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EXPLORING NEW HORIZONS OF ACADEMIC EXPLORATION IN SECURITY SCIENCES: LINKING DIFFERENT SCIENTIFIC DISCIPLINES TO SECURITOLOGY

ODKRYWANIE NOWYCH HORYZONTÓW EKSPLORACJI AKADEMICKIEJ W NAUKACH O BEZPIECZEŃSTWIE: POWIĄZANIE RÓŻNYCH DYSCYPLIN NAUKOWYCH Z SECURITOLOGIĄ

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Abstract. Man, through his daily functioning in various systems of action, is as if "immersed" in space-time. Therefore, security should not be understood as a property of operation system, but as a hypothetical element at the interface between the system and environment. Incapacity of this system generates unreliability of the system's security and entails its destruction. The paper continues the problem of metatheoretical considerations of securitology. The author's aim is to compare the scientific disciplines which in their subject and methodological scopes are included in the latest security science and offer possibilities for using their achievements in securitological research. The main research problem is expressed in the question: what are the possibilities of applying various scientific disciplines in comprehensive security science? The course of cognitive process used deductive inference from the patterns and models of system sciences and analogy.
Keywords: metasecuritology, security philosophy, security cybernetics, security theory, disciplines

Abstrakt. Człowiek poprzez codzienne funkcjonowanie w różnych systemach działania, jest jakby „zanurzony" w czasoprzestrzeni. Bezpieczeństwo nie powinno być zatem pojmowane jako właściwość systemu działania, lecz jako hipotetyczny element na styku systemu i otoczeniem. Niezdatność tego systemu generuje zawodność bezpieczeństwa systemu i pociąga za sobą jego zniszczenie. Artykuł stanowi kontynuacje problematyki metateoretycznych rozważań na temat securitologii. Autor miał na celu zestawienie dyscyplin naukowych, które w swoich zakresach przedmiotowych i metodologicznych wchodzą w skład najnowszej nauki o bezpieczeństwie i dysponują możliwościami wykorzystania ich dorobku w badaniach securitologicznych. Główny problem badawczy wyrażania się w pytaniu: jakie są możliwości zastosowania

różnych dyscyplin naukowych w kompleksowo pojmowanych naukach o bezpieczeństwie? W toku procesu poznawczego zastosowano wnioskowanie dedukcyjne ze wzorców i modeli nauk systemowych oraz analogię.
Słowa kluczowe: metasecuritologia, filozofia bezpieczeństwa, cybernetyka bezpieczeństwa, teoria bezpieczeństwa, dyscypliny

Introduction

Securitology as a scientific discipline is highly interdisciplinary and is intended to be a comprehensive science. Therefore, as a rule, it relates to many spheres of human activity and requires researchers addressing security issues to use methods that are more flexible and versatile than in traditional, atomized and fragmented science, and that can be used for security evaluation both in the process of operation and in the design process of the operating system.

Based on the literature review, a judgment can be made that at the current stage of security science development, special attention should be paid to basic research. This is because (Świniarski, Kawalerski 2019, p. 140):

1) the security theories in operation today and their languages were formed in a spontaneous manner and have many sources of expansion;
2) the creators of many names in the field of security science very often did not relate the new concepts to a deeper theoretical and methodological layer;
3) the basic concepts of this science do not have sufficiently precise definitions;
4) the basic divisions of security science are inaccurate and imprecise;
5) the security theory has little diagnostic power (poor explanation and prediction, imprecise description) and is poorly proven. Indicated theory also does not provide a strong basis for empirical research and practical application (unverifiable claims).

The above-mentioned barriers are important for the reason that in the intensive system of social control currently prevalent in developed countries, in addition to the "*best will*" of decision-makers to make decisions, at every level of social action, the "best calculating" is still required, i.e. the optimal posing and solution of the decision problem (complete optimization). In other words, for social activity to be based not on guesswork, intuition or conjecture, regarding the decisions to be made, but on knowledge drawn from the duly substantiated claims of the sciences.

Indicatum concerns metasecuritology, while the main research problem is expressed in the exploratory question: what are the possibilities of applying various scientific disciplines to comprehensive security sciences? Therefore, the fundamental objective of this paper is to compare scientific disciplines that, in their subject and methodological scopes, are part of the latest security science and have opportunities to use their achievements in securitological research.

In the course of cognitive process, deductive inference from the patterns and models of system sciences, as well as analogy, contradiction, completeness was used. Thus, the design of securitology is based on the idealization theory of science and the strategy of theory before research is applied (Nowak 1977, pp. 62-113).

Materials and method

Fragmentary and comprehensive view of the world

The analytical-reductionist approach, as expressed by Descartes and Newton, advocated bringing the object under study down to the simplest elements that comprise it in order to explore them in detail and understand the nature of interactions between them. "*Then, changing each time only one of the variables present, deduce general laws allowing to predict the properties of the system under different conditions*"(de Rosnay 1982, p. 117). However, a prerequisite for prediction is the additivity of elementary properties, which is that the magnitude corresponding to the whole object equals the sum of values corresponding to the parts of object, given any division of the object. Except that additivity occurs in the case of homogeneous objects/systems, i.e., those that contain similar elements and interact with each other to a small extent. In the case of complex systems, the laws of additivity do not apply, because they consist of a variety of elements linked by very strong interactions (couplings). Therefore, complex systems are referred to, following Aristotle, as "*the whole is more than the sum of its parts*" (Kieżun 1997, p. 323)

The systems approach is a response to the fundamental fragmentation and atomization of science and its differentiation. However, the analytical and synthetic-system approaches, should not be regarded as mutually exclusive, but rather as complementary. This is because it is impossible to replace one of them with the other.

The specific features of both approaches are better shown in Table 1.

Under the influence of systems thinking, concepts change; liquidity replaces fixity, movability replaces permanence, flexibility and adaptability replaces rigidity and stability. "*The concepts of flux and flux balance join the concepts of power and power balance. Permanence and irreversibility become fundamental dimensions of the nature of phenomena. Causality becomes circular and open toward finality*" (de Rosnay 1982, p. 120). Due to the dynamics of a complex system, relativity and becoming are introduced. Here again is a table (No. 2) that contrasts the characteristics of "*classical thinking*" and "*systems thinking*".

Table 1. Main features of the analytical approach and systemic approach

Analytical approach (fragmented)	Systemic approach (comprehensive)
Distinguishes: focuses on elements.	Connects: focuses on interactions between elements.
Studies the nature of interactions.	Studies the effects of interactions.
It is based on the precision of details.	It is based on general perception.
Modifies individual variables.	Modifies groups of variables at the same time.
Independent of duration: phenomena considered are reversible.	Includes persistence and irreversibility.
Fact-checking is carried out by experimental testing within the theory.	Fact-checking is carried out by comparing the model's functioning with reality.
Models precise and detailed, but difficult to apply in action (e.g., econometric models).	Models not accurate enough to serve as a basis for knowledge, but usable for decision-making and action.
Effective approach for linear and weak interactions.	Effective approach for non-linear and strong interactions.
Leads to teaching by discipline (disciplines existing side by side).	Leads to multidisciplinary teaching.
Leads to action programmed into the details.	Leads to goal-oriented action.
Knowledge of details, goals poorly specified.	Knowledge of objectives, liquid details.

Source: J. de Rosnay, *Macroscope. An attempt at a global vision*, PIW, Warsaw 1982, pp. 118-119

Table 2. Features of static (analytical) vision and dynamic (systemic) vision

Static vision (simple systems)	**Dynamic vision (complex systems)**
Fixed	Liquid
Power	Flux
Closed system	Open system
Unidirectional causality	Circular causality
Stability	Dynamic stability
Stiffness	Stationary state
Durability	Permanent renewal (*turnover*)
Power balance	Flux balance
Example: crystal	Example: cell
Systems behavior: predictable, repeatable, reversible	Systems behavior: unpredictable, unique, irreversible

Source: J. de Rosnay, *Macroscope. An attempt at a global vision*, PIW, Warsaw 1982, pp. 121-122

Classification of sciences

The classical division of sciences proceeds by cognitive or decision-making (practical) research objective. Cognitive (theoretical) sciences conduct basic, purely cognitive studies. Their main purpose is to explain what exists or can exist (first causes and principles of all existence, structure of functioning, fundamental knowledge). At the same time, they provide applied sciences with knowledge that is implemented in practice. The four great divisions of the theoretical sciences are: mathematical sciences, social-humanistic sciences, physical sciences and biological sciences (Such, Szcześniak 2000, pp 52-53).

Today, contact sciences and integrative sciences should still be mentioned. Contact sciences are borderline sciences, e.g.: biophysics, physical chemistry, biochemistry, biogeography, geophysics, geochemistry. They are formed at the intersection of two or more classical sciences (monodisciplines), usually related, and combine various aspects from these separate fields in their research. Complex (integrative) sciences can be called contact sciences, but in a more general sense. These include, for example, cybernetic, synergetic, chaos theory, information theory, communication theory, general systems theory. These sciences combine different aspects of phenomena hitherto studied even by very distant disciplines, build general theories and construct languages with high information content. For example, cybernetics as the science of control processes in various systems, in living organisms and machines, in society, is at the interface of theory and practice. On the one hand, it is a formal science, because it uses the language of mathematics, while on the other hand, it is a concrete (real) science, both biological and physical, because it is based on their axioms and theorems.

The subject of comprehensive securitology research

The subject of reliability research and analysis is **every failure**, every error and unreliability of a link or link of a chain, system, or operation system, while the subject of security issues are such failures and such errors that create a **special situation** that requires additional human effort to avoid losses (Jaźwinski, Ważyńska-Fiok 1993, p. 13).

Therefore, securitology is interested not in all failures and errors, but only in those that create security risks, which can be broadly caused by the following causes (Pihowicz 2008, pp.17-20):

1) unfavorable environmental influences, such as the effects of natural forces, fires, floods, security failures;

2) operational errors understood as link errors made in the process of operating the system, such as due to disease, stress, under-training, information noise, risk appetite;
3) malfunctioning of components, aggregates or functional assemblies, as a result of defects, such as malfunctioning of the braking system in a vehicle, **failure of the flight control system,** error in the drainage system.

Therefore, destruction of objects is one of the important processes occurring in any operating systems. This process is carried out either as an unintentional action (the action of natural forces) or as an intentional action (the action of people) in a specific system of things combined into a single whole (Konieczny 1970, p. 27). Among the elements of this system, in the previous text, the chain of action and its environment were distinguished. The terminological convention thus introduced is intended to solve the problem of obscurity and information clutter in security theory, and should be used to describe any process of security-related action regardless of its physical realization in specific applications in security practice.

Results and discussion

It seems that at every stage of the life cycle of any chain, system and operation system, there should be consideration of safety issues. In all types of systems there are security problems. This should be reflected in the directions of the theory of securitology. However, such an approach requires taking into account a very large range of factors, in which individual narrow scientific disciplines specialize. Table 3 presents the subject of study and the possibilities of using these sciences in securitology.

Table 3. Linking various knowledge disciplines to securitology

No.	**Scientific discipline**	**Subject of study**	**Possibilities for use in securitology**
1	Securitology	It deals with special cases of facility operation in which there is/can be damage to the links in the chain of operation and its environment, as well as to the cooperating chains.	Securitology allows to describe, explain and apply the laws of security of technical, anthropotechnical, social systems. It provides a general and precise language, methods and theory.

2	Operations Science	Operations science deals with the study and analysis of processes, systems and equipment in terms of their ability to operate without failure or according to specified requirements for a certain period of time. The goal of reliability theory is to understand and improve the reliability, or stability, durability and correct operation of various systems, from simple equipment to complex technologies.	Operations science gives quantitative measures and evaluations of flux characteristics of the cause of functional imbalance stimuli, determinants of unfitness, and the development of recommendations to improve security based on improving the reliability of various links/chains in their design, manufacturing, implementation and operation. Operations science has a repertoire of probabilistic methods that can be used to model the safety of systems.
3	Sociology	The subject of study in sociology is the analysis of society, its structure, social processes and interactions between people. Sociology is a social science that studies various aspects of social life, seeking to understand how individuals, groups and societies function, develop and influence each other.	Sociology can study how people perceive the level and types of threats that exist in their society, the causes of crime, wars, conflicts, profiles of criminals and the effectiveness of preventive and punitive measures, how societies respond to different types of crises, such as natural disasters, terrorist attacks or pandemics.
4	Psychology	Psychology deals with the study of human behavior, thoughts, emotions and cognitive processes, regulating its relations with the environment.	Psychology can study how individuals cope with difficult situations, such as natural disasters, terrorist attacks or emergencies. In currently existing chains of action, people usually function in extreme situations, at the limit of their abilities. These are stressful situations in which a person makes mistakes, the consequences of which can be a threat to security.
5	Economics	The subject of economics involves the study of economic processes, production, distribution and consumption of goods and services in society. Economics analyzes how societies manage their resources to satisfy people's needs and desires.	Economics can help evaluate the costs and benefits of various security measures. Economic studies can assess whether certain security strategies are cost-effective and efficient compared to other options. Economic studies can help understand what the economic impact of different risks and threats are.

6	History	The subject of study in history is the analysis of past events, social, cultural, political, economic processes and human experiences, with the aim of understanding, interpreting and explaining their impact on the present. History is a science that allows to explore the past in order to discover the roots of modern phenomena and explain how societies have evolved and developed.	Historical studies provide a deeper understanding of past conflicts, their causes, course and consequences. Past crisis events, such as natural disasters or terrorist attacks, can provide insights into how societies respond to such situations and what crisis management strategies are effective. History allows comparisons between different periods and places in terms of hazards and security.
7	Occupational Medicine	Occupational medicine is a field of medical science and practice that focuses on the health and safety of employees in the workplace. Occupational medicine studies focus on understanding the impact of work on employees' physical and mental health and developing strategies to prevent and manage occupational hazards.	Occupational medicine can help identify potential health risks associated with particular types of work, chemicals, tools or production processes. Occupational medicine can assist in the management of employees who have been injured or become ill in a work-related relationship to ensure appropriate treatment and rehabilitation.
8	Ergonomics	Ergonomics deals with the design of work environments, tools, equipment and systems to be adapted to the capabilities and limitations of the human body. Studies in ergonomics focus on improving the productivity, comfort, safety and health of employees by optimizing the interaction between people and the work environment.	Designing workstations, tools and equipment with ergonomic principles in mind can help minimize the risk of injury from poor posture or movement. Ergonomics can help design tools and machinery so that they are easier to operate, reducing the risk of misuse.
9	Computer Science	Computer science deals with the processing of information using computer technology.	Computer science allows the identification and analysis of potential security risks in information systems, networks, applications and data. Simulation studies of various emergency situations and responses to them. Data analysis, design of decision support systems in security.

10	Systemology	Systemology, also known as systems science, is an interdisciplinary field of science that deals with the study and analysis of complex systems and the relationships between their elements. Systemology allows the understanding, modeling and management of different types of systems, both in the natural and social sciences.	Systemology can help analyze the structure and operation of security systems, identifying key components, information flows and potential vulnerabilities. Create models of systems in a security context to identify potential threats, attacks and their effects on the system. System studies can help design and optimize control and monitoring systems to detect and respond to threats.
11	Management	Management is a broad research field that covers various aspects of planning, organizing, coordinating, controlling and directing resources and processes in organizations. The subject of management studies is very comprehensive and can cover various aspects of organizational activities.	Risk management involves the identification, evaluation and management of threats and risks present in an organization. Studies in this area help to identify what threats can affect security, what their effects are and what strategies can be adopted to minimize risks. Management of organizational physical security can include analysis of strategies to protect buildings, infrastructure, equipment and security features.
12.	Logistics	Logistics is a branch of science that deals with planning, organization, management and control of the flow of goods, services, information and resources from their origin to their destination.	Analysis of strategies and procedures related to the security of goods and information in logistics processes, including protection against theft and sabotage. Analysis of the environmental impact of logistics operations and determination of strategies that simultaneously minimize environmental impact and ensure process security. Securing operating systems in a security system.
13	Physics	Physics is the science that studies the laws and principles governing the behavior of matter, energy, motion, forces and interactions in nature. It is one of the basic natural sciences that deals with the analysis of fundamental phenomena and the development of theories to explain their essence.	Physics provides tools and technologies for detecting various types of threats, such as ionizing radiation, hazardous materials or dangerous chemicals. Physics can help analyze evidence from crime scenes, such as examining materials, identifying prints or reconstructing the scene of an incident.

14	Chemistry	Chemistry is the science that studies the structure, properties, composition and transformation of matter. Studies in chemistry are of great importance in many aspects of life, from understanding basic chemical phenomena to developing new materials, drugs, energy sources and many other technologies.	Chemical studies can help develop effective methods to protect against toxic relationships or chemicals used in chemical attacks. Chemistry used in analyzing the chemical composition of food can detect contaminants, toxic substances and potentially dangerous ingredients.
15	Biology	Biology is the science that studies life, organisms, their structure, function, evolution and interactions between them and the environment. Biological studies deal with various aspects of organisms, from microscopic cells to entire ecosystems.	Biology is crucial in studying the spread of infectious diseases, analyzing viruses, bacteria and other pathogens, and developing preventive strategies. Biological studies help understand and reduce the risk of disease transmission between animals and humans.
16	Materials Engineering	Materials engineering is a field of technical science that deals with the study, design, manufacture and analysis of materials to obtain desired physical, mechanical, chemical and thermal properties. Studies in materials engineering are of great importance for developing new materials, improving the strength and durability of structures, and developing innovative solutions in various fields.	Analysis of the strength and durability of materials used in construction, transportation or infrastructure. Analysis of materials used in industry, including in the context of their strength, resistance to corrosion and extreme conditions. Studies of materials used in the energy industry, including energy production or chemical storage.
17	Mechanical Engineering	Mechanical engineering is a field of technical science that deals with the design, analysis, manufacture and operation of machines, mechanical devices and mechanical systems. Studies in this field range from the design of individual components to complex mechanical systems.	Analysis of machine design, component strength, safety in use, and development of safety features. Studies on building structures, analyzing their stability and durability, and developing solutions to ensure the safety of users.

18	Philosophy	Philosophy is a research field that deals with the analysis of fundamental questions about reality, knowledge, morality, existence and many other aspects of human experience. Although philosophy is not a typical „technical science" in the technological sense, it has many important applications and influences our understanding of the world and decision-making in many areas.	Philosophy of ethics can help analyze moral dilemmas related to security. Consideration of ethical values and norms can lead to a better understanding of what actions are acceptable or unacceptable in the context of security. Philosophical studies on the nature of knowledge and command can help to better understand how to obtain and evaluate information in the context of threat and risk analysis. Philosophical studies on theories of justice, power and the organization of society can help analyze the political aspects of security, including the relationship between individual freedoms and the state's requirements.
19	Theology	Theology is a research field that deals with the study of God, faith, religion, spirituality and related philosophical and ethical issues	Studies of various religious traditions and their impact on the formation of security-related values, norms and beliefs. Studies on the processes of forgiveness, reconciliation and reconciliation as ways to achieve peace and security. Analysis of the ways in which spirituality can influence coping with stress, trauma and threats.
19	Political Science	Political science studies the structures, processes, institutions and theories related to politics and governance. Studies in political science include the analysis of political systems, political decisions, state institutions and international relations.	Political science can analyze international relations, diplomacy, armed conflict, terrorism and threats to international security. Studies on state structures, defense systems, defense policy and crisis management to ensure national security. Analysis of internal policies to combat crime, terrorism, extremism and maintain public order.

20.	Legal Science	Legal science, also known as jurisprudence, is a research field that focuses on the analysis of law, its structures, functions, sources, interpretations and related social, moral and political aspects. Studies in the field of legal sciences include the analysis of various fields of law, legal processes and the impact of law on society and its functioning.	Analysis of norms and procedures in criminal law, including definitions of crimes, judicial processes and sanctions, to ensure social security and justice. Studies of administrative structures and procedures, including in the context of ensuring security in the public sphere. Studies on labor and employment regulations, workplace safety and worker protection.

Source: Own elaboration

As the above exploration shows, looking at security requires considering technical, social, psychological and natural issues. In other words, it is an integrated view of security, and such a general and strict (with high information content) security theory should be constructed.

Conclusions

Modern securitology is strongly related to structural and technological sciences, which are based on natural sciences. In addition, the link in the chains of control that securitology explores is the human being, which links this science to the human sciences. Therefore, all the human sciences that deal with its history, culture, morality and philosophy are to some extent useful in modern security knowledge. Undoubtedly, such mainly include relevant fields of psychology, sociology, biology, geography, history, philosophy, economics, management, etc. Therefore, system securitology belongs to the group of modern comprehensive (systemic) sciences. The common part of system sciences is contained primarily in the research method and formulation of problems. The momentousness of their approach is expressed in the study of complex wholes and identification of the laws that govern these wholes.

Modern security science at the current stage of its development should strive to become an exact science and take a prominent place among the complex sciences practiced today. After all, having a reliable security science is as momentous for the continuity of a country's operations as having a strong and well-armed army, police force, or other institutional homeostatic services.

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