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THE IMPACT OF SOCIAL NETWORKS ON KNOWLEDGE CREATION: AN EXPLORATORY RESEARCH

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ABSTRACT

The present research aims to identify the impact of social networks on the creation of knowledge, using as a strategy the bibliographic, exploratory and documentary research for accessibility. As a source of data, the dissertations and theses developed in the Graduate Program in Strategic Studies INEST at UFF were used, in the period of the last 10 years of scientific production. As a result, the knowledge clusters were identified using the research strategy presented and the use of an available tool that allowed the analysis of social networks.

Keywords: Social Networks. Knowledge Clusters. Management.

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INTRODUCTION

According to Medeiros (2015), who addresses the formation and evolution of defense studies in Brazil, the use of social networks in the construction of knowledge is not common. The author multidimensionally represents, on maps, hybrid areas from proximity clusters. Thus, the intercession of fields and disciplines is not usually represented in complex networks.

According to Marques and Fuccille (2015), who describe the trajectory of defense studies in Brazil and present the existing lines of research in graduate studies, the use of social networks in the generation of knowledge may be related to studies in the social sciences. In this sense, military themes were linked to the dynamics of social classes during the second half of the twentieth century.

For Figueiredo (2015), who clarifies what strategic studies are, the use of social networks in the formation of knowledge may be linked, to some extent, to national defense issues, given that "defense", in a broad sense, among its aspects, refers to the prevailing social structure. In this case, like any socially produced concept, the most pertinent field would be military social service.

According to Domingos (2006), who recognizes defense and security as an area of scientific knowledge, the use of social networks in the creation of knowledge may come from the relevance given to studies of the social sciences since the period of military governments. The National Association for Research and Graduate Studies in Social Sciences (ANPOCS), considered the most important institution among social scientists in Brazil, reveals the increase in the networks of civilian academics linked to the themes of the defense sector.

According to Costa (2005), who analyzes the transmutation of the concept of "community" into "social networks", the use of social networks in the structuring of knowledge comes from the fact that we are associated with networks by personal communities. These networks have a different complexity and image from what we were used to, revealing new forms of association with countless individuals spread across multiple dimensions.

According to Kaufman and Santaella (2020), who demystifies beliefs about how the artificial intelligence behind the functioning of social networks works, the use of these networks in the generation of knowledge is also related to search engines. These, together with the networks, are under the control of artificial intelligence algorithms, to identify and

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recognize certain patterns, which cooperates in the recognition of people's behavior and, eventually, helps in decision-making processes.

According to Faggion, Balestrin and Weyh (2002), who examine strategic intelligence and knowledge management in the universe of interorganizational networks, the use of social networks in knowledge architecture stems from the competitiveness between companies in today's world. In the meantime, entrepreneurship leverages small businesses, with networks as a broad strategic phenomenon. Therefore, it is feasible to analyze cooperation, hierarchy, contract and connivance, which demonstrates the existence of key elements of observation of the organization of the networks under examination.

For M. dos Anjos, Bazzo, A. dos Anjos, Roveroto and Witkoski (2015), social network analysis (SNA) allows us to understand how the relationships between the subjects involved in a given project were established. Furthermore, the use of social networks in the structuring of knowledge is a phenomenon that comes from the intensive exchange of information between people. Therefore, it is essential to identify, characterize and evaluate the different relationships established between the multiple actors of a network.

According to Ribeiro and Rodriguez (2016), who present how interpersonal relationships occur in a given general management, the use of social networks in the construction of knowledge may be related to factors such as friendship and trust. Thus, the relationship between the group influences the flow and transfer of information, generating greater or lesser sharing according to the interactions identified.

Based on the contextualization presented, it was identified as a problem-question to be researched: what are the impacts of social networks on the creation of knowledge?

According to Gil (2002), the research strategy used was bibliographic, exploratory and documentary by accessibility, having used the scientific databases of SCOPUS, Google Scholar and Web of Science.

The delimitation of the research was restricted to dissertations and theses defended in the Graduate Program in Strategic Studies – PPGEST of the Institute of Strategic Studies of the Fluminense Federal University carried out over 10 years, until 2023.

As a research tool, the UCINET application (http://www.analytictech.com/archive/ucinet.htm) was used, which is a solution developed by two researchers from the company Analytic Technologies, located in Lexington,

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Kentucky, in the United States of America. The use of this application is justified by the fact that it contains a quantitative module and another graphic module, which facilitates the identification of the relationships between the actors in a visual way, in addition to the numerical one.

LITERATURE REVIEW

On the subject object of this research, the SCOPUS, Web of Science and Google Scholar databases were used, and a systematic literature review (RSL) was carried out materialized by the PRISMA model (Main Items for Reporting Systematic Reviews and Meta-analyses).

Figure 1 illustrates the Systematic Literature Review (RSL) using the PRISMA method, in which the procedure for selecting articles based on the main and macro theme is filtered until reaching the specific theme of the desired object, thus allowing the search for scientific production strongly related to the research objectives.

Initially, 486,036 academic articles, theses, dissertations and non-scientific texts were obtained from the selected keywords, such as: information, military sciences, knowledge, defense and strategic studies, networks and social media, artificial and strategic intelligence, among others. In the meantime, based on the criterion of delimiting the search according to the respective titles existing in the search tools used, 482,428 studies found in the preliminary examination were excluded. Sequentially, the content analysis was based on the adequacy of the abstracts and, fundamentally, of the keywords to the object of this investigation. Thus, of the 608 texts previously selected, 16 remained more appropriate and related to the theme proposed in this work, given 592 excluded contents.

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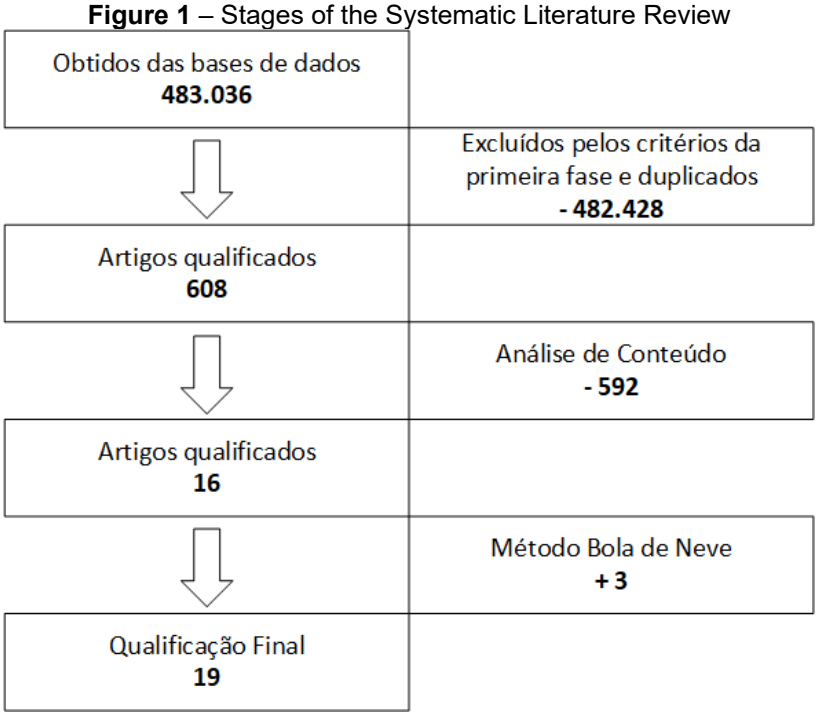
Figure 1 – Stages of the Systematic Literature Review



Source: Prepared by the authors.

As for the snowball methodology, which allows the researcher to include content that would not be feasible under the same approach criteria, three articles were added, mitigating possible flaws that may have occurred in the previous phases of the selection process in question. To this end, the following keywords were added to the exact titles of the works: *defense studies*, critical knowledge and social network map. Therefore, for the final qualification, the 19 referenced articles represented the most appropriate works, in line with the objectives proposed for this article.

According to Sampaio, Behr, De Medeiros, and Bandeira (2021), who seek to map the profile of scientific research on social media and knowledge management, the use of social networks in the construction of knowledge makes communications at the different levels of a network clear. Also, the popularization and increased use of social media in labor relations have been evident in recent years. Thus, in the twenty-first century, informational media are fundamental platforms for the transformation of data into knowledge of strategic business interest.

According to Moré and Crepaldi (2012), who present a certain social network map proposed as an instrument for data collection in the context of qualitative research, the use of social networks in the generation of knowledge is central. Many conceptualizations are appropriate in this theme, especially if we consider the process of permanent construction,

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both individual and collective. The existence of the possibility of establishing new contacts enhances interactions with new people or even networks.

According to Tomaél (2007), social networks permeate the information that leads to the appropriation of knowledge and its adaptation to different realities. Thus, the use of social networks in the formation of knowledge allows the development of innovations. The ARS methodology favors the observation of interactions and flows of information circulation between actors. With this, the networks progress with each contact maintained between their members, which is feasible through the sharing of data of common interest.

According to Da Cunha and Migon (2019), who investigate scientificity in the military sciences, particularly in the graduate programs of the Brazilian Armed Forces' schools of higher studies, the use of social networks in the creation of knowledge comes from the social origin of the field. The general classification of this area resides in the social sciences and, sequentially, in political science and political studies as a specific sector and subarea, respectively. Thus, the military sciences, with their interdisciplinary character, have dialogue with the applied human and social sciences.

For Gama and Carvalho (2017), who analyze the network of scientific co-authorship of researchers who have published on digital repositories, the use of social networks in the structuring of knowledge results, among other factors, from the impetus given to networks of personal relationships. The actors who have the highest concentration of symbolic capital in the networks, that is, social capital, generally have abundant connections with other researchers. Therefore, the following are preponderant influencing factors: the ability to arrange, mobilize and articulate, as well as the notion of belonging to a given network.

According to Mizruchi (2006), who examines future perspectives for network analysis, the use of social networks in the construction of knowledge is a kind of structural sociology. Network analysis can apply to any scientific topic, considering the context of centrality and power in social interactions. Consequently, the examination of networks proves to be a dynamic conception of social actions, which is especially promising for the treatment of strategic issues.

In line with Omena and Rosa (2015), who promotes a background for new research practices in the field of communication sciences, the use of social networks in the generation of knowledge allows for innovative forms of analysis. Furthermore, the behavioral investigation of a community creates subsidies for the understanding of when

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two members belong or do not belong to the same group. In addition, by the connections formed, it is feasible to identify leaders in medium-sized networks.

According to Silva and Gorga (2023), who analyze the construction of defense studies as science in Brazil, the use of social networks in the formation of knowledge is facilitated by the participation of society. This democratizes the construction that, through scientific and technological dissemination, enhances the culture of innovation in the sector. For the above, social involvement should be increased, which will strengthen the participation of the largest number of actors, contributing to the maintenance of a network of dialogue between defense specialists.

According to Marteleto (2001), who addresses the networks of social movements in studies of the flow and transfer of information, the use of social networks in the architecture of knowledge reveals differences between the members of a group that provoke the redefinition of strategic positions. As an example, individuals considered central are responsible for mobilizing and dynamizing networks. In this way, the ARS can be applied to different contexts and issues involving social groups, which contributes to innovative understandings of structures, dependencies and tensions between the components.

According to J. Formanski, F. Formanski and Rodriguez (2012), in which social network analysis can be applied in the construction of knowledge maps, the use of social networks in such structuring contributes to the identification of critical knowledge. Informal networks are of fundamental importance for strategic development, which helps to locate strengths and weaknesses in organizational structures.

From a summary of the bibliographic analyses carried out, it is worth highlighting those listed in Table 1, where the articles with the greatest relation to the researched theme are presented for the keywords searched in the google scholar database, which highlights the importance of the theme given the number of published articles, which reach 228,000 articles when searched by the keyword knowledge.

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Table 1 - The selected articles with the highest number of occurrences with the search keyword

Article	Keyword (exact in the title)	# Articles	Article Contribution to the topic	Author	Year
Social Media, Knowledge and Localized Innovation	Knowledge	228000	Social networks permeate the sharing of information that leads to the appropriation of knowledge and its adaptation to different realities	Maria Inês Tomaél	2007
Social Network Analysis - application in information transfer studies	Information	216000	Analysis of social networks in studies of the flow and transfer of information	Regina Maria Martele-to	2001
For a New Concept of Community: Social Networks, Personal Communities, Collective Intelligence	Social Media	17000	Transmutation of the concept of "community" into "social networks"	Rogério Da Costa	2005
The Role of Artificial Intelligence Algorithms in Social Media	Artificial intelligence	6820	Demystifying beliefs about how the artificial intelligence behind the functioning of social networks works	Dora Kaufman/ Lucia Santaella	2020
Studies on Facebook in Portugal: Systematic Review of Research Methods	Facebook	6820	To promote a *background* for new research practices in the field of communication sciences	Janna Joceli C. De Omena/ Jorge Martins Rosa	2015
Bibliometric and Cluster Mapping of Scientific Research on Knowledge Management and Social Media	Social Media	3430	Map the profile of scientific research on Social Media and Knowledge Management	Gabriel Sampaio/ Ariel Behr/ Mauricius Medeiros/ Marina Bandeira	2021
Social Media Analysis: Recent Advances and Current Controversies	Network Analysis	1750	Prospects for network analysis	Mark S. Mizruchi	2006
The Analysis of Social Networks as a Tool for the Mapping of Relations between Social Actors of a University Extension Project	Social Media Analysis	901	Through social network analysis (SNA), to understand how the relationships between the subjects directly and/or indirectly involved in a university extension project were established	Mônica Dos Anjos/ Walter Bazzo/ Adilson Dos Anjos/ Giovani Roveroto/ Juliana Witkoski	2015

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Table 2 – Searched articles ordered by date of production of the article.

Article	Keyword (exact in the title)	# Articles	Article Contribution to the topic	Author	Year
The construction of Defense Studies as a science in Brazil	*Defense Studies*	200	The construction of defense studies as science in Brazil	Bárbara Thaís Pinheiro Silva/ Eduardo Freitas Gorga	2023
Bibliometric and Cluster Mapping of Scientific Research on Knowledge Management and Social Media	Social Media	3430	Map the profile of scientific research on Social Media and Knowledge Management	Gabriel Sampaio/ Ariel Behr/ Mauricius De Medeiros/ Marina Bandeira	2021
The Role of Artificial Intelligence Algorithms in Social Media	Artificial intelligence	6820	Demystifying beliefs about how the artificial intelligence behind the functioning of social networks works	Dora Kaufman/ Lucia Santaella	2020
Military Sciences and the Configuration of Defense Studies as an Area of Scientific Knowledge	Military Sciences	44	perspective of scientificity of Military Sciences, particularly in the Graduate Programs of the Schools of Advanced Studies of the Armed Forces in Brazil	Rafael Soares Pinheiro Da Cunha/ Eduardo Xavier Ferreira Glaser Migon	2019
Trends and Perspectives of Research on Digital Repositories in Brazil: A Social Network Analysis (SNA)	Digital Repositories	353	To map the network of scientific co-authorship of Brazilian researchers who have published on the theme of digital repositories	Ivanilma Da Silva Gama/ Lidiane Dos Santos Carvalho	2017

Source: Prepared by the authors

Table 2 presents the most recent articles related to the themes of the research object in order of date. In this case, it can be observed that the research is carried out not only for the identification of social networks, but also the intelligence that is behind the social networks, which is the main objective of this research.

METHODOLOGY

The research methodology used is presented below, to provide clarity on the path of actions adopted to achieve the objective results.

a) Bibliographic research: aimed to identify the areas of knowledge that can be used for the application of knowledge management and analysis of social

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networks in the search for knowledge clusters that can be used in the identification of gaps and knowledge that is not interesting for the object of research;

b) Data collection: in this phase, data were collected from the researchers, focusing on the dissertations and theses advised, as well as from those actors who participated in these researches;
c) Data processing: in this phase, the processes of cleaning and organizing the data were carried out, aiming to make them suitable for use in a subsequent stage of *Knowledge Discovery*, from unstructured data;
d) Word cloud: this technique was used to highlight the areas of knowledge that could be used to identify clusters of knowledge of the researchers who are the object of this study;
e) Taxonomy: from the word clouds, the set of keywords that could refer us to the areas of knowledge of each researcher was identified. In this stage, the taxonomy was carried out with the alignment and standardization of the theme names to be considered for each researcher;
f) Clustering: with the use of social network analysis, the UCINET tool was used, with which the correlations between the themes and researchers were mapped, to visualize the clusters that were presented from it;
g) Analysis of the results: this stage consisted of analyzing the clusters and their correlations, identifying the islands or archipelagos of knowledge in the studied area. In this way, it was possible to identify the impacts of social networks on the creation of knowledge.

RESULTS: DATA COLLECTION, PROCESSING AND WORD CLOUD

For the adequate treatment of the problem-question presented, data related to the master's and doctoral dissertations of the graduate program in strategic affairs (PPGEST) were collected, containing the information presented below:

a) Title of the dissertation or thesis.
b) Student author of the dissertation or thesis.
c) Advisor researcher.
d) Evaluation board.

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Based on this information, analyses were carried out, using word clouds to identify the main areas of knowledge of each researcher, as illustrated in figure 2.

Figure 2 - Word clouds obtained from the dissertations and theses supervised by the researchers, after data cleaning with the exclusion of connecting words and *alias* list

Researcher 1	Researcher 2
	
Researcher 3	**Researcher 4**
	
Researcher 5	**Researcher 6**
	
Researcher 7	**Researcher 8**
	

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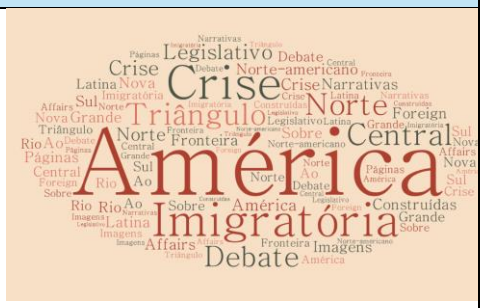
Researcher 9	Researcher 10
	
Researcher 11	**Researcher 12**
	
Researcher 13	**Researcher 14**
	

Source: Prepared by the authors

Figure 2 illustrates the word clouds from the dissertations and theses supervised by the researchers, from the data cleaning with the exclusion of connecting words and alias list. With this, it was possible to identify the keywords of the areas of knowledge explained in these scientific works.

DISCUSSION: TAXONOMY, CLUSTERING AND ANALYSIS OF RESULTS

Based on the concept of social networks that have existed since the 1930s (Marteleto, 2001) and (Rodriguez, 2011), developed with the occurrence of the "bankruptcy" of several companies, the researchers needed to identify possible flaws and correction points in the management model of companies. The UCINET application from analytictech.com was used in this study for this analysis. The use of social network analysis, at the time presented as a sociogram, was a tool used for this better understanding of how social relations occur.

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Thus, some attributes used by the UCINET software and in the analysis of social networks were adopted in this research, according to the definitions presented below:

a) NODE: represent the actors of a social network, that is, the people involved;
b) FLOW: is the connection between two nodes;
c) ACTOR: are the people who make up the analyzed social network, a type of node;
d) BROKER: are actors responsible for connecting groups or clusters in a network;
e) PERIPHERAL ACTOR: these are actors that are far from the center, with few flows and, therefore, with high dependence on individual nodes of the network;
f) CENTRAL ACTOR: are the actors that are highly connected in a given network or cluster so that their dependence on other actors, or nodes of the network, is reduced by the possibility of alternative paths to satisfy their needs;
g) NETWORK DENSITY: is the result of dividing the number of links (flows) in a network by the number of nodes in the same network or network cluster depending on the focus of the analysis;
h) NETWORK COHESION: it is the measure that evaluates the distance between nodes, clusters, and other elements of a social network to show its cohesion itself, that is, how solid and low distance the network is;
i) CLUSTER IN THE NETWORK: are regions of the network grouped by proximity, similarity or some other criterion that can be analyzed in the network;
j) EGO-CENTERED ANALYSIS: analysis focused on nodes (egos), which can be groups, organizations, people or even societies;
k) STRUCTURAL ANALYSIS: is the analysis focused on the structure itself of the network, and the structural roles of its maintenance that the actors, nodes and flows present and relate to each other and to the clusters that are present in the network.

DATA COLLECTION AND ANALYSIS

The data were collected from the Graduate Program in Strategic Studies of Defense and International Security (PPGEST) of the Fluminense Federal University based on the dissertations defended by the master's candidates of the program in question.

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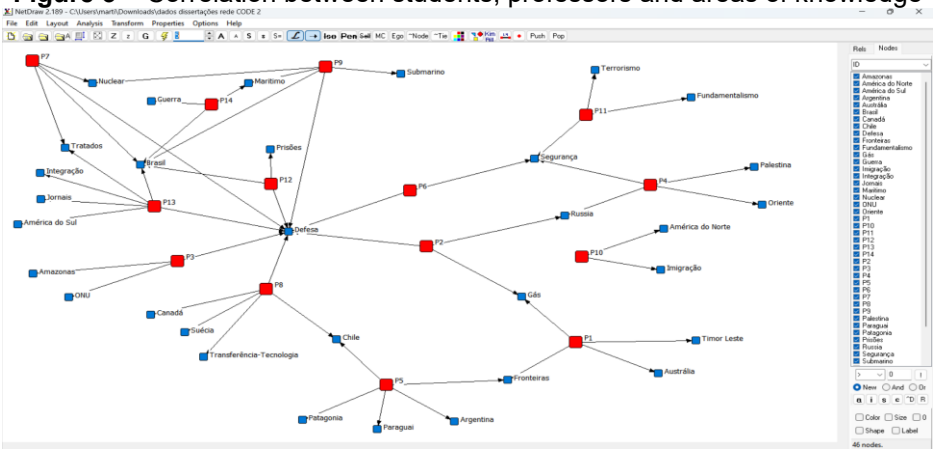
From the data collected, as shown in Figure 3, the analysis is made based on relationship networks between the advisors, the students and the themes of the research presented the identified relationship of the clusters by area of knowledge.

Based on the graphic analysis of Figure 3, it can be seen that, except researcher 10, all the other researchers have a connection with areas of knowledge that are connected with the research carried out. This is positive in the sense that the connection allows a diversified view of each type of knowledge researched, thus making the research carried out richer in content.

Figure 3 – Correlation between students, professors and areas of knowledge



Source: Prepared by the authors

Figure 4 shows the nodes with the highest number of connections, as evidenced by their size. This figure shows the theme DEFENSE as being an area of knowledge studied by several researchers, in this case researchers P9, P13, P12, P3, P8, P2, P6, representing 50% of the research workforce focused on the theme DEFENSE.

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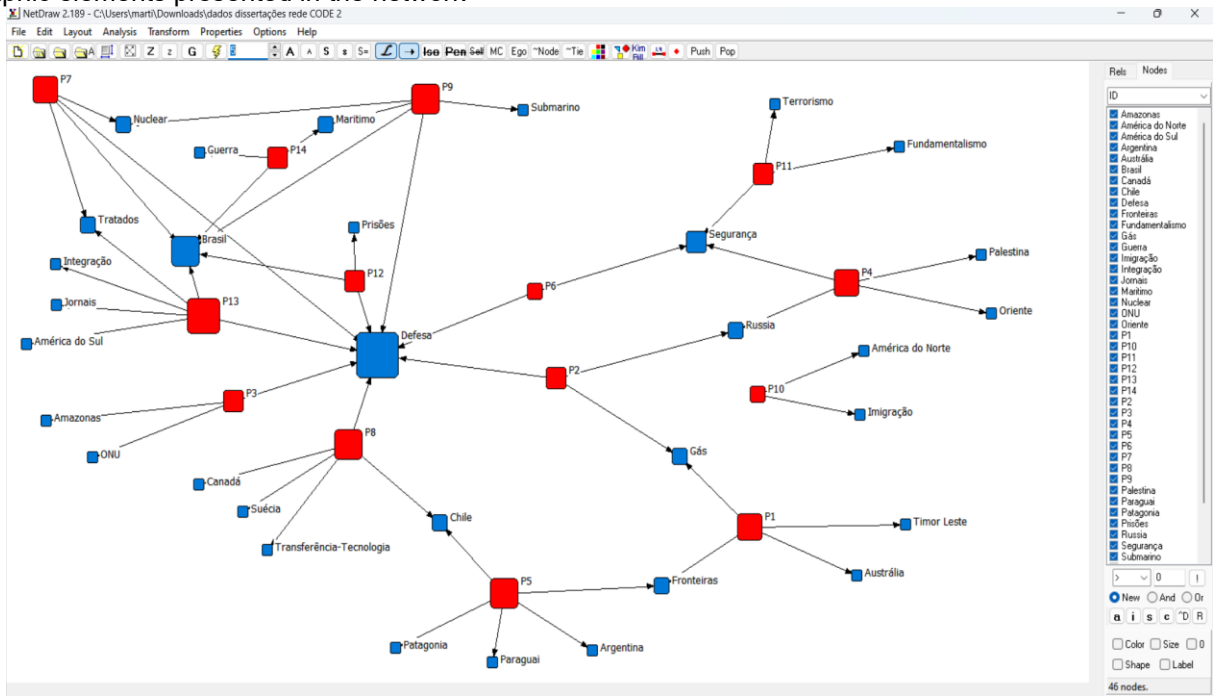
Figure 4 – Identification of the actors with the highest density of connections – visually they are the largest graphic elements presented in the network



Source: Prepared by the authors

Finally, Figure 5 presents graphically three major clusters of knowledge identified as:

a) **Cluster 1**: topics related to DEFENSE, such as Brazil, Maritime, Submarine, Nuclear, Integration, Treaties, UN, South America and Amazonas.

b) **Cluster 2**: themes exogenous to Brazil, such as Chile, Sweden, Canada, Australia, Palestine, Orient, Russia, East Timor, Argentina, Borders, Paraguay, Patagonia, Terrorism, Security and Fundamentalism.

c) **Cluster 3**: the smallest cluster developed by the P10 researcher dealing with North America and Immigration.

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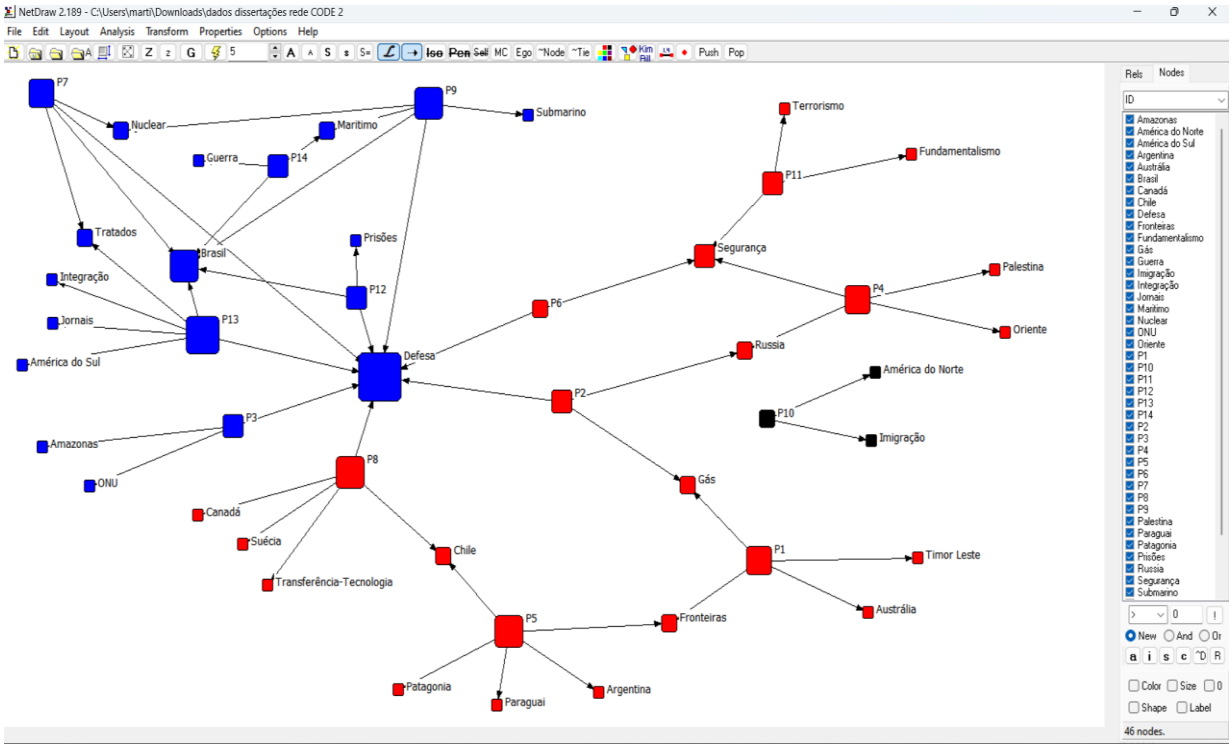
Figure 5 - Identification of clusters based on related connections or greater identity between nodes, forming factions or clusters



Source: Prepared by the authors

All the analyses produced were based on the research theme of the master's candidate and its correlation with the advisor, to bring together the thematic groups of each professor of the program and organize the areas of knowledge present in clusters.

CONCLUSIONS AND FUTURE WORK

Based on the research carried out, it is possible to answer the initial research question, related to the impact of social networks on the creation of knowledge, based on some evidence, which are: (A) the construction of a knowledge cluster with a higher density of researchers and research evidenced a more solid and consistent network; and (B) the cluster that contains a single researcher becomes fragile to the extent that it will depend on only one person for knowledge to develop.

Associated with this issue of network density, it is verified that the construction of knowledge in a sustainable and accelerated way occurs as several people connect in favor of common or complementary knowledge, thus bringing the necessary differential for research with a stronger innovative bias. On the other hand, research that depends only on one person brings the difficulty of evidencing the various angles of the same object of study, and does not have, in this case, the natural competition that other researchers could

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bring by adding new ideas to existing research, thus hindering the process of innovation and creation of new solutions to the problem-questions presented.

As a future work, it is desirable to map the knowledge of other graduate programs and research centers, to identify clusters exogenous to the research program analyzed. And, also, it could be verified from this broader research the existing knowledge gaps to be filled, and even research and its related areas of knowledge that are not of interest to the graduate program studied due to the objective it proposes.

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