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ENSURING INFORMATION SECURITY AND CYBERSECURITY IN THE MODERN INFORMATION SPACE: MODELS AND METHODS

Ministry of Education and Science of Ukraine
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CONTENT

Introduction

The reasons for the violation of information security and the vast majority of incidents are people. It is people's behavior, which, due to subjective reasons, leads to a violation of norms and rules developed to ensure information security.

Today, there are a large number of mathematical models, the use of which can reduce the level of risk and increase the protection of information. However, the realities of applying these models, norms and rules by both individuals and social groups often indicate their violation. This is especially evident in the tasks of cybersecurity, which are aimed at ensuring the protection of information security subjects from negative information influence, from information attacks.

The scientific study of the reaction of both an individual and social groups to a negative information impact, to a targeted information attack still does not allow to make an effective forecast of the behavior of subjects and to develop effective measures to counteract such attacks. Despite some results obtained along this path, the practical implementation of a number of recommendations encounters serious resistance from the subjects of information security themselves. A significant part of practical measures to counteract information attacks is based on technologies to restrict subjects from accessing information that is considered harmful to them. This is what causes significant resistance from both individuals and numerous social groups. This is caused, for example, by objective reasons, when the restriction of access harms the performance of functional duties by employees. This is also caused by social reasons, when the subjects of information security react extremely negatively to the restriction of their access to information. Because the current development of society corresponds to the level of the information society, where the very restriction of access to information can be considered as an information attack on the main mechanisms of existence of such a society.

On the way to further development of society, the contradiction between the need to provide access to the widest possible range of information and the need to protect both individuals and society as a whole from negative information impact will only grow. For example, with the growth of the amount of information accumulated by society, which is necessary for its functioning, the number of people who are able to rationally operate only with certain fragments of this general information is rapidly growing. They are forced to perceive other fragments of the general information of society uncritically. It is this feature of the functioning of society that is often the target of an information attack today.

This situation is typical for any society, both developed and developing. This is clearly seen in the example of the emergence of a spontaneous movement of "anti-vaxxers" against the backdrop of the COVID pandemic. It is quite significant that even scientists are involved in this movement.

Thus, the development of models and methods that have on me to ensure information security and cybersecurity in the modern information space is relevant in scientific and important in practical application problem. Approaches to resolving the contradiction between the need to provide people with free access to any information and the need to protect people from harmful information are gradually becoming the main focus of research in the field of information and cybersecurity.

Conclusions

1. The National Security Strategy of Ukraine, the Military Doctrine of Ukraine, the Cybersecurity Strategy of Ukraine and other documents emphasize the growing need to strengthen measures to protect a person and a social group from negative information and informational-psychological influence, the need to develop new methods and means for the implementation of these activities. The standards of the ISO/IEC 27000 – 27037 Information technology – Security techniques series set the requirements for the development, operation and modernization of information security management systems (ISMS), which also includes the need to model the activities of information security subjects. It has been found that today violations of information security by the subjects of information security in the world are massive. It is shown that the informational-psychological factors used in the process of building models of protection of a person and a social group as subjects of information protection originate from management, psychology, sociology and game theory. Which is clearly insufficient, since it cannot be integrated into information security models.

2. It is shown that in modern models of description of information security processes, the subject component (a person or a social group) is modeled at the level of implementation of the given formal rules, and these rules relate to both interaction with the objects of information protection and interaction between subjects. It is shown that there is a need to develop such models of activity of subjects and subject-subject interaction, which allow to carry out formal modeling.

3. The existing models of management of subjects, which originate from psychology, sociology and management, are analyzed. It is shown that for the tasks of information and psychological security there is a need to develop new models of human activity and human interaction, since the existing models cannot be effectively used.

4. The proposed tool is a promising tool for identifying agents ofconfidentiality threats in the case when agents are part of a social network. Grouping of quantitative values of coefficients $R_{\leftarrow}$, $R_{\rightarrow}$ and M_i allows you to analyze information processes in the social network, to identify informal agents of influence on the network and agents that are ignored by the network, and those agents who actually ignore the activities of the network (almost without taking part in its activities).

5. The proposed remedy is used without the participation of agents of the social network, which excludes the distortion of the results of the study, since the channel of uncontrolled influence on the social network is excluded. This increases the level of reliability of the data obtained. The proposed computer program is a powerful tool for monitoring social networks, as it can be used even in the background. This allows you to get the dynamics of the coefficients $R_{\leftarrow}$, $R_{\rightarrow}$ and M_i in its temporal unfolding. In particular, it allows you to detect agents who become a potential privacy threat in time.

6. The paper is the first to develop a model for constructing an information space for a given subject of information security, which is based on the specifics of perception and processing of information, features of decision-making and implementation of activities of the subject of information security, which led to the division of an integral database into eight subsets using three dichotomous operators.

7. The paper describes the method of using the information space of the subject of information security to protect subjects from attacks on the components of the information space, to identify the presence of such influence and its specific characteristics, as well as to counteract the negative information and psychological impact on the formation of an adequate goal of the information space.

8. For the first time, a methodology for comprehensive protection of a person and structured and unstructured social groups has been developed, taking into account the possibility of adaptation of individual subjects in need of protection and their groups to the organized social environment, as well as one- and multi-level social networks from negative information and psychological influence, which takes into account the classes of characteristics of the activity of an individual subject and a finite set of classes of binary relations between these subjects using certain operators, which made it possible to ensure the protection of various kinds of subjects and subject groups from negative information and psychological influence.

9. For the first time, the model of structuring the information space of the activities of individual subjects of information security is used to apply in the development of a method of protecting the subject from information and psychological influence. It is proved that arbitrary activity in the information space can be described by two-component operators, which translate one component of the information space, which describes the subject area of activity before the implementation of the activity, into one component of another information space, which describes the subject area of activity after the implementation of the activity.

It is proved that in order to describe arbitrary activity in the subject area of the task, it is necessary, in general, to have 64 two-component operators that translate the information space "before the activity" into the information space "after the activity". It is shown that simple regulators and systems of positive and negative feedback can be described as certain such operators.

10. A method of protecting a person from negative information and psychological influence isproposed, which uses the proposed model of structuring the information space of individual subjects to protect against influence, as well as dividing the set of characteristics of activity into subsets with characteristics characteristic of a wide range of subjects and an individual subject, allocating the characteristics of the subject's activity from 16 defined classes (classes are distinguished by the poles of dichotomies "participant – observer", "generalizing – detailing" and others), which made it possible to identify factors, channels and characteristics.

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