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# Theoretic Trends in Private-Public Partnership Research: Bibliometric Analysis

*Nestor Shpak[1], Olha Pyroh[2], Kateryna Doroshkevyc[3], Orest Koleshchuk[4], Andrii Lipentsev[5]*

**Abstract:**

This paper conducted detailed research on publication activity in the public-private partnership (PPP) field based on bibliometric analysis. The main aim was to research the different literature materials and systematize trends and priority fields of PPP research. Scopus tools were used to determine the dynamics of the number of indexed publications, research belonging to the country and journals, and the branch structure of publication activity on the research topic, highlighting academics' contributions in the PPP research field by the number of citations and published papers. The search for the most relevant publications used the key concept of "private-public partnership" in titles, abstracts, and keywords in the bibliometric database Scopus for 1952 – 2022. VOSviewer software is used to build network maps of keyword compatibility, collaborate with authors by country, and measure the research time. Based on the results of the literature review, conclusions are drawn about the growing dynamics of the number of publications in the PPP field; 3 stages of scientific interest in PPP research are identified; the multidisciplinary nature of the concept under study is confirmed; the PPP term is clarified; 7 clusters that characterize the main areas of

1 Lviv Polytechnic National University, Lviv, Ukraine.
2 Lviv Polytechnic National University, Lviv, Ukraine; Université de Sherbrooke, Sherbrooke, Canada.
3 Lviv Polytechnic National University, Lviv, Ukraine; Ruskin University, Cambridge, Great Britain.
4 Lviv Polytechnic National University, Lviv, Ukraine.
5 Ukrainian National Forestry University, Lviv, Ukraine.

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research in the field of PPP are identified; the leading countries and the most cited authors are identified by their affiliation to a particular country; it is established that the intensive development of scientific research in PPP in the countries of the world took place in the period 2010-2014; the development of PPP in CEE and Ukraine is characterized.

**Keywords:**

bibliometric analysis; clustering; private-public partnership (PPP); publication activity; VOSviewer

## 1. Introduction

Government and the private sector's cooperation (interaction) to decide socially significant tasks has a long history. Contracting public services to private firms is one of the most common alternative service-delivery arrangements (Merickova & Nemec, 2013). Since this type of interaction between the state and business structures has the character of systemic cooperation, the activity of which depends on both the state and private enterprises, under the conditions of a mixed economy, the private sector is involved in all, without exception, stages of the implementation of economic projects. International practice (The World Bank, 2017) demonstrates the effectiveness of public-private partnership (PPP) in the case of its skillful application in the implementation of infrastructure projects compared with the involvement of private businesses in the framework of public procurement. As a result, the public-private partnership provides an opportunity to effectively solve current economic system development issues and significant economic, social, and environmental problems in many developed and developing countries.

Public-private partnerships in modern conditions of sustainable development are gaining more and more relevance worldwide. This circumstance is connected with the peculiarities of partnership, that is, an institutional and organizational alliance of state power and private business to implement socially significant projects in a wide range of spheres of activity – from the development of strategically important sectors of the economy to the provision of public services on a nationwide scale or in individual territories, which improves putting the world on the path of sustainable and sustainable development.

Many governments across the globe (developed and developing countries) are seeking to tap the private sector's expertise and capital to minimize their infrastructure deficit following the 2008-2009 global financial crises (Osei-Kyei & Chan, 2015). It should be noted that this type of partnership can also become the foundation for solving significant problems that have affected many countries. The development of PPPs is

built upon the possibility of achieving higher efficiency gains and access to private capital in the context of public funding shortage, providing an alternative for governments in developing their infrastructure development plans (Neto et al., 2016).

As world experience shows, the implementation of PPP projects is also based on the achievement of such goals as:

- development of public services, including transport services: passenger transport (airports, public urban transport (car transport, metro), intercity transport, sea and river transport, passenger terminals in seaports); as well as social services construction and maintenance of schools, universities, hospitals, polyclinics, stadiums, theaters, libraries, parks; construction of premises of courts, other authorities (Mouraviev, 2021);
- offloading budgets of all levels (in particular local): PPP projects involve the involvement of private capital, although direct financing from the state or local budgets of part of the project is not excluded;
- improving the quality of services;
- attracting new resources for implementing the regional development policy (implementation of investment projects at the local and regional levels) (The World Bank, 2017).

PPPs also became popular in Central and Eastern European (CEE) nations, such as Bulgaria, the Czech Republic, Hungary and Poland, who started deploying PPPs at the end of the 1990s (Mouraviev, 2021) through weak fiscal positions. The Polish PPP market is probably one of the most developed in the CEE (Cieślak, 2022). However, it remains very far from the mature European PPP markets (European Investment Bank, 2023). PPPs in Poland are implemented in at least a dozen sectors, such as waste management, water and sewage management, sports and recreation, energy efficiency, transport, education, health care, housing, revitalization, and telecommunication; in the vast majority of cases, these are the tasks of local government units (Cieślak, 2022). Hungary and the Czech Republic have already implemented PPPs for some years, mainly in the transport sector, whereas states like Bulgaria and Romania have been slower in adopting them (Butcher & Gentchev, 2009). During 2007 – 2012, Romania was relatively active in PPPs (over 150 small-scale projects in waste management and sanitation were delivered), driven by local administrations, and there have also been larger energy projects in solar, wind and nuclear power (The Economist Intelligence Unit, 2017).

In Ukraine, an association member of the EU located in Eastern Europe geographically, the laws of PPP have already been formed. There are certain normative legal acts of PPP, but its potential has not been fully utilized within the national economy. Now, PPP is an efficient mechanism for the reconstruction and reconstruction of territories, cities and objects that were destroyed due to Russia's military aggression against Ukraine in Ukraine. Since the beginning of the full-scale invasion of Russia on the territory of Ukraine, the national economic system has

suffered a devastating impact, and numerous industrial, social, residential and infrastructure facilities have been destroyed. In these conditions, there is a change in priorities from the development of economic systems to the solution of significant social, infrastructural, and environmental problems.

Getting out of the problematic situation and rebuilding Ukraine post-war requires significant financial, technical, technological, and administrative assistance, cooperation with international organizations, global funds and international corporations, and business entities of various forms of ownership. It is possible to ensure the possibility of solving these problems and create a solid foundation for the interaction of the state and business structures thanks to the mechanisms of PPP, which have proven their effectiveness in various types of economic activity in both developed and developing countries.

At the same time, the understanding of the concept of "public-private partnership" in scientific debates is quite different. There are many different interpretations of this concept proposed by various scientists. Nevertheless, in connection with the constant effective solving of the current economic, social, and environmental problems, there is a growing need and request to study and analyze the essence of the concept of "public-private partnership," which is dynamic, formed and changes over time. Scientific schools conducting research in this area are also dynamically changing. Forming the projection of the scientific landscape of public-private partnerships becomes an essential scientific and practical task. The paper "Review of studies on the Critical Success Factors for Public-Private Partnership (PPP) projects from 1990 to 2013" by Osei-Kyei and Chan (2015) made the methodically review studies on the Critical Success Factors for implementing PPP from some selected top tier academic journals from 1990 to 2013 (years inclusive) used Scopus. The paper "Bibliometric Analysis of PPP and PFI Literature: Overview of 25 Years of Research" (Neto et al., 2016) presented a comprehensive literature review of papers (more than 600 papers) relating to PPPs and private finance initiatives (PFIs), using a bibliometric analysis based on Web of Science, between 1990 and 2014.

So, considering the active growth of public, scientific, and international interest in private-public partnerships, we consider it appropriate to continue researching scientists' publication activity in this sphere using the bibliometric method.

The article aims to outline the modern trends and priority directions for private-for-public partnership research to identify a network of collaboration between authors based on their belonging to a particular country engaged in research in this sphere. To achieve this purpose, the research is aimed at solving such tasks:

1. To identify trends in publishing articles devoted to directions private-public partnership.
2. To determine the branch structure of the number of indexed publications devoted to private-public partnerships in Scopus.

3. To identify the most cited publications and journals containing PPP articles.
4. To identify the authors with the highest publication activity in the field of private-public partnership and analyze the country of collaboration between authors according to their affiliation to a particular country.
5. To identify the main thematic directions of publications devoted to private-public partnerships.
6. To cluster scientific publications according to the main areas of research to determine further areas for analysis.
7. To summarize, compare and contrast the findings of private-public partnership studies during the research period.

## 2. Literature review of public-private partnership

The term "public-private partnership" appeared in the 1990s, when interest in such affairs increased significantly since the late 1990s, and the scope of their application expanded to those objects and functions traditionally in public ownership.

The "public-private partnership" (Ahmad et al., 2018; Li et al., 2005a; Li et al., 2005b; Hodge & Greve, 2007; Neto et al., 2016; Osei-Kyei & Chan, 2015; The World Bank, 2017; Zheng et al., 2018) is also called "private finance initiative" (PFI) (Li et al., 2005a; Li et al., 2005b; Neto et al., 2016; Osei-Kyei & Chan, 2015), "private infrastructure," "public infrastructure," "contracting" (Hodge & Greve, 2007), "cooperation", "state-society synergy" (Evans et al., 1996), and the like. The most popular and used worldwide is PPP, although PFI was the first term adopted by the British government (Neto et al., 2016). There is no universally accepted terminology for PPP globally, which causes its boundaries to be blurred.

Hodge and Greve (2007) defined public-private partnerships as "cooperative institutional arrangements between public and private sector actors" (p. 545). Naoum (2003) described private-public partnerships as "originating when two or more organizations in the public or private sector start a new cooperative relationship based on mutual trust, rather than being characterized by a hierarchical structure" (p. 72). Van Ham and Koppenjan (2001) defined the PPP through an institutional lens as "cooperation of some sort of durability between public and private actors in which they jointly develop products and services and share risks, costs, and resources which are connected with these products" (p. 594). Ke et al. (2010) recognized the "public-private partnership" as "an effective way of delivering value-for-money public infrastructure or services" (p. 482). Neto et al. (2016) defined PPP as "a procurement model used to deliver public infrastructure, services, or both, typically in the sectors of transportation, energy, environment, health, security, or education" (p. 3).

Furthermore, there is no single, internationally accepted PPP definition. The word bank at "Reference Guide" takes a broad view of what a PPP is: "a long-term contract

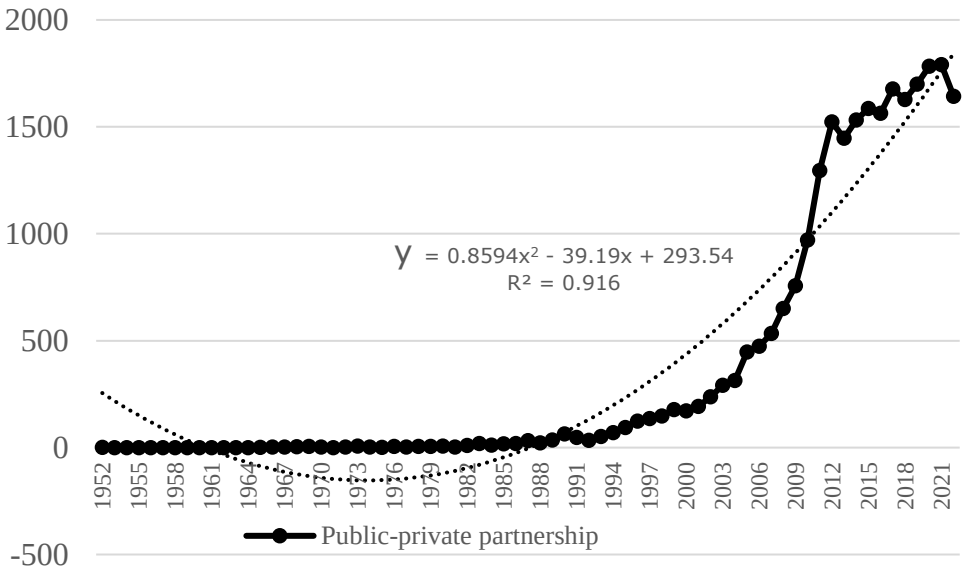
between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance" (The World Bank, 2017, p. 5). In addition, Ahmad et al. (2018) clarified that "PPPs are intrinsically longer-term than procurement relationships" (p. 157).

However, the term "public-private partnership" has gained more popularity over time, especially after 2005. For example, Osei-Kyei and Chan (2015) concluded that the researchers' interest in exploring the critical success factors for PPPs increased from one publication in 1992 to six publications in 2013. Also, Neto et al. (2016) averred that according to the Web of Science (2015) database, after 2000, the literature on PPPs has expanded significantly, with a more robust growth rhythm over the last five years.

The rapid increase in the level of publishing activity convincingly testifies to the significant attention and growth of the field from scholars to public-private partnerships worldwide (Figure 1).

**Figure 1:**

Dynamics of the number of publications indexed in Scopus that contain the term "Public-Private Partnership" in the title, abstract and keywords during 1952 – 2022




Source: compiled by the authors based on data from the Scopus database, 2024

A similar nature and trend can be observed in the case of a comparative analysis of Google search queries (based on the use of the Google Trends toolkit) by category

"public-private partnership." The frequency of query applications in search engines is determined using the Google Trends tool, which was started in 2004. The above is a public application that displays, based on the Google search engine, the frequency of search popularity of a particular term concerning the total volume of search queries in different regions and languages (Shpak et al., 2023b).

Based on the amplitude of the graph (Figure 1), three stages of scientific interest in PPP research can be identified:

1) stage I (1952-1981) is the stage of the formatting bases in PPP. This stage is characterized by slow dynamics of the number of scientific articles, monographs, and conference materials devoted to the PPP topic. During an extended period (1953-1965), no articles on the PPP field were published and indexed in Scopus. The first publications of PPP indexed in Scopus were published in the field of medicine:
2) Stevenson A. presented the research of partnership in the article "The partnership of public and private agencies in the field of mental hygiene" (Stevenson, 1952) 1952;
3) Ball R.M. (United States) presented the PPP research in the article "Partnership of Government and Private Agencies in Strengthening the Financing of Health Services" (Ball, 1965) 1965.
4) stage II (1982-2004) is a stage of moderate growth with an average of 70-75publication annually;
5) stage III (2005-2022) is the stage of the rapid development of theoretical and practical bases in PPP. The emergence of theoretical and practical interest in PPP is accompanied by an active search for information and knowledge and the development of info-communication technology. Three principal enablers were identified for rapid PPP deployment: simplified procedures for a PPP launch, the pressure exerted on regional governments, and extensive government financial support to PPPs (Mouraviev, 2021).

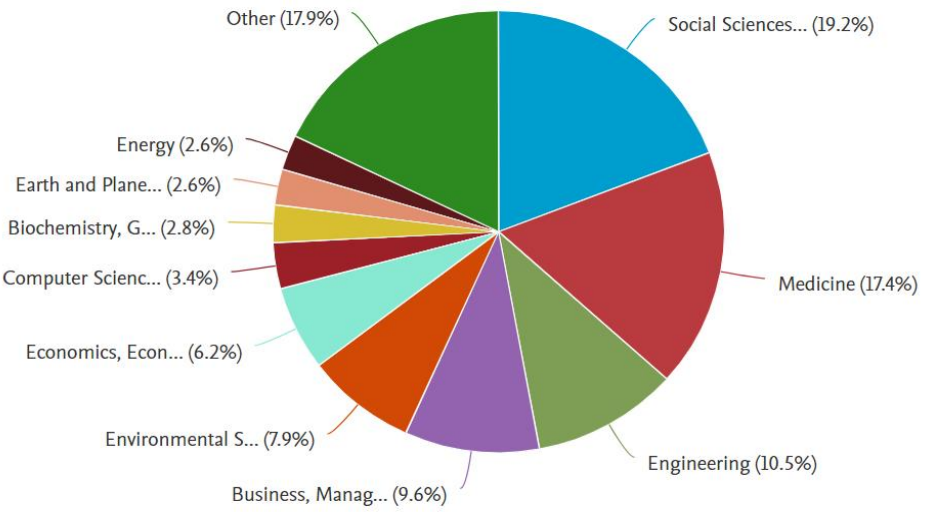
Health systems in most (if not all) countries perpetually struggle with financial problems and search for resources to cover healthcare needs (Nemec et al., 2021).

The research results showed that, in general, for the period 1952 – 2022, 25,371 documents were published and indexed in Scopus, respectively, that contained the phrase "public-private partnership" in the title, abstract and/or keywords. The number of publications about public-private partnerships has begun to increase at a very high rate since 2005. This is confirmed by the nature and direction of the corresponding polynomial function of the 2nd degree, built on the basis of data on the number of publications (see Figure 1).

The analysis shows that the branch structure of publication activity on the subject under study is quite diversified (Figure 2).

**Figure 2:**

Branch structure of the number of publications indexed in Scopus, which contain the term "Public-Private Partnership" in the title, abstract and keywords




Source: compiled by the authors based on data from the Scopus database, 2024

The diagram's cross-sector nature can be explained by the multidisciplinary nature of the studied concept since PPP is a tool used in the social sciences, medicine, engineering, business, management and accounting, environmental science, economics, econometrics and finance, computer science, biochemistry, genetics and molecular biology, agricultural and biological sciences, energy, and other sciences.

Analytical data displayed in Figure 2 show that 19.2% of all research was carried out in the social sciences, and medicine is second in terms of the volume of scientific publications (17.4%). Engineering is in third place in the branch structure of PPP research with an indicator of 10.5%. Scientific publications in business, management and accounting were 9.6%, and in economics, econometrics and finance—6.2%.

Such diversification of the branch structure of publication activity can be explained by the world's experience in implementing PPP projects. That shows that most PPP projects were implemented in such types of economic activities as infrastructure (electricity production and distribution, water supply and sewerage, waste disposal, pipelines, air transport and railway management, road construction and reconstruction, management housing stock), medicine (hospitals, health of population), education (school buildings and educational facilities, stadiums) and public services (digitization of public services and implementation of information technologies in the

provision of public services).

Regarding the contribution of individual scientists to the research of PPP, scientists from the United States, the United Kingdom and Australia occupy the leading positions in terms of the number of citations in the Scopus database in the fields of "Social Sciences," "Business, Management and Accounting" and "Economics, Econometrics and Finance" (Table 1). In addition, the most indexed PPP research (three of the most cited works) was published in the International Journal of Project Management.

**Table 1:**

Contribution of individual scientists on the Public-Private Partnership subject in the fields of "Social Sciences," "Business, Management and Accounting," and "Economics, Econometrics and Finance."

| # | Document title | Authors | Year | Source | Countries | Cited by |
|---|---|---|---|---|---|---|
| **1** | Marketing the competitive destination of the future | Buhalis D. | 2000 | Tourism Management | United Kingdom | 1,679 |
| **2** | An integrative framework for collaborative governance | Emerson K., Nabatchi T., Balogh S. | 2012 | Journal of Public Administration Research and Theory | United States | 1,419 |
| **3** | Cross-sector partnerships to address social issues: Challenges to theory and practice | Selsky J.W., Parker B. | 2005 | Journal of Management | United States | 786 |
| **4** | Public-private partnerships: An international performance review | Hodge G.A., Greve C. | 2007 | Public Administration Review | Denmark, Australia | 733 |
| **5** | Government action, social capital and development: Reviewing the evidence on synergy | Evans P. | 1996 | World Development | United States | 688 |
| **6** | The allocation of risk in PPP/PFI construction projects in the UK | Li B., Akintoye A., Edwards P.J., Hardcastle C. | 2005 | International Journal of Project Management | United Kingdom, Australia | 607 |
| **7** | Evaluating the risks of public private partnerships for infrastructure projects | Grimsey D., Lewis M.K. | 2002 | International Journal of Project Management | Australia | 573 |
| **8** | Critical success factors for PPP/PFI projects in the UK construction industry | Li B., Akintoye A., Edwards P.J., Hardcastle C. | 2005 | Construction Management and Economics | United Kingdom, Australia | 532 |
| **9** | Incomplete contracts and public ownership: Remarks, and an application to public-private partnerships | Hart O. | 2003 | Economic Journal | United States | 530 |
| **10** | Public private partnerships: The worldwide revolution in infrastructure provision and project finance | Grimsey D., Lewis M.K. | 2004 | Public Private Partnerships: The Worldwide Revolution in Infrastructure | Australia | 508 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Provision and Project Finance | | |
| **11** | Review of studies on the critical success factors for public-private partnership (PPP) projects from 1990 to 2013 | Osei-Kyei R., Chan A.P.C. | 2015 | International Journal of Project Management | Hong Kong | 475 |

Source: Authors' own, 2024

The publication "Marketing the Competitive Destination of the Future" by Buhalis (2000) is the most cited (1,679 citations). In this paper, the author provides the development of local partnerships between the public and private sectors to differentiate products and coordinate delivery. Second is the publication "An Integrative Framework for Collaborative Governance" (Emerson et al., 2012) (1,419 citations). In this research, the authors integrate knowledge about a suite of conceptual frameworks, research findings, and practice-based knowledge into an integrative framework for collaborative governance (IFCG) that draws from diverse realms of practice and research in public administration. The authors extend the IFCG, which provides a broad conceptual map for situating and exploring components of cross-boundary governance systems that range from policy- or program-based intergovernmental cooperation to place-based regional collaboration with nongovernmental stakeholders to public-private partnerships. Thirdly, the publication "Cross-sector Partnerships to Address Social Issues: Challenges to Theory and Practice" (Selsky & Parker, 2005) was cited 786 times. Research on "project-based cross-sector partnerships to address social issues" (CSSPs) is multidisciplinary, and different conceptual "platforms" are used: (1) resource dependence, (2) social issues, and (3) societal sector platforms. The authors highlighted that CSSPs occur in four "arenas": (1) business-nonprofit, (2) business-government, (3) government-nonprofit, and (4) tri-sector.

The authors with the most significant number of PPP publications are listed in Table 2.

**Table 2:**

Top 10 authors by the number of PPP publications

| # | Authors | Country | Number of published works | h-index of the author in the Scopus database |
|---|---|---|---|---|
| 1 | Chan, A.P.C. | Hong Kong | 97 | 73 |
| 2 | Osei-Kyei, R. | Australia | 45 | 22 |
| 3 | Greve, C. | Denmark | 43 | 21 |
| 4 | Marques, R.C. | Portugal | 41 | 46 |
| 5 | Ke, Y. | Australia | 35 | 22 |
| 6 | Yuan, J. | China | 35 | 23 |
| 7 | Zhang, X. | Hong Kong | 30 | 35 |
| 8 | Garvin, M.J. | United States | 28 | 20 |
| 9 | Siemiatycki, M. | Canada | 28 | 20 |
| 10 | Hodge, G. | Australia | 27 | 24 |

Source: Authors' own, 2024

Among the research of scholars, the following trends in the study of PPP can be distinguished:

- a tool of governance.
- the infrastructure projects and are institutional arrangements for cooperation expressed through the establishment of new organizational units.
- the financial models enable the public sector to use private finance capital to enhance the possibilities of the elected government and the private company, among other things.

Considering the active growth of academic and scientific interest in PPP, we consider it appropriate to continue researching publishing activity in this field using the bibliographic method.

## 3. Methodology

Bibliometric methods or "analysis" are now firmly established as scientific specialties and are integral to research evaluation methodology, especially within the scientific and applied fields (Ellegaard & Wallin, 2015). Bibliometric analysis or literature review is one of the evaluating methods of the results of scientific research:

- bibliometrics is a discipline that uses mathematical and statistical methods to study the flow of scientific documents to identify trends in the development of subject areas, features of authorship and mutual influence of publications (Liao et al., 2018; Kharchuk & Oleksiv, 2023; Romanini et al., 2021; Shpak et al., 2023b; Urbanovics, 2022). In addition, the bibliometric analysis is primarily based on the number of documents and citations, additionally supplemented with the contents extracted from the titles, abstracts, and keywords (Aristovnik et al., 2020; Vujković et al., 2022);
- a literature review is an excellent way of synthesizing research findings to show evidence on a meta-level and uncover areas in which more research is needed. The above is critical to creating theoretical frameworks and building conceptual models (Snyder, 2019).

Bibliometric methods have been used to quantitatively analyze written publications (Ellegaard & Wallin, 2015; Kharchuk & Oleksiv, 2023; Romanini et al., 2021). This analysis is necessary and helps to be acquainted with the state of research in the field of public-private partnership, identify critical trends, sources and authors who are most interested in the given topic, review previous research and identify unsolved issues. The bibliographic analysis allows us to expand theoretical knowledge in the field of public-private partnership, revealing key concepts and ideas that are the basis for the development of this field and determining promising research directions that can become the basis for further development of this field. By integrating findings and

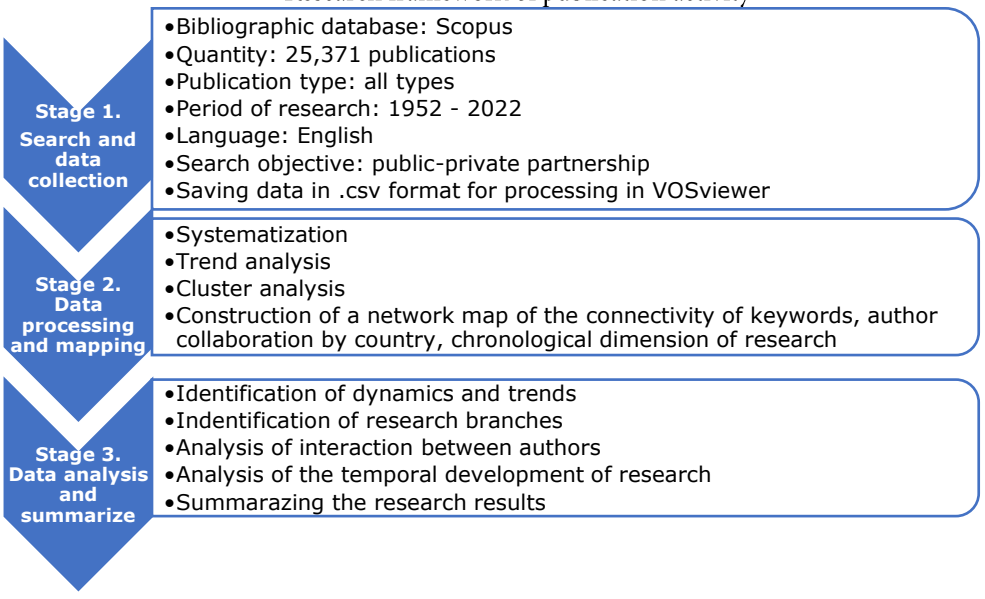
perspectives from many empirical findings, a literature review can address research questions with a power that no single study has (Snyder, 2019).

The critical research aspect of bibliometric analyses is bibliometric mapping, which has two aspects: constructing bibliometric maps and graphical representation (Liao et al., 2018; Van Eck & Waltman, 2009). The software used in our research for constructing and viewing bibliometric maps is VOSviewer (Visualizing Scientific Landscapes). This platform is freely available software to the bibliometric research community (www.vosviewer.com). VOSviewer offers a viewer that allows bibliometric maps to be examined in full detail: construct maps of authors or journals based on co-citation data or construct maps of keywords based on co-occurrence data; display a map in various ways, each emphasizing a different aspect of the map; it has functionality for zooming, scrolling, and searching, which facilitates the detailed examination of a map (Van Eck & Waltman, 2009; Urbanovics, 2022).

To analyze scientific developments devoted to public-private partnership issues, this research was conducted in several stages (Figure 3).

**Figure 3:**

Research framework of publication activity




Source: compiled by the authors based on (Filc et al., 2020; Kharchuk & Oleksiv, 2023; Ravšelj et al., 2022; Roehrich et al., 2014; Shpak et al., 2023b; Wang et al., 2018).

In the first stage, the search made for the most relevant publications of PPP in the bibliographic database – Scopus performed considerably better for its accuracy and coverage than other search engines such as Web of Science, Google Scholar and PubMed

(Falagas et al., 2008; Neto et al., 2016; Romanini et al., 2021). In addition, we chose to work with Scopus as the world-leading bibliographic database of peer-reviewed literature (Ravšelj et al., 2022; Vujković et al., 2022) for such reasons:

- the difference is the predominant profile: Scopus is dominated by the humanities sciences, while Web of Science is dominated by exact and natural sciences (Visser et al., 2021). The Scopus search engine was chosen because it covers most publication databases in different research areas such as engineering, business, management, and accounting (Hong & Chan, 2014; Urbanovics, 2022).
- the number of journals and their indexed: the number of journals and citations in Scopus is more significant than in Web of Science (Martín-Martín et al., 2020).
- the language of publications: the Scopus base is more diverse, and English is not the only dominant language (Singh et al., 2020).
- the search for scientific publications conducted using only the keyword "public-private partnership" in the titles, abstract and keywords.

We did not limit the search only to titles and keywords. The possibility of searching by article abstracts to increase the accuracy of the research results has been added to the search since, in our opinion, mentioning the researched concept in the abstract means that it is key in the research. Abstracts that also contained the researched concept added to the search for publications, so changing the research area or entering additional keywords that related to digital marketing have provided additional and clearer results.

The research period, 1952 – 2022, was chosen, and the research sample is 25,371 publications. During the analyzed period, publications in the Scopus database were mainly represented by articles (14,988 articles or 59.1%), the share of Conference Paper was 11.8% (2,992 units), the share of Review was 8.9% (2,252 units), the share of Book Chapters was 8.3% (2,112 units). The share of other types of publications is 11.9% (3,027 units). Scopus tools were used to identify the dynamics of the number of indexed publications, study affiliation to the country, journal, and industry structure of publication activity on the researched topic and distinguish the contribution of individual scientists in the public-private partnership research by the number of citations and published works.

The Scopus database allows one to store bibliographic data for further analysis. Bibliographic data is saved in .csv format, which the VOSviewer software requires.

The second stage involves processing and visualizing the data found and collected from the Scopus database. Data grouping and visual representation were carried out using the Scopus database tool "Analyze search results." In addition, with the help of the same tool, grouped data on the number of publications by period were obtained, which were used for graphical representation of the dynamics and structure of

publications, conducting trend analysis using Excel software.

The mapping method was applied to visualize the thematic orientation of scientific developments. The obtained results (25,371 scientific publications exported from Scopus) were imported into the VOSviewer platform. The work uses the VOSviewer software to build network maps of the connectivity of keywords, a collaboration of authors by country, and the time dimension of research.

In the third stage of the study, data analysis was conducted to obtain answers to the research questions posed at the beginning of the research.

## 4. Results

The semantic analysis of "Public-Private Partnership" used the Microsoft Office 365 tools, which provides a visual opportunity to identify keywords most often found in the definitions of various scientists (Figure 4). This type of analysis makes it possible to identify the following keywords and signs, which will be used to clarify the essence of the term "Public-Private Partnership": private sector, state, governance, services, risks, responsibility, provision, business, cooperation, and development.

**Figure 4:**

Semantic analysis of "Public-Private Partnership" key worlds

Source: compiled by the authors based on data from the Scopus database using the Microsoft Office 365 tools

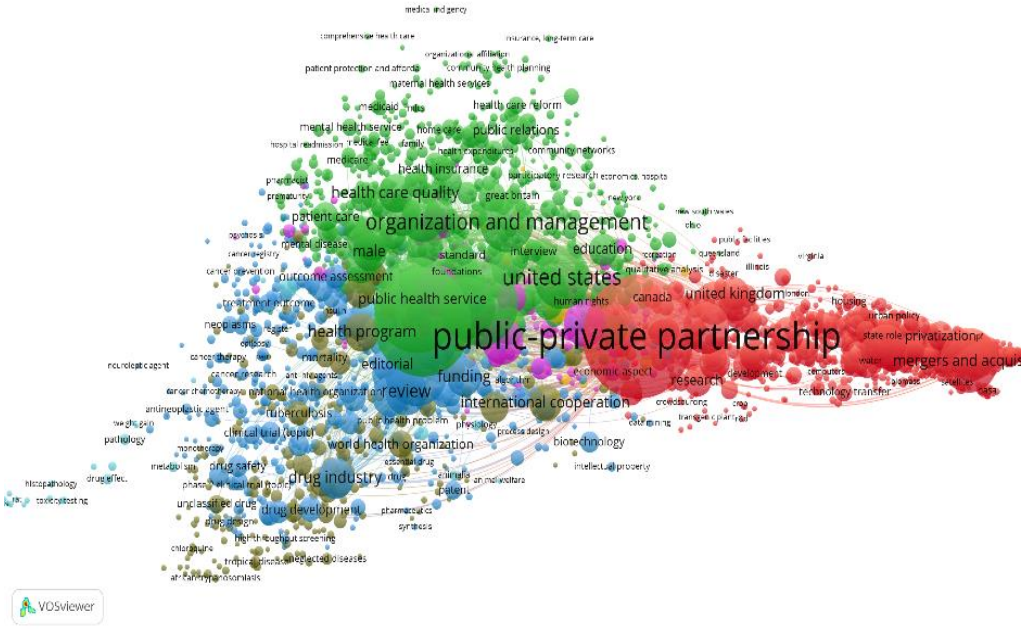
The VOSviewer software used the term "Public-Private Partnership" for more detailed analyses. Based on Scopus bibliographic data, a network map of common words

was built. A limit was set to carry out a more detailed analysis, according to which the term should occur at least 15 times. Thus, among all (52,222) keywords, 2,854 met the threshold value. The keywords were checked for relevance, after which the total number of keywords was reduced to 2,732.

The visual results of building the bibliometric map are shown in Figure 5. It is worth noting that the bibliometric map reflects the frequency of use of terms by the circle size and the connection's closeness. It makes it possible to monitor options for combinations of terms within and between clusters. The circle's color indicates that the keyword belongs to a particular cluster. In turn, the circle's size corresponds to the frequency of appearance of the corresponding keyword in scientific publications – the larger the circle's diameter, the more often this term occurs. The links in the map show the co-occurrence of keywords in the posts. At the same time, the shorter the distance between the keywords, the stronger the connection between them.

**Figure 5:**

Visualization of the network map of keyword connectivity, 1952 – 2022




Source: constructed by the authors from the Scopus database using VOSviewer

According to Figure 5, keywords were grouped into seven clusters, which characterize the main research directions in digital marketing. Let us analyze the

isolated clusters.

The first is the largest cluster (red), which combines 1,074 keywords and can tentatively be called "economic aspects of public-private partnership worldwide." This cluster is the most distant from all the others and includes concepts directly related to public-private partnerships. The analysis of this cluster shows a strong connection between the public and private sectors from the point of view of cooperation for sustainable development in a globalized world.

The second largest cluster (green) consists of 618 keywords. Keywords indicate that scientists have paid the most attention to studying public-private partnerships in the health system, particularly in organizations and management in the public healthcare system.

The third cluster (blue) unites 501 keywords that indicate that public-private partnership projects were studied from the point of view of biomedical technology (biology, biotechnology, cancer, clinical practice, diseases, drugs, gene therapy, information systems, medical society), and the like.

The fourth cluster (grey) consists of 332 keywords. This cluster explains the study of the trends of public health problems in terms of pandemics (antibiotic therapy, bacterial infection, epidemic, global health, immunization, infection, mortality, and virus vaccine).

The fifth cluster (purple) is formed by 141 keywords, which indicate that scholars have paid great attention to social responsibility in public nutrition policy (social marketing, risk factors, sport, protection, mass media, lifestyle, and the food industry).

The sixth cluster (light blue) comprises 36 keywords that indicate that public-private partnership has been researched from animal health projects (animal model, fertility, and physiology).

The seventh cluster (orange) is also formed from 29 keywords, which indicate that scientists have studied government social programs as a model of public-private partnership. In particular, scientists pay special attention to health planning, organizations, the marketing of health services, and international agencies.

The frequency of the keyword phrase "public-private partnerships" is the highest (12,141). The list of other keywords that occur most often is as follows: human/humans (10,904), organization and management (1,892), economics (1,410), government (1,156), and private sector (984). All other keywords occurred less.

Table 3 presents the generalized characteristics of clusters of "Public-Private Partnership" keyword combinations in scientific research.

**Table 3:**

Characterization of key word clusters in scientific research

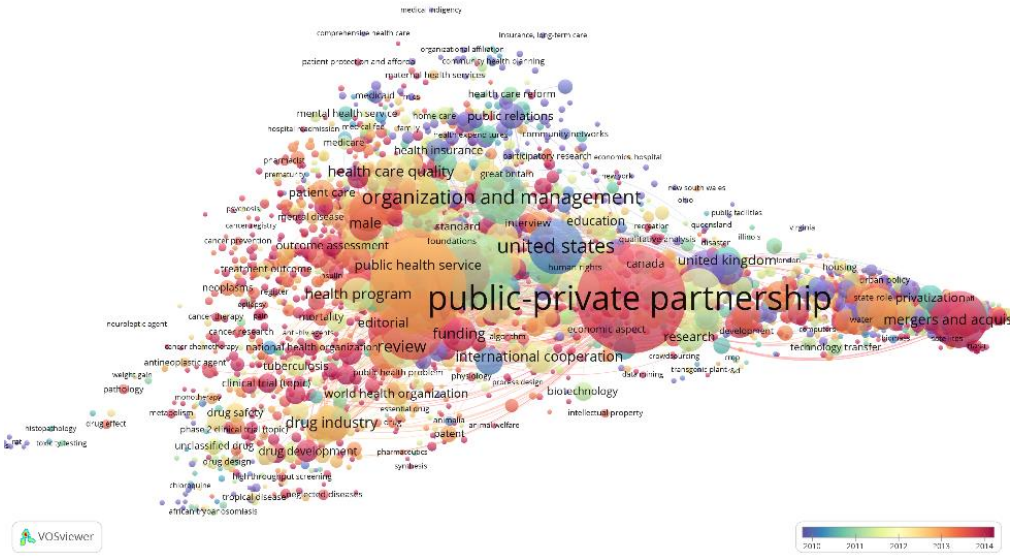
| # | Cluster color | Conventional name of the direction of scientific research | The most used term | Number of keywords | Related keywords |
|---|---|---|---|---|---|
| 1 | red | economic aspects of public-private partnership in the world | public-private partnership | 1 074 | government, private sector, public sector, business, PPP models, management, decision making, risk assessment, commerce, technology, research, sustainable development, globalization, developed countries (United Kingdom, Canada, Italy), developing countries (Brazil, China), Africa |
| 2 | green | public-private partnership in health system | human, humans | 618 | organization and management, cooperative behavior, public relations, health care, female, male, child, health services, medical care, hospital, school |
| 3 | blue | PPP projects in biomedical technology | biomedicine | 501 | biology, biotechnology, cancer, clinical practice, disease, drugs, gene therapy, information system, medical society |
| 4 | grey | public health problems in the terms of pandemic | pandemic, vaccination | 332 | antibiotic therapy, bacterial infection, epidemic, global health, immunization, infection, mortality, virus vaccine |
| 5 | purple | social responsibility in public nutrition policy | nutrition | 141 | social marketing, risk factors, sport, protection, mass media, lifestyle, food industry |
| 6 | light blue | social projects in animal health | animal welfare | 36 | animal model, fertility, physiology |
| 7 | orange | government social programs | society, government | 29 | health planning, population, organizations, marketing of health services, international agencies, social problem |

Source: Authors' own, 2024

Let us consider the chronological perspective of scientific research in the field of PPP by constructing a network map using the VOSviewer software. The program builds network connections and classifies keywords using a timeline (Figure 6). Visualization of the network map allows one to explore the latest trends in publishing activity by keywords.

**Figure 6:**

Visualization of the network map of the chronological dimension of research, 2010-2014




Source: constructed by the authors from the Scopus database using VOSviewer

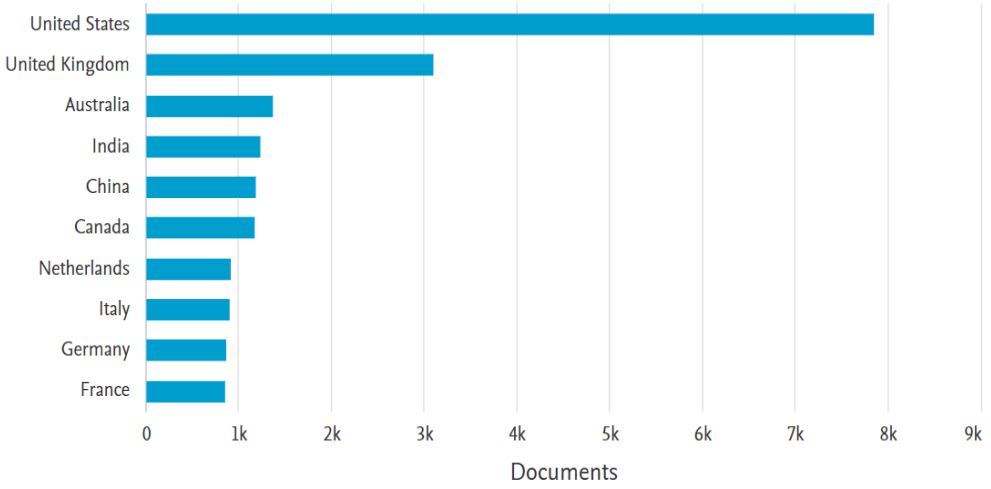
Keywords acquire different colors depending on the year of publication (average value for the cluster). The color gradation, which changes from dark blue to dark red, determines the papers' publication period.

Those keywords that appeared recently (in our case, 2010-2014) are highlighted in dark red. The results of the bibliometric analysis on a chronological scale demonstrate that the intensive development of scientific research in the field of PPP in the world's countries occurred from 2013-2014. In recent years, research has primarily focused on studying the global theoretical model of public-private partnerships. In addition, research is closely related to the study of public-private partnerships in medicine, health systems, biomedical technology, and social problems.

It was established that during the analyzed period of 1952 – 2022, American and British scientists had the most significant number of articles on PPP in the Scopus database (Figure 7).

**Figure 7:**

TOP-10 countries by the number of publications indexed in Scopus, which contain the term "Public-Private Partnership" in the title, abstract and/or keywords, 1952 – 2022




Source: compiled by the authors based on data from the Scopus database

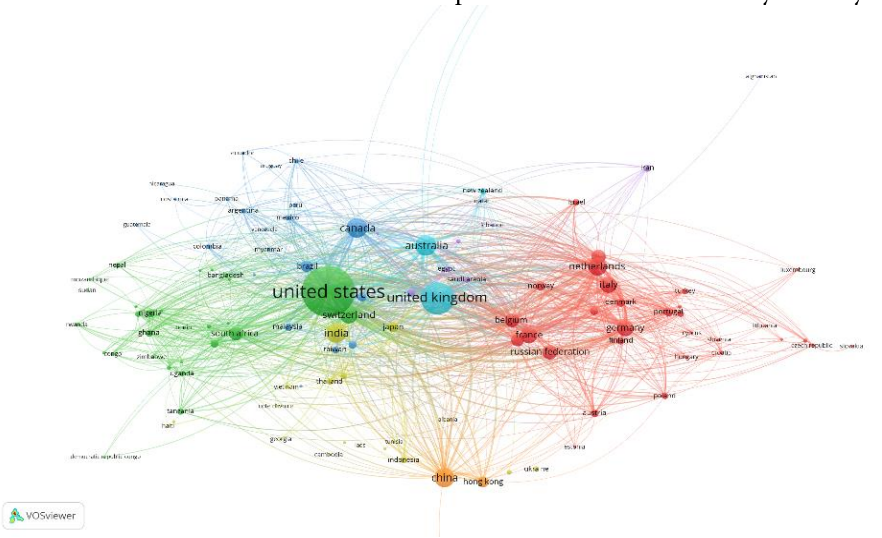
We will build and analyze a collaboration network between authors based on their affiliation to a particular country (Figure 8). To visualize the results, we will use VOSviewer software. The limiting criterion for building the map is a minimum of five publications in one country. Thus, out of 320 countries, this requirement is met for 114 countries.

According to Figure 7 and Figure 8, the world leaders in terms of the number of publications are the United States (7,846 publications or 30.9% of the total volume), the United Kingdom (3,096 publications or 12.2%) and Australia (1,358 publications or 5.3%).

Figure 8 visualizes the authors' interaction according to the co-authorship criterion between countries. Scientists from the United States were found to have the highest number of publications in total, with 3,549 publications co-authored by scientists from 108 countries. The second most popular publishing activity is in the United Kingdom, where scientists from 100 countries co-authored 1,420 publications. The maximum number of joint publications in the United States and the United Kingdom is 320. Australia published 581 publications in co-authorship with scientists from 85 countries, and the most joint publications with scientists from the United States – 107.

**Figure 8:**

Visualization of the network map of authors' collaboration by country

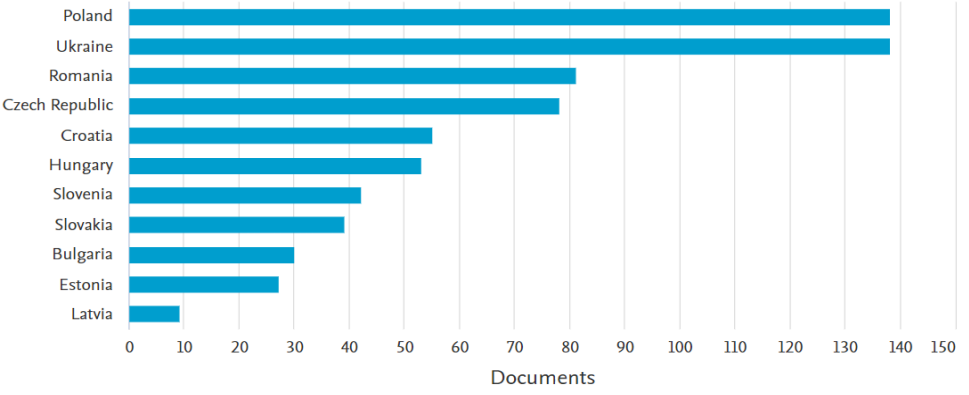



Source: constructed by the authors from the Scopus database using VOSviewer

Central and Eastern Europe (CEE) and Ukrainian scientists' interest in PPP issues is actively growing, and the theoretical development of public-private partnership problems is increasing (Figure 9).

**Figure 9:**

10 countries from Central and Eastern Europe and Ukraine by the number of publications indexed in Scopus, which contain the term "Public-Private Partnership" in the title, abstract and/or keywords, 1952 – 2022




Source: compiled by the authors based on data from the Scopus database

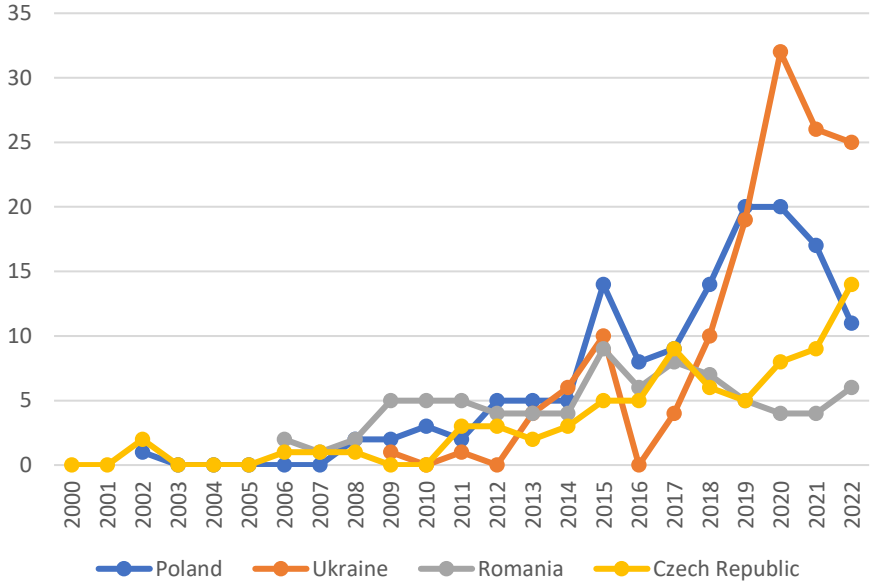
According to Figure 9, the leaders in CEE in terms of the number of publications are Poland (138 publications or 0.54% of the total volume), Ukraine (138 publications or 0.54%), Romania (81 publications or 0.32%) and the Czech Republic (78 publications or 0.31%).

From 2000 to 2022, CEE and Ukrainian authors published PPP publications with different dynamics (Figure 10) and had a pretty diversified branch structure compared to the world level:

- Polish scientists published 138 publications (0.54% of the global flow of publications) from 2002 to 2022, and they occupy the 36th position in the overall rating. The number of joint publications in Poland and other countries (United States of America, United Kingdom, China, France, Germany and CEE – Czech Republic, Bulgaria, and Croatia) is 61 publications. Analytical data show that 20.1% of all research was conducted in social sciences; the second in terms of the volume of scientific publications (12.1%) was the fields of economics, econometrics and finance; business, management and accounting were in third place in the branch structure of PPP research with an indicator of 11.0%. In Poland, the concept of PPP has been developing steadily since 2005, and, unlike Western Europe, the Polish PPP market is dominated by small projects (Cieślak, 2022).
- Ukrainian scientists published 138 publications (0.54% of the global flow of publications) from 2009 to 2022 and occupy the 38th position in the overall rating. The number of joint publications in Ukraine and other countries (CEE) is 48 publications. Analytical data show that 22.1% of all research was conducted in the field of economics, econometrics and finance; the second in terms of the volume of scientific publications (14.9%) was business, management and accounting; the third place in the branch structure of PPP research were social sciences with an indicator of 14.2%.
- Romanian scientists published 81 publications (0.32% of the global flow of publications) from 2006 to 2022 and occupy the 54th position in the overall rating. The number of joint publications in Romania and other countries (United Kingdom, France, Germany, Denmark and CEE: the Czech Republic and Bulgaria) is 26 publications. Analytical data show that 20.7% of all research was conducted in social sciences; the second in terms of the volume of scientific publications (17.3%) were business, management and accounting; medicine was in third place in the branch structure of PPP research with an indicator of 12.0%.

**Figure 10:**

Dynamics of the number of publications of Public-Private Partnership by CEE and Ukrainian authors and indexed in Scopus during 2000 – 2022



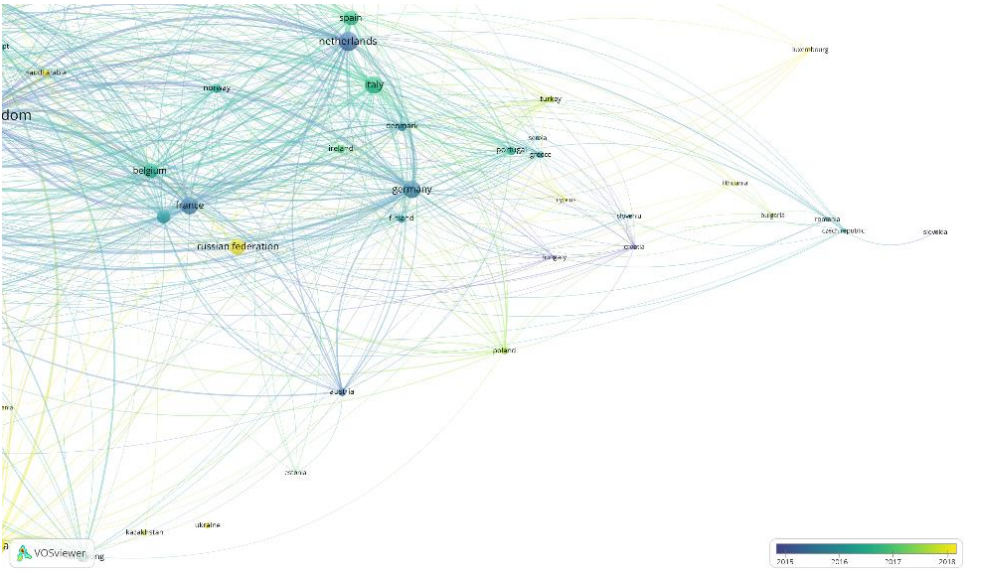

Source: compiled by the authors based on data from the Scopus database

- Czech scientists published 78 publications (0.31% of the global flow of publications) from 2000 to 2022 and occupy the 55th position in the overall rating. The number of joint publications in the Czech Republic and other countries (United Kingdom, Germany, Italy and CEE: Poland, Slovakia, Romania, Bulgaria) is 30 publications. Analytical data show that 15.7% of all research was conducted in medicine; the second in terms of the volume of scientific publications (15.7%) is social sciences; environmental science was in third place in the branch structure of PPP research with an indicator of 12.9%.

In recent years, the network between the researchers in the PPP sphere has been developed in CEE and Ukraine. To be more precise, from 2015 to 2018, the interaction between CEE and Ukrainian authors with other authors, according to the criterion of co-authorship between countries, actively grew, as shown in Figure 11. So, the network between the researchers from Croatia, Hungary, Slovakia and other countries increased in 2015; for the researchers from Romania and the Czech Republic – from 2016 to 2017; for the researchers from Poland from 2017 to 2018; and the researchers from Ukraine in 2018.

**Figure 11:**

Visualization of the network map of the chronological dimension of research in CEE and Ukraine, 2015-2018




Source: constructed by the authors from the Scopus database using VOSviewer

The significant contribution of CEE and Ukrainian scientists to the study of PPP implementation mechanisms in countries in certain economic activities is as follows: housing and communal services; water collection, purification, and distribution; real estate management; waste processing; tourism and recreation; scientific and innovative sphere; agrarian, land, environmental and space relations; and road sector.

In CEE and Ukraine, the relevance of public-private partnership development is determined by many factors, meaning these problems are increasingly becoming a promising area of scientific research. The image of the Polish PPP market appears to be still in its nascent stage, without a significant number of large infrastructure projects, fragmented and dominated by smaller undertakings implemented mainly at the local government level (Cieślak, 2022). The development of PPPs in Romania is tempered by a lack of government capacity to structure and finance projects and weak planning processes, reflecting incomplete legislation and the PPP Unit's lack of operational stability (The Economist Intelligence Unit, 2017). The issues of decentralization of power, formation of capable territorial communities, effective management of territories and various aspects of local self-government are incredibly relevant. Strengthening the local economy, the competitiveness of territories, increasing investments and improving the quality of life require understanding local economic

development processes and taking strategic actions in a changing and increasingly competitive market economy. Taking into account the competitive challenges of the new century and taking into account the positive experience of local development in Western countries, the planning of future local economic development should be approached based on publicity, dialogue and reconciliation of the interests of the three subjects of the national economy – "government, private sector (business) and community."

## 5. Discussion

The bibliometric analysis of the Scopus database showed a continuous high growth of studies citing abstracts and keywords related to public-private partnerships. All this determines the additional need for further research despite the available data. In several papers (Ke et al., 2009; Liao et al., 2018; Alazzam et al., 2023; Mouraviev, 2021; Neto et al., 2016; Osei-Kyei & Chan, 2015; Roehrich et al., 2014; Urbanovics, 2022; Wang et al., 2018), the scientists chose other periods to research and limited their research to the analysis of branches (Medical journals (Filc et al., 2020; Liao et al., 2018; Stevenson, 1952), Construction journals (Li et al., 2005a; Ke et al., 2009; Neto et al., 2016; Zhang, 2005), in the paper, Osei-Kyei and Chan (2015), the authors limited the sphere of research to the critical success factors for PPP, and in the papers, (Ke et al., 2010; Liao et al., 2018; Neto et al., 2016; Roehrich et al., 2014; Wang et al., 2018), the scientists chose other databases (Web of Science (Liao et al., 2018; Neto et al., 2016; Roehrich et al., 2014; Wang et al., 2018) for the bibliometric analysis conducted to study the field of PPP/PFI. Unlike other studies, the authors' studies comprehensively reflect the current trends in the publishing activity of scientists in public-private partnerships.

The authors' contributions to the development of theoretical aspects in public-private partnership bibliometrics are as follows:

- PPP research based on the systematic review of previous articles relating to PPP has allowed us to understand the state and tendencies of PPP and also to clarify the determination of the term PPP;
- the results of this study will allow us to pay attention to those factors that substantially impact the development of public-private partnerships in the private sector (innovation, technical knowledge and skills, managerial efficiency, and entrepreneurial spirit) on the one hand and in the public sector on the other hand (social responsibility, social justice, public accountability, and local knowledge);
- the research will reveal promising directions for the development of public-private partnerships, which will help businesses and local communities understand what trends are happening and how they can affect the effectiveness of PPP projects;

- the results of the research will help to identify gaps and future needs in scientific research, identify trends in the development of science, directions of research that are gaining popularity and the level of interest of the scientific community in specific issues;
- analyzing publications by countries and scientists will make it possible to single out the main scientific directions and schools on the research subject and identify potential co-authors or scientific groups for cooperation.

This study confirms the evidence of previous observations (such as Neto et al., 2016, Osei-Kyei & Chan, 2015, Roehrich et al., 2014, Wang et al., 2018) about the significant growth of public-private partnerships and its prospects for application in all spheres of activity, in particular in health (Filc et al., 2020; Liao et al., 2018; Stevenson, 1952) and construction (Li et al., 2005a; Li et al., 2005b; Grimsey & Lewis, 2002; Grimsey & Lewis, 2004; Ke et al., 2009; Neto et al., 2016; Zhang, 2005), which was revealed through the frequency of occurrence of abstract/keywords indicating those industries. In addition, the problems with PPPs for sustainable development may depend upon an interdisciplinary workforce and multi-sectoral approach with broad skills related to project and program management (Chen et al., 2018; De Los Ríos-Carmenado et al., 2016).

The analysis of the branch structure of publishing activity on public-private partnerships showed the multidisciplinary nature of the research concept, creating opportunities for forming multidisciplinary perspectives and highlighting the need for collaboration between different branches and fields. In particular, the analysis of abstracts and keywords in the PPP field from a chronological perspective revealed the growing popularity of scientific publications related to the study of social infrastructure and PPP projects in recent years. Zhang (2005) and Ke et al. (2010), who conducted a bibliometric analysis of PPP and the development of social infrastructure, came to a similar conclusion. Roehrich et al. (2014), who conducted a holistic view of PPPs in healthcare delivery, also obtained similar conclusions.

An interesting conclusion can be formed about the research results of PPP in Ukraine. The problem of PPP in Ukrainian studies is presented and analyzed in a somewhat limited way, in particular without a detailed analysis of the activities of the entities that make this partnership public-private and not only such just public-private. In modern economic conditions, the term "public-private partnership" is more correct, which most accurately reproduces the concept's meaning since, in foreign practice, state authorities and local self-government bodies, public organizations, and charitable foundations actively participate in relationships with the private sector. At the same time, the issues of PPP application in education, medicine and health care, ecology, public order and security, recreation, culture and sports, social infrastructure development, and the telecommunications sector remain undisclosed and understudied. So, research on the development of the PPP institute (partnership of public authorities, the private sector and the community) as a critical component of the ability of united territorial communities to solve local development issues can become

the subject of further scientific research and discussions.

Among the main problematic points of this research is that only the quantitative aspect of publication activity is analyzed that is, which countries have published the most articles, which abstracts / keywords are more common in publications, etc. Bibliometric analysis does not allow for the analysis of publications by quality. So, this problematic issue is also noted in the works of other scientists (Ellegaard & Wallin, 2015; Hodge & Greve, 2007; Osei-Kyei & Chan, 2015; Roehrich et al., 2014).

## 6. Conclusions

The bibliometric analysis of scientific literature on private-public partnerships (PPP) from 1952 to 2022 was conducted to outline the modern trends and priorities for private-public partnership research to single out institutions and scientists engaged in research in this sphere. The research used several special methods and tools, including built-in Scopus tools, VOSviewer software, and Microsoft Office 365 tools.

Based on the results of the research, the following conclusions can be formed:

Based on the results of the bibliographic analysis, we propose to define "public-private partnership" as "the cooperation (interaction) between the government and business – actors in economic activity of Ukraine and foreign actors, which are one of the conditions for attracting the necessary investment resources, increasing innovative activity in the national economy, development of economic and social infrastructure, deciding economic, social and environmental problems, and the like." (Shpak et al., 2022; Shpak et al., 2023a). The analysis of the branch structure of the number of publications indexed in Scopus, which contain the terms "private-public partnership" in the title, annotation and/or keywords, showed a significant diversification of research and made it possible to conclude the multidisciplinary nature of the studied concept since PPP is the mechanism used in social sciences and medicine, and also other areas of economic activities. Most publications were in social sciences, medicine, engineering and business, management and accounting.

This research analyzed publications on PPP for 1952 – 2022 indexed in the Scopus database. It was found that publishing activity on PPP is gaining increased popularity every year, especially after 2005. The results of the bibliometric analysis on a chronological scale demonstrate that the intensive development of global scientific research on PPP topics occurred in 2010-2014. In recent years, research has primarily focused on studying the global theoretical model of public-private partnerships. In addition, research is closely related to studying the public-private partnership in medicine, health systems, biomedical technology, and social problems. The above was confirmed by determining the frequency of query applications in search engines using Scopus tools. We can conclude that PPP is a global topic that requires effective collaboration between scientists and academics. Three stages of scientific interest in PPP

research are identified: (1) stage I (1952 – 1981) is the stage of the formatting bases in PPP and is characterized by small dynamics of the number of scientific articles, monographs, and conference materials devoted to the PPP topic; (2) stage II (1982 – 2004) is a stage of moderate growth with an average of 70-75publication annually; and (3) stage III (2005 – 2022) is the stage of the rapid development of theoretical and practical bases in PPP.

Visualization of the network map of familiar words based on bibliographic data made it possible to single out seven clusters characterizing the main research directions in the PPP field. The first cluster includes concepts that directly relate to public-private partnership and shows a strong connection between the public and private sectors from the point of view of cooperation for sustainable development in a globalized world. The second cluster presents the study of public-private partnerships in the health system, particularly in organizations and management in the public health care system. The third cluster indicates that projects of public-private partnership are studied from the point of view of biomedical technology. The fourth cluster explains the study of the trends of public health problems in terms of different pandemics. The fifth cluster explains the social responsibility in public nutrition policy. The sixth cluster shows that public-private partnerships have researched animal health projects. The seventh cluster indicates that scientists have studied government social programs as one of the public-private partnership models.

The analysis of the collaboration network between authors based on their affiliation to a particular country showed the leadership in publishing activity of the United States, the United Kingdom and Australia. In the Scopus database, 134 publications of Ukrainian scientists are indexed, taking the 40th position in the overall ranking among all countries. The interest of CEEC and Ukrainian scientists in PPP issues is actively growing, and the theoretical development of public-private partnership problems is primarily increasing in branches such as economics, econometrics and finance, social sciences, business, management and accounting, and medicine. The significant contribution of CEE and Ukrainian scientists to the study of PPP implementation mechanisms in countries in certain economic activities is as follows: housing and communal services; water collection, purification, and distribution; real estate management; waste processing; tourism and recreation; scientific and innovative sphere; agrarian, land, environmental and space relations; and road sector.

On the other hand, our research has some limitations:

- the selection of publications was limited mainly to the Scopus database. At the same time, scientific publications from other databases (such as Web of Science, Dimensions, Google Scholar, Microsoft Academic, and PubMed) were not considered;
- all keywords from all fields were considered, which increased the number of terms and reduced the accuracy of the bibliographic analysis to clarify the essence of "public-private partnership" in our research.

This research will be helpful for future scientists to familiarize themselves with the state of PPP publishing activity and the trend regarding the topic, find out which main keywords the authors used, get acquainted with the most popular publications, which are the most cited because they contain important information about the researched topic, and to find out what exactly is missing and which topics require further research in the scientific field. The bibliometric analysis presented in the research will allow us to understand the evolution of PPP from the beginning of the active use of business and government cooperation in medicine. Consequently, research on publishing activity is still necessary, and further theoretical and empirical research on private-public partnerships will contribute to progress in this sphere.

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