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RELATIONS BETWEEN INFORMATION SCIENCE AND INFORMATION SECURITY CULTURE

Abstract

This paper presents an analysis of the relations (interactions) that exist and occur between information science and security culture defined as the main object of interest of security sciences. Due to the transdisciplinary and interdisciplinary nature of these fields of science, one may notice common methodological aspects in their areas. These aspects refer, in particular, to issues such as shaping the behaviour of the information society or protecting information. Although the development of information and communication technologies provided users with fast access to an abundance of information, one should search for threats that emerge along with the opportunities. An absence of appropriate action aimed at shaping the right attitudes of users may lead to threats – for example, susceptibility to disinformation or manipulation. The aim of the article is to present the relations that exist between the culture of information security and information sciences and answer the following question: How can information science influence the formation of information security culture?

Keywords: *security sciences, information science, culture of information security*

Introduction

Both security sciences and information science are interdisciplinary and transdisciplinary. The common property of these two domains is their multidisciplinary nature. Security sciences and information science are disciplines that belong to the domain of social sciences[1]. Information science is a discipline of science that, among others, analyses how people function in the world of information and supports research in security sciences, in particular with reference to the development of the technological civilisation and communication. It includes all the theoretical and practical issues related to information activity. It uses the statistical methods and the methodology of social sciences, but does not have a uniform field of research or a separate methodology. As a new discipline of science, it has not yet formed a homogenous field of focus (Sosińska-Kalata, 2013, p. 9-41). Information science as a science derives from three other domains: information technology, library science and telecommunication. The term was first used in 1959, but at that

time it referred to the description of software. At the end of the 1960s, information science was met with great interest by librarians. This was mainly due to the development of software that enabled to search for documentation with use of a computer. The development of information science may be divided into four stages (Yan, 2011, p.510 – 527):

- Stage 1 – the embryonal phase of information science (1948 – 1959)
- Stage 2 – the period of coexistence of three classical information sciences (information technology, library science, and telecommunication)
- Stage 3 – the period of development of sector information science (1974 – present)
- Stage 4 – the period of planning the homogenisation of the research subjects of information science (1994 – present)

The issues related to information science, which may include information, information resources, information systems, information users, as well as information-related behaviour, are not connected to the traditional area of focus of security sciences. However, from the point of view of the research scope, the following subjects may be included (Batorowska, 2021, p. 342):

- the influence of the infosphere on individuals,
- the effects of information overload and the pace of technological development on the level of security of specific individuals or social groups,
- the consequences of rivalry between subjects that compete for information resources and access to knowledge in their activities aimed at obtaining power,
- the importance of information culture in counteracting manipulation,
- society's information awareness in combating information threats and in ensuring the continuity of operations of various entities,
- the effects of the information fight on the security of individuals,
- the influence of the quality of the possessed information resources and of the analytical and informational potential of employees and their importance in the process of strategic decision-making in the national security sector.

Due to its characteristic properties, the term security is inextricably linked to civilisational progress. The challenges and threats posed by users require a broad scientific approach in multiple aspects of safety: legal, social, environmental, health, and information security. These issues are being analysed in a series of theoretical and empirical studies. The analysis of the problems of information security culture that refers to its spiritual, organisational, and material aspects, must take into account the research area of information sciences. In order to observe a common subject of research that will allow various manifestations of information culture and security culture to be diagnosed, it is necessary to combine the scientific reflections of researchers working in both these domains.

Information culture is extremely important, as it reinforces the inter-cultural competences of a security unit by supporting it in its work to prevent the exclusion of social minorities within the whole multicultural community. Education for information, like multicultural education, promotes the upbringing that is based on humanistic values and shapes the personality traits of the subject enabling him or her to perceive another person as a being that thinks, feels, and suffers in the same way as others do. Finally, information security culture allows us to refer to information security and resources from the point of view of different organisational cultures (Cieślarczyk. 2014, p. 291-300).

The moral relation within information culture and security culture must not be underestimated. An important element of security that exists in the information environment is shaping pro-environmental and civic-minded attitudes, which, in turn, requires high morale among the security subjects. Therefore, assuming that information culture is a problem that may be referenced to information science and security sciences, the interdisciplinary thought that enables the integration of various ways to formulate it should be continued.

Transdisciplinary and interdisciplinary nature of security sciences and information science

Information science and security culture use the research results of various fields of science, so scientific publications on the methodology of these domains often emphasise the interdisciplinary and transdisciplinary nature of these sciences. Interdisciplinarity refers first of all to both information science and security culture, which share their research areas with other disciplines. One may also notice that their cognitive structures are synthesised. On the other hand, its transdisciplinary nature involves creating new knowledge in specific disciplines of science and across them, paying special attention to the applied methodology. A comparison of security sciences and information science reveals that both are interdisciplinary due to the fact that they have not developed a synthetic research approach, although, similarly to the domains presented before, they operate in various research fields. As a result, it is difficult to determine the borders of the research areas of these sciences.

The literature provides various definitions of information science. The Institute of Information Scientists defines it as a science that encompasses the broad concepts and theories of information and communication technologies in the domain that is related to the principles and practices of information management (Institute of Information Scientists, 1996). The Polish Language Dictionary defines it as a science that includes both the theory and methodology of information-related activity, connected to the actions of gathering, processing, and disclosing data, information or news from various fields of science[III]. M. Górny presents a similar definition, of a science that focuses on designing and using specific information systems that mediate the knowledge acquisition process (Górny , 2016, p. 35).

One of the first definitions of information science was presented by H. Borko. According to him, information science is a discipline that investigates the properties and behaviour of the information, the forces that govern its flow and processing to optimise its accessibility and use (Borko, 1968, p. 3-5). This definition presents information science as a multi-disciplinary science that is linked to other disciplines in terms of searching and gathering knowledge in recorded form. Information science may be defined in many

different ways, depending on the discipline; it is relatively new compared to other fields of science and it continues to develop rapidly.

Depending on the scientific domain that uses information science, one may encounter various attempts at defining it. The literature points to the origins of information science that originates from library science. This science defines the domain as a research area that applies the methods and techniques from multiple disciplines in order to understand the attributes, behaviour, and flow of information. Information science made a significant contribution in particular to the theoretical aspect and the intellectual basis for the work of librarians (Paul, Bhuimali, Aithal, 2017, p. 56). Another definition was provided by Viswanathan, who perceived it as a discipline that is concerned with the principle and technique governing the transfer or communication of organised thought (knowledge) from one human to another and ultimately to society (Saracevic, 1975, pp. 321 – 343).

The literature often refers information science to information technology. However, both information technology and social sciences attempt to develop a safe information infrastructure for the society. The illustration above presents information science and its aspects that are investigated by social sciences and information technology.

One may state that information science is an interdisciplinary domain that focuses mainly on investigating information and its properties, including gathering, organising, publishing, using, and storing information. This discipline uses the research results from numerous other disciplines such as information technology or social sciences. The key issue that constitutes a methodological aspect is the investigation of information-related behaviour of people who actively operate in the information environment. This refers to the methods of searching for information on the Internet, the factors that influence the choice of information sources that are trustworthy, as well as the methods of verifying the quality and reliability of the given piece of information. According to the definition provided by the Institute of Information Scientists, another important area of focus in this discipline is the development of systems that are responsible for searching for information. In recent years information science has become increasingly important, due to the growing activity and increasing amount of gathered and processed information.

Fig. 1. *Information science and its involvement in social sciences and information technology.*
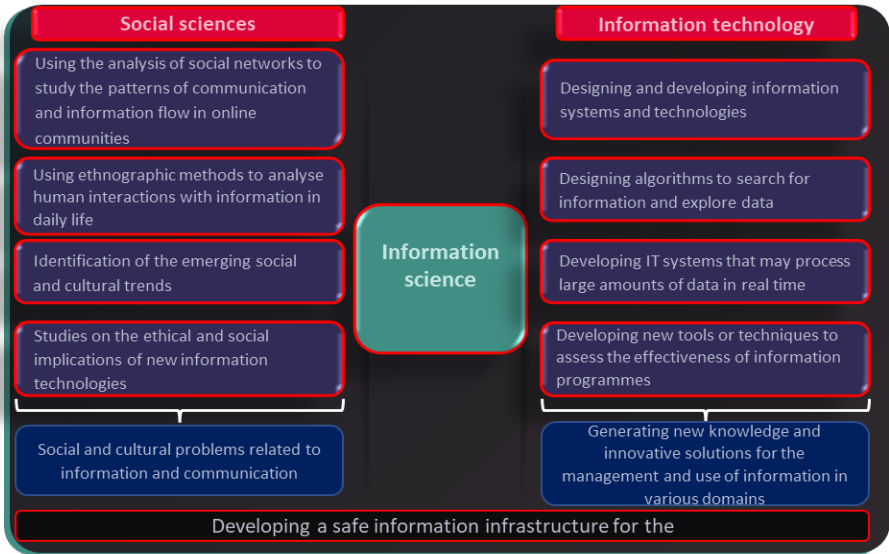
Although security sciences and information science are related, their interest focuses on different areas of information management and protection. Security sciences focus primarily on the aspects of protecting information from unauthorised access, use, modification, or destruction. The main aim is to develop optimal strategies and technologies to prevent threats to information. Although the disciplines have different fields of interest, cooperation between scientists is necessary to ensure attributes of information such as integrity, availability,and confidentiality in the virtual world.

The methodological aspects in terms of the area, subject, and object of research of information sciences may also be analysed in greater detail from the point of view of security sciences. The illustration below presents sample scopes of research of both these disciplines.

Fig. 2. *Common methodological elements of security sciences and information science.*

Research area	Research object	Research subject
· Infosphere · Information space, the world of information · The period during which the	• Social reality • Information users, information resources • Institutions and networks that gather, process and distribute information resources • Processes and phenomena connected to the realization of the information process and the mediation process • Information systems, organization and management of information systems	• Virtual, real, and hybrid environment • Infosphere, logosphere, mediasphere, technosphere, galenosphere • The environment of an individual, collective, national, or global subject

The literature recognises the common research area for both these sciences presented as shown above. B. Hołyst presents the domain of security sciences from the point of view of other disciplines, including anthropology, law, physics, ethics, philosophy, and technology. Although each of these research areas is characterised by different theoretical and methodological approaches, the author presents a wide definition of security. It is defined as *a set of conditions that allows the individual to achieve the planned goals without any interferences*(Hołyst, 2014, p.10).

As far as information science is concerned, one may state that it is similar in attempting to create a basis in order to ensure the optimum conditions to realise the information process. Moreover, it eliminates the barriers that prevent humans from satisfying their informational needs and from reaching satisfaction by individuals who demand information providers to deliver products that meet specific standards of quality and intermediaries to provide the highest possible quality of information-related services.

The research areas of both security sciences and information science are interdisciplinary. The interdisciplinary nature of information science is manifested not only in specific disciplines, but in all spheres of science, social life, or professional activity. The subjects of research of this discipline are problems related to information flow: from the source where it is created, through intermediaries, to the end user who receives specific information. Special

attention should also be paid to the actions aimed at detecting interferences that may occur at various stages of information flow and those that strive to remove such interferences.

THE LINKS BETWEEN INFORMATION SECURITY CULTURE AND INFORMATION SCIENCE

The discipline of security sciences is associated with several notions. They include security culture, security climate, securitology, and defence culture (Korzeniowski, 2012, p. 55). The main fields of investigation of security science as a discipline are the threats to the existence, development, and normal functioning of the subject, focusing on the security of an individual, a small social group, social security, or finally, the security of humanity (Korzeniowski, 2012, pp. 53 – 55).

The notion of information security culture may be perceived in various ways. Lev Manovich defines the term as a manner in which information is presented in specific locations and cultural facilities (Lev, Manovich, 2001, p. 71). According to the author, security culture is a synonym of visual culture or so-called information aesthetics and it is understood as the new culture of the information society, which differs from the preceding culture of the industrial society. It is worth noting that the discussed attempt to define this notion is not holistic, as the author focuses only on the visible, visual aspect of information objects. Information security culture is a term that has been used for a long time. Another definition of this term means that it is understood as socially identified behaviour patterns constituting norms and values that describe the meaning and use of information (Choo, Chun, 2008, pp. 792 – 804). On the other hand, M. Ginman defines it as a culture in which the transformation of intellectual resources occurs simultaneously to the transformation of material ones. The author emphasises the fact that the main resources in these processes are various types of knowledge and information. He also mentions the added value that emerges between developed information culture and effective business activity. As a result, information security culture may be a goal or a strategic asset and it should be planned in the same way as other material resources (Ginman, 1998, pp. 93 – 106). Another approach to the

definition of information security culture was presented by T. Schlienger and S. Teufel, who assumed that the essence of this definition is its connection to organisational culture due to the fact that it is perceived as one of the functions of the organisation of information security. According to these authors, the information security culture is an organisational sub-culture that supports all activities so that information security becomes a natural element of the everyday work of all employees (Schlienger, 2003, pp. 46 – 52).

Fig. 3. *Components of security culture that are related to information science.*
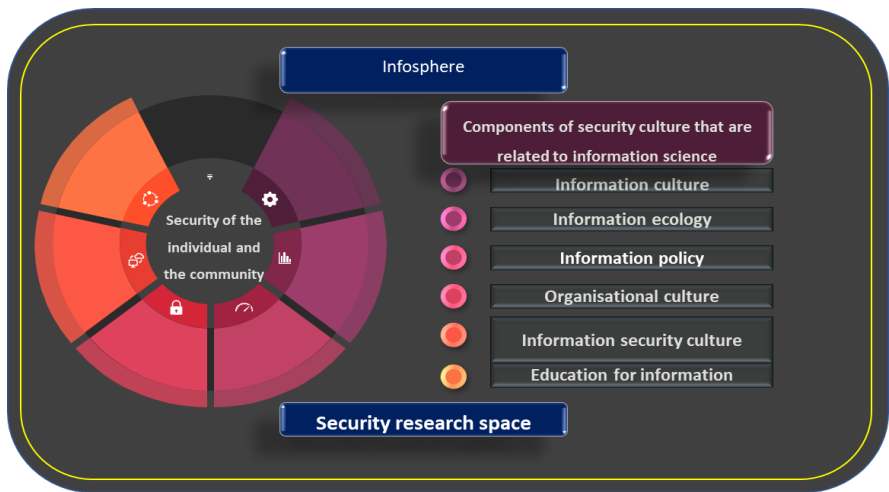
Polish subject literature defines the term as all the tangible and intangible components of the recorded human heritage (Piwowarski, 2018, p. 111).

To conclude this brief outline of the attempts to define the information security culture both in Polish and international literature, one should highlight two main aspects: the individual information competences of the given subject as the necessary condition for development and the information environment being an environment where the competences presented above are indispensable.

The relations between the element of security sciences in form of information security culture and information science are noticeable in the information-related components of security culture (fig. 3).

The components presented in the illustration influence the quality of life of users and define the information environment of the subjects that is determined by the progress of technological civilisation and the dominance of information in all spheres of human activity. The components aimed at counteracting and preventing threats that emerge as a result of the activity of the information society are as follows:

- information culture,
- information ecology,
- information education,
- organisational culture,
- information policy,
- information security culture.

In the literature, information culture is defined as the set of values, attitudes, behaviours, and skills that enable smart use of information resources. It is also used to disclose information and use it in an appropriate manner. It is a collective culture of sharing and enriching the users, which exists in the space between information, communication, education, and information technology[II]. The above definition suggests that it constitutes the mental structure of the society, at the same time being a tool for preventing digital threats. It is also responsible for shaping the informational awareness of the user and ensuring the informational continuity of various entities (Zaskórski et al., 2021, pp. 26 – 32 and 56 – 64).

Information ecology is a science that investigates the influence of the total information on the emergence and functioning of systems, focusing in particular on individuals, social groups, and humanity, as well as on the relations that occur between all elements of the information environment as part of the collective and individual processes of cognition and decision making (Eddy et al., 2014). The analysis of the above informational component of security culture leads to the statement that information ecology is connected, first of all, to a specific user of the information environment As an approach, it presents the relations between people and the infosphere that are based on the appropriate and cultured information management.

The literature defines information policy as a set of standards and principles established by public authorities and organisations, whose aim is to control the creation, access, management, and use of information (Charles et al.,2005, p. 227). Hence, information policy deals with shaping the standards and principles both locally and globally and influences the creation and maintenance of informational order and social information security. The absence of an appropriate information policy may lead to problems with smooth and correct flow of information. Information policy should be created based on the information culture of the information users. This will enable the subjects to develop a sense of responsibility and political participation. As a result, it will shape an appropriate security culture among information users in specific social groups, as well as national security.

Another information-related component of security culture is the organisational culture. It is important in terms of information security in the given organisation or business entity. It promotes models that refer to the attitudes of the organisation that determine the security level. The main field of focus in this sphere are the attitudes and behaviour of employees of a specific organisation. Creating an appropriate model of organisational culture and ensuring that employees comply with it enables an organisation to avoid losses that result, for example, from a loss of data that belong to the shareholders of the organisation.

Information security culture is a tool that helps combat the vulnerability of the community to information attacks. In addition, it is an important attribute of maintaining the continuity of modern organizations. Finally, the aim of the last component of security culture – i.e., education for information – is to shape good patterns of behaviour in society. In terms of security culture, the aim of education for information is to socialise the community while at the same time adapting people to use the information environment correctly, as they are perceived as responsible subjects of security. This component also enables a specific level of stabilisation and acceptable risk to be established.

To conclude these reflections on the components of security culture that are related to information science, it is worth noting that they do not apply only to information *per se*, to data of specific strategic value, or to information infrastructure. Much attention is paid to information users so as to minimise the risk of occurrence of adverse situations or threats.

It is also worth mentioning that the components of information culture related to information science presented above are aimed at supporting it in the realisation of the tasks and goals with the aim to ensure the external and internal security of the subject. Security culture may be perceived in three aspects – spiritual, material, and organisational – and the relation between those aspects may be analysed in terms of individual streams. It is essential to understand and determine whether, and to what extent, the components of security culture that are related to information science are supported and whether they are a source of added value for a given culture. In searching for the relations between information science and security culture it may be helpful to analyse the behaviour of subjects who actively participate in the world of information and who follow specific models and patterns.

Fig. 4. *Relations between the components of security culture that are related to information science.*
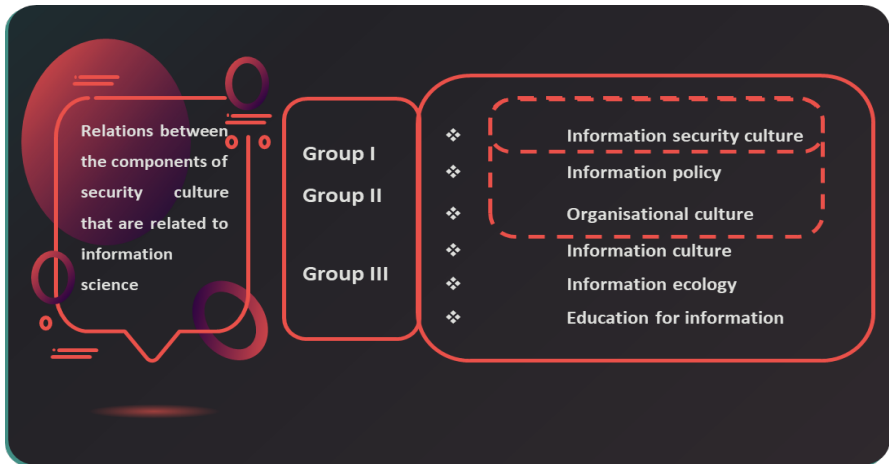
Although the culture of information security is one element of the security culture, it is closely linked to other components, so they cannot be analysed separately. All the elements create a common culture of security. The illustration presents how they are divided, based on the tasks for which they are responsible. The aim of the elements in group III is to shape the security subject in order to create a culture of information security. They influence

the creation of principles and standards, build the correct attitudes of users towards information and teach the society the practical skills of information management. Information policy and organisational culture use the previous activities of the components from group III to create social order and information security. At the same time, information security culture combines all the effects of groups III and II, which helps to create optimal models of behaviour in the information environment in a given community.

Fig. 5. *The influence of the components of security culture that are related to information science on the culture of national security.*
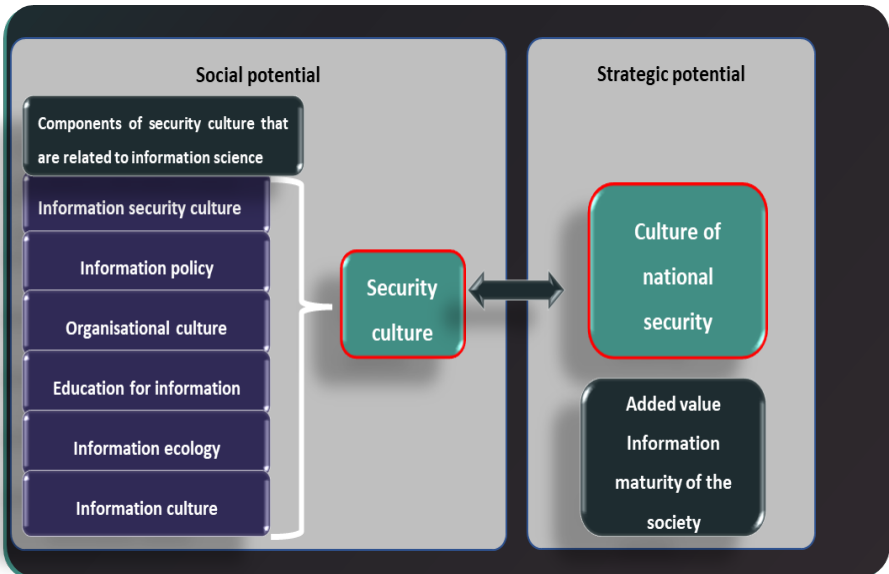
The relation between information science and security culture may also be presented in terms of its influence on shaping the potential of the culture of national security (fig. 5). This influence is strong in particular during digital development. If citizens are well-prepared, providing them with the appropriate patterns of behaviour, knowledge and skills may improve the resilience of the state to external activities, such as disinformation, as well-established attitudes reduce the risk of information-related threats. From this

point of view, the security subject possesses adequate resources and is able to actively participate in the life of the information society.

The process of creating the culture of national security should take into consideration elements of security culture, especially when most of the citizens use information tools for various purposes on a daily basis. The absence of a security culture may undermine the information security in the state.

Conclusion

Information management is an extremely difficult task. If conducted systematically, actions related to information enable to apply it effectively on various levels (individual, organisational, and social). They are connected to the methods, principles, and the tools that support these activities.

The ability to manage information correctly is essential from the point of view of security. As a result, one may conduct research with the aim of developing optimised actions concerning information management and determine the borders between the security of information and informational security. In this aspect, the scientific considerations should also include studies of the relations that exist between information management and information security management. In order to manage security efficiently, it is necessary to understand the nature of security and to know the current challenges and threats. Another important element is the education of the society in order to effectively solve the emerging crises and to perform actions in situations that pose a threat to people.

To answer the previously set research question – *How does information science contribute to shaping the culture of information security?* – one should state that in a world where IT tools are an indispensable element of daily human activities, information science has a strong influence on the information security culture. These areas of activity mainly include the development of security technologies, where information science strives to develop systems that would effectively protect users from threats such as distortion or data loss.. Another sphere is education for employees about information security, which would help develop appropriate models for an information security

culture. Another important aspect is the human awareness of threats that may be encountered during the use of IT tools or platforms. The final aspect that should be considered is risk management. Information science enables analysis to be conducted regarding risks related to information security and to treat them as the basis for developing optimum action plans in the event of an emergence of threat. A properly educated society is less vulnerable to information-related threats, whose scale is increasing year by year. The culture of information security as an information science component of the security culture is even important in creating national security. Thus, one may claim that the presence of information science in security sciences is a key factor in effectively solving information society problems..

The prophylactic actions in this respect require, first of all, reliable studies aimed at diagnosing the sense of security in various subjects and enabling them to cooperate under the conducted educational initiatives. In conclusion, it is essential to consider the problems of the information security culture as a field that should become a new area of research for information scientists and that is primarily related to the functioning of the subjects in the infosphere. The technological development resulted in increased information opportunities and in their transfer to the virtual world. However, these opportunities cause several threats for the potential user, due to the fact that the information published on the Internet is not verified and that it may only be verified by its users. Such great risks require in-depth studies, both in the domain of security science and information science, in order to develop optimum solutions.

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