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Bibliometric Analysis of Economic, Social and Information Security Research

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Abstract

Issues of national security are of particular scientific interest because without it. It is impossible to imagine the existence of any state. Protecting the economic and social interests of the population has long been one of the prerogatives of public policy, which has expanded to information security of the people in the face of rapid digitalization of all spheres of life and the introduction of information attack as a new form of weapon. In this context, it is essential to conduct a thorough study of primary scientific papers on economic, social and information security. In this work, it is proposed to use quantitative and qualitative bibliometric analysis methods, which allows to identify the main trends and form a basis for further research. The information basis for this work was the international scientometric database Scopus and SciVal by Elsevier, which allows you to analyze bibliographic data using built-in tools and import them for external use in the software VOSviewer. Bibliographic information is presented from the 1930s to June 2021. The results show that in the world, the most researched is the topic of first, social, second, information, and third, economic security. At the same time, these studies are interdisciplinary, mainly at the intersection of economic and social sciences and information security at the intersection of economic and mathematical, computer sciences. The analysis of time trends changes the number of scientific papers on economic, social and information security in Scopus database shows their gradual growth. In contrast, information security has the fastest growth rate. The study of geographical trends shows that economic security research occurs mainly in the United States, the Russian Federation and Ukraine (the funding of research confirms this at the expense of the relevant ministries and foundations). Social security is mostly studied in English-speaking and European countries (United States, United Kingdom, Germany). Information security research is concentrated in English-speaking (United States, United Kingdom) and China, India. The qualitative bibliographic analysis allowed to analyze the most cited, and hence the trend works on selected topics, confirming the multidisciplinary nature of the work. In addition, a cluster analysis of co-occurrence of keywords was coducted, which formed clusters devoted to social, economic, socio-psychological, legal and other issues.

Introduction

The need to ensure national security arose simultaneously with the creation of the first state and remained a very relevant and urgent issue. If we briefly summarize its main essence, national security aims to protect national interests from possible external or internal threats. National security as a complex category covers all spheres of public life (economic, political, social, etc.) and is divided into separate subspecies. Within the framework of this work, it was decided to focus on one of the main types of national security that form its basis: economic, social

and information security. The allocation of information security is due to the growing role and importance of digitalization processes in society. It is the key to the transition to a new type of social relations - post-industrial (information) society and a new threat - information attacks and wars. The study of any issue logically includes the analysis of existing scientific developments, which allows identifying the relevance, central areas of research and trends. In this regard, this work aims to conduct a quantitative and qualitative bibliometric analysis of research on economic, social and information security.

Literature Review

Studies of national security have deep historical roots and have been considered together with the formation of states. According to some scholars, the beginning of the concept of the same name is attributed to the 17th century (Holmes, 2015), which was originally associated with military power and defence. However, in the second half of the twentieth century, non-military ideas of national security began to take shape, which led to the emergence of new, more applied research. In particular, to date, many scientists have studied some issues and manifestations of macroeconomic (Bouchetara et al., 2020; Musa & Boychenko, 2018), energy (Salihaj & Pryimenko, 2017; Ziabina et al., 2020), food (Anderson, 2018; Peng & Berry, 2019), environmental (Zurlini & Muller, 2008), information security (Yarovenko et al., 2020), etc. However, these studies are incomplete and require a more systematic study not individually but in combination, which is why this work is devoted.

Methodology and research methods

Like any scientific research, this work began with collecting information on scientific papers related to economic, social and communication security, it's grouping, analysis and synthesis, tabular and graphical representation. All this formed the basis for quantitative and qualitative bibliometric analysis. For this purpose, data obtained from Scopus and SciVal databases were used as one of the most well-known international scientometric databases for the available period (depending on the category but is fixed as of June 26, 2021). The databases contain the necessary statistical information and developed built-in tools that help analyze scientific trends in time, geography, thematic, etc. For a more thorough qualitative analysis, the VOSviewer software was used, which allows the graphical presentation of information in visual cluster maps.

Results

First, we will conduct a quantitative analysis of research on economic, social and information security. Table 1 first presents the general results of search queries for the keywords "economic security", social security, information security in all available subject areas. Given the specifics of this study, the search query was narrowed by areas: Economics, Econometrics and Finance, Business, Management and Accounting, which is also shown in the table in an adjacent row. The third group displays additional metrics that provide a set of SciVal by Elsevier modules - the number of Topics (as a set of documents of general intellectual interest) and Topics cluster (as a combination of topics of similar research interest).

Table 1. Quantitative composition of scientific papers on economic, social and information security in Scopus and SciVal databases

Research category	General number of scientific works		Specified number of scientific works		Additional SciVal metrics	
	Scopus	SciVal	Scopus	SciVal	Topics	Topics cluster
Economic security	3,363	1,669	952	936	353	137
Social security	33,077	18,258	4,752	4,555	847	229
Information security	24,514	24,737	2,146	2,163	569	189

Sources: complied by author via Scopus Tools, SciVal of Elsevir.

Findings show that the country's social security is a rather urgent problem, which economic scientists at the world level widely study. Information security is second place, reducing the number of works by narrowing the search for financial disciplines (because most of them were related to Computer Science). The issue of economic security is the least studied among the selected categories.

Obtained in the system of modules SciVal Topics cluster can be grouped by subject area in the form of a bubble diagram, which is formed based on their prominence (Fig. 1). The size of the bubble depends on the scholarly output of this research area.
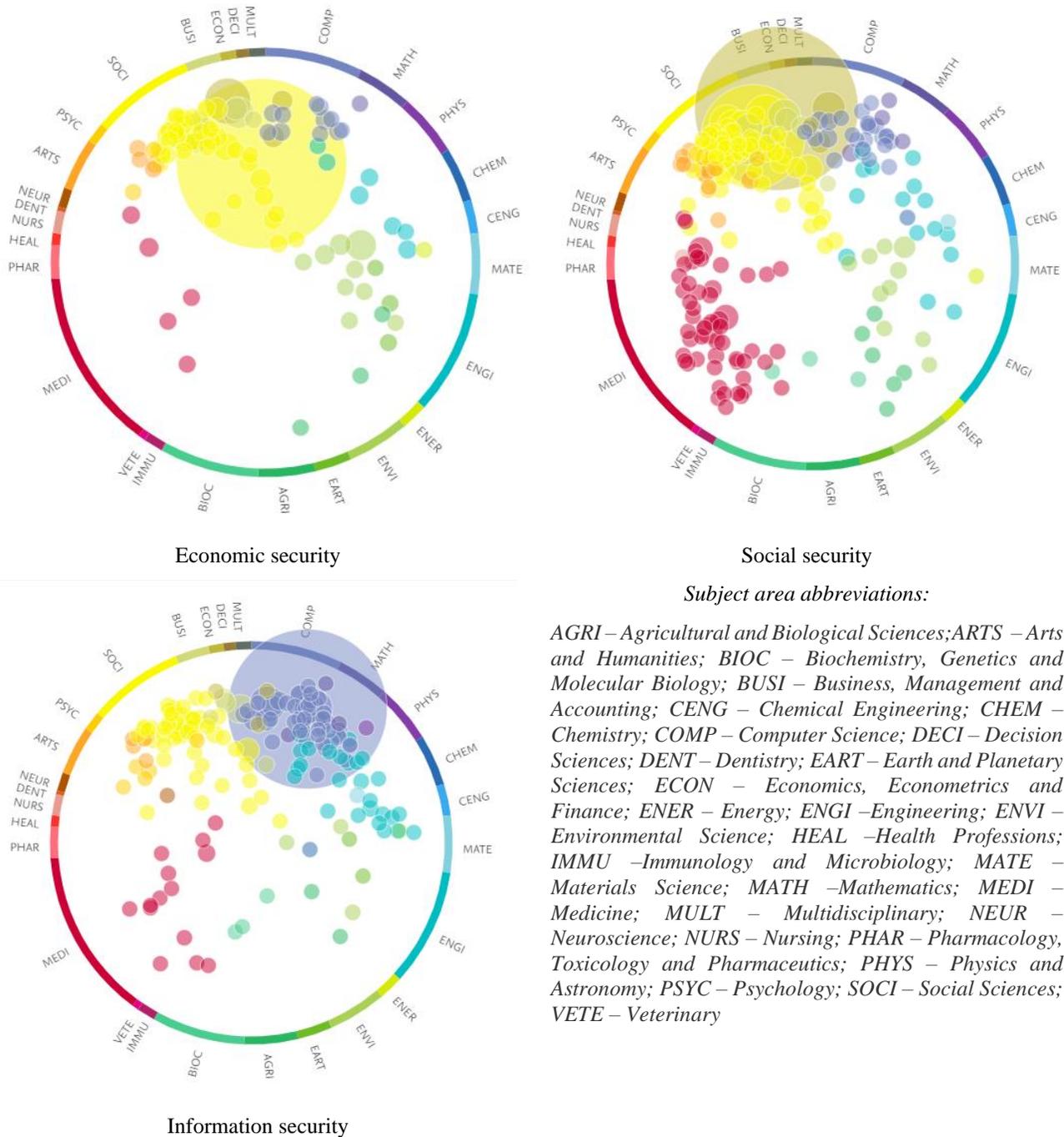

Economic security

Social security

Subject area abbreviations:

AGRI – Agricultural and Biological Sciences; ARTS – Arts and Humanities; BIOC – Biochemistry, Genetics and Molecular Biology; BUSI – Business, Management and Accounting; CENG – Chemical Engineering; CHEM – Chemistry; COMP – Computer Science; DECI – Decision Sciences; DENT – Dentistry; EART – Earth and Planetary Sciences; ECON – Economics, Econometrics and Finance; ENER – Energy; ENGI –Engineering; ENVI – Environmental Science; HEAL –Health Professions; IMMU –Immunology and Microbiology; MATE – Materials Science; MATH –Mathematics; MEDI – Medicine; MULT – Multidisciplinary; NEUR – Neuroscience; NURS – Nursing; PHAR – Pharmacology, Toxicology and Pharmaceutics; PHYS – Physics and Astronomy; PSYC – Psychology; SOCI – Social Sciences; VETE – Veterinary

Information security

Figure 1. Distribution of topics cluster on economic, social and information security in SciVal database за subject area

Source: complied by author via SciVal of Elsevir.

Analyzing the bubble chart in the category of economic and social security, we note that most topics cluster are grouped into financial (Business, Management and Accounting; Economics, Econometrics and Finance) and social (Social Sciences) subject areas that tend to be multidisciplinary. Regarding thematic clusters in information

security, there is a shift of research towards the exact sciences (Computer Science; Mathematics). Consider the top 3 topics cluster (most enormous bubbles in Figure 1) for economic, social and information security, obtained using the SciVal metric in Table 2. The system's names are automatically generated by the system, which generally characterizes the articles included in it. For example, the first cluster of the economic security bloc, in our opinion, is incorrectly named because it has, among other things, institutional and managerial aspects of financial security, energy issues, and so on. The Prominence indicator, which according to the SciVal reference information is an indicator of momentum and is obtained as the average of the indicators of the number of citations, views and growth of CiteScore.

Table 2. Metrics tor-3 topics cluster on economic, social and information security in SciVal databases

Topic cluster	Scholarly output	Publication share	Field-weighted citation impact	Prominence percentile
Economic security				
Students; Russian; Education (TC.1114)	238	0.85% decline	0.65	77.324
Monetary Policy; Economic Growth; Exports (TC.21)	46	0.05% growth	0.46	94.448
Industry; Innovation; Entrepreneurship (TC.24)	23	0.02% growth	0.79	98.997
Social security				
Monetary Policy; Economic Growth; Exports (TC.21)	492	0.51% decline	0.62	94.448
Pensions; Financial Literacy; Retirement (TC.1067)	293	3.04% decline	0.63	38.796
Taxes; Tax Evasion; Tax Compliance (TC.920)	86	0.77% decline	0.62	42.876
Information security				
Computer Crime; Network Security; Intrusion Detection (TC.218)	566	0.81% decline	1.16	95.518
Cryptography; Authentication; Data Privacy (TC.84)	93	0.10% decline	1.81	97.993
Industry; Information Systems; Research (TC.254)	80	0.22% decline	0.86	87.023

Source: complied by author via SciVal of Elsevir.

As can be seen from Table 2, the thematic clusters from the social security block are closely intertwined with economic issues and in the information security block - with computer science. Based on this information, it was decided to analyze further the narrow sample of scientific papers on economic orientation.

Let's move on to further quantitative research of scientific papers on economic, social and information security in time. The first mention of financial security dates back to 1948 (in the form of a resolution of the Inter-American Conference for the Maintenance of Continental Peace and Security), social security – in 1937, information – in 1982. After that, the number of papers gradually increased. Figure 2 shows the change in the number of works on selected search queries from 1982 to 2020. As of 2020, the Scopus database presents 100 results related to economic security, 233 – social and 196 – information. At the same time, the growth of research on information security has a fairly rapid growth, which in 2019 was equal to the number of research on social security.
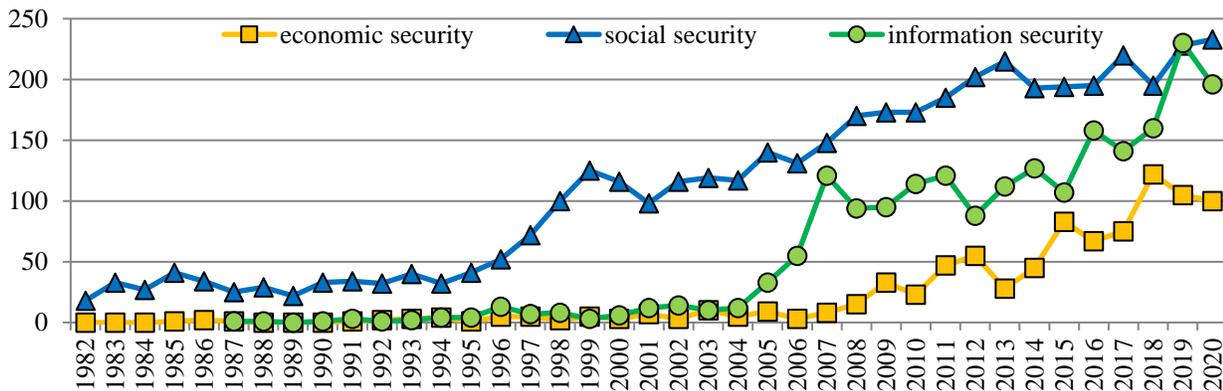
Figure 2. Dynamics of the number of scientific papers on economic, social and information security in the Scopus database for 1982-2020

Sources: complied by authors via Scopus Tools.

The number of works on selected topics varies in the geographical dimension. That is why Table 3 shows the top 15 countries with the most significant number of scientific papers.

Table 3. Quantitative composition of scientific papers on economic, social and information security in Scopus database in the geographical dimension

Economic security		Social security		Information security	
Country/Territory	Documents	Country/Territory	Documents	Country/Territory	Documents
United States	530	United States	3534	United States	1392
Russian Federation	365	United Kingdom	1429	China	467
Ukraine	233	Germany	834	United Kingdom	305
United Kingdom	167	China	507	Russian Federation	202
Canada	86	Netherlands	425	India	194
Australia	81	Australia	408	South Africa	189
China	54	Spain	375	Australia	164
India	53	France	364	Germany	121
Germany	35	Italy	334	South Korea	119
Kazakhstan	31	Canada	333	Taiwan	111
Poland	31	India	281	Malaysia	110
Singapore	28	Belgium	253	Sweden	104
Netherlands	27	Switzerland	231	Canada	89
Sweden	25	Japan	213	Greece	68

Sources: complied by authors via Scopus Tools.

The leader of scientific research in all areas is the United States. Interestingly, economic security is widely studied in the Russian Federation and Ukraine (2nd and 3rd places in the top 15), and only then in such English-speaking countries as the United Kingdom, Canada, Australia. Social security is the subject of numerous studies in European countries (United Kingdom, Germany, Netherlands, etc.) and China. Information security is considered by scientists in the United States, United Kingdom, China, and the Russian Federation, India, South Africa and others.

According to the results obtained above, there is a distribution of scientific papers for funding sponsor. The leaders in the category of economic security are the Russian Foundation for Basic Research (19 works), the Russian Science Foundation (10 works), the Ministry of Education and Science of Ukraine (5 works) and the Russian Federation (4 works). For the social security category, the main funding organizations are U.S. Department of Health and Human Services (67 papers), National Institutes of Health (66 papers), U.S. Social Security Administration (58 papers), National Institute on Aging (55 papers), European Commission (49 papers). Research on information security is funded mainly by the National Science Foundation (35 works), National Natural Science Foundation of China (28 works), European Commission (13 works), Russian Foundation for Basic Research (13 works), Ministry of Education of the People's Republic of China (12 works). Thus, the study of information security in India, South Africa is mostly carried out by scientists themselves.

The next step is to move to a qualitative analysis of scientific papers. In table 3 we consider the top 5 most cited works in the Scopus database for each search query economic security, social security, information security. A qualitative analysis of the most cited works on selected topics allows us to draw the following conclusions. In general, the work on the economic security block concerns the impact of certain factors on it: scientific and technical, financial (through the prism of financial risks), social (development of entrepreneurship and financial inclusion among women), economic (through the formation of a more applied index of economic well-being). In addition, the social security block is related to issues related to the role of economic levers (e.g. government bonds, individual savings for the population) and social and labor issues (regulation of labor markets through employment laws, collective relations and social security, birth rate regulation). The works singled out in the

information security block are mainly considered at the meso level (business) and relate to the optimization of economic commerce and the prevention of systemic and other information risks in enterprises.

Table 4. TOP-5 most cited articles for search queries economic security, social security, information security in Scopus database

Cited by	Authors	Document title	Source(Year)
		Economic security	
1354	Partha, D., David, P.A.	Toward a new economics of science	Research Policy (1994)
231	Shiller, R.J.	The new financial order: Risk in the 21st century	The New Financial Order: Risk in the 21st Century (2009)
179	Datta, P.B., Gailey, R.	Empowering Women Through Social Entrepreneurship: Case Study of a Women's Cooperative in India	Entrepreneurship: Theory and Practice (2012)
141	Schuler, S.R., Hashemi, S.M., Riley, A.P.	The influence of women's changing roles and status in Bangladesh's fertility transition: Evidence from a study of credit programs and contraceptive use	World Development (1997)
123	Osberg, L., Sharpe, A.	An index of economic well-being for selected OECD countries	Review of Income and Wealth (2002)
		Social security	
2195	Barro, R.J.	Are government bonds net wealth?	Journal of Political Economy (1974)
1131	Madrian, B.C., Shea, D.F.	The power of suggestion: Inertia in 401(k) participation and savings behavior	Quarterly Journal of Economics (2001)
977	Botero, J.C., Djankov, S., La Porta, R., Lopez-De-Silanes, F., Shleifer, A.	The regulation of labor	Quarterly Journal of Economics (2004)
699	Ariely, D., Loewenstein, G., Prelec, D.	"Coherent arbitrariness": Stable demand curves without stable preferences	Quarterly Journal of Economics (2003)
598	Becker, G.S., Barro, R.J.	A reformulation of the economic theory of fertility	Quarterly Journal of Economics (1988)
		Information security	
1361	Pavlou, P.A., Huigang, L., Yajiong, X.	Understanding and mitigating uncertainty in online exchange relationships: A principal-agent perspective	MIS Quarterly: Management Information Systems (2007)
958	Bulgurcu, B., Cavusoglu, H., Benbasat, I.	Information security policy compliance: An empirical study of rationality-based beliefs and information security awareness	MIS Quarterly: Management Information Systems (2010)
747	Straub, D.W., Welke, R.J.	Coping with systems risk: Security planning models for management decision making	MIS Quarterly: Management Information Systems (1998)
680	Johnston, A.C., Warkentin, M.	Fear appeals and information s ecurity behaviors: An empirical study	MIS Quarterly: Management Information Systems (2010)
504	Straub Jr., D.W.	Effective IS security: An empirical study	Information Systems Research (1990)

Sources: complied by authors via Scopus Tools.

In addition to the qualitative bibliometric analysis, we will cluster keywords found in scientific papers related to economic, social and information security using VOSviewer software. The co-occurrence of keywords was chosen as the method of analysis. The data extracted from the Scopus database and processed in the program, which is normalized by the fractionalization method, were selected as the basis. As a result of clustering, the following results were obtained:

– for the economic security block (Fig. 3): based on 359 items (keywords) 6 clusters, 8050 links (co-occurrences) with 14944 total link strength (number of publications in which two terms occur together) were formed;

– for the social security block: based on 321 items 4 clusters, 7941 links from 19635 total link strength are formed;

– for the block of information security: based on 313 items, 4 clusters, 7504 links from 17951 total link strength are formed.

Cluster analysis for economic security is the most general, as it includes references to social and economic security. Let's analyze the obtained clusters in Figure 3:

– the first cluster (red, 120 items) related to social issues of economic security: poverty, migration, employment and unemployment, working conditions, disability, etc. In particular, there is a category of social security;

– the second cluster (green, 116 items) related to economic security issues: energy security, financial security, foreign economic activity, business, economic policy, digital economy, etc. In particular, there is a category of information security;

– the third cluster (blue, 61 items) related to socio-psychological issues, in particular: the formation of social capital, living conditions and well-being of people, women, children, people with disabilities, displaced persons, etc.;

– the fourth cluster (yellow, 38 items) related to the legal aspects of economic security to ensure decent pensions, social assistance, care in case of illness;

– fifth cluster (purple, 13 items) related to the situation due to the coronary viral disease pandemic and its consequences;

– sixth cluster (blue, 11 items) related to issues of gender equality and relations in society.

Figure 3. Cluster analysis of co-occurrence of keywords on economic security in Scopus database

Sources: complied by authors via VOSviewer.

As we can see, the research is closely interdisciplinary, manifested in the presentation of economic, social, and information issues to ensure the country's national security.

Conclusions

This study was devoted to the quantitative and qualitative bibliometric analysis of research on economic, social and information security using Scopus database. To achieve this goal, the author analyzed the quantitative composition of scientific papers on specific topics, considered the dynamics of their change, subject areas and geography of distribution, qualitative analysis of the most cited works and cluster analysis of co-occurrence of keywords.

As a result, it was found that most research is devoted to social and information security, least of all economic.

The research of the subject areas in which these researches took place forced to narrow the search to the economic direction (Economics, Econometrics and Finance, Business, Management and Accounting). Numerous studies have been conducted in the social and computer sciences, which are not of scientific interest within our work. The first works recorded in the Scopus database date back to 1937-1982, after which the number of works gradually increased (with social security being ahead of others). Most research in all areas belongs to the United States. For economic security are Ukraine and Russia, social – English-speaking and European countries, and information security – China, Britain, Russia, India.

Qualitative analysis of the most cited works revealed the following trends: for economic security, works on factor impact (financial, social, scientific and technical indicators, etc.) are most often cited; for social security – on the role of economic levers and social and labor regulation; for information security – to prevent the loss of information and avoid other risks in enterprises. As a result of clustering of keywords found in scientific papers related to economic, social and information security, the interdisciplinarity of research is re-emphasized, as there are clusters related to social, economic, socio-psychological, legal and other issues.

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