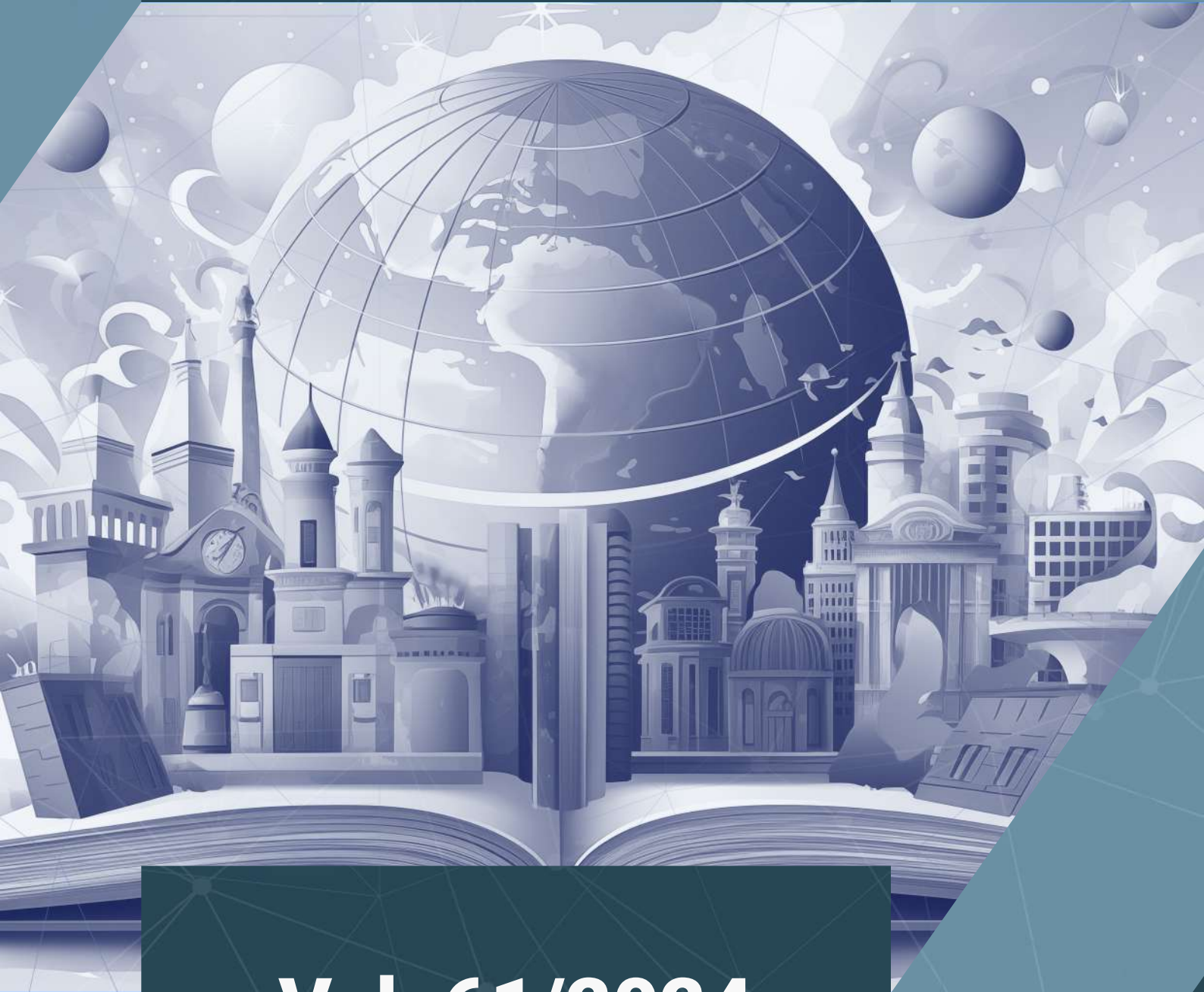




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# A Systematic Review in Digital Entrepreneurship Ecosystems

**Giotopoulos Konstantinos**

Department of Management Science and Technology, University of Patras, Greece

[kgiotop@upatras.gr](mailto:kgiotop@upatras.gr)

**Abstract.** This study conducts a systematic review of Digital Entrepreneurship Ecosystems (DEEs), focusing on their organization, development, and impact within the Greek Chamber of Commerce. Utilizing the Webster and Watson (2002) methodology, the review examines a broad range of literature to design and analyze a DEE framework. The study emphasizes the significance of innovation and digital collaboration in fostering entrepreneurship. The review identifies key themes including technological platforms, e-governance, and user satisfaction. Findings indicate that DEEs play a crucial role in enhancing business development through digital means. The study aims to bridge the knowledge gap in DEE literature and provide a practical foundation for similar initiatives. The research underscores the need for digital transformation in business ecosystems to support extroversion, innovation, and targeted entrepreneurial actions, advocating for cultural, structural, and systemic changes within chambers of commerce to better serve businesses and foster long-term relationships.

**Keywords.** Digital Entrepreneurship Ecosystems, Digital Transformation, Innovation, E-Governance, User Satisfaction, Digital Platforms

## 1. Introduction

In contemporary times, more than ever, technological advancements and globalization are creating new conditions for the development of entrepreneurship. Digital transformation is a reality in both the private and public sectors, while digital entrepreneurship ecosystems represent innovative practices that contribute to business development through digital collaborations. Innovation has become a fundamental component of entrepreneurship, and a new form, that of digital entrepreneurship, has emerged, necessitating the existence of digital entrepreneurship ecosystems. Such ecosystems are gradually appearing in Greece, making their study particularly interesting, as there is still insufficient literature on the subject [1].

The objective of this research is the design and analysis of a digital entrepreneurship ecosystem within a Greek chamber of commerce. Initially, a literature review is conducted using the methodology of Webster and Watson (2002), and the selection methodology of the theoretical framework, on which the design and analysis of a digital entrepreneurship ecosystem is based, is presented. A detailed account of the methodology followed, the technical means, and the implementation tools is provided, along with a comprehensive presentation of the proposed applications [2].

In today's highly competitive environment, the Chamber of Commerce needs to play a substantial role for businesses, fulfill its institutional role, and meet evolving needs. Therefore,

it must emerge as a "Multifunctional and Innovative Center for Entrepreneurship and Development Support." This will be achieved through digital transformation. Digital transformation must be oriented towards extroversion, innovation, and supporting corresponding entrepreneurial actions. All of the above require changes in culture, structures, and systems [3]. The application of digital solutions is necessary for the Chamber to better manage business-client data and develop targeted actions and specialized services. In this way, the Chamber will acquire a modern form and be able to establish long-term relationships with businesses-clients who share the same perspectives on innovation, possess vision and enthusiasm, and create value within the institution of the Chamber [4].

The contribution of this research lies in the following points. First, it is one of the few studies that theoretically addresses the concept of a digital entrepreneurship ecosystem and related concepts [5]. Additionally, the design and analysis of the digital entrepreneurship ecosystem within a chamber of commerce will serve as a foundation for similar efforts, not just at a theoretical level but in practical applications. In this way, it will provide ideas for those responsible for developing such initiatives to create genuinely competitive chambers capable of meeting the needs of their businesses/clients [6].

This study is divided into several chapters. The current chapter serves as an introduction to the subject under investigation. It includes an outline of the research purpose, the problem it aims to address, the contribution of the research, and the presentation of the research model. The next chapter provides a literature review, utilizing the methodology of Webster & Watson (2002). It details the methodology of the literature review and its findings. The third chapter discusses the research methodology, the objectives of the study, and the methods used for the development and analysis of the digital entrepreneurship ecosystem's design [7].

## **2 Literature review**

The literature review helps define the framework within which the research will be developed. It includes a search and evaluation of existing literature on the subject under investigation, identifies potential gaps, and seeks to explore the best way to implement the research to contribute new knowledge [8]. The purpose of the literature review is then outlined, previous literature reviews are presented, along with the methodology selected for the current research, and finally, the results are presented.

The objective of the literature review is to understand the existing literature related to a research topic of interest and to present the findings [9]. Through the literature review, knowledge is developed as the researcher enriches their understanding of concepts, research methods, and experimental techniques. Additionally, gaps and needs for further research are identified, and the framework within which the current research is situated is established [10].

To achieve its goals, the literature review must be characterized by quality. A high-quality literature review is comprehensive and focuses on the concepts under investigation [11]. A comprehensive literature review is not restricted to a single research methodology, specific journals, or a particular geographical area. Moreover, the literature review should provide a theoretical foundation that contributes both to understanding the issues and to developing answers that concern the scientific community [12].

In the case of Digital Entrepreneurship Ecosystems, knowledge about their organization is incomplete, and there is a significant knowledge gap at both theoretical and practical levels [13]. Unlike traditional business organization forms, stakeholders in digital entrepreneurship ecosystems do not share the same goals, making it interesting to explore how these systems are designed and organized to promote coordination and collaboration [14]. Therefore, it is

necessary to choose a literature review methodology that will highlight issues related to the topic under study, identify potential gaps, and delineate the current research [15].

### 3 Related work

The search for previous literature reviews helps identify specific issues related to the development of digital entrepreneurship ecosystems. It also uncovers keywords used in earlier reviews that may be useful for the current research. Additionally, examining previous literature reviews provides a clearer definition of the research subject.

The keywords used for searching articles are as follows:

- “Doing Business” AND “e-government information systems” AND “business registry information systems” AND “one stop shop information systems”
- “chamber of commerce” AND “B2B services”
- “open data” AND “digital ecosystem”

The results from searches in the Scopus and Google Scholar databases led to the articles listed below:

*Table 1: Existing Literature Reviews*

Authors	Methodology	Results
Senyo, Liu, & Effah, (2019): “Digital business ecosystem: Literature review and a framework for futurerearch” [16]	Search in Databases: ABI/INFORM, ACM Digital Library, AISel, Emerald journals, IEEE Xplore Digital Library, EBSCOhost, SAGE, Science Direct, Scopus, Springer Link, Web of Science and Wiley Online Library. Use of the Systematic Literature Review Method Selection of 101 articles out of the initial 303, following thorough review of titles, abstracts, and full texts Analysis of selected articles through coding	The majority of studies are secondary (50.50%). For empirical research, the methods include case studies (19.80%), simulations (19.80%), interviews (3.96%), focus groups (3.96%), and field studies (1.98%). The issues addressed are as follows: research on the commercial applications of digital entrepreneurship ecosystems, studies exploring the development of relationships among stakeholders within digital networks, research on the stability and reliability of digital entrepreneurship ecosystems, studies on the co-creation of value among stakeholders, research on governance and legislation governing digital entrepreneurship ecosystems, research on the security and risks associated with digital ecosystems, research on the technologies used in digital

		entrepreneurship ecosystems, and research on the structure and organization of these systems, including their software.
Shin, Jung, & Rha(2021): “Study on Business Ecosystem Research Trend Using NetworkText Analysis” [17]	Search in the Scopus database. Keyword: Business ecosystem. The methodology used was "network text analysis," which involves the "extraction" and analysis of texts. The search resulted in 340 articles.	The researchers concluded that the most frequently appearing keywords in the articles are (in order of frequency): "innovation," "sustainability," "business model," "network," "digital," "platform," "entrepreneurship," "competitive advantage," "learning," and "collaboration." The most frequently mentioned country was China.
Gu, Hu, Zhang, & Hou, (2021) : “Innovation Ecosystem Research: Emerging Trends andFuture Research” [18]	A systematic literature review was conducted using the databases Science Citation Index Expanded (SCIE) and Social Sciences Citation Index (SSCI). The search was conducted with the phrase "innovation ecosystems," and out of the initial 428 articles identified, 136 were deemed suitable for inclusion in the literature review.	According to the researchers, five distinct areas were identified where the articles focus: technological innovation, platforms of innovation ecosystems, regional development, efforts to define and theoretically approach innovation ecosystems, and entrepreneurship and innovation.
Barbosa & Alves, (2011): “A Systematic Mapping Study on Software Ecosystems” [19]	The researchers employed the method of Systematic Literature Review to address the following questions: "What are the key characteristics of a digital ecosystem?", "What is the current knowledge regarding the benefits, challenges, and limitations of digital ecosystems?", "What is the relationship between existing literature, research, and practice?", and "Which areas have been most studied from the perspective of digital	According to the research findings, all the research questions were answered, and the key characteristics of digital systems were identified, including their connection to business ecosystems and innovation. Additionally, the benefits such as advanced analytics were identified, along with the limitations and challenges like platform stability and license heterogeneity. Moreover, regarding research and practice, many academic

	systems?" Out of the initial 1026 articles retrieved, only 44 were relevant to the topic and suitable for inclusion in the literature review.	institutions are engaged in this field. Finally, areas of study such as the presentation of modeling techniques were identified.
Tan, Dhakal, & Ghale, (2020): "Conceptualising Capabilities and Value Co-Creation in a Digital Business Ecosystem (DBE): A Systematic Literature Review" [20]	The researchers utilized a systematic literature review and used keywords such as "value creation," "IT skills," "Digital Ecosystem," and "Business Ecosystem." Out of the initial 284 articles retrieved, 46 were deemed suitable for analysis.	Scholars have managed to provide answers to which skills are essential for developing within an organization to implement digital entrepreneurship ecosystems, how value is created for the stakeholders, and what the key terms associated with digital entrepreneurship ecosystems are.

The discovery of so few articles related to the literature review confirms that the literature on the subject under investigation is limited [21]. According to the findings of the aforementioned studies, Senyo, Liu, & Effah (2019) identify the following research gaps:

- Analysis of the interdependence among digital entrepreneurship ecosystems
- Development of theoretical frameworks and models
- Development of platforms and methods for effective management
- Governance, legislation, and security
- Standardization of technologies
- Digital infrastructures
- Empirical testing of theoretical frameworks

Regarding the methodologies used, the gaps in existing research include:

- Quantitative studies on digital entrepreneurship ecosystems
- Multiple case studies
- Case studies in different environments and contexts

Furthermore, researchers focus on the topics of articles related to digital business systems and note that they primarily address business issues such as value co-creation, system governance, and the relationships developed. The next group includes articles dealing with technical issues, such as platform design, technologies, architecture of digital entrepreneurship ecosystems, and the design of services and processes. Subsequently, researchers identified articles focusing on methodologies, operational frameworks, and models of digital entrepreneurship ecosystems.

Shin, Jung, & Rha (2021) address the key terms identified in 340 articles on digital ecosystems to pinpoint the core issues discussed in the literature. The results indicate that innovation and collaboration for value creation are priorities for businesses. Additionally, the development of sustainable businesses and digitalization using technologies such as the internet, blockchain, and big data are business priorities. Finally, the researchers categorized the topics related to digital ecosystems into five distinct groups. The first group pertains to the development of entrepreneurship ecosystems aimed at innovation. The second group focuses on collaboration and joint creation and development. The third group concerns platforms and

networks developed within digital entrepreneurship ecosystems. The fourth group addresses sustainability and ongoing communication between businesses and customers to ensure corporate social responsibility. Lastly, the fifth group emphasizes the importance of digitization and the opportunities provided by digital tools.

Given these findings, it is evident that the current research can address gaps and contribute to the existing literature.

Gu, Hu, Zhang, & Hou (2021) aimed to study the focus areas of articles related to digital innovation ecosystems and identified the following five areas:

- Technological innovation, specifically the creation and evolution of these systems, the manner of business collaboration within the ecosystem, and the organization of innovative ecosystems.

- Platforms of innovation ecosystems, specifically their organization, collaboration, competition, and diffusion of technologies and related products.

- Regional development, such as cluster development, national and industrial innovation ecosystems, and the use of ecosystems in developing "smart cities."

- Theoretical approaches and developments in this area.

- Entrepreneurship and innovation, with references to academic institutions, businesses, and entrepreneurs.

Barbosa & Alves (2011) conducted a systematic literature review to answer significant questions about digital ecosystems. They initially state that most research focuses on the characteristics of digital ecosystems. Consequently, digital ecosystems are linked to entrepreneurship, can be used to align the needs of various stakeholders, relate to innovation processes, contribute to the development of small and medium enterprises, and involve concepts such as interface stability, security, and reliability. Regarding the benefits of such systems, they include:

- Contributing to success, joint development, and innovation within organizations and continually attracting new stakeholders.

- Reducing costs related to software development and distribution.

- Contributing to the analysis and understanding of software architecture to decide which platform to use.

- Supporting collaboration and knowledge dissemination among many independent entities.

- Assisting in service design activities and risk identification.

Regarding the challenges and limitations of developing digital ecosystems, they include:

- Developing relationships among ecosystem participants and ensuring the presence of knowledgeable individuals.

- Various core architectural issues, such as interface stability on the platform, security, reliability, and supporting business strategies.

- The heterogeneity of software licenses and the ongoing evolution of systems.

- Difficulty in achieving differentiation compared to competitors.

Tan, Dhakal, & Ghale (2020) used systematic literature review to identify the main issues addressed in articles about innovation ecosystems. Initially, regarding technological innovation, the articles discuss ways to develop ecosystems in an evolving environment. Additionally, the researchers discuss the concept of sustainable technological innovation, which is increasingly used and highlights the need for collective action among all stakeholders. Subsequently, regarding the platforms of innovation ecosystems, research focuses on the

advanced technology required for their development and their complexity. They also discuss platform management and the need for continuous development and participation from more members [22].

The researchers also address articles related to the core concepts of digital entrepreneurship ecosystems and conclude that the core concepts are "definition," "characteristics," "benefits," and "stakeholders." Additionally, regarding the skills required by an organization before developing or participating in a digital entrepreneurship ecosystem, these include collaboration skills, strategic development, digital skills, and governance skills. Finally, concerning value co-creation, research focuses on how digital entrepreneurship ecosystems contribute to value creation through the interrelationships and interactions of the involved parties.

#### **4 Research Methodology**

##### ***Selection of Methodology***

For the purposes of this study, the methodology of Webster & Watson (2002) was chosen. This methodology was used by the researchers to investigate articles related to information systems, thus having some relevance to the subject under investigation. Additionally, this methodology does not exclude sources but focuses on searching for articles with similar conceptual content. As detailed in the following paragraph, this methodology clearly defines the steps of the literature review [23].

##### ***The Webster & Watson Method***

The methodology of Webster & Watson (2002) is, as mentioned, conceptual. Using keywords, the researchers propose the following steps. First, search the most well-known and recognized journals concerning the issue under investigation, and in databases where relevant articles are most likely to be found. Next, through "backward searching," examine the articles collected in the first stage and select the most relevant ones. In the third stage, perform another search for articles cited in the references of the articles selected in previous stages and include those that could be useful for the literature review.

A criterion indicating that the literature review is comprehensive—although this does not mean that no relevant articles have been missed—is the lack of new ideas and new knowledge in the articles being studied.

The organization of the literature review is based on concepts, meaning that concepts determine the framework of the review. Alternatively, some researchers prefer to organize the review by authors of the articles, providing summaries of them. However, this approach does not facilitate the "synthesis" of the literature. The tables that follow schematically depict the two different approaches to literature review, as well as the categorization of articles based on concepts. This method of organization helps the researcher to delineate their study and avoid repetitions and omissions.

**Table 2-4: Methods of Organizing a Literature Review Based on a Conceptual Approach, Source: Webster & Watson (2002: 17)**

Table 2. Approaches to Literature Reviews	
Concept-centric	Author-centric
Concept X ... [author A, author B, ...]	Author A ... concept X, concept Y, ...
Concept Y ... [author A, author C, ...]	Author B ... concept X, concept W, ...

Table 3. Concept Matrix					
Articles	Concepts				
	A	B	C	D	...
1		*	*		*
2	*	*			
...			*	*	

Table 4. Concept Matrix Augmented with Units of Analysis															
Articles	Concepts														
	A			B			C			D			...		
Unit of analysis	O	G	I	O	G	I	O	G	I	O	G	I	O	G	I
1					*				*						*
2	*				*	*		*							
...								*	*			*			

***Application of the Method***

The first stage of the method involves using keywords to identify articles relevant to the study's subject. Preliminary literature research helped define the following keywords:

- "Doing Business" AND "e-government information systems" AND "business registry information systems" AND "one stop shop information systems"
- "chamber of commerce" AND "B2B services"
- "open data" AND "digital ecosystem"

The databases utilized were Scopus and Google Scholar, and studies and articles were also searched on official websites of the Greek government, official websites of organizations, and EU websites.

Following the completion of the literature review and a thorough examination of the articles deemed relevant to this study, a table summarizing the descriptions of the selected articles is provided.

*Table 5: Summary Description of Articles*

S/N	Author	Year	Title	Journal/Publication
1	Namugenyi et al. [24]	2019	Design of a SWOT Analysis Model and its Evaluation in Diverse Digital Business Ecosystem Contexts	Procedia Computer Science
2	Lenkenhoff et al. [25]	2018	Key challenges of digital business ecosystem development and how to cope with them.	10th CIRP Conference on Industrial Product-Service Systems
3	Raudah & Akilah [26]	2014	Users Satisfaction on e-government services: An integrated model	Procedia - Social and Behavioral Sciences
4	Valdez-De-Leon [27]	2019	How to Develop a Digital Ecosystem: a Practical Framework	Technology Information Management Revue
5	Teece & Linden [28]	2017	Business models, value capture, and the digital enterprise	Journal of Organization Design,
6	Larda & Xydia [30]	2020	Startup and Innovation Ecosystem in North Macedonia	Report: Embassy of Greece in Skopje - Office of Economic and Commercial Affairs
7	Godin&Terekhova[231]	2020	Digital ecosystems as a form of modern business transformation	ICID-2019 Conference
8	Tsai & Zdravkovic[32]	2020	A Survey of Roles and Responsibilities in Digital Business Ecosystems	PoEM
9	Krasyuk[33]	2020	Conceptual Framework for Creating a Digital Business Ecosystem based on Marketing	IOP Conference Series: Materials Science and Engineering
10	Yevgenievich-Barykin et al. [34]	2020	Economics of Digital Ecosystems	Journal of Open Innovation
11	Senyoetal.	2019	Digital business ecosystem: literature review and a framework for future research	International Journal of Information Management
12	Nashira et al. [35]	2007	Digital Business Ecosystems	Luxembourg: European Commission, Information Society and Media

13	Li et al. [36]	2017	Digital entrepreneurship ecosystem as a new form of organizing: the case of Zhongguancun	Frontiers of Business Research in China
14	Razavi et al. [37]	2014	From Business Ecosystems towards Digital Business Ecosystems	Digital Ecosystems and Technologies (DEST), 2010 4th IEEE International Conference
15	Peltoniemi & Vuori[38]	2008	Business ecosystem as the new approach to complex adaptive business environments	<a href="https://asset-pdf.scinapse.io/prod/174598537/174598537.pdf">https://asset-pdf.scinapse.io/prod/174598537/174598537.pdf</a>
16	Stanley & Briscoe[39]	2010	The ABC of Digital Business Ecosystems	Communications Law
17	Wiredu[40]	2012	The Implementation of G2B Inter-Organizational Information Systems: A Dialectical Design Perspective	The African Journal of Information Systems:
18	Tan et al. [41]	2009	Leveraging Digital Business Ecosystems for Enterprise Agility: The Tri-Logic Development Strategy of Alibaba.com	. ICIS 2009 Proceedings
19	Smith et al. [42]	2016	Digital Service Innovation from Open Data: Exploring the Value Proposition of an Open Data Marketplace	2016 49th Hawaii International Conference on System Sciences
20	Boston Consulting Group[43]	2020	Building India's Digital Highways The Potential of Open Digital Ecosystems	Omidyar Network India

As shown in the table, the articles are relatively recent, which is due to the fact that Digital Entrepreneurship Ecosystems are relatively new forms of entrepreneurship. The following chart illustrates the distribution of articles by year.

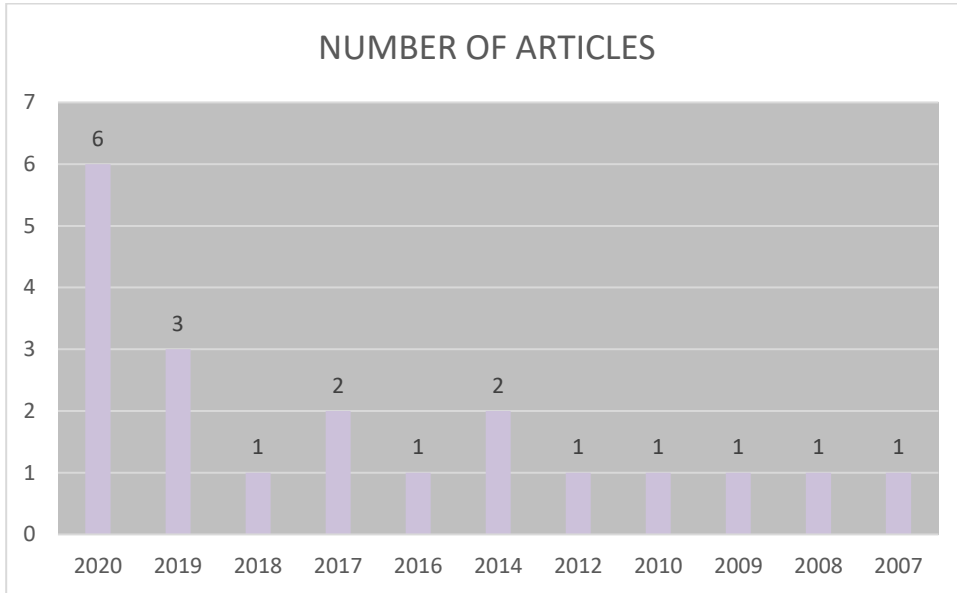


Figure 1: Number of Articles per Year

Subsequently, the articles were classified into a table (matrix) based on the key concepts found in them. The key concepts are then illustrated.

Table 6: Article Composition Table

Index	Authors	Year	Title	Category	entrepreneurship	digital entrepreneurship ecosystem	e-government	platform	user satisfaction	APIs	networks	user evaluation	open data
1	Namugenyi et al.	2019	Design of a SWOT Analysis Model and its Evaluation in Diverse Digital Business Ecosystem Contexts	SWOT Analysis	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>			

2	Lenkenhoff et al.	2018	Key challenges of digital business ecosystem development and how to cope with them.	Case Study	<input type="checkbox"/>	<input type="checkbox"/>												
3	Raudah & Akilah	2014	Users Satisfaction on e-government services: An integrated model	Literature Review			<input type="checkbox"/>		<input type="checkbox"/>									
4	Valdez-De-Leon	2019	How to Develop a Digital Ecosystem: a Practical Framework	Literature Review		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>								
5	Teece&Linden	2017	Business models, value capture, and the digital enterprise	Literature Review		<input type="checkbox"/>		<input type="checkbox"/>										
6	Siteece & Linden	2017	Startup and Innovation Ecosystem in North Macedonia			<input type="checkbox"/>		<input type="checkbox"/>										
7	Godin & Terekhova	2020	Digital ecosystems as a form of modern business transformation	Literature Review		<input type="checkbox"/>												
8	Tsai & Zdravkovic	2020	A Survey of Roles and Responsibilities in Digital Business Ecosystems	Literature Review		<input type="checkbox"/>												
9	Krasyuk	2020	Conceptual Framework for Creating a Digital Business	Literature Review/Model		<input type="checkbox"/>		<input type="checkbox"/>										

			Ecosystem based on Marketing	Development														
10	Barykin et al.	2020	Economics of Digital Ecosystems	Literature Review/Model Development		<input type="checkbox"/>		<input type="checkbox"/>										
11	Uilsenyo et al.	2019	Digital business ecosystem: literature review and a framework for future research	Literature Review/Model Development		<input type="checkbox"/>												
12	Nashira et al.	2007	Digital Business Ecosystems			<input type="checkbox"/>	<input type="checkbox"/>											<input type="checkbox"/>
13	U et al.	2017	Digital entrepreneurship ecosystem as a new form of organizing: the case of Zhongguanau n	Case Study		<input type="checkbox"/>												
14	Razavi et al.	2014	From Business Ecosystems towards Digital Business Ecosystems	Literature Review		<input type="checkbox"/>												<input type="checkbox"/>
15	Peltoniemi & Vuori	2008	Business ecosystem as the new approach to complex adaptive business environments	Literature Review		<input type="checkbox"/>												
16	Stanley & Briscoe	2010	The ABC of Digital Business Ecosystems	Literature Review		<input type="checkbox"/>												<input type="checkbox"/>



and user satisfaction of e-government services, demonstrating how digitalization can enhance public administration and service delivery [45].

Overall, the articles indicate that Digital Entrepreneurship Ecosystems, networks and platforms, and e-governance are central to current research, reflecting the multifaceted impact of digital transformation on business and society.

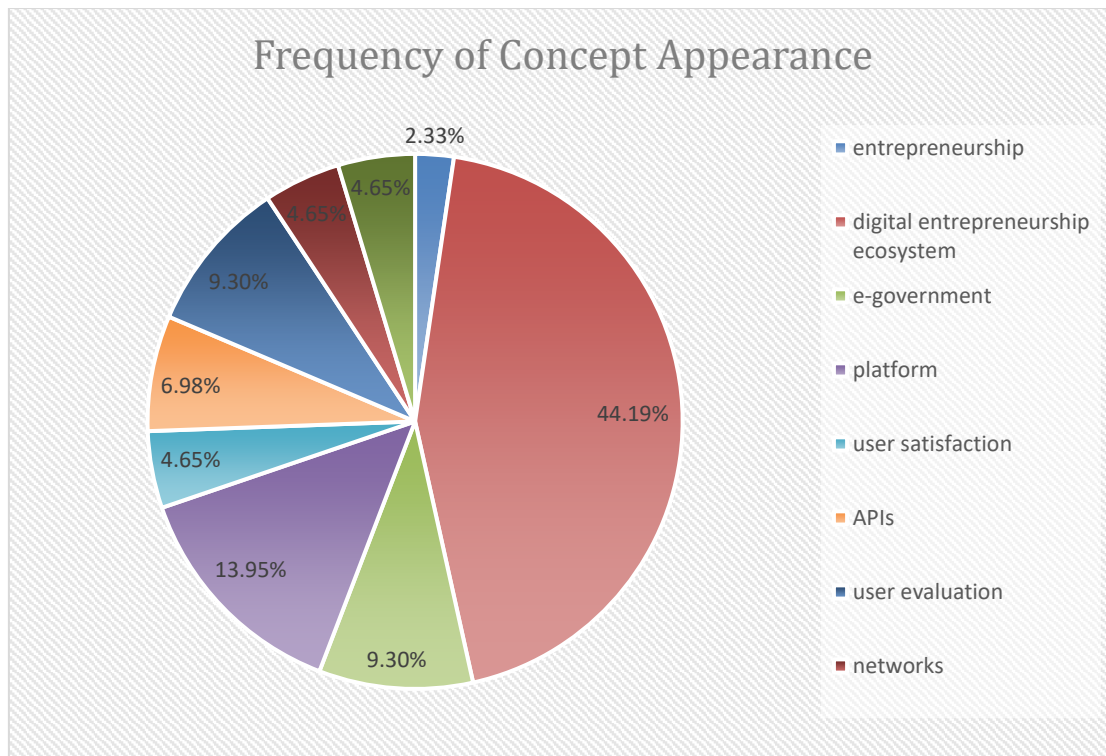


Figure 2: Frequency of Concept Appearance

## 5 Conclusions

The focus of this research was the design and analysis of a digital entrepreneurship ecosystem in a Greek Chamber of Commerce. To achieve this, a literature review was initially conducted. The methodology for searching previous research and the selected articles were presented. For this study, the methodology of Webster & Watson (2002) was chosen. This methodology does not exclude sources but focuses on searching for articles with similar conceptual content. The significance of the research lies in its being one of the few studies that theoretically address the concept of a digital entrepreneurship ecosystem and related concepts. Additionally, it can serve as a foundation for the development of similar efforts, not at a theoretical but at a practical level. In this way, ideas will be provided for stakeholders to develop truly competitive chambers capable of meeting the needs of their businesses/clients.

The limitations of the research mainly concern the lack of input from stakeholders, namely businesses and Chamber representatives. Therefore, further primary research through interviews (qualitative) or questionnaires (quantitative) among stakeholders is suggested to highlight additional aspects of the investigated issue.

## References

- [1] Autio, E., Nambisan, S., Thomas, L. D., & Wright, M. (2018). Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal*, 12(1), 72-95. <https://doi.org/10.1002/sej.1266>.
- [2] Vasilopoulos, C., Theodorakopoulos, L., & Giotopoulos, K. (2023). Big Data and Consumer Behavior: The Power and Pitfalls of Analytics in the Digital Age. *Technium Soc. Sci. J.*, 45, 469.
- [3] Michalopoulos, D., Karras, A., Karras, C., Sioutas, S., & Giotopoulos, K. C. (2022). Neuro-Fuzzy Employee Ranking System in the Public Sector. In *Fuzzy Systems and Data Mining VIII* (pp. 325-333). IOS Press.
- [4] Halkiopoulos, C., Giotopoulos, K., Antonopoulou, H., & Theodorakopoulos, L. (2020). E-business and cloud computing services in Greek companies during economic recession. *International Journal of Business and Management Review* (2020).
- [5] Tumbas, S., Berente, N., & vom Brocke, J. (2018). Digital innovation and institutional entrepreneurship: Chief Digital Officer perspectives of their emerging role. *Journal of Information Technology*, 33(3), 188-202. Valdez-De-Leon, O. (2019). How to develop a digital ecosystem: A practical framework. *Technology Innovation Management Review*, 9(8), 25-34. <https://doi.org/10.22215/timreview/1263>
- [6] Theodorakopoulos, L., Antonopoulou, H., Mamalougou, V., & Giotopoulos, K. (2022). The drivers of volume volatility: A big data analysis based on economic uncertainty measures for the Greek banking system. Available at SSRN 4306619.
- [7] Kraus, S., Palmer, C., Kailer, N., Kallinger, F. L., & Spitzer, J. (2019). Digital entrepreneurship: A research agenda on new business models for the twenty-first century. *International Journal of Entrepreneurial Behavior & Research*, 25(2), 353-375.
- [8] Drakopoulos, G., Giotopoulos, K., Giannoukou, I., & Sioutas, S. (2020, October). Unsupervised discovery of semantically aware communities with tensor Kruskal decomposition: A case study in Twitter. In *2020 15th International Workshop on Semantic and Social Media Adaptation and Personalization (SMA)* (pp. 1-8). IEEE.
- [9] Song, Y., & Vinig, T. (2012). The role of entrepreneurship education on digital entrepreneurs: A case study of the knowledge entrepreneurship education program at the University of Amsterdam. *Technology Innovation Management Review*, 2(8), 22-26.
- [10] Vasilopoulos, C., Theodorakopoulos, L., & Giotopoulos, K. (2023). The Promise and Peril of Big Data in Driving Consumer Engagement. *Technium Soc. Sci. J.*, 45, 489.
- [11] Elia, G., Margherita, A., & Passiante, G. (2020). Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process. *Technological Forecasting and Social Change*, 150, 119791.
- [12] Giotopoulos, K. C., Halkiopoulos, C., Papadopoulos, D., & Antonopoulou, H. (2019). Towards bring your own device marketing policy. *International Journal of Technology Marketing*, 13(2), 156-164.
- [13] Venkataraman, S. (2019). The digital matrix: New rules for business transformation through technology. *Journal of Business Research*, 102, 411-421.
- [14] Vasilopoulou, C., Theodorakopoulos, L., & Giotopoulos, K. (2023). Big Data Analytics: A Catalyst for Digital Transformation in e-Government. *Technium Soc. Sci. J.*, 45, 449.

- [15] Kauffman, R. J., Ma, D., & Yu, M. (2018). A metrics suite of digital entrepreneurship ecosystems: Strategic outcomes and success factors. *Journal of Management Information Systems*, 35(3), 778-817.
- [16] Senyo, P. K., Liu, K., & Effah, J. (2019). Digital business ecosystem: Literature review and a framework for future research. *International Journal of Information Management*, 47, 52-64. <https://doi.org/10.1016/j.ijinfomgt.2019.01.002>
- [17] Shin, N., Jung, K., & Rha, J. (2021). Study on business ecosystem research trend using network text analysis. *Journal of Open Innovation: Technology, Market, and Complexity*.
- [18] Gu, S., Hu, J., Zhang, W., & Hou, J. (2021). Innovation ecosystem research: Emerging trends and future research. *Journal of Open Innovation: Technology, Market, and Complexity*.
- [19] Barbosa, O., & Alves, C. (2011). A systematic mapping study on software ecosystems. *Proceedings of the 15th International Conference on Evaluation and Assessment in Software Engineering*.
- [20] Tan, B., Pan, S. L., Lu, X., & Huang, L. (2009). Leveraging digital business ecosystems for enterprise agility: The tri-logic development strategy of Alibaba.com. In *Proceedings of the International Conference on Information Systems (ICIS) 2009*. Association for Information Systems (AIS).
- [21] Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Qi Dong, J., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889-901.
- [22] Gkintoni, E., Toggias, P., Halkiopoulou, C., Giotopoulos, K., & Antonopoulou, H. (2016, May). Burnout: Emerged Issue in Business during Economic Recession in Greece. In *4th International Conference on Contemporary Marketing Issues (ICCM)* (pp. 22-24).
- [23] Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, 26(2), xiii-xxiii.
- [24] Namugenyie, R., de Pablos Heredero, C., Sanz, R., & Moustafa, A. (2019). Design of a SWOT analysis model and its evaluation in diverse digital business ecosystem contexts. *Procedia Computer Science*, 164, 403-408.
- [25] Lenkenhoff, T., Müller, O., & vom Brocke, J. (2018). Key challenges of digital business ecosystem development and how to cope with them. In *10th CIRP Conference on Industrial Product-Service Systems* (pp. 34-39). <https://doi.org/10.1016/j.procir.2018.03.165>
- [26] Raudah, K., & Akilah, A. (2014). Users satisfaction on e-government services: An integrated model. *Procedia - Social and Behavioral Sciences*, 129, 584-590. <https://doi.org/10.1016/j.sbspro.2014.03.717>
- [27] Valdez-De-Leon, O. (2019). How to develop a digital ecosystem: A practical framework. *Technology Information Management Review*, 3(2), 15-29. <https://doi.org/10.1007/s11277-018-6003-2>
- [28] Teece, D. J., & Linden, G. (2017). Business models, value capture, and the digital enterprise. *Journal of Organization Design*, 6(8), 1-14. <https://doi.org/10.1186/s41469-017-0018-x>
- [29] Larda, N., & Xydia, A. (2020). Startup and innovation ecosystem in North Macedonia. Report: Embassy of Greece in Skopje - Office of Economic and Commercial Affairs.

- [30] Godin, M., & Terekhova, A. (2020). Digital ecosystems as a form of modern business transformation. In *ICID-2019 Conference* (pp. 112-119). <https://doi.org/10.1109/ICID.2019.00021>
- [31] Tsai, W., & Zdravkovic, J. (2020). A survey of roles and responsibilities in digital business ecosystems. In *PoEM* (pp. 130-142). [https://doi.org/10.1007/978-3-030-46197-4\\_9](https://doi.org/10.1007/978-3-030-46197-4_9)
- [32] Krasnyuk, I. (2020). Conceptual framework for creating a digital business ecosystem based on marketing. *IOP Conference Series: Materials Science and Engineering*, 940, 012032. <https://doi.org/10.1088/1757-899X/940/1/012032>
- [33] Yevgenievich-Barykin, S., Yurevna-Kalabina, O., & Alexandrovich-Ilkevich, S. (2020). Economics of digital ecosystems. *Journal of Open Innovation*, 6(4), 120. <https://doi.org/10.3390/joitmc6040120>
- [34] Senyo, P. K., Liu, K., & Effah, J. (2019). Digital business ecosystem: Literature review and a framework for future research. *International Journal of Information Management*, 47, 52-64. <https://doi.org/10.1016/j.ijinfomgt.2019.01.002>
- [35] Nashira, N., Hildebrandt, T., & Brudermann, T. (2007). Digital business ecosystems. Luxembourg: European Commission, Information Society and Media.
- [36] Li, Y., Chen, K., & Zhang, M. (2017). Digital entrepreneurship ecosystem as a new form of organizing: The case of Zhongguancun. *Frontiers of Business Research in China*, 11(1), 1-22. <https://doi.org/10.1186/s11782-017-0003-x>
- [37] Razavi, M. N., Ramezani, N., & Parsania, S. (2014). From business ecosystems towards digital business ecosystems. In *Digital Ecosystems and Technologies (DEST), 2010 4th IEEE International Conference* (pp. 103-109). <https://doi.org/10.1109/DEST.2010.5610587>
- [38] Peltoniemi, M., & Vuori, E. (2008). Business ecosystem as the new approach to complex adaptive business environments. <https://asset-pdf.scinapse.io/prod/174598537/174598537.pdf>
- [39] Stanley, L., & Briscoe, G. (2010). The ABC of digital business ecosystems. *Communications Law*, 15(3), 22-29. <https://doi.org/10.2139/ssrn.2387418>
- [40] Wiredu, G. O. (2012). The implementation of G2B inter-organizational information systems: A dialectical design perspective. *The African Journal of Information Systems*, 4(1), 1-18. <https://digitalcommons.kennesaw.edu/ajis/vol4/iss1/3>
- [41] Tan, B., Pan, S. L., Lu, X., & Huang, L. (2009). Leveraging digital business ecosystems for enterprise agility: The tri-logic development strategy of Alibaba.com. In *ICIS 2009 Proceedings* (pp. 169-183). <https://aisel.aisnet.org/icis2009/169>
- [42] Smith, G., Sandberg, J., & Fuentes, C. (2016). Digital service innovation from open data: Exploring the value proposition of an open data marketplace. In *2016 49th Hawaii International Conference on System Sciences* (pp. 1277-1286). <https://doi.org/10.1109/HICSS.2016.160>
- [43] Boston Consulting Group. (2020). Building India's digital highways: The potential of open digital ecosystems. Omidyar Network India. <https://www.bcg.com/publications/2020/potential-of-open-digital-ecosystems-in-india>
- [44] Giotopoulos, K. C., Alexakos, C. E., Beligiannis, G. N., & Likothanassis, S. D. (2005). Computational Intelligence Techniques and Agents' Technology in E-learning Environments. *International Journal of Information Technology*, 2(2), 147-156

- [45] Giotopoulos, K. C., Michalopoulos, D., Karras, A., Karras, C., & Sioutas, S. (2023). Modelling and analysis of neuro fuzzy employee ranking system in the public sector. *Algorithms*, 16(3), 151.