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Knowledge Management Network in the COVID-19 Era

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Abstract **–** The pandemic has been a watershed in the knowledge management that is carried out in Higher Education Institutions (HEIs). Studies on vulnerability and resilience risks highlight material, financial, and human resources as the central axis of the knowledge network, although research on stigma indicates that mistrust prevails between decision-makers and those who carry it out. Therefore, the objective of this work was to contrast the hypotheses related to knowledge management as a regulatory process of trust relationships between the parties involved. A cross-sectional, exploratory, and correlational study was carried out with a sample of 10 professional practitioners and social workers involved in COVID-19 care. The results show that a structure of nodes prevails that begins with innovation, continues with competitiveness, and ends with efficiency as central, unifying, and structural axes of information translation and knowledge transfer. The results are not extensive to the university community, although they are innovative because they highlight trust as the guiding principle of knowledge management.

Keywords **–** *COVID-19, Stigma, Knowledge management, Knowledge Network, Risk*

Introduction

The history of epidemics has played a significant role in shaping the formation of intellectual capital- the collective knowledge, skills, and innovation within societies (Xu, Haris & Irfan, 2022). Throughout different periods, epidemics have spurred advancements in medicine, public health, and various fields. Here is an overview of how some historical epidemics have influenced the development of intellectual capital:

The Black Death, a devastating pandemic of bubonic plague, swept through Europe in the 14th century (Papíková & Papík, 2022). Despite the immense loss of life, this epidemic had cultural repercussions. The scarcity of labor resulting from the plague led to changes in labor relations, with increased wages for remaining workers. This shift contributed to a higher valuation of labor and knowledge, adding to societal intellectual capital.

The Spanish Flu pandemic had a profound impact on global society following World War I (Faisol, Astuti & Puji Winarko, 2021). Despite the tragic loss of lives, it brought about changes in medicine and public health. The response to the Spanish Flu contributed to the development of epidemiology as a scientific field. Improved disease surveillance emerged, laying the foundation for research and the study of future epidemics.

The HIV/AIDS epidemic led to significant advancements in medical research and the formation of intellectual capital in virology and epidemiology (Leon, 2021). The fight against HIV/AIDS also raised public awareness about health, human rights, and stigma, contributing to intellectual capital in broader areas beyond just medicine.

The Ebola outbreak in West Africa highlighted the need for a coordinated global response and prompted improvements in epidemic preparedness (Vătămănescu et al., 2023). International alliances were formed, and investments were made in research to understand and combat Ebola, contributing to intellectual capital in virology, public health, and crisis management.

The COVID-19 pandemic has had a profound impact on the formation of intellectual capital worldwide (Guillen, 2021). The response to the pandemic has accelerated medical research, scientific collaboration, and the adoption of information technologies in healthcare. It has also underscored the importance of public health and the need for a coordinated global response.

Epidemics throughout history have driven advancements in knowledge, medicine, and societal structures (Alnatsheh, Karaatmaca & Çavuşoğlu, 2023). The challenges posed by these events have often catalyzed the formation of intellectual capital as societies adapt, learn, and innovate in the face of public health crises. The intellectual capital developed during these times continues to shape our understanding and responses to current and future challenges.

The relationship between COVID-19 and the formation of intellectual capital is intricate and involves both challenges and opportunities (Alnassafi, 2022). Intellectual capital encompasses the intangible assets of an organization, such as knowledge, skills, innovation, and culture. The impact of the pandemic on the formation of intellectual capital can be examined in several ways: The shift to remote work, driven by the pandemic, has highlighted the importance of virtual collaboration tools and digital platforms. Organizations have had to enhance their intellectual capital in terms of technology adoption, virtual communication skills, and collaboration methods. The disruptions caused by COVID-19 have emphasized the need for continuous learning and upskilling. Organizations that invest in the intellectual capital of their employees through training programs and professional development initiatives can adapt more effectively to changing circumstances.

The pandemic has created a dynamic and uncertain business environment, requiring organizations to innovate and adapt quickly (Jaradat et al., 2023). Intellectual capital is formed and strengthened when organizations encourage a culture of innovation, allowing employees to contribute ideas and solutions to address challenges. Building intellectual capital involves not only acquiring new knowledge but also managing and preserving existing knowledge within the organization. The pandemic has underscored the importance of resilience and effective knowledge management strategies to mitigate risks and uncertainties. While the pandemic has posed challenges, it has also created opportunities for entrepreneurial ventures. Organizations that can identify and capitalize on these opportunities contribute to the formation of intellectual capital by fostering a culture of entrepreneurship and strategic thinking.

The accelerated pace of digital transformation during the pandemic has led to the formation of intellectual capital related to technology adoption, data analytics, and digital strategies (Mubarik et al., 2022). Organizations that embrace digital tools and processes are likely to strengthen their intellectual capital in these areas. Intellectual capital is not limited to technical skills but also includes social capital—the relationships and networks within an organization. The pandemic has prompted organizations to prioritize employee well-being, contributing to the formation of intellectual capital in terms of a positive and supportive workplace culture.

Organizations have had to reevaluate and strengthen their supply chains in response to disruptions caused by the pandemic (Xu, Haris & Irfan, 2023). The formation of intellectual capital in supply chain management involves developing strategies for resilience, risk mitigation, and agility. The relationship between COVID-19 and the formation of intellectual capital is characterized by the challenges posed by the pandemic, as well as the opportunities for organizations to enhance their knowledge, skills, and innovation capabilities. Proactive management of intellectual capital is crucial for organizations seeking to navigate the complexities of the current business landscape and position themselves for future success.

While there may not be a specific theory explicitly named "the theory of the formation of health intellectual capital," we can draw upon existing theories and concepts to understand how intellectual capital is developed within the health sector (Augustinah et al., 2022). Intellectual capital in health involves the accumulation of knowledge, skills, and innovation that contributes to advancements in healthcare, medical research, and public health. Here are several theories and concepts that provide insights into the formation of health intellectual capital:

The Knowledge-Based View emphasizes the role of knowledge as a strategic resource for organizations (Pablos, 2023). In the health sector, organizations such as hospitals, research institutions, and public health agencies accumulate intellectual capital by fostering a culture of continuous learning, investing in research and development, and promoting knowledge sharing among professionals.

Human Capital Theory focuses on the value of individual knowledge, skills, and abilities. In the health sector, the theory suggests that investing in the education, training, and professional development of healthcare professionals contributes to the formation of intellectual capital (Schislyaeva et al., 2022). Well-trained and skilled healthcare workers enhance the overall capacity and effectiveness of the healthcare system.

The Innovation Theory highlights the importance of innovation in organizational success. In the health sector, intellectual capital is formed through innovative practices, technologies, and approaches to patient care, medical research, and public health interventions (Paoloni et al., 2022). Organizations that foster a culture of innovation contribute to the development of health intellectual capital.

Social Capital Theory emphasizes the value of social relationships and networks (Muftiasa, Wibowo & Rahayu, 2023). In the health sector, collaboration among healthcare professionals, researchers, and organizations contributes to the formation of intellectual capital. Strong social networks facilitate the exchange of knowledge, best practices, and collaborative efforts to address health challenges.

The Learning Organization Theory posits that organizations capable of continuous learning and adaptation are better positioned for success (Cristea & Dinu, 2022). In the health sector, organizations that embrace a learning culture, encourage feedback, and invest in training and development contribute to the formation of intellectual capital by staying abreast of medical advancements and evolving healthcare practices.

The Triple Helix Model describes the collaboration between government, industry, and academia to foster innovation (Al Momani et al., 2021). In the health sector, this model suggests that partnerships between public health agencies, healthcare providers, and research institutions contribute to the formation of intellectual capital by combining knowledge from various sources and driving innovation.

Health Systems Strengthening focuses on improving the six building blocks of health systems: leadership and governance, health information systems, health workforce, service delivery, medical products and technologies, and financing (Ashraf et al., 2023). Strengthening these components contributes to the development of intellectual capital in the health sector by enhancing the overall capacity and performance of healthcare systems.

The formation of health intellectual capital is a multifaceted process influenced by various theories and concepts (Florensia, Kohardinata & Laturette, 2022). It involves investments in education, research, innovation, collaboration, and continuous learning within the healthcare ecosystem. The integration of these elements contributes to the advancement of medical knowledge, the improvement of healthcare delivery, and the overall resilience of health systems.

The COVID-19 pandemic has demonstrated the critical importance of knowledge management in responding to emergencies and global health crises (Vuong et al., 2022). Knowledge management is a process that consists of identifying, capturing, organizing, storing, and sharing knowledge within an organization to improve its performance and obtain competitive advantages. This discipline focuses on managing both explicit knowledge (found in documents, databases, manuals, etc.) and tacit knowledge (experience, skills, intuitions) that reside in the minds of individuals.

Knowledge management is essential to collect relevant information about the virus, its spread, symptoms, treatments, and prevention strategies (Kirchner, Ipsen & Hansen, 2021). Knowledge management has enabled experts and scientists to collect, analyze, and share real-time data on the spread of the virus, its burden of disease, and its impact on different populations. Collaboration and knowledge sharing between researchers and laboratories around the world have been essential in accelerating the development of effective vaccines and treatments against the virus. Knowledge management has been instrumental in communicating accurate and up-to-date information about the pandemic to the general population, health workers, and decision-makers.

Knowledge management has allowed health professionals to learn from the best practices and experiences of other colleagues in different regions, which has led to an improvement in the care and management of patients with COVID-19 (Wang & Wu, 2021). Knowledge management has facilitated the dissemination of information on prevention measures such as social distancing, mask-wearing, and hand washing, which has been crucial in controlling the spread of the virus. Health institutions and governments have been able to learn from the lessons learned during the pandemic, identify weaknesses in the response, and better prepare for future health emergencies. Knowledge management has enabled health systems and public health authorities to constantly monitor the epidemiological situation, which has been essential for making informed decisions about policies and restrictions.

Knowledge management has been a powerful tool to address the challenges posed by the COVID-19 pandemic (Ghasemi, Nejad & Aghaei, 2021). It has enabled a faster and more efficient response to an emergency, as well as a more effective exchange of critical information and knowledge between different actors around the world. As the fight against the pandemic continues and new global health challenges are faced, knowledge management will continue to be essential to deal with these crises effectively. Knowledge management has become crucial in today's business environment, where knowledge is a valuable asset that drives innovation and effective decision-making. Some of the main practices and tools used in knowledge management include: Identifying and collecting relevant and valuable information from various sources, both internal and external, to ensure that no essential knowledge is lost. Structure knowledge logically and systematically, using taxonomies, categories, and labels, to facilitate its search and retrieval. Use content management systems, databases, and repositories to securely store knowledge and ensure it is available to employees who need it. Promote the exchange of knowledge among the organization's members, whether through training, meetings, communities of practice, or online collaboration platforms. Take advantage of the lessons learned from past projects and experiences to avoid repeating mistakes and continuously improve processes and results (Velásquez & Lara, 2021). Foster an organizational culture that values and promotes collaboration, innovation, and constant learning. Use technological tools, such as customer relationship management systems (CRM), learning management systems (LMS), or document management software, to facilitate knowledge management. Improved decision-making by having relevant and updated information, leaders can make more informed and accurate decisions. It facilitates the emergence of new ideas and approaches since the exchange of knowledge and diverse perspectives is encouraged. Reduction of duplication of efforts since it avoids the loss of time and resources in reinventing solutions or carrying out tasks that have already been carried out successfully in the past. Adaptation to change: It allows organizations to adapt more quickly to changes in the environment by learning from previous experiences and being open to new ways of doing things.

Knowledge management is an essential discipline for any organization that wants to stay competitive and be successful in a dynamic and constantly changing business environment (Saide & Sheng, 2021). By leveraging the knowledge that their employees possess and facilitating its flow and access, companies can achieve higher levels of productivity, efficiency, and innovation. In the context of knowledge management, there are different scales or levels of approach that are used to understand and address knowledge in an organization. These scales help to visualize how knowledge flows and is managed within a company or community. Knowledge management at the level of each individual within the organization tries to understand how knowledge is acquired, created, shared, and used by employees and how it influences their performance and decision-making. At the group or team level, the focus is on improving collaboration, communication, and knowledge sharing among team members to achieve more efficient and effective performance. At the organizational level, it analyzes how the organization manages knowledge to obtain competitive advantages and improve its performance. It focuses on how knowledge is stored, shared, and applied across the enterprise, and how it integrates with business processes and strategies. Knowledge management between different organizations or entities includes strategic alliances, collaborations, knowledge networks, and other ways of sharing information and experience between different actors. At the societal scale, knowledge is managed and shared through public policies, educational systems, research networks, and other initiatives that promote large-scale knowledge sharing and dissemination.

The measurement of knowledge management is an important aspect of evaluating the effectiveness of the practices and strategies implemented in an organization (Deliu, 2020). Although measuring knowledge quantitatively can be challenging, there are several ways to assess and monitor the impact of knowledge management. Periodic employee surveys can be conducted to assess their perception of knowledge management in the organization. These surveys may include questions about the availability of information, the ease of access to relevant knowledge, the effectiveness of knowledge management tools, and collaboration between teams.

Key performance indicators (KPIs) related to knowledge management can be useful to measure its impact on organizational performance (Schleper et al., 2021). These KPIs can include the problem resolution rate, the improvement in decision-making, the response time to queries, and the knowledge retention rate in the organization, among others. You can analyze the productivity of teams and employees before and after implementing knowledge management initiatives. An increase in productivity may indicate better management and access to relevant knowledge. At the end of the projects, evaluation sessions can be held to identify lessons

learned and how the knowledge was applied during the project. These lessons can feed into future knowledge management strategies.

Comparing knowledge management in the organization with other companies in the same sector or with good industry practices can provide an external perspective and help identify areas for improvement (Bratianu & Bejinaru, 2021). If collaboration platforms and internal social networks are used, the degree of interaction and participation in these platforms can be analyzed to measure the level of collaboration and the flow of knowledge between employees.

The formation of intellectual capital in health is a multidimensional process that involves the accumulation, management, and utilization of knowledge, skills, and innovation within the healthcare sector (Campas et al., 2023). Several dimensions contribute to the formation of intellectual capital in health, each playing a crucial role in advancing medical knowledge, improving healthcare delivery, and addressing public health challenges. Here are the key dimensions of the formation of intellectual capital in health:

The knowledge and skills of healthcare professionals are a vital component of intellectual capital (Agostini & Nosella, 2023). Investments in education, training, and professional development contribute to the formation of a highly skilled and knowledgeable healthcare workforce. The expertise and experience of healthcare professionals, including physicians, nurses, and allied health professionals, contribute to the intellectual capital in health. Clinical competence and specialized knowledge enhance patient care and outcomes. Investment in research institutions, laboratories, and medical facilities contributes to the structural capital in health. Ongoing research activities generate new knowledge, medical technologies, and treatment modalities, enhancing the intellectual capital of the healthcare sector. The development and utilization of robust health information systems contribute to intellectual capital by facilitating data-driven decision-making, epidemiological research, and the efficient management of health information.

Collaboration among healthcare organizations, research institutions, and public health agencies fosters the exchange of knowledge and resources (Hariyono & Tjahjadi, 2021). Building strong relationships and partnerships contributes to the relational capital in health. Engaging with communities and stakeholders contributes to intellectual capital by addressing social determinants of health and promoting health equity. Community involvement enhances understanding and responsiveness to diverse health needs.

The integration of cutting-edge technologies, such as telemedicine, artificial intelligence, and digital health solutions, contributes to the intellectual capital in health (Haribowo, 2024). Technological innovation enhances healthcare delivery, diagnostics, and treatment options. The adoption of innovative practices and evidence-based approaches within healthcare organizations contributes to intellectual capital. Continuous improvement and the implementation of best practices enhance the overall quality of healthcare services.

A culture of continuous learning within healthcare organizations promotes ongoing professional development, adaptability to emerging challenges, and the incorporation of new knowledge into practice (Yang & Chen, 2023). Encouraging knowledge sharing and collaboration among healthcare professionals and departments within an organization enhances intellectual capital by facilitating the exchange of ideas and expertise.

The development and implementation of effective health policies contribute to intellectual capital by providing a framework for healthcare delivery, research priorities, and public health interventions (Amirullah, Dharma & Putri, 2021). Strong leadership and governance structures within healthcare organizations and at the national level contribute to intellectual capital by fostering a strategic vision, innovation, and effective decision-making.

A robust system for monitoring and surveillance of infectious diseases and public health trends enhances intellectual capital by providing timely information for effective public health interventions (Pellegrini, Aloini & Latronico, 2023). Preparedness for health emergencies, including pandemics, contributes to intellectual capital by ensuring a coordinated and effective response to unforeseen challenges.

The dimensions of the formation of intellectual capital in health are interconnected and contribute collectively to the advancement of healthcare knowledge, the improvement of patient outcomes, and the overall resilience of health systems (Carreon-Guillen & Garza-Sanchez, 2023). Organizations and systems that strategically address these dimensions are better positioned to navigate challenges, innovate, and contribute to the ongoing development of intellectual capital in health.

However, the measurement of knowledge management has not been carried out from its scientometric dimension, which suggests the impact of knowledge on productivity, competitiveness, and innovation based on expert evaluation and consultation with members of an organization.

Therefore, the objective of this work was to establish the scientometric network of knowledge management in a public university in central Mexico. In other words, during the pandemic, knowledge management was oriented towards corporate governance; identity, reputation, and image of the university in risk communication and damage control. Therefore, a scientometric study with students and professors reflects the impact of anti-COVID-19 policies on the productivity, competitiveness, and innovation of the university.

Are there significant differences between the theoretical structure of knowledge management in the face of anemia concerning the structure observed in the present work?

Hypothesis. The impact of anti-pandemic policies on knowledge management suggests that the confinement and distancing of people reduced the transfer of knowledge to preventive measures. Consequently, the theoretical structure and the answers of the respondents will be different. Knowledge management, defined as the translation and transfer of knowledge, having been impacted by anti-COVID-19 policies and reduced to prevention recommendations, intensified in non-collaborative or non-entrepreneurial groups. The translation and transfer of knowledge reduced to prevention recommendations encouraged innovation, productivity, and competitiveness in entrepreneurial and collaborative groups, but decreased their financial transparency.

Method

Design. A documentary, cross-sectional, exploratory, and correlational study was carried out with a sample of 100 students (M = 23.4 SD = 2.3 age and M = 7'895.00 SD = 456.00 monthly income) from a public university in Mexico and selected according to their inclusion in the system of professional practices and social service in strategic alliance with public health institutions.

Instrument. The Prisma systematic registry was used (see Figure A1 in the annex) to be able to record the selection of indexed sources and the answers to the questionnaire of trigger questions: How did the pandemic change your trust towards people? How did you carry out your academic, professional, and work training in the face of the pandemic? How to modify your contact and study habits due to the pandemic? Benford's test suggests that the record is valid as it covers more than 30% of the cases in the first figures.

Procedure. Participants were contacted through institutional mail. The guarantee of confidentiality and anonymity is attached. They were informed that the results would not affect their academic status, since the objectives and those responsible for the project carried out the research for academic purposes and in strict adherence to the ethical standards of the American Psychological Association. A focus group was held to homogenize the concepts. The Delphi technique was used to evaluate the selected abstracts according to a Likert-type criterion: 0 = "totally disagree" to 5 = "totally agree".

Analysis. The coefficients of centrality, grouping, and structuring were estimated to contrast the hypotheses. Values close to unity were assumed as evidence of non-rejection of the hypotheses.

Results

Competitiveness is the central node of the social representations of those surveyed. That is, the knowledge management network revolves around competitiveness. It means then that knowledge management is defined as a system of translation and transfer of knowledge and skills in the face of the pandemic that establishes intermediation, proximity, gradation, and influence of competitiveness to other nodes (see Figure 1).

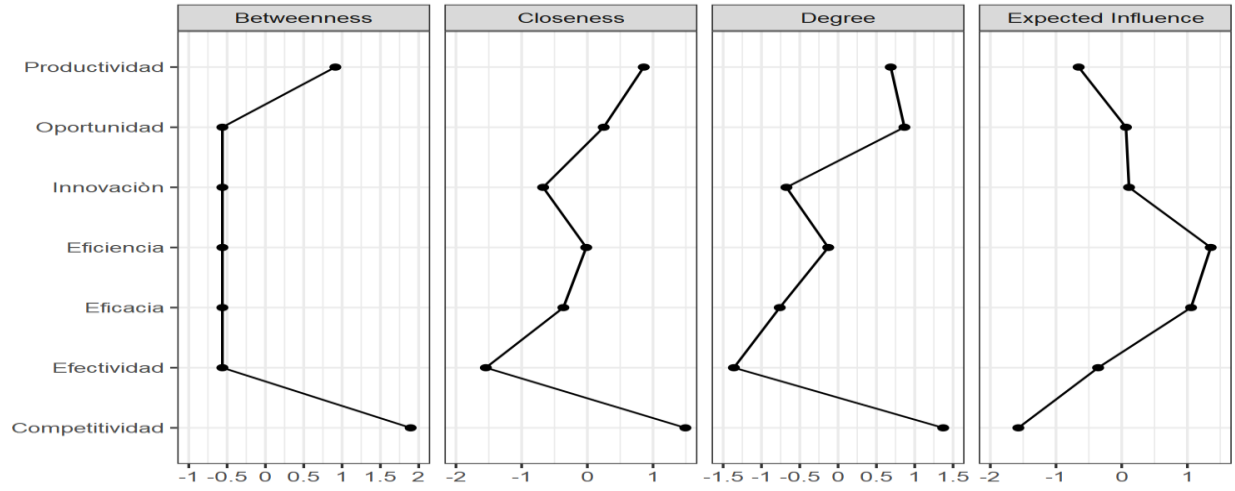

Figure 1. Centrality of knowledge management in the COVID-19 era
Source: Prepared with study data

In the case of the group as the guiding axis of the knowledge network, competitiveness is hegemonic. In this sense, knowledge management; translation, and transfer of knowledge are built as borders that enhance competitiveness as a gradient where knowledge accumulates (see Figure 2).

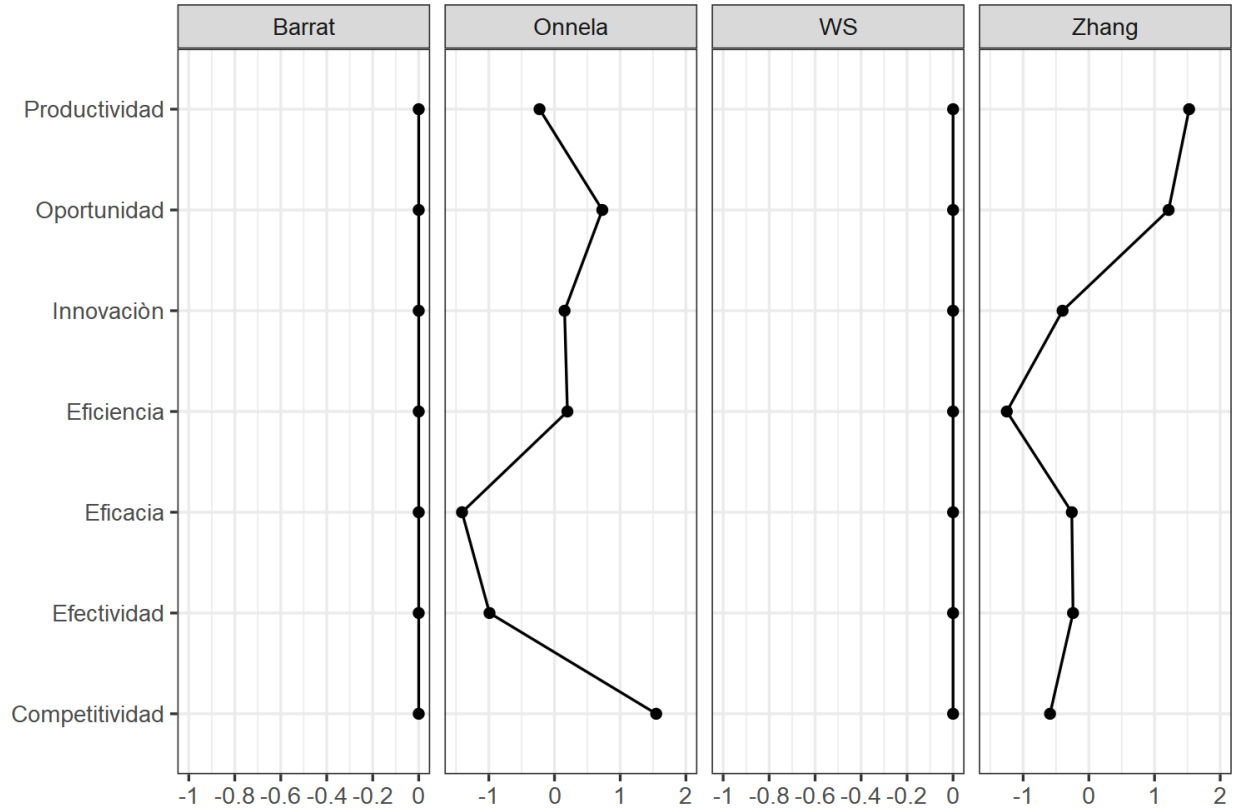

Figure 2. Clustering knowledge management in the COVID-19 era
Source: Prepared with study data

The knowledge network, defined as a structure of relationships between nodes and edges, was evaluated as a learning system in which the transfer of innovation begins and culminates in the translation of effectiveness. In other words, knowledge management is a process of translation and transfer of innovation and effectiveness on which the other nodes are produced and reconfigured (see Figure 3).

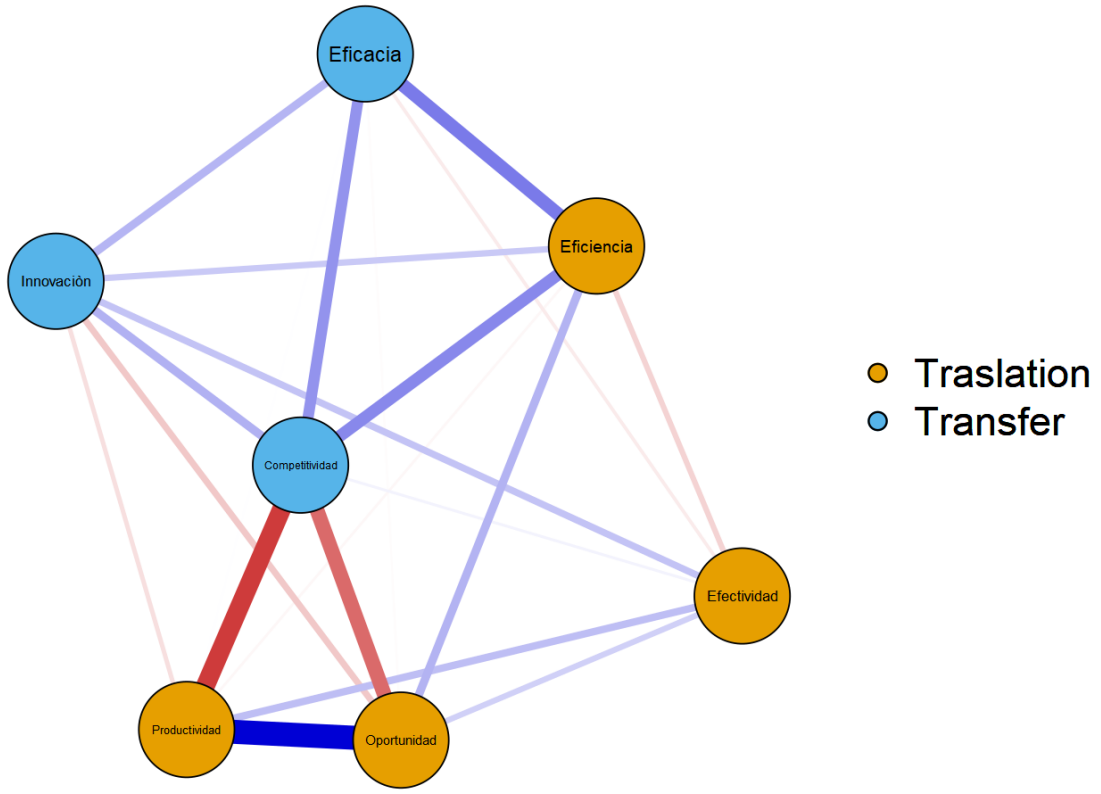

Figure 3. Structuring knowledge management in the COVID-19 era
Source: Prepared with study data

The values of centrality, grouping, and structuring suggest the non-rejection of the hypotheses related to the differences between the theoretical structure for the established empirical model.

Discussion

The contribution of the study lies in the establishment of a knowledge network for COVID-19 at a public university in central Mexico. The results show that the competitive one is the central and hegemonic node in which the other nodes are related and structured. In this process, two dimensions related to the translation and transfer of innovations and efficiency (Karakose et al., 2021). Such findings correspond to studies of stigma where relationships of mistrust prevail between users of public services with the authorities regarding the communication of risks of the pandemic (Jalal et al., 2021). The knowledge network is built from relationships of trust between the parties involved (Al-Omoush, Simón-Moya & Sendra-García, 2020). In the present work, it was established that competitiveness catalyzes innovation and transforms it into efficiency as the learning axis of the network. This discovery suggests a system of trust between the authorities and the student community that the literature identifies as corporate governance (Sotomayor-Castillo et al., 2021). In other words, identity, reputation, and image are trust structures that the literature links to efficiency, competitiveness, and innovation (Mahdi & Nassar, 2021). The identity or sense of belonging to a group makes it possible for the knowledge network to be distinguished from other structures in terms of its translation and transfer of knowledge (Gombos et al., 2021). Next, reputation extends the sense of belonging towards a prestige that will serve to build an institutional image (Putrino et al., 2020; Crespo et al., 2022). In this way, the trust between the parties materializes in indicators of innovation, competitiveness, and efficiency (Landolo et al., 2021). Studies on stigma warn that distrust of authorities is not permanent and can even be reversed as long as the parties involved continue to believe in the technology (Aleanizy & Alqahtani, 2021). In this way, confidence in vaccines translates into acceptance of the

anti-COVID-19 immunization policy (Chi, 2021). Therefore, the inclusion of stigma in the knowledge network is recommended to be able to contrast the relationships between the nodes.

However, the limits of the study revolve around the nodes that make up the knowledge management structure. Even though the focus group technique and Delphi allow delineating and evaluating the concepts, this exercise does not reach an explanatory status but rather a descriptive one. In addition, the selection of the sample does not allow extending the findings towards proportional representativeness of the university community, although the findings are consistent with the state of the art, it is necessary to stratify the population to establish vulnerability, risk and resilience groups as recommended by the literature itself.

Despite the study's limitations, it is possible to highlight the knowledge network as an innovation. Review studies indicate that the knowledge network depends on strategic alliances between public institutions and private organizations, although this paper warns that competitiveness reflects this alliance. Therefore, it is necessary to investigate the structure of trust, vulnerability, risk, and resilience to be able to anticipate knowledge management scenarios aimed at defenselessness and inaction in the face of crises.

Conclusion

The study aimed to create a network of knowledge among a group of students from a public university in central Mexico regarding the pandemic. The results support previous research on the subject by highlighting trust as a crucial factor for sharing essential knowledge during a health crisis. The success of such a network in the face of COVID-19 depends on innovative and efficient knowledge management. Moreover, this paper proposes that universities should focus on reducing stigma related to SARS-CoV-2 prevention and response by including it as a key agenda item, alongside risk, vulnerability, and resilience studies.

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