



THE STUDY ON IBN KHALDUN: BIG DATA VISUALIZATION AND KNOWLEDGE GRAPH ANALYSIS

EL ESTUDIO SOBRE IBN KHALDUN: VISUALIZACIÓN DE BIG DATA Y ANÁLISIS DE GRÁFICOS DEL CONOCIMIENTO

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ABSTRACT

Objective: This study employs bibliometric approaches to systematically analyze the structural research development of Ibn Khaldun. **Design/Methodology/Approach:** A total of 195 publications from the Web of Science database, published between 2014 and 2023, were selected and thoroughly investigated using visual analysis tools, including VOSviewer and Scimago Graphica. **Results/Discussion:** The main finding reveals the study of Ibn Khaldun faces obstacles to growth and requires the immediate exploration of new research channels. Furthermore, the main topics of research on Ibn Khaldun are comparisons with Western and Arabic thinkers and analyses of his perspectives on sociology, history, and politics. **Conclusion:** Ibn Khaldun is a significant scholar from the medieval Arab era. His ideas continue to offer tremendous inspiration for modern civilization. There is still a substantial amount of unexplored terrain when it comes to investigating Ibn Khaldun's research methods, contents, and directions. **Originality/Value:** The primary objective is to provide valuable insights for future Ibn Khaldun research by offering a detailed understanding of the prevailing research landscape.

KEYWORDS: Ibn Khaldun, visualization, knowledge graph, VOSviewer, Scimago Graphica

RESUMEN

Objetivo: Este estudio emplea enfoques bibliométricos para analizar sistemáticamente el desarrollo estructural de la investigación de Ibn Jaldún. **Diseño/Metodología /Enfoque:** Se seleccionaron e investigaron en profundidad un total de 195 publicaciones de la base de datos Web of Science, publicadas entre 2014 y 2023, utilizando herramientas de análisis visual, incluidas VOSviewer y Scimago Graphica. **Resultados/Discusión:** El hallazgo principal revela que el estudio de Ibn Khaldun enfrenta obstáculos para su crecimiento y requiere la exploración inmediata de nuevos canales de investigación. Además, los principales temas de investigación sobre Ibn Jaldún son las comparaciones con pensadores occidentales y árabes y los análisis de sus perspectivas sobre sociología, historia y política. **Conclusión :** Ibn Jaldún es un importante erudito de la época árabe medieval. Sus ideas siguen ofreciendo una tremenda inspiración para la civilización moderna. Todavía hay una cantidad sustancial de terreno inexplorado cuando se trata de investigar los métodos, contenidos y direcciones de investigación de Ibn Jaldún. **Originalidad/Valor:** El objetivo principal es proporcionar información valiosa para futuras investigaciones de Ibn Khaldun ofreciendo una comprensión detallada del panorama de investigación predominante. **PALABRAS CLAVE:** Ibn Khaldun, visualización, gráfico de conocimiento, VOSviewer, Scimago Graphica

INTRODUCTION

Ibn Khaldun (1332-1406), born in Tunis and belonging to the distinguished lineage of Sevillian Arabs (Irwin R, 2018), stands alongside Avicenna and Nasir Din Tusi as a towering figure in medieval Arab Islamic culture. His legacy extends beyond mere historical eminence; he is recognized as one of the foremost Arab historical philosophers and sociologists of the Middle Ages (Khaldun, 2014). The impact of his thought transcends the confines of his era and offers valuable theoretical insights into the contemporary prosperity of human society and the development of civilization (Razak, 2020), especially in the realms of politics, economics, and education (Ilgaroğlu, 2019; Wazir et al., 2022; Rizkiah & Chachi, 2020; Stockton, 2020). Furthermore, numerous Western intellectuals, while not directly shaped by Ibn Khaldun's ideas, appear to resonate with common threads embedded in his thought (Razak et al., 2020; Malešević, 2021; Abozeid, 2021). Hence, Ibn Khaldun's profound contributions not only provide insight into the past but also give lasting direction for understanding and navigating the complexities of contemporary society.

Within the dynamic landscape of academic research, the escalating influence of information technology is evident (Merali & McKelvey, 2006). Simultaneously, there is an explosive surge in scientific publications. These trends highlight the importance of scholars developing proficiency in using advanced data analysis tools to benefit their research. Such tools assist academics in effectively navigating the complexities of scientific study and comprehending emerging trends in many fields. Additionally, they enhance academic discussion and provide opportunities for novel avenues of research (Vasudevan et al., 2016). Recently, researchers have started to use big data analytics tools often, including but not limited to VOSviewer, Scimago Graphica, and CiteSpace, to explore scholarly research trends, focus themes, and research hotspots (Vasudevan et al., 2016; Hassan-Montero et al., 2022; Pan et al., 2017).

This study aims to provide a comprehensive overview of Khaldun's research domains and develop patterns by using two widely used bibliometric tools, namely, VOSviewer and Scimago Graphica. Initially, we conducted an analysis of the data referring to document types, Web of Science categories, and Web of Science index. Furthermore, by examining the contributing countries and regions, publication volume and citation frequency, publication periodicals, authors and contributions, and keyword co-occurrence to determine the knowledge structure and development of Ibn Khaldun research and subsequently identified emergent subjects. Ultimately, we anticipate that this study will provide a clear path for future research endeavors on Ibn Khaldun.

RESEARCH METHODS AND DATA

Research methods

VOSviewer is a bibliometric network analysis tool written in the Java programming language. It can generate

maps of coauthorship, co-occurrence, citation, bibliographic coupling, and co-citation. This tool supports in-depth analysis of clustering solutions in a visual manner, providing researchers with an intuitive presentation of data (Vasudevan et al., 2016; Hassan-Montero et al., 2022). Scimago Graphica is also a professional visualization tool designed not only for the visual communication of data but also for exploratory analysis (Van Eck, 2017; Li, 2023). In this study, we primarily utilized VOSviewer 1.6.18 (0) and Scimago Graphica for bibliometric analysis and the creation of literature knowledge maps. Furthermore, when examining the authors and contributions to Ibn Khaldun’s research, we employed Excel software to generate knowledge pie charts.

Data source and collection

The research data in this study are collected from the Web of Science (WOS) database, introduced by the Institute for Scientific Information (ISI). The criteria for selecting research data encompass the topic (Ibn Khaldun), publication year (2014-2023), document type (exclusion letter), and language (English). Based on these specific criteria, we eventually selected 195 works that were of exceptional quality and importance for comprehensive visualization and analysis.

Table 1. Document types

Document Types	Record Count	% of 195	Document Types	Record Count	% of 195
Article	148	75.897	Early Access	8	4.103
Book Chapter	30	15.385	Proceeding Paper	8	4.103
Book Review	21	10.769	Review Article	3	1.538
Editorial Material	13	6.667	Book	2	1.026

Source: based in data retrieved in WoS

Table 2. Top 10 Web of Science Categories

Web of Science Categories	Record Count	% of 195	Web of Science Categories	Record Count	% of 195
Religion	41	21.026	Philosophy	16	8.205
History	30	15.385	Asian Studies	14	7.179
Sociology	27	13.846	Social Sciences Interdisciplinary	12	6.154
Anthropology	16	8.205	Humanities Multidisciplinary	11	5.641
Area Studies	16	8.205	Political Science	11	5.641

Source: based in data retrieved in WoS

Table 1 displays the selected document types based on our criteria. The most prominent type is “article”, comprising 148 papers, accounting for nearly 76% of the total number of documents. Furthermore, there are 30 items categorized as “book chapters”, representing approximately 15% of the total. The “book review” type encompasses 21 items, constituting approximately 11% of the overall number of documents.

Based on the number of publications in each category, Table 2 ranks the top 10 Web of Science categories. The field of religion has many publications, at 41, compared with the other topics. This area represents approximately 21% of all publications. Among all academic fields, history has the second-highest number of publications (30 studies), or approximately 15% of the total. Among all academic disciplines, sociology has the third-highest publication volume, with 27 documents. This accounts for approximately 14% of the total. The combined publication output of these three fields surpasses 50%, emphasizing their substantial contributions to the study of Ibn Khaldun.

The Web of Science index for the 195 selected items is detailed in Table 3. The three Web of Science Index categories with the highest number of records, listed in descending order, were the emerging sources citation index (ESCI), the arts & humanities citation index (A&HCI), and the social sciences citation index (SSCI).

Approximately 38% (75 publications) of the documents originated from the ESCI, while approximately 26% (50 publications) were sourced from the A&HCI. Furthermore, approximately 18% (36 publications) of the writings were derived from the SSCI. The statistics presented in this study highlight the widespread dissemination of written works across multiple indices in the WOS.

Table 3. Web of Science Index

Web of Science Index	Record Count	% of 195
Emerging Sources Citation Index (ESCI)	75	38.462
Arts & Humanities Citation Index (A&HCI)	50	25.641
Social Sciences Citation Index (SSCI)	36	18.462
Book Citation Index – Social Sciences & Humanities (BKCI-SSH)	32	16.41
Conference Proceedings Citation Index – Social Science & Humanities (CPCI-SSH)	7	3.59
Science Citation Index Expanded (SCI-EXPANDED)	4	2.051
Book Citation Index – Science (BKCI-S)	1	0.513
Conference Proceedings Citation Index – Science (CPCI-S)	1	0.513

Source: based in data retrieved in WoS

RESULT AND DISCUSSION

Top contributing countries and regions analysis

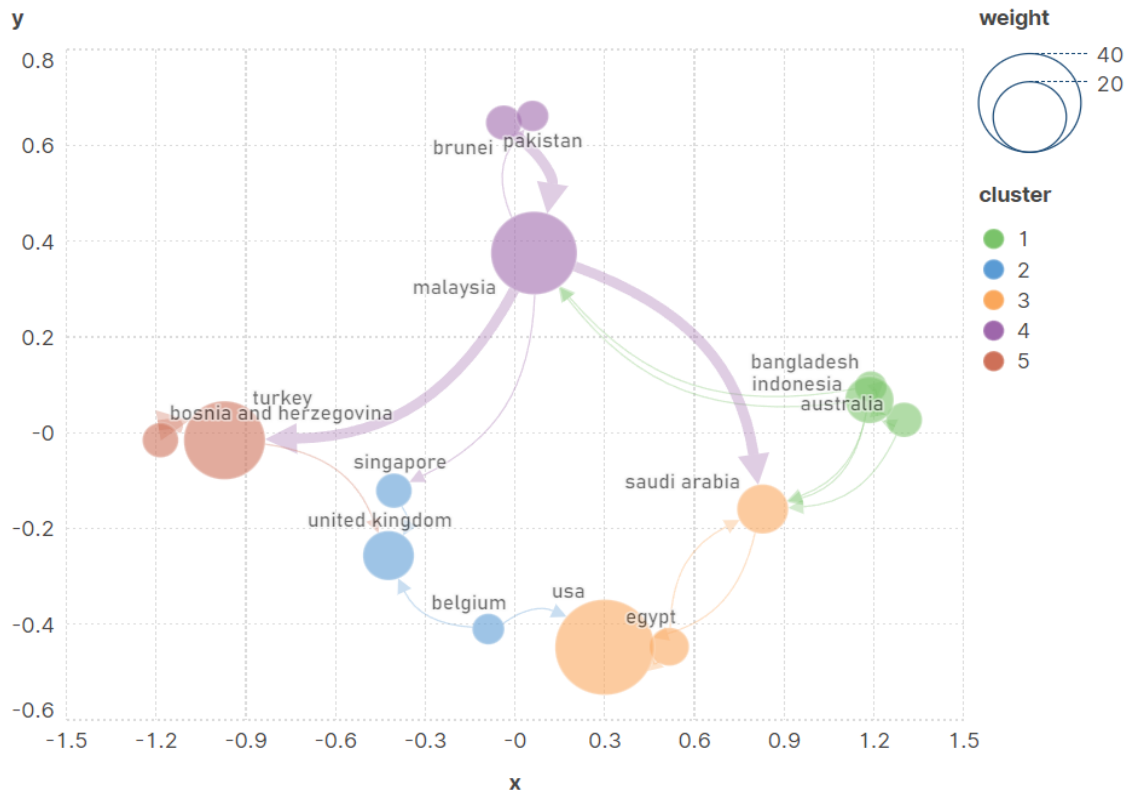
Figure 1 displays the top 14 countries and regions that produce the most research on Ibn Khaldun, ranked by the number of research publications. The dots in the graph are sized proportionally to represent the size of the contribution to the literature. Larger dots indicate a higher number of publications indicating a more significant contribution. The United States of America is at the top of the table with 35 publications while Malaysia is in second place with 26 publications, and Turkey is in third place with 23 publications. This figure effectively illustrates the necessity of the study and the significance of Ibn Khaldun's theories among Muslim nations, as well as the notable interest in his ideas in non-Muslim nations.

Publication volume and citation frequency analysis

According to the citation analysis report from the WOS database, we found that the total number of publications amounted to 195, with an average of approximately 19 publications per year. The cumulative citation frequency for these documents is 256, with an average of approximately 28 citations each year. These data offer valuable insights into the vibrancy of the field of Ibn Khaldun studies and the impact of the literature, reflecting sustained attention to Ibn Khaldun in works that have a strong record of academic citations.

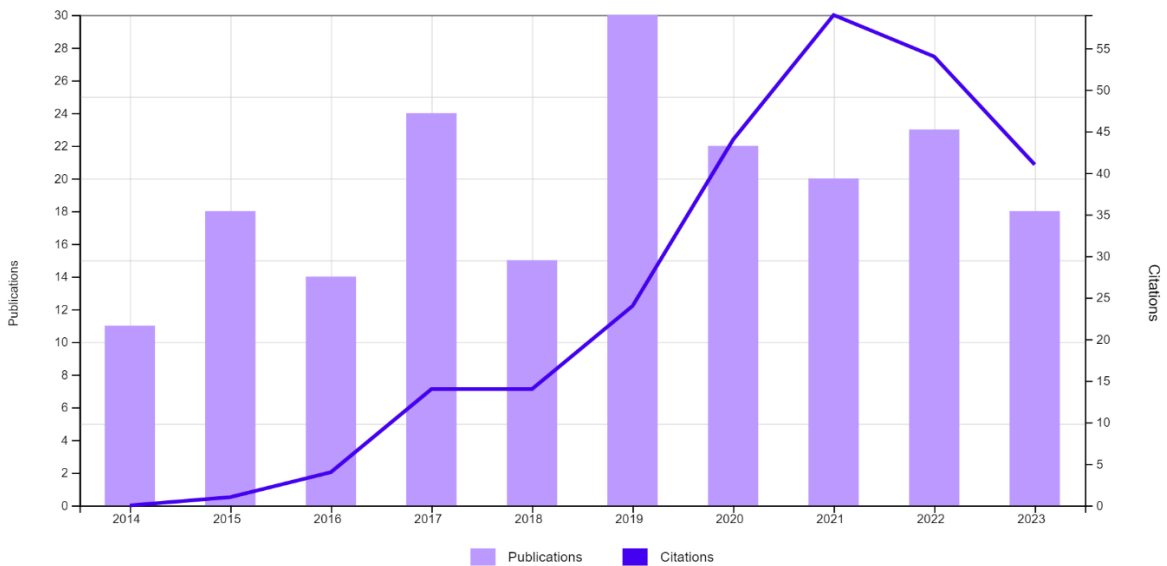
Figure 2 illustrates the publication volume and citation frequency of literature on Ibn Khaldun. Except for the year 2019, which reached 30 publications, the annual publication volume from 2014 to 2023 remained below 30. The growth trend in the number of publications has not shown an exciting upward trajectory. Meanwhile, the citation frequency showed a consistent rising trend until 2021, followed by a subsequent fall.

Figure 1. Publication of Ibn Khaldun works by frequency and location: The top 14 countries and regions



Source: result of Scimago Graphica

Figure 2. Distribution of the publication volume and citation frequency of Ibn Khaldun literature



Source: based in data retrieved in WoS

Top journal analysis

Table 4 lists the top 10 journals. The Journal of Historical Sociology has included the largest number of research publications on Khaldun in the past decade, but only 11 items. The remaining journals contain fewer than 10 documents. Figure 2 and Table 4 together reflect the exceptional difficulties encountered in promoting the academic examination of Ibn Khaldun. It is essential to explore new areas of study to maintain the creative edge and leadership in the sector.

Table 4. Top 10 periodicals

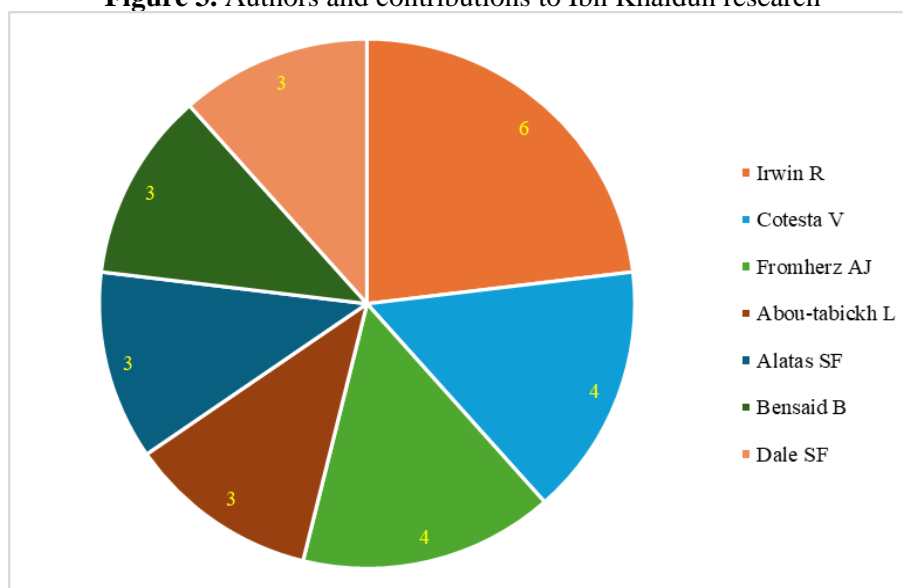
Periodical Titles	Record Count	% of 195	Periodical Titles	Record Count	% of 195
Journal of Historical Sociology	11	5.641	Journal of North African Studies	4	2.051
Philosophy East West	8	4.103	Philological Encounters	4	2.051
Ibn Khaldun an Intellectual Biography	5	2.564	Afkar Journal Akidah Pemikiran Islam Journal of Aqidah Islamic Thought	3	1.538
Heavens and the Earth	4	2.051	Al Masaq Journal of the Medieval Mediterranean	3	1.538
International Comparative Social Studies	4	2.051	Critical Sociology	3	1.538

Source: based in data retrieved in WoS

Authors and contributions analysis

Figure 3 illustrates authors who have contributed 3 or more publications to Ibn Khaldun studies. One academic, Irwin R., has thus far written six papers that are pertinent to the topic of Ibn Khaldun. Abou-Tabickh L., Alatas S.F., Bensaid B., and Dale S.F. have each contributed three relevant works, while Cotesta V. and Fromherz A.J. have published four works each. An analysis was conducted on the works of these authors that have a reference count exceeding 10, utilizing the data recorded in WOS. The specific information regarding these works is presented in Table 5.

Figure 3. Authors and contributions to Ibn Khaldun research



Source: result of Excel software

Table 5 lists five documents with their details. The primary focus of Work I revolves around the biography of Ibn Khaldun (Irwin R., 2018). Work II focuses on the visual representations of Greco-Roman, Ancient Chinese, and Medieval Islamic civilizations, delving into their origins and distinctive features (Cotesta, 2021). The primary topic of Work III is a thorough elucidation of the term *asabiyya* (Abou-Tabickh, 2022). Work IV specifically examines Ibn Khaldun's notion of slavery and the cyclical patterns of development and collapse in nations, with a particular emphasis on his analysis of luxury and the passage of time (Alatas, 2017). The main research topic of Work V is Ibn Khaldun's perspectives on critical thinking and the critique of intellectual disciplines (Machouche & Bensaid, 2015).

Table 5. The details of highly referenced publications by the most-published authors

No.	Author (Year)	Title	References	Citations	Document types
I	Irwin (2018)	Ibn Khaldun: An Intellectual Biography	208	48	Article & Book Chapter
II	Cotesta (2021)	The Heavens and the Earth: Graeco-Roman, Ancient Chinese, and Mediaeval Islamic Images of the World Preface	904	0	Editorial & Book Chapter
III	Abou-Tabickh (2022)	How Significant Is the Term 'Condition' (hal) to Understanding Ibn Khaldun's Historical and Political Thought? Al-'Asabiyya as an 'Essential Condition' of Human Association	43	1	Article
IV	Alatas (2017)	Luxury, State, and Society: The Theme of Enslavement in Ibn Khaldun	12	3	Article
V	Machouche & Bensaid (2015)	The Roots and Constructs of Ibn Khaldun's Critical Thinking	32	5	Article

Source: based in data retrieved in WoS

Keyword co-occurrence

The researchers performed a co-occurrence study incorporating all of the keywords, which encompassed both the "authors' keywords" and the "keywords plus" suggested by the VOSviewer.

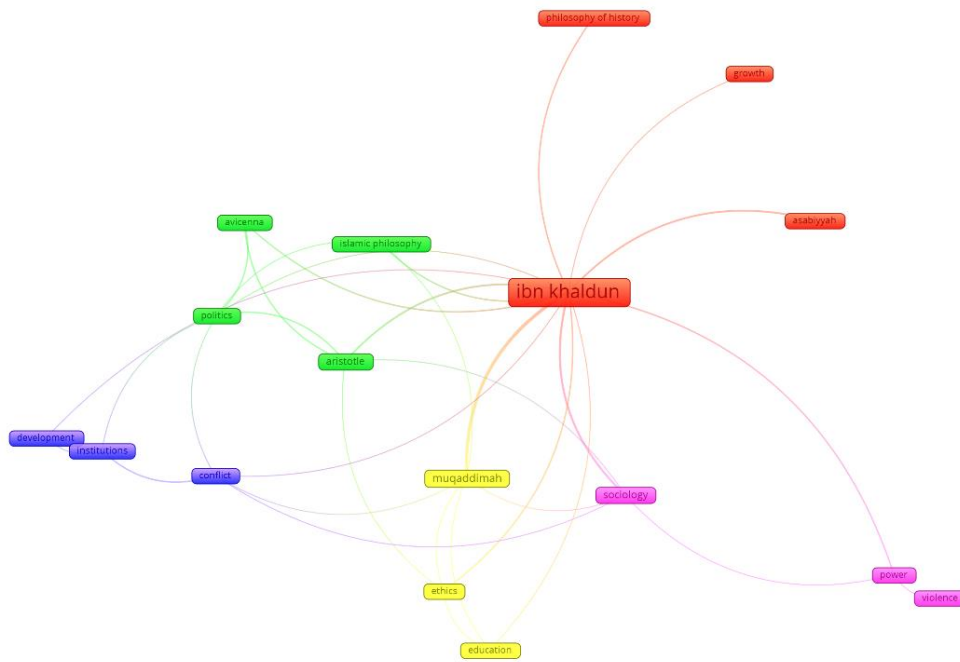
Figure 4 depicts the co-occurrence network of keywords in Ibn Khaldun research. Researchers set the minimum co-occurrence of keywords to 3, resulting in 17 valid keywords. In Figure 4, there are 5 clusters distinguished by different colors. Cluster 1, marked in red, consists of 4 nodes, focusing primarily on Ibn Khaldun's philosophy of history. The most important keywords are Ibn Khaldun (total line strength = 33, occurrences = 67), *asabiyyah* (total line strength = 3, occurrences = 4), and philosophy of history (total line strength = 2, occurrences = 4). Research is focused on the resonance of Ibn Khaldun's perspectives with Western and Arab intellectuals in Cluster 2, which is represented by 4 nodes in green. Aristotle (total line strength = 9, occurrences = 6) is the most significant keyword. The second is politics (total line strength = 8, occurrences = 4), and the third is Avicenna (total line strength = 6, occurrences = 3). Cluster 3, in blue, comprises 3 nodes, primarily studying the relationship between the institutions described by Ibn Khaldun and conflict and development. Keywords include institutions (total line strength = 4, occurrences = 4), conflict (total line strength = 6, occurrences = 3), and development (total line strength = 2, occurrences = 3). The three nodes that make up Cluster 4, which is yellow, center on Muqaddimah's ideas on ethics and education. The most important keywords are Muqaddimah (total line strength = 13, occurrences = 10), ethics (total line strength = 5, occurrences = 4), and education (total line strength = 3, occurrences = 3). Cluster 5, in purple, is marked by 3 nodes, primarily studying Ibn Khaldun's sociological thinking. Key terms include sociology (total line strength = 8, occurrences = 8), power (total line strength = 4, occurrences = 3), and violence (total line strength = 1, occurrences = 3). These color-coded clusters vividly illustrate the different themes and research directions in the field of Ibn Khaldun studies.

Figure 5 illustrates the co-occurrence overlay network of Ibn Khaldun studies. Utilizing the overlay network,

researchers identified four recent popular terms: conflicts (occurrences = 3, Avg. pub. year: 2022.67), politics (occurrences = 4, Avg. pub. year: 2021.75), institutions (occurrences = 4, Avg. pub. year: 2021.50), and violence (occurrences = 3, Avg. pub. year: 2021.33).

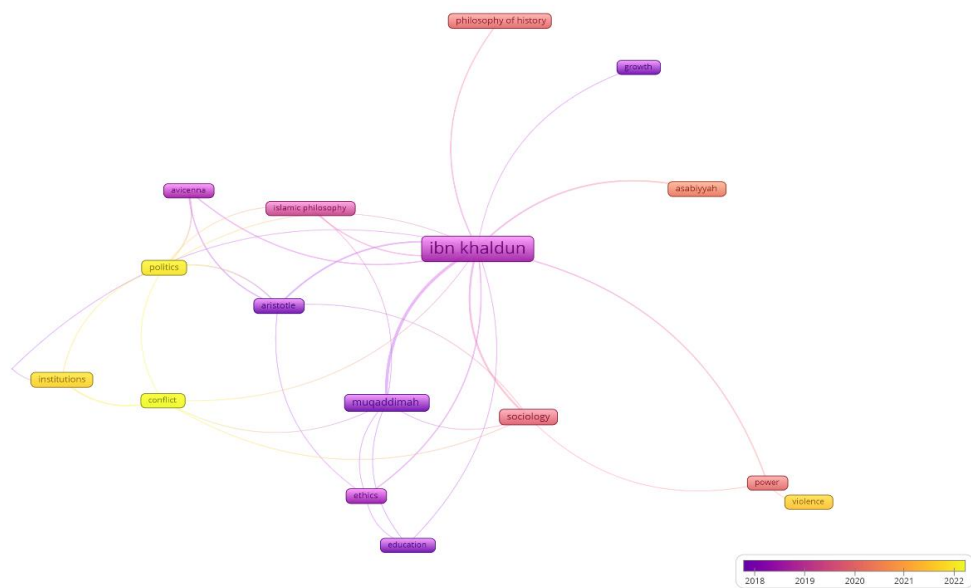
Figure 6 exhibits keyword co-occurrence in the clusters of Ibn Khaldun studies. Ibn Khaldun, *Muqaddimah*, sociology, Aristotle, and institutions are the most prevalent terms in this cluster. These findings reflect the academic inclination toward specific themes in Ibn Khaldun research.

Figure 4. Keyword co-occurrence in the network of Ibn Khaldun studies



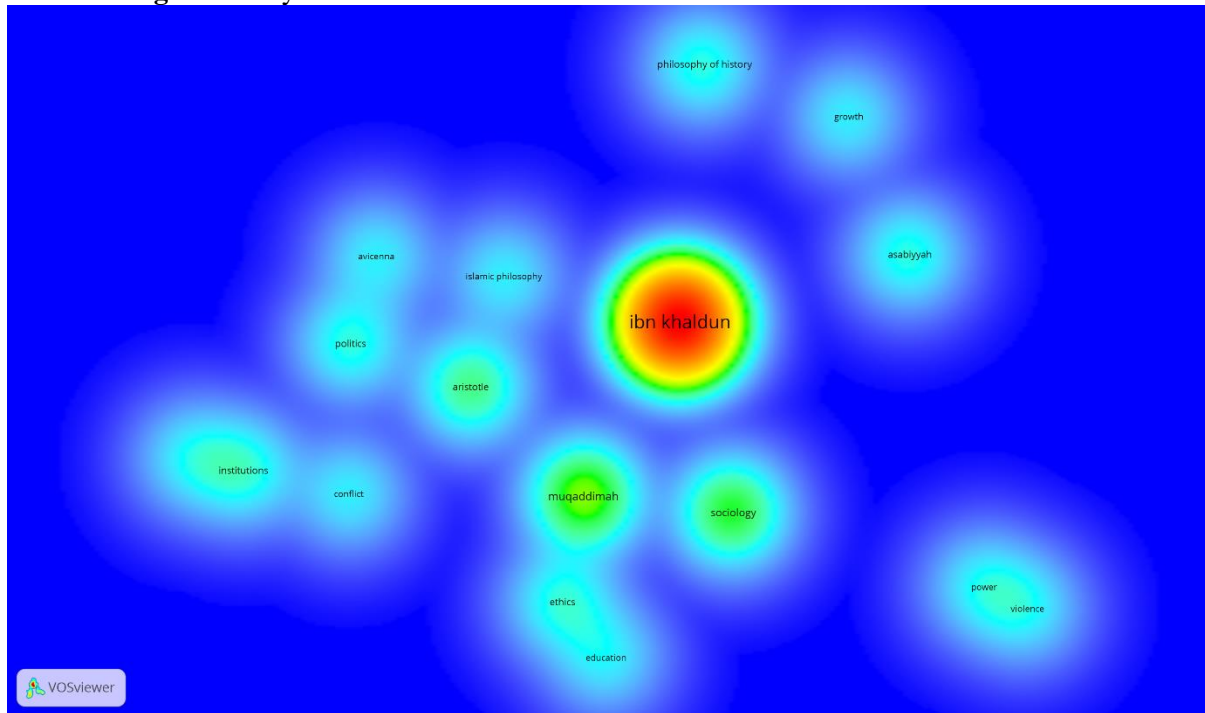
Source: result of VoSviewer

Figure 5. Keyword co-occurrence in the overlay network of Ibn Khaldun studies



Source: result of VoSviewer

Figure 6. Keyword co-occurrence in the clusters of Ibn Khaldun studies



Source: result of VoSviewer

CONCLUSION

Ibn Khaldun is an important medieval Arab scholar. His thought continues to provide profound inspiration for contemporary society (Nizamuddin & Şentürk, 2008; El-Kholei, 2019). However, the trends seen in the quantity of published items and the frequency of citations during the last decade are quite concerning. Statistical analysis reveals a subdued state in the academic exploration of Ibn Khaldun's ideas, with scholars showing a notable lack of enthusiasm for Ibn Khaldun research. This compels us to engage in a thorough contemplation of the orientations and trajectories of intellectual inquiry into Ibn Khaldun studies.

Utilizing advanced big data visualization analysis techniques offers extensive research prospects for delving into the ideas of Ibn Khaldun. Moreover, successful examples in this realm already exist. For instance, Kholiq et al. (2022) and Maripatul Uula (2022) have showcased the effective application of visualization analysis methods in the study of Ibn Khaldun's economic thought through their papers published in *Islamic Economics and History*.

The study of Ibn Khaldun's ideas primarily occurs in fields such as politics, history, and sociology, often referred to as traditional research. However, Ibn Khaldun's thought itself is inherently interdisciplinary, as evidenced by contributions in interdisciplinary fields in the social sciences and the humanities. The publications in these two categories comprise approximately 12% of the total publications, ranking fourth among all categories. Therefore, interdisciplinary research on Ibn Khaldun's thought has ample space for growth, presenting new possibilities for further exploration and expansion of the applications of Ibn Khaldun's ideas.

Comparative research stands out as one of the contemporary academic hot points in the study of Ibn Khaldun's ideas. Recent research primarily centers on comparisons between Ibn Khaldun and Western and Arab thinkers. However, the Asian region is home to many distinguished intellectuals whose ideas have a lasting impact on modern society and resonate with the theories of Khaldun, such as Confucius (Shi & Kang,

2022; Billioud, 2016; Karim, 2006). Additionally, Confucianism and Ibn Khaldun's thought are integral components of Chinese and Arab-Muslim cultures, respectively (Khaldun, 2014). Therefore, comparative studies of Confucianism and Ibn Khaldun's thought can offer valuable perspectives on understanding both Chinese and Arab-Muslim cultures. In-depth research in this area will contribute to a more comprehensive understanding of the universality and applicability of Ibn Khaldun's ideas. Conducting research in this field may produce language and comprehension barriers. However, scholars with a keen interest in both cultures are expected to make significant contributions to the future study of Ibn Khaldun.

While we have obtained a reasonably satisfactory forecast of the research prospects for Ibn Khaldun studies, relying on a single database for data collection may result in a lack of comprehensive coverage in our study. This is an aspect that we need to refine in the subsequent stages of our research.

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