



ARTICLE



PHYGITAL: INVESTIGATION OF ITS INTERNATIONAL SCIENTIFIC PRODUCTION FROM THE PERSPECTIVE OF SOCIAL NETWORK ANALYSIS

PHYGITAL: INVESTIGAÇÃO DE SUA PRODUÇÃO CIENTÍFICA INTERNACIONAL SOB A PERSPECTIVA DA ANÁLISE DE REDES SOCIAIS

¹ Federal University of Delta do Parnaíba (UFDPAr), Piauí, Brazil. ORCID: <https://orcid.org/0000-0002-0704-1812>

Corresponding Author:
Henrique César Melo Ribeiro
E-mail: hcmribeiopapers@gmail.com

Editor in chief
Altieres De Oliveira Silva
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How to cite this article:

Melo Ribeiro, H. C. (2026). Phygital: Investigation of its International Scientific Production from the Perspective of Social Network Analysis. *Journal of Sustainable Competitive Intelligence*, 16, e0521. <https://doi.org/10.37497/eagleSustainable.v16i.521>

ABSTRACT

Purpose: To investigate the profile, behavior and trend of international scientific production of the term phygital from the perspective of social network analysis.

Methodology/approach: Social network analysis was used in 34 scientific articles.

Originality/Relevance: The relevance of this study, which is based on and guided by its originality, is evident here and, consequently, brings state-of-the-art data, information, knowledge and expertise to academia.

Key findings: 2024 and 2023 were the most central periods. Journal of Strategic Marketing, Décisions Marketing and Journal of Marketing Management were the most central journals. Jean Moulin Lyon 3 was the most central university. France and USA were the most central countries. Phygital, customer experience, phygital marketing, marketing, retail, digitalization, omnichannel, experience, phygital customer experience, digital, augmented reality, consumer behavior, digital marketing, holistic perspective, consumer-centric logic, were the most central keywords. It is also worth noting that the networks of a mode (authors, institutions and countries) were measured with low density, thus impacting the flow and exchange of information and knowledge of the term phygital.

Theoretical/methodological contributions: This study concludes by emphasizing the state of the art of the term phygital, from the perspective of social network analysis and from the perspective of the EBSCO database, contributing, a posteriori, to the emergence of future research, and, consequently, to the growth, development and maturation of the aforementioned theme in the scientific panorama.

Keywords: Phygital. Scientific production. International journals. EBSCO. SNA.



DOI: <https://doi.org/10.37497/eagleSustainable.v16i.521>



RESUMO

Objetivo: Investigar o perfil, o comportamento e a tendência da produção científica internacional do termo *phygital* sob a perspectiva da análise de redes sociais.

Metodologia/abordagem: Utilizou-se a análise de redes sociais em 34 artigos científicos.

Originalidade/Relevância: Vislumbra-se aqui a relevância deste estudo que se baseia e se norteia em sua originalidade, e, conseqüentemente, traz dados, informações, conhecimentos e saberes em estado da arte para a academia.

Principais conclusões: 2024 e 2023 foram os períodos mais centrais. *Journal of Strategic Marketing*, *Décisions Marketing* e *Journal of Marketing Management* foram os periódicos mais centrais. Jean Moulin Lyon 3 foi a universidade mais central. França e EUA foram os países mais centrais. *Phygital*, *customer experience*, *phygital marketing*, *marketing*, *retail*, *digitalization*, *omnichannel*, *experience*, *phygital customer experience*, *digital*, *augmented reality*, *consumer behavior*, *digital marketing*, *holistic perspective*, *consumer-centric logic*, foram as palavras-chave mais centrais. Salienta-se também que, as redes de um modo (autores, instituições e países) foram aferidas com baixa densidade, impactando com isso no fluxo e na troca de informação e conhecimento do termo *phygital*.

Contribuições teóricas/metodológicas: Este estudo conclui ao colocar em ênfase o estado da arte do termo *phygital*, sob a perspectiva da análise de redes sociais e sob a perspectiva da base de dados EBSCO, contribuindo, a posteriori, para o surgimento de futuras pesquisas, e, conseqüentemente, no crescimento, desenvolvimento e maturação da referida temática no panorama científico.

Palavras-chave: *Phygital*. Produção científica. Periódicos internacionais. EBSCO. ARS.

1 INTRODUCCION

The term “*Phygital*” was coined in 2007 by Chris Weil, who is currently the President and CEO of Momentum Worldwide. This term is an internationally recognized practice in the fields of consulting, strategy, data analysis, and experience *design*, used to describe the inseparable connections between the physical and digital worlds. In other words, the *phygital* concept refers to the integration of the physical and digital, proposed to describe how companies seek to engage customers through the use of smart technologies inteligentes (Cennamo, Dagnino & Di Minin, 2022; Mele, Spina, Marzullo & Bernardo, 2023).

That said, *phygital* is widely used across various companies, with existing studies defining the concept in relation to *marketing* channel approaches, in most cases, *phygital* is used

to refer to multichannel, *crosschannel*, or omnichannel strategies. It is worth noting that, with the rise of digital transformation, retail companies have adopted an omnichannel (*omnichannel*) strategy to integrate *online* and *offline* channels and provide customers with a seamless experience. Thus, *phygital* is regarded as a comprehensive framework that fosters the management of customer experiences. Such a framework ensures continuity in value delivery by connecting *offline* and *online* offerings (Failli, Reyes & Rodríguez, 2023; Batat, 2024).

In addition, it is important to highlight that the retail sector is increasingly investing in new technologies to attract consumers, adapting to changes in their perception of convenience at each stage of the customer journey. The integration of *online* and *offline* sales has led to the development of omnichannel commerce, including the implementation of digital technologies in physical spaces known as phygital retail. Providing digital convenience in physical stores is part of adaptive omnichannel retail. It offers flexibility to phygital consumers, who make no distinction between the physical and digital worlds, allowing them to shop *online*, *offline*, or through mobile applications, anytime and anywhere (Dimitrova, 2024).

Therefore, the *phygital* concept can be envisioned within *marketing* in other words, *phygital marketing* which seeks to merge physical and digital environments to create a unique customer experience. On the one hand, by converging both environments, customers gain an enhanced consumption experience throughout their journey. On the other hand, companies increase customer engagement and lifetime value, thereby boosting their performance in other words, creating greater value for themselves (Šošić & Gregurec, 2024).

By increasing value for both parties, the importance of the *phygital* concept in *marketing* becomes evident. Thus, it can be understood that the expression *phygital marketing* promotes advantages in retail, focusing on its application to improve customer relationships, increase sales, and create unique and memorable brand encounters in an increasingly competitive market (Šošić & Gregurec, 2024).

At a macro level, *phygital* is a hybrid consumption experience, and to implement this strategy, the organization leverages both the physical aspects of the offering—for example, the point of sale and the digital specificities, by providing applications, *totems*, and other forms of in-store digital interaction. Thus, in line with the *phygital* concept (physical + digital), this approach has created new environments in which customers can interact and learn to use different digital channels (Prado & Lourenço, 2024).

Consequently, it is found that although the term is mainly used by professionals, research on the theoretical development of *phygital* remains scarce, however, in recent years, academic journals have devoted efforts to uncovering the theoretical foundations and managerial applications of the term *phygital* (Batat, 2020). In light of this, there is growing attention from both researchers and professionals toward the *phygital* universe, which is reflected in the increasing number of scientific articles, reports, and business websites negócios (Cennamo, Dagnino & Di Minin, 2022).

In view of this, the study by Mele *et al.* (2023) is emphasized, in which the authors conducted a systematic literature review (SLR) to obtain an overview of the phenomenon and to understand how the term “*phygital*” is discussed and applied in the scientific domain. The analysis carried out by these authors revealed that the development and use of physical and digital objects and applications (i.e., *phygital* resources) in a *phygital* context (that is, spaces and places) affect the customer journey in a *phygital* manner, enabling the improvement of new forms of *phygital* experience. Based on this, Mele *et al.* (2023) suggest new specific research directions in order to achieve a deeper understanding of the *phygital* construct.

In light of this, this scientific article raises the research question that underpinned and guided this study, namely: What is the profile, behavior, and trend of international scientific production on the term *phygital* from the perspective of social network analysis? Accordingly, the objective of this study was to investigate the profile, behavior, and trend of international scientific production on the term *phygital* from the perspective of social network analysis.

The predominant use of Social Network Analysis (SNA) in this scientific article is reinforced, as it is a research method that provides a unique perspective on the scientific investigation of networks, this is because SNA can analyze the dynamic relationships among actors, the evolutionary development of academic works, and the complexity of research groups (Chen, Zhang, Lau, Wang, Wang & Zhang, 2023; Xiao, Si & Guo, 2024; Ribeiro, 2026b).

To identify the international scientific production on the term *phygital*, the EBSCO database was chosen, as it is known for including scientific articles from a broader range of fields of knowledge compared to other databases, such as the *Web of Science (WoS)*.

EBSCO is a data platform with an *online* interface that provides access to other public data sources, data systems, and institutions such as colleges, universities, libraries, schools, agencies, and private corporations. It is also worth noting that EBSCO has had an academic presence since 1933 and indexes approximately 2.200 journals. Therefore, EBSCO is considered a legitimate and relevant database for global scientific literature (Reis, Mattedi & Barrios, 2017; Eichler & Schwarz, 2019; McLellan & Steele, 2022; Ribeiro & Corrêa, 2023; Reis & Barrios, 2024).

It is noted that there is already a study published in the global scientific literature (Mele *et al.*, 2023) that is similar to the present research, however, it is not analogous to the question and objective that this scientific work aims to address. Therefore, for the first time and up to the present moment, this ongoing study brings forth the term *phygital*, investigated through research focused on the scientific production of international academic studies published in journals from the perspective of the EBSCO database and under the predominant lens of (SNA).

Therefore, the relevance of this academic article lies in its originality, as it is founded and guided by its unprecedented nature, consequently, it brings contemporary data, information, knowledge, and insights to academia. As a result, this scientific study will contribute to the creation of further research on the academic production of the term *phygital* and, simultaneously, to its dissemination within academia, thereby, enhancing its understanding and, subsequently, its broader comprehension, this, in turn, will influence its growth, development, and maturation within the global scientific literature.

2 PHYGITAL

Technology has created many opportunities for companies every day and has expanded numerous avenues for growth by inspiring the appropriate use of technology in their daily operations. In addition to this evolution, technology, if implemented carefully, can become an asset and add value to business operations. Therefore, organizations are ensuring the *design* of customer-friendly interaction platforms, where consumers can make efficient use of available technologies such as *smartphones, tablets, laptops, etc.*, further easing the burden involved in tracking and completing their purchases (Bassi, Goel & Kathuria, 2024).

In light of the above, the concept of *phygital* is highlighted as the aggregation of physical and digital aspects to achieve a synergistic advantage that allows a company to actively engage with and ensure the satisfaction of its customers. Accordingly, it is noted that the

expression *phyigital* became popular during the COVID-19 pandemic, and as a result, retail companies in particular began to actively engage both physically and digitally in other words, *phyigital* rather than merely creating websites to ensure a digital presence. This shift provided these organizations with an opportunity to innovate and demonstrate their value, elevating their businesses to another level (Bassi, Goel & Kathuria, 2024).

Given the foregoing, the concept of consumption experiences in “*phyigital*” retail is relatively new, reflecting the recent emergence of digital technologies that make such experiences possible. Thus, *phyigital marketing* has emerged, involving the creation of a consumer journey that seamlessly integrates physical and digital experiences developing interactions that are only achievable due to the rise of emerging digital technologies. For example, popular *phyigital* approaches include the incorporation of contactless payment systems, interactive touch screens, integrated digital payment systems, and augmented reality into the customer experience (Johnson & Barlow, 2021).

Still regarding technologies, it is observed that there are *phyigital* product experiences that include a potentially vast range of permutations. The first involves the use of digital sensing technology to automate in-person processes that are often the main source of customer dissatisfaction. In this case, digital sensing technologies and artificial intelligence combine to track the items taken from the shelves by individual customers, who are then charged directly to their accounts without the need for any additional action on their part (Johnson & Barlow, 2021).

A second, no less impactful, set of *phyigital* innovations is related to the use of augmented and virtual reality technologies to “import” digital artifacts into the physical world, allowing consumers to interact with and personally evaluate them before purchasing. In these cases, consumers can have a simulated experience with products in the comfort of their homes, without giving up the convenience of digital search and payment. These technologies can be similarly applied to other types of products, including household items or appliances, which can be visualized in the home environment, as well as technological products themselves, which users can handle and “use” even before they are released to the public (Johnson & Barlow, 2021).

It is further noted that the *phyigital* approach incorporates immersive technologies, such as augmented and virtual reality, mobile applications, and the metaverse, among others, to better connect customers’ physical and digital experiences. Thus, the term *phyigital* is the driving force behind the *optichannel* concept, which is generally understood as an evolution and/or refinement of the omnichannel approach (Faria & Carvalho, 2025).

Therefore, it can be understood that paradigm shifts have been taking place in retail, in other words, from a multichannel strategy, through omnichannel and *phyigital*, to an *optichannel* strategy. Thus, it is understood that these transformations may indicate that *marketing* professionals are adopting a more customer-centered approach to brand management and, consequently, to consumer behavior (Faria & Carvalho, 2025).

In view of this, it is understood that the use of these strategies has broad applications across various sectors, such as banking (Fasano & La Rocca, 2024), services (Roten, Vanheems & Laroutis, 2022), tourism (Sustacha, Baños-Pino & Del Valle, 2022), education, and particularly in the retail sector. That said, interest in the application of *phyigital marketing* to retail commerce has especially increased in recent years. Implicit in this enthusiasm is the notion that physical experiences provide a unique value that goes beyond what can be offered through digital means, and therefore, that the combination of both (physical and digital) can

drive retail sales (Johnson & Barlow, 2021).

Furthermore, in recent years, the need to obtain a more refined understanding of hybridized physical and digital experiences has undoubtedly been intensified and accelerated by the dramatic exogenous shock presented by the COVID-19 pandemic. Indeed, by challenging the traditional understanding of organizational behavior, the pandemic has undoubtedly contributed to radically transforming the way humans, citizens, and consumers think and behave when shopping, traveling, dining, attending events, and so forth. Thus, COVID-19 has, in fact, made technology and the processes linked to its rapid adoption an increasingly significant interface that interconnects people (consumers) and spaces (businesses), thereby, enabling safer and more engaging experiences (Cennamo, Dagnino & Di Minin, 2022).

In summary, the term “*phygital*” is a combination of the words “physical” and “digital” and describes an approach that harmoniously and complementarily merges these two worlds. Thus, *phygital* consumers often seek the convenience of digital technologies while, at the same time, valuing experiences related to physical contact with the product or service, such as personally checking the product before purchase, using in-store services, or participating in live events.

Therefore, for brands, understanding consumer needs and behaviors with a focus on the *phygital* concept is essential to effectively combine these two aspects (consumer and the *phygital*) and offer a consistent shopping experience. Thus, it is understood, and simultaneously comprehended, that researching the term *phygital* allows companies to develop more personalized and engaging strategies that not only address consumers, current needs but also capture their interest and explore new possibilities. (Strzelecki, Jaciow & Wolny, 2024).

3 METHODOLOGICAL PROCEDURES

The objective of this study was to investigate the profile, behavior, and trend of the international scientific production on the term *phygital* from the perspective of social network analysis. To this end, it is emphasized that the first stage of this research involved the use of bibliometrics in the investigated sample in order to define the networks of actors (authors, institutions, countries, among others). That said, it is highlighted that SNA, that is, sociometry, was the predominant research method in this study (Sampaio, Sacerdote, Fonseca & Fernandes, 2015; Kumar & Yadav, 2023; Ribeiro, 2024b; Seijas-Díaz, Reátegui-Villacorta, Barbachan-Ruales, Cabel-Rabines, Cueto-Orbe & Riva-Ruiz, 2024; Ribeiro, 2026a).

SNA can be composed of *one-mode* and *two-mode* networks. In other words, two-mode networks comprise connections between two distinct sets of actors, as the term “mode” refers to the specific categories of actors. Thus, one-mode networks are characterized when actors within a social network have ties with other actors of the same category, such as networks focused on authors, which give rise to co-authorship networks (Tomaél & Marteleto, 2013; Ribeiro, 2025).

The two-mode network differs in that its actors interact with actors from other, that is, distinct categories. In this sense, a two-mode network is understood as the relationship between different actors within a single social network, that is, as a single social system, such as the relationships between authors and journals (two distinct sets of actors) within the same social network (Tomaél & Marteleto, 2013; Ribeiro, 2025).

It is important to emphasize that network structures and their formations are analyzed

through components that constitute social networks, which are: nodes (actors), ties (connections between actors), dyads (connections composed of two actors), triads (connections formed by a set of three actors), giant components (the largest group in the social network), *small-worlds* (groups of actors with strong ties), structural holes (gaps or failures in the structure and formation of the social network), density (the number of existing relationships among actors), and centrality (atores com maior número de relações, parcerias) (Walter & Bach, 2013; Sampaio *et al.*, 2015; Kohler & Digiampietri, 2021; Melo, Jesus & Musial, 2024; Ribeiro, 2025).

In this regard, density is a measure that determines the intensity of internal cohesion within a social network. Thus, when there is direct interaction among all actors in the social network, this network is referred to as a complete social network. Considering this, the density of a social network is defined as the ratio between the total number of existing connections in the network and the maximum possible number of interactions for the social network (which is equivalent to saying it is a fully connected social network). It is evident that the density of a social network ranges from 0 (zero), meaning that all actors in the network are disconnected, to 1 (one), indicating that all actors in the network are connected (Williams dos Santos & Farias Filho, 2016; Grácio, 2018).

It is further noted that density reveals that the denser a social network is, the closer its measurement will be to one, thus, the actors will be more standardized, conversely, a social network with low density is measured with a value below 0,2, indicating that it is a dispersed social network with low internal cohesion (Williams dos Santos & Farias Filho, 2016; Grácio, 2018).

When it comes to centrality measures, (*degree*) centrality and (*betweenness*) centrality are highlighted. These measures are among the most commonly used by scholars in research focused on SNA. Degree centrality represents the number of relationships (partnerships) that an actor has with other actors in the social network, thus allowing the characterization of the actor's structural position in relation to other actors in the network, therefore, the higher the degree centrality measurement, the greater the actor centrality. Betweenness, on the other hand, considers the number of shortest paths between any other two actor's (Grácio, 2018; Favaretto & Francisco, 2017; Welter, Souza, Trajano & Behr, 2021; Facin, Barbosa, Matsumoto, Cruz & Salerno, 2022; Urbizagástegui-Alvarado, 2022; Ribeiro, 2024^a).

For example: "actor a" and "actor b," which pass through "actor c." In this way, *betweenness* calculates an actor's ability to mediate the flow and exchange of information, communication, and knowledge among actors in the social network. It is further noted that both *degree* and *betweenness* are represented as percentages in actors' social networks (Grácio, 2018; Favaretto & Francisco, 2017; Welter, Souza, Trajano & Behr, 2021; Facin *et al.* 2022; Urbizagástegui-Alvarado, 2022; Ribeiro, 2024a).

3.1 Data Collection and Analysis Procedures

The universe of this academic work highlighted scientific articles published in journals indexed in the EBSCO database. The choice of EBSCO as the sole database for this research is reiterated, given that it is a data platform that allows users to search for scientific material relevant to their topic by accessing multiple sources, using advanced search options, and employing boolean operators to obtain more detailed results across various fields of knowledge (Ebsco Database, 2025).

The process of selecting the sample of scientific research was carried out as follows: a)

choosing the keywords applied in the search filter of the EBSCO database; b) collecting the data from the EBSCO data platform; c) searching for the keywords in the titles, abstracts, and keywords of the scientific articles; d) defining the sample through the reading of the titles and/or abstracts of each scientific article. In the EBSCO data system, using the boolean operator “AND” (Rungo, Madio & Grácio, 2023), a filter was applied with the keyword “Phygital.”

This keyword was searched in the “title” AND “abstract” AND “keywords” of each scientific article, not simultaneously, thus allowing all academic works on the topic under investigation in this research to be identified and related. It is further noted that the selection of scientific articles on the subject of study was also conditioned by the following criteria: (i) the aforementioned studies had to be fully available, that is, in their entirety, thereby allowing the *download* of the complete research on the central topic of this study from the EBSCO data system; (ii) the academic studies had to have been peer-reviewed; and (iii) only scientific articles published in journals were selected. This action helped in the identification of 34 scientific articles on the term *phygital* within the international scientific context, from the perspective of journals indexed in the EBSCO database.

The period for the beginning and end of the search and subsequent tabulation of data from the scientific studies occurred between 25/04/2025, and 25/04/2025. As mentioned earlier, the sample comprised 34 scientific articles, covering a time frame from 2017 to 2025, totaling eight years. The aforementioned temporality was conditioned by the academic articles found in the EBSCO database, that is, the first scientific work on the *phygital* theme was found only in 2017, and its most recent publication occurred in 2025, more specifically on 26/04/2025.

It is also noted that the measurement of SNA indicators, that is, sociometric indicators, as well as the creation of symmetric matrices (*one-mode* networks) and asymmetric matrices (*two-mode* networks) of the actor’s social networks (Ribeiro, 2026c), along with their respective graphical visualizations, took place between 26/04/2025, and 01/05/2025.

Finally, the data and information related to the SNA indicators were measured using the *UCINET software*, and the graphical visualization of the social networks was carried out using the *NetDraw software*. It is also stated that the analyses of the 34 scientific articles were conducted according to the SNA (sociometric) indicators, which were: (i) two-mode network of periods and authors; (ii) two-mode network of journals and authors; (iii) co-authorship networks; (iv) HEI networks; (v) country networks; and (vi) keyword networks. It is further emphasized that Figure 1 was generated, showing the step-by-step methodological path of this scientific article.

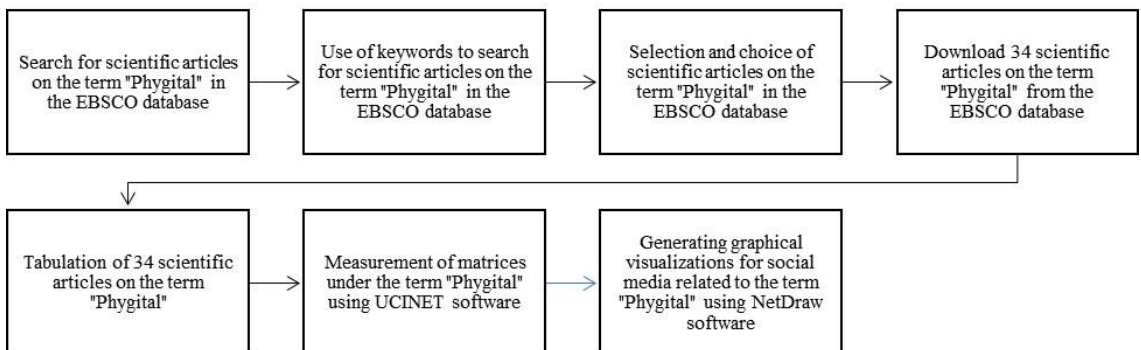


Figure 1: Methodological Path

Source: Prepared by the author (2025)

4 ANALYSIS AND DISCUSSION OF THE RESULTS

This section presents the analysis and discussion of the results of the 34 scientific articles on the term *phygital*, in light of the journals indexed in the EBSCO database and from the perspective of (SNA).

4.1 Two-Mode Network of Periods and Authors

Figure 2 highlights the two-mode network of the eight periods and the 70 authors. Degree centrality was used to emphasize the most central years in light of the authors.

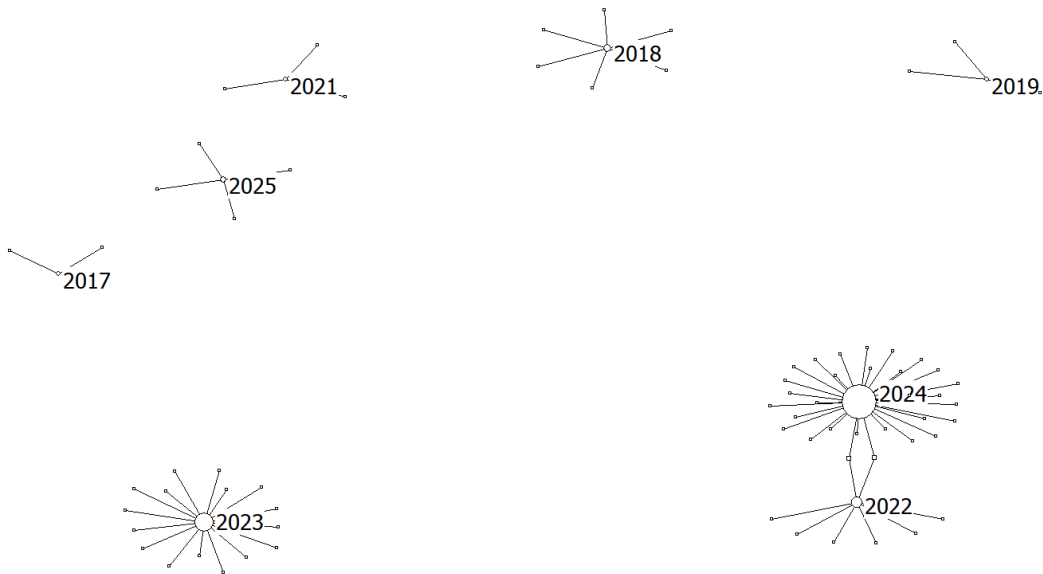


Figure 2: Two-Mode Network of Periods and Authors
Source: Research data (2025)

In this way, the periods that stood out, in descending order of productivity, were 2024, 2023, and 2022. Therefore, it can be understood that the term *phygital* shows a tendency to evolve in the international scientific literature, as the highlighted years reflect the contemporaneity of the term *phygital* and reveal a growing and strong attention from researchers, simultaneously impacting the rise of scientific articles on the *phygital* topic within the global academic context (Cennamo, Dagnino & Di Minin, 2022; Mele *et al.*, 2023), from the perspective of journals indexed in the EBSCO database.

4.2 Two-Mode Network of Journals and Authors

Figure 3 depicts the two-mode network of the 21 journals and the 70 authors. Degree centrality was used to highlight the most central scientific journals from the researchers' perspective.

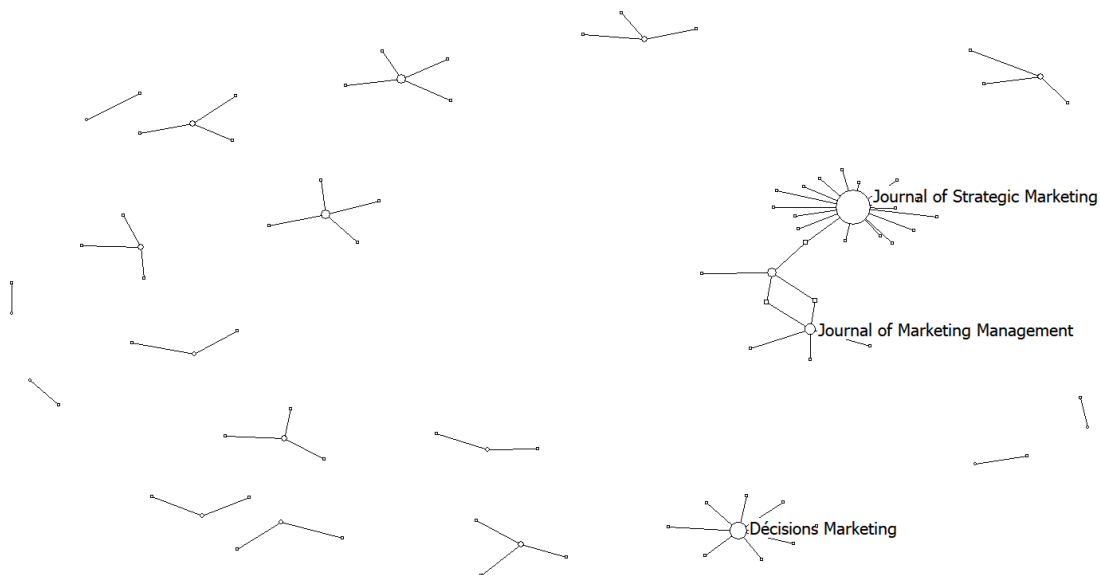


Figure 3: Two-Mode Network of Journals and Authors
Source: Research data (2025)

Thus, the most central journals, in descending order of influence, were: *Journal of Strategic Marketing*, *Décisions Marketing*, and *Journal of Marketing Management*. Among these journals, the *Journal of Marketing Management* can be highlighted, as it is considered one of the most influential and representative scientific journals within the Latin American marketing research community (Seijas-Díaz *et al.*, 2024).

Therefore, it can be understood that the term *phygital* has a strong connection with the field of marketing (Failli, Reyes & Rodríguez, 2023; Batat, 2024), simultaneously impacting its publication in scientific journals with a marketing scope and focus (Cennamo, Dagnino & Di Minin, 2022; Mele *et al.*, 2023). In other words, the authors in this study demonstrate an aptitude for disseminating their respective findings and contributions in academic journals aligned with the field of marketing knowledge.

4.3 Co-Authorship Networks

Figure 4 visualizes the co-authorship networks, which were composed of 70 nodes and 112 ties.

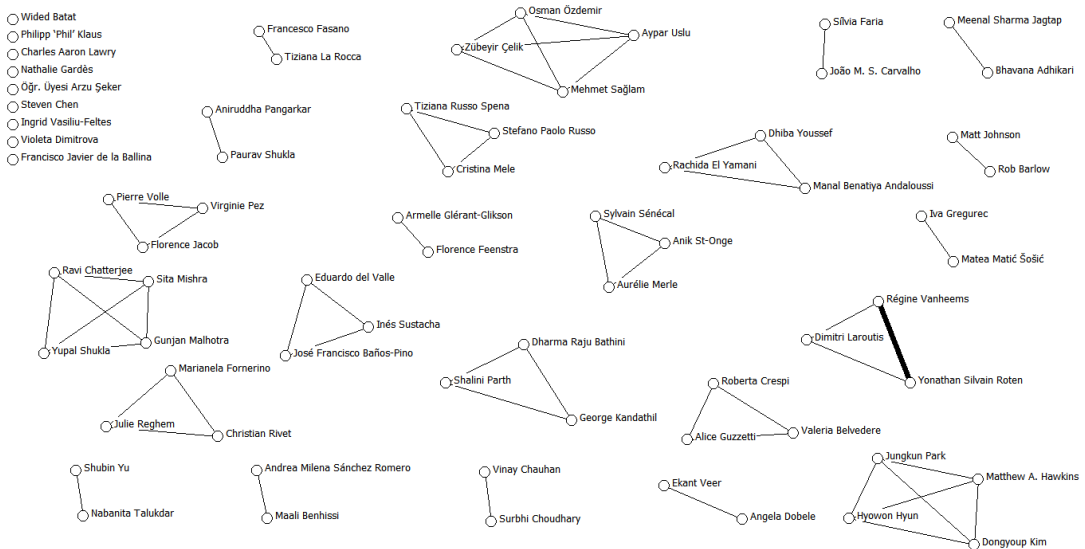


Figure 4: Co-Authorship Networks

Source: Research data (2025)

Observing Figure 4, it is noted that the most dominant interactions among the authors occurred through dyads and triads. It was also found that there were larger study groups composed of four researchers each, working directly in the flow and exchange of information and knowledge about the subject under investigation. It was observed that some scholars published on the core topic of this research individually (nine authors), therefore, it can be understood that the co-authorship networks in this study are considered multirelational social networks, since there is more than one type of tie, that is, more than one form of relationship among the authors (Melo, Jesus & Musial, 2024).

Regarding the interaction among researchers, the most recurrent partnership occurred between the scholars Yonathan Silvain Roten and Régine Vanheems, who published two studies on the term *phygital* within the global academic context, in light of the journals indexed in the EBSCO database.

Still examining the co-authorship networks in Figure 4, it is evident that their density was calculated at 0.0236, meaning that only 2.36% of the 70 authors effectively interacted with each other. Therefore, it can be considered that the co-authorship network in this scientific article presents low density, directly influencing the emergence of a dispersed cooperation network and, consequently, leading to the appearance of structural holes, conditioning the fragmentation of collaboration among the authors (Williams dos Santos & Farias Filho, 2016; Favaretto & Francisco, 2017; Ribeiro, 2024a).

Thus, the emergence of the so-called small worlds and, consequently, the weak ties among scholars resulted in low internal cohesion, simultaneously influencing the fluidity and harmonization of the flow and exchange of communication, knowledge, and information on the subject analyzed in this investigation (Williams dos Santos & Farias Filho, 2016; Favaretto & Francisco, 2017; Ribeiro, 2024a).

Therefore, to foster the density of co-authorship networks, it is necessary to expand the dissemination, sharing, and socialization of studies on the topic under investigation, especially

through partnerships among researchers and, coincidentally, among their respective native HEIs. This strategy is essential for increasing the density of the researchers' network and, consequently, its internal cohesion, thereby enhancing the flow and exchange of knowledge and expertise on the central theme of this study within the international academic sphere, in light of the scientific journals indexed in the EBSCO database.

4.4 Networks of HEIs

Figure 5 depicts the networks of (HEIs), which were formed by 54 nodes and 64 ties. It is noteworthy that betweenness centrality was used to highlight the most central HEIs.

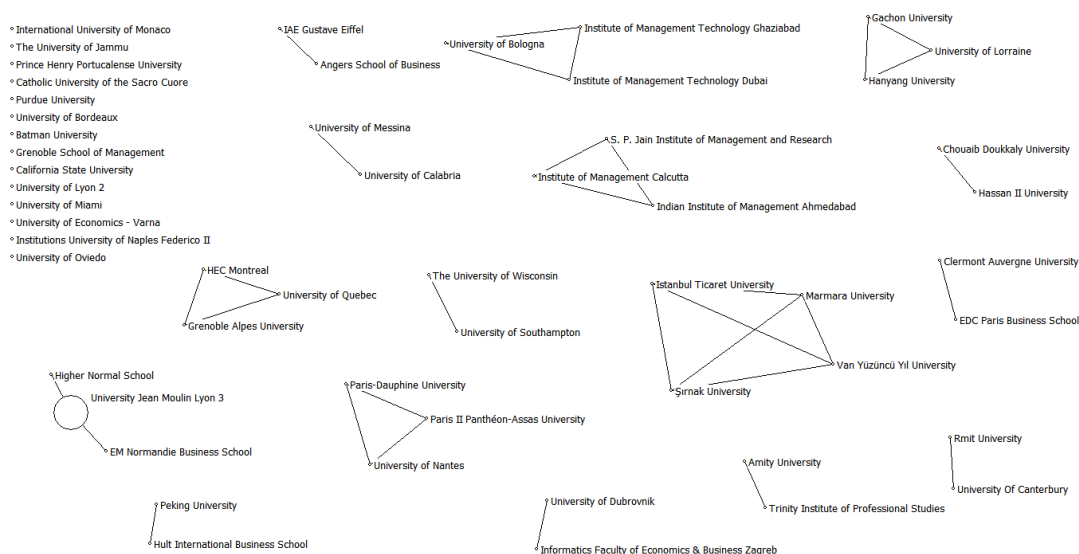


Figure 5: Networks of HEIs
Source: Research data (2025)

Given the evidence, the most central HEI was Jean Moulin Lyon 3, located in France. Therefore, it can be stated that, within the scope of this research, this HEI is the most influential and prominent in mediating the informational flow and the exchange of knowledge and insights (Favaretto & Francisco, 2017; Grácio, 2018; Ribeiro, 2025) concerning the term *phygital* in the international academic literature, from the perspective of the scientific journals indexed in the EBSCO database.

Still analyzing Figure 5, its density was calculated at 0.0224, corresponding to 2.24% of the effective interactions among the 54 HEIs identified in this study. This result aligns with what was observed in the co-authorship networks of this academic work, and, therefore, the conclusion is also similar, since the HEI social network presents low density, which directly affects its internal harmony (Williams dos Santos & Farias Filho, 2016; Favaretto & Francisco, 2017; Grácio, 2018; Ribeiro, 2024a).

Parallel to this, it affects the fluidity of the flow of information and the exchange of knowledge among the HEIs analyzed in this research, concerning the main theme of this scientific article (Williams dos Santos & Farias Filho, 2016; Favaretto & Francisco, 2017;

Grácio, 2018; Ribeiro, 2024a), consequently, this impacts its evolution, improvement, and maturation within the global academic sphere, under the perspective of the journals indexed in the EBSCO database.

It is important to emphasize and reinforce that, as observed in the co-authorship networks, the HEI networks also presented low density. Consequently, as suggested for the researchers' networks, in order to foster the density of the HEI networks, it is essential and paramount to promote a greater exchange of information and knowledge among authors, through partnerships originating from their respective HEIs, this, in turn, contributes to the optimization of the internal cohesion of the HEI network and, simultaneously, to the fluidity of the knowledge flow regarding the core theme of this investigation within the international scientific sphere, under the perspective of the journals indexed in the EBSCO database.

4.5 Country Networks

Figure 6 depicts the country networks, which were composed of 18 nodes and 16 ties. It is emphasized that betweenness centrality was used to highlight the most central countries.

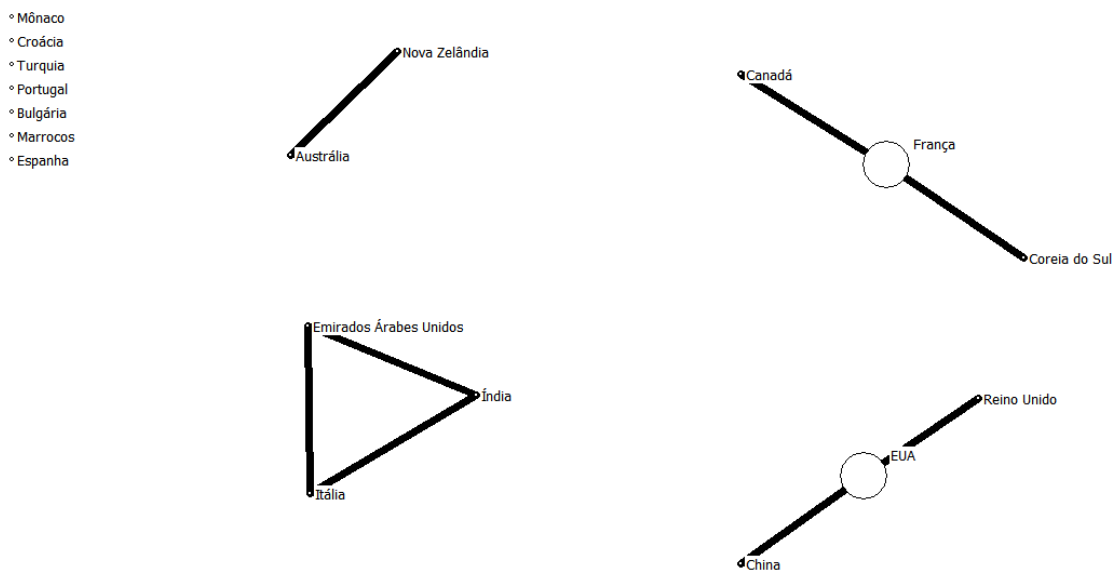


Figure 6: Country Networks
Source: Research data (2025)

In this way, the nations that stood out in terms of *betweenness* were France and the United States. This result is similarly corroborated by the study of Kumar and Yadav (2023), who analyzed, through bibliometric methods, the production of scientific research on *omnichannel* management in the international context. It is noteworthy that *omnichannel* is an intrinsic topic related to the term *phygital* (Dimitrova, 2024).

Still regarding Figure 6, it is observed that its density was measured at 0.0523, corresponding to 5.23% of the total interactions among the 18 countries in this study. This result is similar to what was observed in the co-authorship networks and the HEI networks of this

investigation; however, it presents a slightly higher density value, which may indicate greater proximity among nations through their respective HEIs and affiliated authors, consequently impacting the fluidity of information exchange and knowledge sharing about the subject under analysis in this research (Grácio, 2018; Ribeiro, 2025).

However, the density value of the country network is still below what is expected in a highly dense social network, therefore, the social network of nations in this study is still considered low, thus affecting the cohesion and dispersion of the mentioned collaborative network among countries (Williams dos Santos & Farias Filho, 2016; Favaretto & Francisco, 2017), at the same time, this scenario stimulates the growth, development, and maturation of the term *phygital* within the international scientific sphere, under the perspective of the journals indexed in the EBSCO database.

4.6 Keyword Networks

In a SNA, keywords play a crucial role, as they allow current and future trends of any given topic to be anticipated (Kumar & Yadav, 2023). Accordingly, Figure 7 was created to capture the keyword networks of this study, which consisted of 159 nodes and 932 links. Based on this, it is noted that the 34 scientific articles identified on the term *phygital* contained a total of 159 keyword occurrences.

However, to reach this total of 159 keywords, the following criteria were applied: (i) no distinction was made between uppercase and lowercase letters; and (ii) singular and plural forms of keywords were treated as distinct (Favaretto & Francisco, 2017).

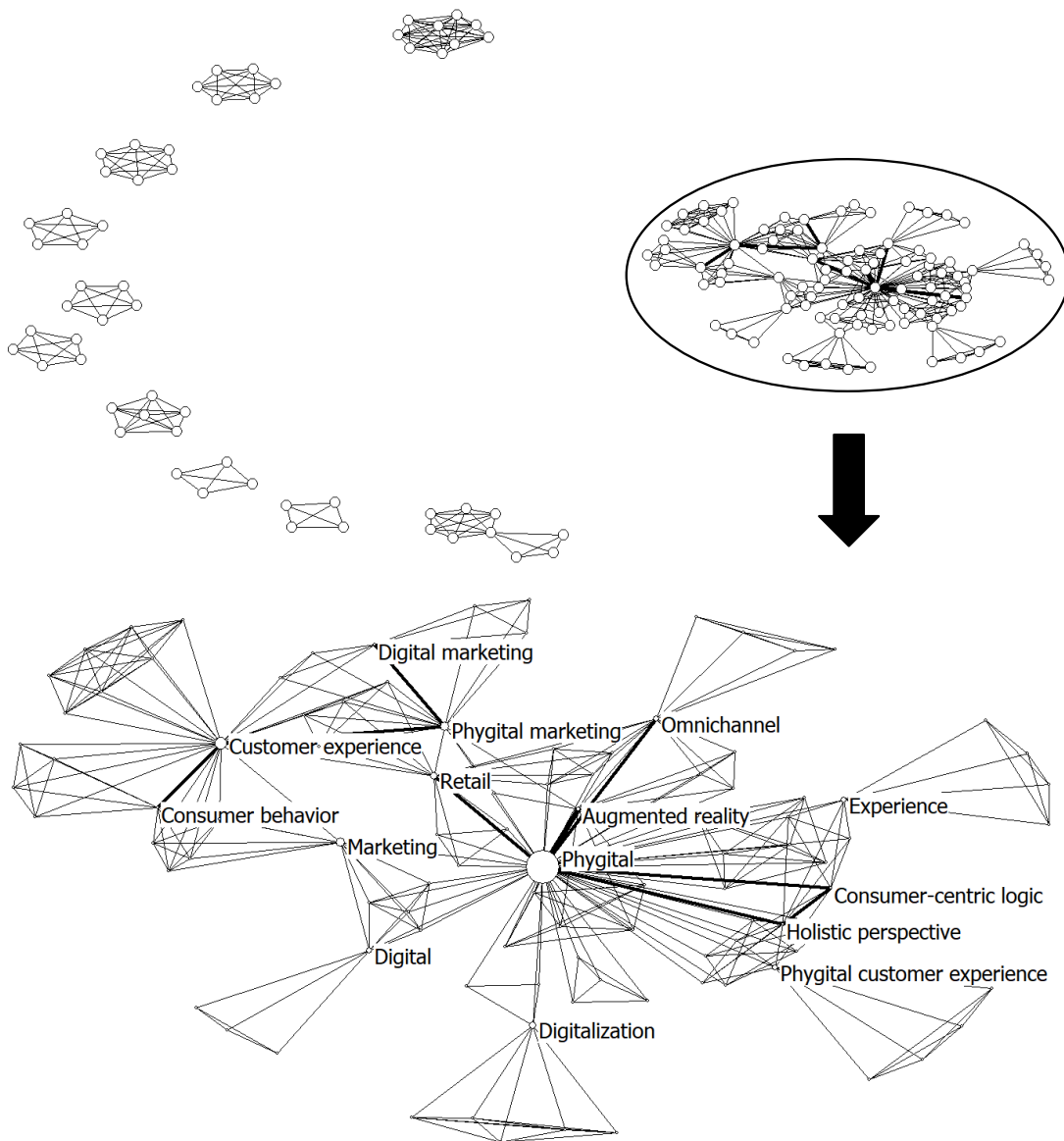


Figure 7: Keyword Networks
Source: Research data (2025)

It is emphasized that the size of each keyword corresponds to the frequency of its occurrence in the scientific papers identified and, consequently, analyzed. Therefore, the more often a keyword appeared in the 34 studies, the larger its size in the giant component shown in Figure 7. Additionally, the lines connecting the keywords represent their respective links (Sampaio et al., 2015; Köhler & Digiampietri, 2021; Ribeiro, 2024a).

Thus, it is evidenced and reinforced that the giant component in Figure 7 highlights and indicates the presence of a flow and, concomitantly, a greater exchange of information and knowledge among a large number of actors within the network (Sampaio et al., 2015; Köhler

& Digiampietri, 2021; Ribeiro, 2024a), in this case, referring to the keywords. In this way, the giant component formed and highlighted in Figure 7 was composed of 100 nodes and 644 ties.

As a finding, the giant component revealed the most central keywords in this investigation, which, in descending order of importance, were: *phygital*, *customer experience*, *phygital marketing*, *marketing*, *retail*, *digitalization*, *omnichannel*, *experience*, *phygital customer experience*, *digital*, *augmented reality*, *consumer behavior*, *digital marketing*, *holistic perspective*, and *consumer-centric logic*. All these central keywords interact with different domains of the term under investigation. Reinforcing the fact that the studied term has begun to attract the attention of researchers (Kumar & Yadav, 2023).

Here, an addition is made by emphasizing that the keyword *phygital* was the most central in this study because it was the term used to search for scientific articles on *phygital* in the EBSCO database system.

It can be stated, for this research, that these keywords are the most influential and relevant in terms of the publication of scientific articles on the main topic of this study in the international scientific literature, furthermore, these most important keywords reflect the areas of greatest activity within the thematic landscape of the subject under analysis in the global scholarly context, in other words, these most central keywords are the most prominent, as they possess the “power” to ground, guide, and mediate the flow of communication, knowledge, and information (Favaretto & Francisco, 2017; Facin *et al.*, 2022; Urbizagástegui-Alvarado, 2022; Ribeiro, 2024a) regarding the term *phygital* in the global academic context, under the perspective of journals indexed in the EBSCO database.

5 CONCLUSION

The objective of this study was to investigate the profile, behavior, and trends of the international scientific production on the term *phygital* from the perspective of SNA. To this end, SNA was applied to 34 scientific articles identified on the term *phygital* published between 2017 and 2025. Regarding the analyzed periods, the most central years were 2024 and 2023, thereby confirming the contemporaneity of the *phygital* theme in the production of scientific research published in journals at the global level. As for the journals, the most central ones were the *Journal of Strategic Marketing*, *Décisions Marketing*, and the *Journal of Marketing Management*, indicating that scholars and researchers tend to publish their respective findings and contributions in academic journals within the *marketing* field.

Regarding the authors, it was found that there are multirelational networks, that is, publications authored individually, in dyads, in triads, and in groups of four co-authors. Concerning the HEIs, the most central one was Jean Moulin Lyon 3, based in France. As for the countries, the most central were France and the United States.

It is also worth highlighting the following nations: Italy, India, United Arab Emirates, New Zealand, Australia, South Korea, China, the United Kingdom, Canada, Monaco, Croatia, Turkey, Portugal, Bulgaria, Morocco, and Spain, originating from the: African, American, Asian, European, and Oceanian continents, this demonstrates that the term *phygital* has been studied, researched, and published worldwide, through their respective originating HEIs (Figure 5) and affiliated authors (Figure 4).

Regarding the social networks of authors, HEIs, and countries, all were measured as having low density, thus contributing to the emergence of so-called small worlds, this, in turn, results in the appearance of structural holes and consequently weak ties, collectively leading to

low cohesion and dispersion within these social networks, simultaneously, this affects the flow of information and the exchange of knowledge among the actors (authors, HEIs, and countries) responsible for constructing scientific understanding of the term *phygital* in the international academic sphere, under the perspective of scholarly journals indexed in the EBSCO database.

Regarding the keywords, the most central were: *phygital, customer experience, phygital marketing, marketing, retail, digitalization, omnichannel, experience, phygital customer experience, digital, augmented reality, consumer behavior, digital marketing, holistic perspective, and consumer-centric logic*.

Given the above, it is evident that these most central keywords are of great significance and usefulness for a better understanding and comprehension of the core term of this research particularly for scholars who are beginning their academic work in this field of study, moreover, knowledge of these central keywords enables the identification of the main themes found in the academic articles that composed the sample, thus allowing the recognition of the area of knowledge that stands out within the research line related to the analyzed term (Kumar & Yadav, 2023; Ribeiro, 2025) in the international scientific context, under the perspective of the scientific journals indexed in the EBSCO database.

By highlighting the most central actors of this research, such as periods, journals, authors, HEIs, countries, and keywords, this study contributes to emphasizing the elements that stand out in the investigated theme within the international scientific sphere, under the perspective of the journals listed in the EBSCO database.

This provides an opportunity for scholars, researcher, especially beginners, and readers to better understand which actors, such as authors, HEIs, countries, and keywords, stand out regarding the core subject of this research, consequently, it enables a broader and more robust comprehension of the *phygital* theme within the global academic sphere, under the perspective of the scientific journals indexed in the EBSCO database.

Regarding the theoretical implications, this investigation offered a contribution to the field of Administration knowledge, but especially to the area of Marketing, by emphasizing an understanding and, subsequently, a comprehension of the term *phygital* through the lens of SNA. The study also contributed by examining the trends, representativeness, and behavior of actors within the structure and formation of social networks concerning the researched topic, thus creating scientific value and fostering a deeper understanding and comprehension, while simultaneously supporting the growth and maturation of scientific production on *phygital* research in the global academic literature.

Concerning practical implications, this scientific article provided a possible guideline for companies, based on the topics that underpin and guide the term *phygital* (the most central keywords of this research), in the formulation and implementation of potential strategies aimed at the development and maturation of the *phygital* subject in Brazil.

As a limiting factor, this scientific article relied solely on the EBSCO database, therefore, as a recommendation for future research, it is suggested to optimize this study by using other national and international databases, such as *WoS, Scopus, Scielo, SPELL, ProQuest*, and *CAPEs Journals*, among others. It is also advisable to conduct a bibliometric analysis of the investigated term and to carry out a systematic literature review (SLR) of the 34 studies included in this article.

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