

KOLEKTIVNA INTELIGENCIJA I UPRAVLJANJE PROJEKTIMA: BIBLIOMETRIJSKA ANALIZA

COLLECTIVE INTELLIGENCE AND PROJECT MANAGEMENT: BIBLIOMETRIC ANALYSIS

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Apstrakt: Ovaj rad istražuje ulogu kolektivne inteligencije i upravljanja projektima kroz bibliometrijsku analizu 289 naučnih publikacija od 2005. do 2025. godine, koristeći Scopus kao bazu podataka za izdvajanje izvora. VOSviewer je korišćen za ispitivanje trendova u obimu publikacija i citiranosti, mreže koautorstva i najuticajnijih radova u ovoj oblasti. Mapiranjem odnosa između autora, zemalja i ključnih referenci, studija pruža vredan uvid u dinamiku saradnje i istraživačke praznine. U poslednje dve decenije došlo je do promene u publikacijama, pri čemu su većinu činili radovi sa konferencija, a zatim članci iz časopisa i poglavlja u knjigama. Istovremeno, trend citiranosti je pokazao konstantan porast. Glavne implikacije ističu potrebu za specijalizovanim časopisima o kolektivnoj inteligenciji u okviru upravljanja projektima. Pored toga, postoji potreba da se promoviše saradnja između zemalja u razvoju i razvijenih zemalja tokom istraživanja.

Ključne reči: Kolektivna Inteligencija, Upravljanje Projektima, Bibliometrijska Analiza, Vosviewer.

Abstract: This paper examines the role of collective intelligence and project management through a bibliometric analysis of 289 scientific publications from 2005 to 2025, using Scopus as the database for source extraction. VOSviewer was used to examine trends in publication and citation volumes, co-authorship networks, and the most influential papers in this field. By mapping the relationships between authors, countries, and key references, the study provides valuable insights into the collaborative dynamics and research gaps. In the last two decades, there has been a shift in publications, with the majority being conference papers, followed by journal articles and book chapters. At the same time, the citation trend has shown a consistent increase. The main implications highlight the necessity for more specialized journals on collective intelligence within project management. Additionally, there is a need to promote collaboration between developing and developed countries during the research.

Keywords: Collective Intelligence, Project Management, Bibliometric Analysis, Vosviewer.

1. INTORDUCTION

Collective intelligence (CI) has been in the focus of science and for many years, for example in biology, sociology, computer science, engineering, etc. (Malone et al., 2009; Leimeister, 2010). CI refers to context in which a group of average people can, under certain conditions, achieve better results than any individual of the group (Fleenor, 2006). This leads to situation in which, group of people that are remarkably intelligent, collectively are smarter than the one smartest persone individually (Alamantariotou et al., 2014). Brabham (2009) stated that, since *'no one knows everything, everyone knows something, all knowledge resides in humanity'* (Lévy, 1997, therefore we should consciously adopt the methods and technologies which will harness this talent. Kaur and Shah (2018) analysed CI definition in the context of organization, groups, computers and art, and found that in organizational context, this concept videly focuses on the synergy, collaboration capacity, and group ability to collectively solve various problems.

Numerous organizations are nowadays project-based. Therefore, in projects, unsuspected situation or issue can emerge, charachtgerized by complexity and uncertainty. Loufrani-Fedida and Missonier (2015) stated that the project's strength lies in the ability to combine team competencies for producing an outcome that could not have been achieved by any one of them deployed in isolation. CI helps projects become more resilient, flexible, and innovative, contributing to their overall efficiency and success. This approach motivates and encourages diverse perspectives and team members' knowledge, reducing the risk of bias and enhancing decision quality (Chinta, 2021). Therefore, team members should keep low distance between themself and have open communication for solving the problem. Aditionally, project manager should support creativity and flexibility, build a culture based on trust and direct face-to-face communication which motivates team members to discuss the issue fostering openness and encouraging active participation (Hansen and Vaagen, 2016; Hansen et al., 2020).

To uncover emerging patterns in a specific scientific study field, bibliometric analysis has been used. This analysis identifies, explains, and categorizes the publications results by year, keyword, author, and country (Ellegaard & Wallin, 2015; Donthu et al., 2021). Thanks to uses of statistics, data mining, mathematical techniques, and especially development of softwares for results visualization, this analysis gained more popularity (Wang et al., 2020). This method is valuable for describing the current state of the art of a well established or emerging research topic. Bibliometric analysis was often performed in project management in domain of project management research (Ng & Chai, 2015; Khalife et al., 2021), identifying gaps in the project management literature (He et al., 2019) or in the connection of projects with the other specific topics like Industry 4.0 (López-Robles, 2020) or artificial intelligence (Mesa Fernández et al., 2022).

This study aims to geet more detailed insights, see the main trends, identify the most productive authors and their co-authorships in the specifities of collective intelligence in project management. For this purpose bibliometric analysis was performed and findings are reported. As a result, it contributes to a more comprehensive comprehension of the collective intelligence role within the project management The paper is organised as follows. After Introduction section, in Materials and methods, research process used in analysis is explained. Section which

follows is Results and discussion where main findings are presented. Finally, remarks, limitations and future research directions are summerized in Conclusion.

2. MATERIALS AND METHODS

To conduct bibliometric analysis for getting deeper insights into actual topic for last two decades, this research study followed the research process depicted in Figure 1.

When applying this type of analysis, important step is choosing an appropriate database to extract the references. Scopus database is one of the most prominent scientific database that provides many scientific papers and detailed information about each publication around the world. Also, Scopus database was developed by Elsevier as the largest publisher of scientific journals (Calof et al., 2022). Therefore, this database was chosen because of all mentioned advantages.

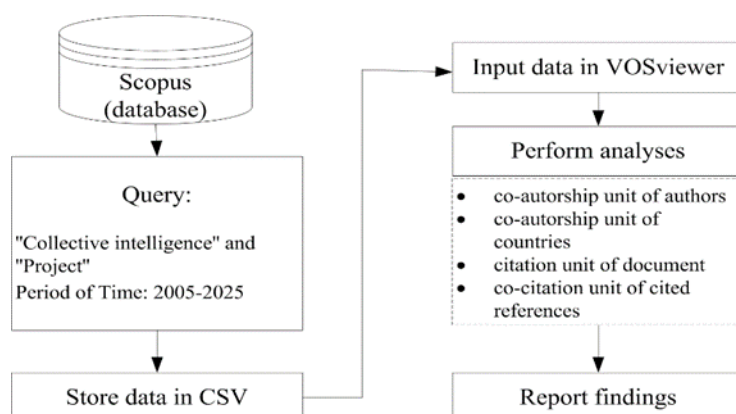


Figure 1. Research process

On the Scopus website the following search string was used as input in the search engine: TITLE-ABS-KEY (collective AND intelligence AND project) AND PUBYEAR > 2004 AND PUBYEAR < 2026)AND (LIMIT-TO (EXACTKEYWORD , "Project Management") OR LIMIT-TO (EXACTKEYWORD , "Collective Intelligence") OR LIMIT-TO (EXACTKEYWORD , "Collective Intelligences") OR LIMIT-TO (EXACTKEYWORD , "Collective Learning")).

Data was sourced from Scopus on 7th of March, 2025, and exported in Comma-SeparatedValues (CSV) format, which contains bibliographic information, keywords information and citation information. Total of 289 scientific publications were extracted. This number of publications satisfy the minimum number of papers suggested by Rogers et al. (2020), who recommended bibliometric analysis only if the number of references to be reviewed is at least 200 papers.

Firstly, performance mapping is partially performed as a descriptive method for evaluating the publication and citation-related metrics like evaluation of the total number of publications and citations. Therefore, among 289 extracted references, 54.0% are conference papers, 37.4% are articles, 4.8% are book chapters, 2.1% are review articles, 0.3% include books, and the rest are other categories such as notes, short reviews, etc.

By analysing number of documents per country, United States, United Kingdom and France are three countries with largest number of scientific publication.

When it comes to subject area, from total number of analyzed documents, 168 documents (33.2%) belong to Computer science, 79 documents (15.6%) belong to Engineering, 48 documents (9.5%) belong to Social science, and 47 documents belong to Business, Management and Accounting. The rest belongs to heterogeneous type of disciplines including Decision science, Economics, and other. This leads to remark that that computer science and management are the top subjects. Similar was found by Calof et al. (2022).

Science mapping is a way of analyzing the influences and strengths of relationships among references. The results of bibliometric mapping can be enhanced through network analysis where evaluation of network metrics, clustering, and visualization are most often utilized. VOSviewer was used to perform all the analyses. Besides VOSviewer is a free online available software, its advantages is in easy understandable presentation of publications' structure and many available analyses, such as co-citation analysis, co-authorship analysis, co-occurrence analysis, etc.

3. RESULTS AND DISCUSSION

For last twenty years, publication trend was varying, while citation trend was growing. Such trend in CI publications was determined by Bouachri & Zerrad (2025). Most of documents are published in 2020 and 2023, namely 26 publications in 2020 and the same number in 2023. On the other hand, the last number of publications was in 2005, more precisely 3 documents. The maximum number of citations was in 2024 (309 citations) while the minimum was in 2005 (3 citations). Number of publication and citations per year, with excluded self-citations, are presented in Figure 2.

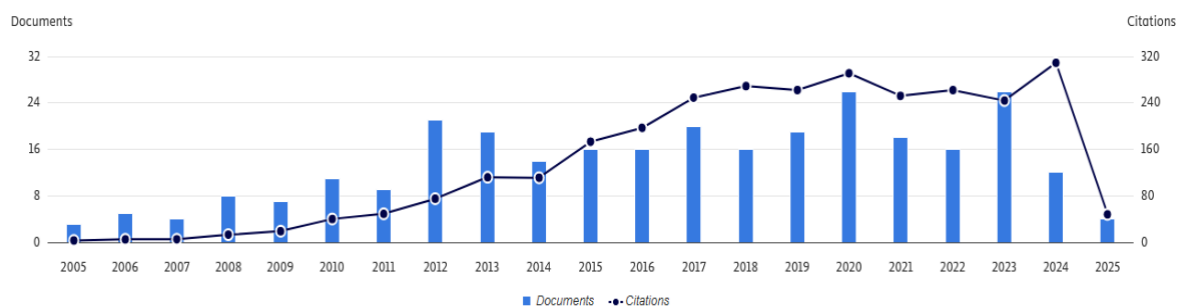


Figure 2. Document and citations (Scopus, 2024)

Co-authorship analysis of author was performed and results are graphically presented in Figure 3. As a threshold, two documents as minimum number of documents of an authors was selected. Of 928 authors, 86 meet the threshold value. As it can be seen, all authors are in the same cluster and they interweave with each other.

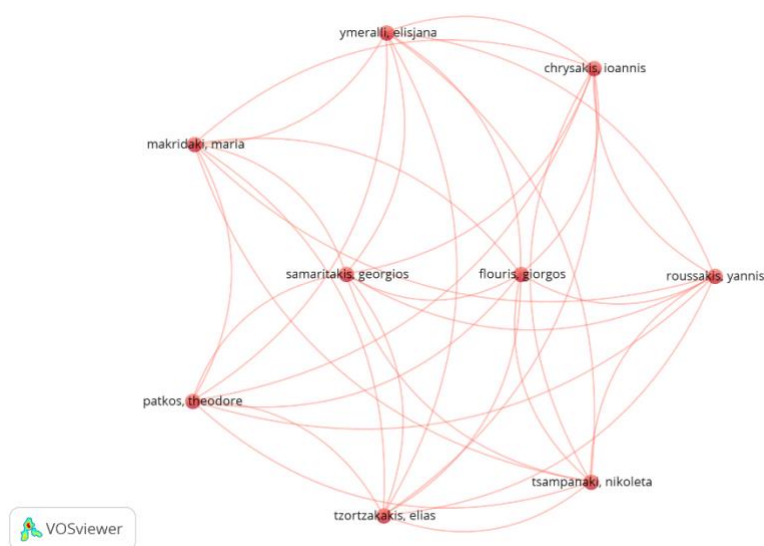


Figure 3. Bibliometric map on co-authorship unit of authors

Also, co-authorship unit of countries analysis was performed. With selected minimum number of documents of a country 3, of 58 country 34 meet the threshold. Results are presented in Figure 4. According to findings, there are totally seven clusters. Countries in same colour implicate that they are in the same cluster and may cooperate more.

Therefore, based on the co-authorship, United Kingdom cooperates the most with Ireland, Netherland and Germany, while on the other hand, China cooperates the most with Japan, India and Hong Kong.

United Kingdom has 34 document and 299 citations with total link strength 31. Next, United States has 53 documents and 1482 citations with total link strength 24. Finally, France has 26 documents and 159 citations with total link strength 19.

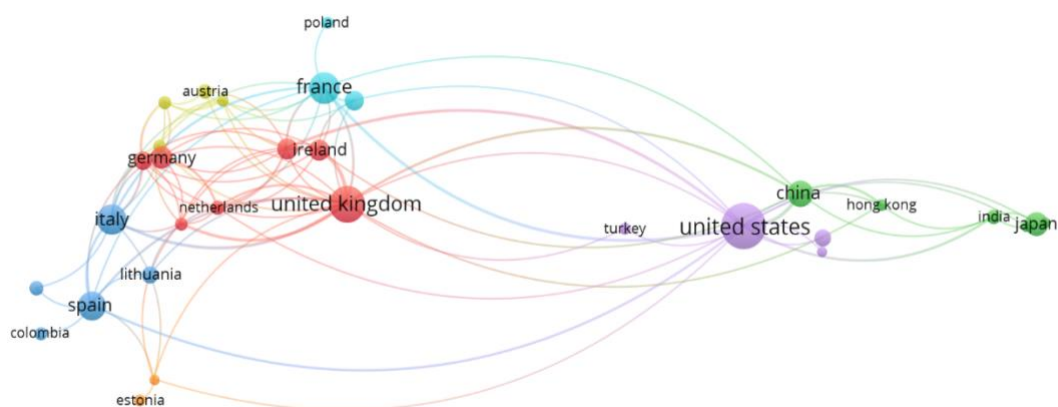


Figure 4. Bibliometric map on co-authorship unit of countries

To get more detailed analysis of document citation, 3 was selected as the threshold value of minimum number of citations of a document. Of 289 documents, 124 meet the given threshold. Results are graphically presented in Figure 5.

According to Figure 5, there are 120 clusters with only 4 links. The most cited document is published by Brabham in 2009 with 486 citations, while publication by Zhao (2014) with 426 citations, publication by Mukerji (2021) with 226 citations, publication by Chiu (2014) with 168 citations, and Latoza (2016) with 133 citations are following. The rest of documents have less than 100 citations.

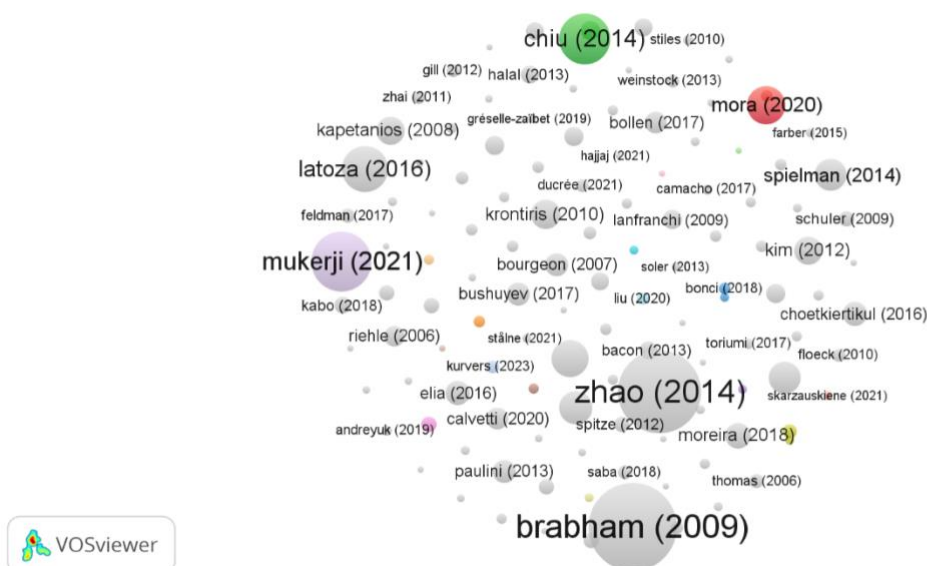


Figure 5. Bibliometric map on citation unit of document

Next analysis is performed regarding co-citation of cited references. This type of analysis can provide a research field trend and the measure of the proximity degree. 3 was selected as the threshold value of minimum number of citation of a cited reference. Of 8757 cited references, 34 meet the given threshold. Results are depicted in Figure 6.

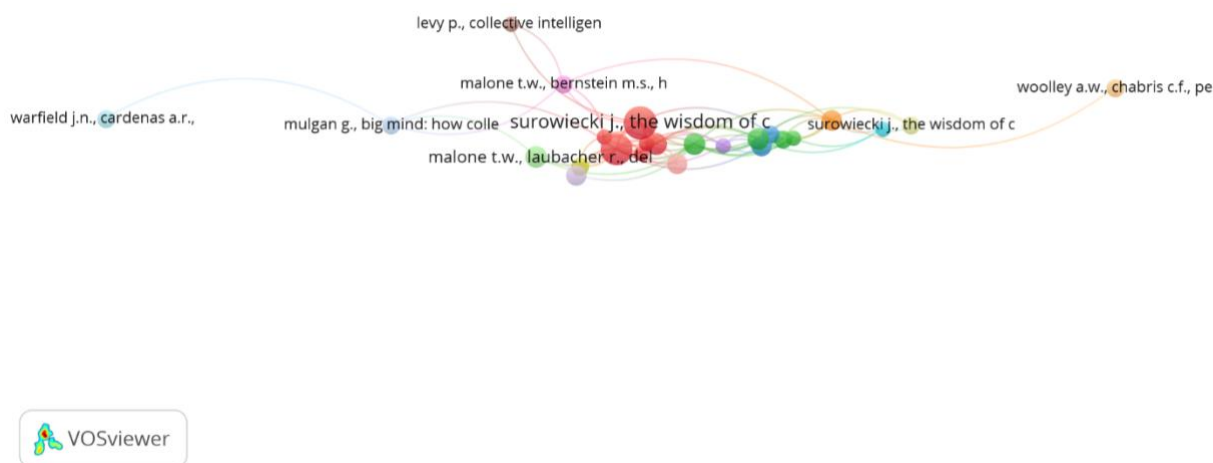


Figure 6. Bibliometric map on co-citation unit of cited references

The node shows a reference, and the size of the node depends of the total number of citations with which the reference is cited. A link between two nodes presents a co-citation relationship, and the thicker the link is, the more citations the reference has. The place of the nodes and the colours means different clusters. According to the Figure 6, there are 16 clusters regarding 16 colours. The most cited reference is „The wisdom of crowds“ published by Surowiecki in 2012. This finding is consistent with study of Calof et al. (2022). Next reference with most of the citations is publication by Woolley et al. (2010) entitled „Evidence for a collective intelligence factor in the performance of human groups“.

4. CONCLUSION

In this paper, a comprehensive overview of CI and project management from 2005 to 2025 is presented. 289 publications are selected and relative information is exported from Scopus. The publication structure, citation structure and the cooperation networks of authors and countries were presented using VOS viewer. As a result, this study contributed to a more comprehensive review of the collective intelligence role within the project management. It was determined that most of the extracted publications are conference papers, followed by journal articles and book chapters.

Hence, this topic is more present at the conferences than in the journals, highlighting the need for establishment of more journals dealing with this topic. Also, results of bibliometric map on co-authorship unit of countries showed only seven clusters and rare connection with developed and developing countries. However, this study has some limitations. Analysis was performed for the last 20 years. This may result in the omission of important publications from the period before 2005. Next limitation is in using only one database, which potentially can result in missing out on contributions from other databases or platforms.

Future research agenda should be directed in way of analysing longer period of time and combination of more bibliometric analysis visualization softwares for getting deeper understanding. Also, future work could look towards using a new hybrid human-machine approaches for preparing bibliometric review.

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