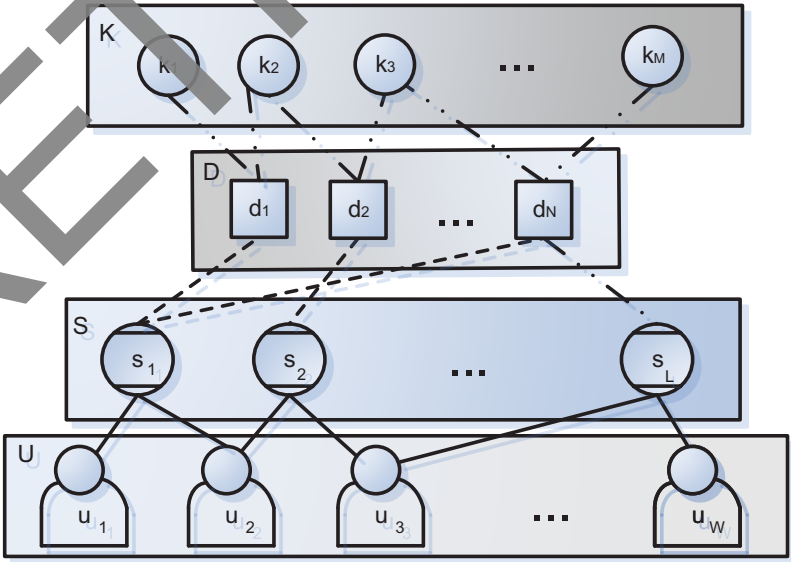


Fig. 1. Graphical representation of the information system model.

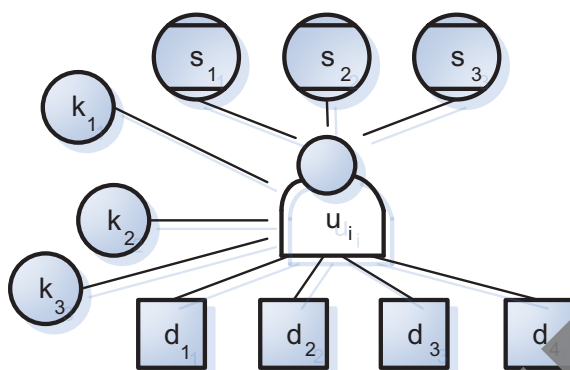


Fig. 2. Graphical representation of the information system user model

The proposed information system enables students to commence the process of selecting a future profession during their academic tenure. It facilitates in-depth exploration of various occupational avenues, illuminating the distinctive characteristics and nuances of specialties. It also enables students to discern their interests and, consequently, to select a specialty that aligns with their highest interests and greatest potential.

In the Russian Federation, final school exams and, accordingly, entrance exams to higher educational institutions are unified state exams. The competencies obtained by students as a result of working with the proposed information system can be confirmed by them and counted towards the relevant disciplines already in the process of studying at the university. Testing on residual knowledge to confirm the acquired competencies is carried out using a computer assessment or on paper forms printed from the information system.

5 Conclusion

The information system proposed by the authors of the article will allow students to satisfy their interest in specialties within the field of information security by studying the material, performing practical and laboratory tasks, and studying material related to various specialties. The special value of the proposed approach is to assist students in making a conscious choice of their future profession during their school years, taking into account their preferences, the organization of their mental abilities, and their individual character traits.

Furthermore, the information system will permit students to continue remote study of disciplines of interest to them, potentially in other expanded groups of specialties or in other specialties or areas of study of the selected expanded group. This contributes to the expansion of students' horizons and the realization of individual learning trajectories.

In the future, the information system is planned to be expanded with materials from other specialties. This will enable future entrants to choose their future specialty not only in the field of information security, but also in other areas.

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