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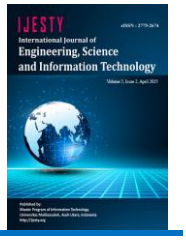

Mapping Research Studies Crowdsourcing Role in The New Era 5.0

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Abstract

Crowdsourcing has emerged as an innovative strategy that utilizes mass collaboration to solve problems, gather ideas, and generate solutions in various fields. This research aims to identify articles that examine the role of crowdsourcing in the new 5.0 era and provide an understanding of crowdsourcing as an innovative approach to marketing. In addition, this research aims to show and explain the mapping of research relevant to the theme. In Industry 5.0, crowdsourcing has entered the marketing world and is starting to be used by some companies. This research uses qualitative methods with bibliometric techniques by utilizing Similarity Visualization (Vosviewers) as an application by entering keywords such as External Stimulus, Cognitive Response, External Stimulus, Opportunity, Barriers, SME, Innovation, Innovator, Knowledge, Digital Sharing to search for articles through Publish or Perish with a total of 346 articles which were then processed using VosViewers. The analysis results found that scientific mapping and the possibility of future research on crowdsourcing can be used as a recommendation variable for future researchers and as a reference for future articles.

Keywords: *Crowdsourcing, Strategy, Innovative, Solution, New Era 5.0.*

1. Introduction

The rapid advancement of technology and digital transformation has made crowdsourcing an innovative strategy to enhance collaboration between individuals and organizations. The 5.0 era, which integrates humans and technology, opens up new opportunities for crowdsourcing in various fields. Crowdsourcing, which brings together ideas, content or solutions from many people, allows companies and institutions to tap into the knowledge and creativity of the wider community. In the 5.0 Era, where AI, IoT, and big data are interconnected, crowdsourcing links advanced technology and human needs. Changes in working and social interaction demand an inclusive and collaborative approach. Crowdsourcing accelerates innovation and creates an environment that encourages everyone's active participation, improving decision-making and relevant and sustainable solutions. In addition, Era 5.0 emphasizes social responsibility and sustainability. Crowdsourcing supports projects that are more sensitive to the needs of society and the environment. By leveraging the collective voice, organizations can create products and services that meet the market while reflecting social and environmental values.

Crowdsourcing in Era 5.0 focuses on technological innovation and positive social impact. This approach strengthens cross-disciplinary collaboration and encourages holistic and inclusive solutions. In the future, integrating crowdsourcing with advanced technology can strengthen communities by valuing and accommodating individual voices in decision-making. This creates an environment that is more responsive to changes and community needs. With crowdsourcing, organizations can accelerate innovation and expand solutions, bringing in new perspectives that are often overlooked. This approach also reduces the producer and consumer divide and creates constructive dialogue. In this complex era, crowdsourcing enables a more efficient exchange of ideas and resources, empowering individuals to shape a better future. Overall, crowdsourcing in the 5.0 Era is becoming essential for facing global challenges and driving sustainable innovation by engaging the entire society.

2. Literature Review

Crowdsourcing has emerged as a significant phenomenon in advancing information and communication technology. In the 5.0 era, where technology is not only used for efficiency but also to improve human well-being, the role of crowdsourcing is becoming increasingly important. [1] In this 5.0 era, crowdsourcing is also increasingly important in product design, where companies can collect feasible design solutions from diverse individuals through open invitations to an unlimited public [2]. In community crowdsourcing, users often

utilize their previous expertise to develop design solutions from many users to share information and solve complex problems collaboratively [2], [3] Most research on crowdsourcing recognizes that this method has unique advantages in gathering product ideas, including the ability to get high-quality ideas at a low cost, this technology is increasingly popular in various Internet applications [2] [3].

Table 1. External Stimulus Factors

Factor	Description	Resources
External Stimulus	Perceived usefulness and perceived user-friendliness	[4], [5], [6], [7], [8]
Opportunity	Efficient problem-solving, cost and time reduction, and knowledge	[9], [10], [11]
Barriers	Problems understanding structure, sources of information that do not lead to solutions, managing crowds and language barriers	[12], [13], [14]
SME	Technology acceptance, government support, cost of compliance, innovative practices, adaptability to change, and strong business model.	[11], [15], [16]
Innovation	Providing more opportunities, such as implementing initiatives, can improve company performance.	[2], [17], [18]
Innovator	User engagement is a key source of innovation, growing digitization and technology modularity.	[19], [20], [21]
Knowledge	Utilize Information and Communication Technology (ICT), heterogeneous knowledge, and web-based platforms.	[22], [23]
Digital	The role of social networks and social media as crowdsourcing platforms facilitates collaboration and rapid information dissemination.	[24], [25], [26]
Sharing	Generate more ideas and opinions, propose and generate new solutions.	[27], [28], [29]

External stimulus and cognitive response are used as keyword terms in bibliometric analysis. Researchers often use benefits, Drivers, Barriers and Challenges to express cognitive responses.

Table 2. Cognitive Response Factors

Factor	**Description**	**Resources**
Benefit	The power of belief, interpreting, making meaning, evaluating and understanding crucial aspects of personal experience.	[30], [31], [32]
Driver	Identify the information mission to improve the accuracy of information assessment in today's digital era.	[33], [34], [35]
Barries	How to integrate and account for the impact of confidence and curiosity.	[30], [36]
Challenge	Pooling of ideas for further consideration of various candidate ideas of varying quality.	[31], [36], [37]

3. Methods

This article uses qualitative research that uses a historical approach to identify developments, trends, and research mapping of the role of crowdsourcing in the 5.0 era. The study was conducted in two stages: data collection from international journal articles and bibliometric analysis to process data from article titles and abstracts. The results of this analysis reveal current trends and provide recommendations for future research themes or variables.

3.1. Collecting Data Method

The data collection consisted of research articles taken from a group of leading journal publishers: 1) Elsevier, 2) Emerald, 3) Springer, 4) Taylor & Francis, 5) Sagepub, and 6) ProQuest. Articles were collected from accessible databases of the six journal publisher groups. Search for articles using Publish or Perish (PoP). This software helps to find articles with relevant research topics. The data collection stages were as follows:

1. Search is limited to the years 2008-2024.
2. The title words used as search criteria are ["Crowdsourcing"].
3. The Combination of keywords used as search criteria consist of two combinations. The first Combination. ["external stimulus"; "cognitive response"]. The second Combination ["external stimulus"; "cognitive response"; "opportunity"; "barriers"; "SME"]. The third Combination [" innovation"; "innovator"; "knowledge"; "digital"; "sharing"].
4. Furthermore, research collected by the software is reduced based on journals written in English. Source articles from reputable journals.
5. Search is limited to journal articles in the scientific fields of management, business, economics, social, information and entrepreneurship. In this study, the data collected did not include conference results, meeting results or books.
6. The articles to be analyzed are examined for the completeness of the research related to the existence of "title", "Abstract", and "keywords".
7. Completeness to be considered in selecting articles to be processed are DOI, publishing journal, publisher, article URL, Number of citations, GS Ranking, CitesPerYear, CitesPerAuthor, and AuthorCount.

Articles collected from searches using Publish or Perish from 2008 to 2024 have 346 articles. With a combination of search titles and keywords, as shown in Table 3.

Table 3. Search Combinations and Number of Articles Generated.

Title	Keywords	Number
["Crowdsourcing"]	External Stimulus, Cognitive Respons	260 Articles
["Crowdsourcing"]	External Stimulus, Cognitive Respons, Opportunity, Barriers, SME	13 Articles
["Crowdsourcing"]	Innovation, Innovator, Knowledge, Digital, Sharing	73 Articles

3.2. Analysis Data Method

Bibliometric analysis was conducted using the VOSviewer application. The results of this analysis produce a bibliographic map related to the crowdsourcing role in the new era 5.0. [38]This bibliometric analysis uses the Vosviewers application to display the results as mapping data. Similarity Visualization (Vosviewers) uses text mining capabilities to identify relevant component concept/phrase combinations in an integrated mapping and clustering approach to cite and analyze data to explore networks. It is an analysis application that brings events together. Analysis results are used to map the field and create bibliographies. Vosviewers can provide up-to-date information and the scope of research conducted in this field [39].

4. Results And Discussions

4.1 Number of Publication Years

The early 2020s were a pivotal moment in the development of crowdsourcing, as the increasing adoption of technology and digitization created new opportunities for community collaboration. The number of studies on crowdsourcing continues to rise, fueled by advances in artificial intelligence and data analytics that enable more efficient interactions. These technological ecosystem changes have transformed how businesses operate and innovate. This has prompted many researchers to investigate the role of crowdsourcing in the 5.0 era, both as the article's main topic and as keywords in the publication. The search results showed 346 articles from 2008 to 2024, as shown in Table 4.

Table 4. Numbers of Publication Years from 2008-2024

Year	Publication Years	Year	Publication Year
2008	4	2017	25
2009	1	2018	17
2010	5	2019	34
2011	4	2020	41
2012	12	2021	37
2013	16	2022	27
2014	23	2023	29
2015	27	2024	18
2016	22	Amount	346

Its value showed significant fluctuations from 2008 to 2024. In this context, research on crowdsourcing is still relatively unpopular. However, it is likely that in the next few years, this topic will attract more and more attention and become highly desirable.

4.2. Author Analysis

The author's analysis uses the Google Scholar (GS) ranking. GS has the same function as Thomson ISI Web of Knowledge, which produces Journal Impact Factors (JIF). JIF assesses the impact factor of articles [45]. GS has an advantage in ranking through access to free articles. Access to free articles allows researchers to use the article as a reference, regardless of the financial capabilities of the institution where the researcher is.

Table 5. Active Publication per Years from 2008-2024.

Author's Name	Title	GS Rank
X Liu (2012)	Experimental Studies of Culture, Diversity and Crowdsourcing	368
FJC Garcia, J Lopes, X Liu, H Hastie (2020)	CRWIZ: A framework for crowdsourcing real-time wizard-of-oz dialogues	243
Cao Fang, Weiquan Wang, Eric Tze Kuan Lim, XinMei Lui, Chee-Wee Tan (2022)	Do social dominance-based faultlines help or hurt team performance in crowdsourcing tournaments?	298
Xicheng Yin, Kevin Zhu, Hongwei Wang, Jiaping Zhang, Wei Wang, Heng Zhang (2022)	Motivating participation in crowdsourcing contests: The role of instruction-writing strategy	55
Ming Wu, Xiaochun Yin, Qianmu Li, Jing Zhang, Xinqi Feng, Qi Cao & Haiyuan Shen (2020)	Learning deep networks with crowdsourcing for relevance evaluation	258
Lingfei Zou, Jinlong Zhang, Liu Wenxing (2015)	Perceived justice and creativity in crowdsourcing communities: Empirical evidence from China	238
Lingfei Zou, Weiling Ke, Jinlong Zhang, Kwok Kee Wei (2014)	User creativity in the crowdsourcing community: From an extrinsic motivation perspective	217
Ruoyu Liang, Zi Ye, Jing Zhang, Liwen Shi, Zhangfan Shen, Wenbin Du (2023)	Continued participation in crowdsourcing innovation: the role of web-specific computer self-efficacy	168

GS ranking can be seen from the author's contribution to producing articles yearly. Five authors actively write based on the data collected. Table 5 discusses the authors contributing articles each year by looking at the GS rank. Table 5 shows the authors' contribution to producing articles annually [38].

4.3. Citation Analysis

Citation analysis shows how many articles are cited or referenced by other researchers. Crowdsourcing-related researchers increased from 2018 to 2020.

The changing environment in the 5.0 era brings new challenges in business management, driving the importance of crowdsourcing as an innovative solution. Business managers, both large enterprises and SMEs, must be able to utilize mass collaboration to adapt to fast dynamics. The increasing role of crowdsourcing demands the commitment of researchers and practitioners to continue developing scientific approaches to optimize collaborative potential to answer increasingly complex business management problems in this digital era.

Table 6. 25 Top 25 Authors and Articles Cited in Crowdsourcing Publication

Author's Name	Publisher	Citied Frequency
DC Brabham (2008)	Convergence: The Internasional Journal of Research into New Media Technologies	3618
DC Brabham (2008)	Convergence: The Internasional Journal of Research into New Media Technologies	3569
Enrique Estellés-Arolas, Fernando González-Ladrón-de-Guevara (2012)	Journal of Information Science	3000
Enrique Estellés-Arolas, Fernando González-Ladrón-de-Guevara (2012)	ournal of Information Science	2949
Jan Marco Leimeister, Michael J. Huber, Ulrich Bretschneider, Helmut Krcmar (2009)	Journal of Management Information Systems	1197
KB Sheenan (2018)	Communication Monographs	508
Tobias Hossfeld, Christian Keimel, Matthias Hirth, Bruno Gardlo, Julian Habigt, Klaus Dieopold, Phuoc Tran-Gia (2013)	IEEE Transactions on Multimedia	339
M Hossain, I Kauranen	Strategic Outsourcing: An International Journal	275

Author's Name	Publisher	Citied Frequency
V Chanal, ML Caron-Fasan (2010)	Management	222
RM Bauer, T Gegenhuber (2015)	Organization	199
H Simula, T Ahola (2014)	Industrial Marketing Management	193
Pavlo Bazilinskyy, SM Petermeijer, Veronika Petrovych, Dimitra Dodou, JCF De Winter (2018)	Transportation Research Part F: Traffic Psychology and Behaviour	188
Daniel McDuff; Rana El Kaliouby; Rosalind W. Picard (2012)	IEEE Transactions on Multimedia	172
Kuan-Ta Chen, Chi-Jui Chang, Chen-Chi Wu, Yu-Chun Chang, Chin-Laung Lei (2010)	IEEE Network	164
Eric Luis Uhlmann, Charles R. Ebersole, Christopher R. Chartier, Timothy M. Errington, Mallory C. Kidwell, Calvin K. Lai, Randy J. McCarthy, Amy Riegelman, Raphael Silberzahn, Brian A. Nosek (2019)	Perspectives on Psychological Science	160
Yannis Charalabidis, Euripides N. Loukis and Aggeliki Androutsopoulou, Vangelis Karkaletsis, Anna Triantafillou (2014)	Transforming Government: People, Process and Policy	147
Lian Van Der Krieke, Bertus F Jeronimus, Frank J Blaauw, Rob B K Wanders, Ando C Emerencia, Hendrika M Schenk, Stijn De Vos, Evelien Snippe, Marieke Wichers, Johanna T W Wigman, Elisabeth H Bos, Klaas J Wardenaar, Peter De Jonge (2016)	International Journal of Methods in Psychiatric Research	144
D Geiger, M Rosemann, E Fielt (2011)	Association for Information Systems	136
Harriet R. Brown, Peter Zeidman, Peter Smittenaar, Rick A. Adams, Fiona McNab, Robb B. Rutledge, Raymond J. Dolan (2014)	PloS one	136
V Chanal, ML Caron-Fasan (2008)	EURAM	136
H Liang, MM Wang, JJ Wang, Y Xue (2018)	Computers in Human Behavior	134
S Vermicelli, L Cricelli, M Grimaldi (2021	R&d Management	132
K Goucher-Lambert, J Cagan (2019)	Information Processing & Management	122

4.4. Bibliometric Analysis

Research developments related to the role of crowdsourcing in the 5.0 era. So that research results can identify relevant and current research themes or variables, thus clarifying the potential impact of research if it is developed.

In the Co-authorship analysis, authors are associated with other authors' names. This analysis shows that the authors collaborated in conducting crowdsourcing-related research, as shown in Figure 1. Zhang J collaborated with other authors. Two research teams did the two articles published by Zhang J. Similarly, Yin X and Wang W have produced two articles published by different author teams.

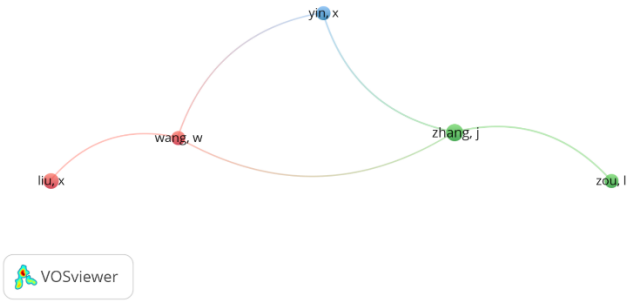

Fig 1. Author Network

The authors' collaboration shows a high commitment to continue researching the role of crowdsourcing. Table 7 shows the research titles of the authors who conducted the research.

Table 7. Author Collaboration.

Author	Title
Cao Fang, Weiquan Wang, Eric Tze Kuan Lim, XinMei Lui, Chee-Wee Tan (2022)	Do social dominance-based faultlines help or hurt team performance in crowdsourcing tournaments?
Xicheng Yin, Kevin Zhu, Hongwei Wang, Jiaping Zhang, Wei Wang, Heng Zhang (2022)	Motivating participation in crowdsourcing contests: The role of instruction-writing strategy
Ming Wu, Xiaochun Yin, Qianmu Li, Jing Zhang, Xinqi Feng, Qi Cao & Haiyuan Shen (2020)	Learning deep networks with crowdsourcing for relevance evaluation
Lingfei Zou, Jinlong Zhang, Liu Wenxing (2015)	Perceived justice and creativity in crowdsourcing communities: Empirical evidence from China
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Ming Wu, Xiaochun Yin, Qianmu Li, Jing Zhang, Xinqi Feng, Qi Cao & Haiyuan Shen (2020)	Learning deep networks with crowdsourcing for relevance evaluation

The results of the analysis with VOSviewer, which performs co-occurrence analysis, found 2,074 keywords related to crowdsourcing. To produce more specific keywords in the title and abstract keyword analysis, the occurrence of keywords was limited to 3. From the restriction of nine occurrences, 184 keywords are obtained, which are divided into 13 clusters, as shown in Table 8

Table 8. Keywords Clustering

Cluster	Keyword
Cluster 1	Behaviour, Capability, Cognitive Ability, Cognitive Load, Cognitive Load Perspective, Crowdsourcing Initiative, Experimental Research, Expert, Extrinsic Motivation, Feasibility, Mechanical Turk, Mturk, Performance, Period, Positive Response, Requester, Researcher, Reward, Sample, Science, Student, Time, Variety, Worker
Cluster 2	Antecedent, Chapter. Co-Creation, Cognitive Effort, Cognitive Process, Consequence, Cooperation, Crowdsourcing Contest, Education, Emotion, Human Cognition, Issue, Knowledge Sharing, Member, Online Crowdsourcing, Partner, Power, Product Development, Questionnaire, Relevance, Reliability, Respondent, Sense, Solver
Cluster 3	Accuracy, Advantage, Business Model, Characteristic, Cognitive Resource, Cognitive Surplus, Contributor, Conversational Crowdsourcing, Effectiveness, Higher Level, Industry, Interaction, Minute, Offline Crowdsourcing, Phenomenon, Professional, Response Rate, Smes, Success, Transformational Leadership
Cluster 4	Cognitive Capability, Cognitive Processing, Cognitive Psychology, Collective Intelligence, Crowdsourcing Method, Crowdsourcing Project, Crowdsourcing Study, Decision, Mean, Measure, Mobile Crowdsourcing, Recognition Time, Response Bias, Social Influence, Social Innovation, Test, View
Cluster 5	Application, Best Practice, Business, Cognitive State, Crowd Worker, Crowdsourcing Data, Crowdsourcing Setting, Emotional Response, Internet, Lesson, New Product Development, Online Crowdsourcing Platform, Outsources Task, Respond, Risk, Social Medium, Thesis
Cluster 6	Crowdsourcing Community, Empirical Analysis, Employee, External Crowdsourcing, Innovation Activity, Interest, Internal Crowdsourcing, Internal Crowdsourcing Platform, Openness, Part, Place, Popularity, Potential, R & D Departments, Resource Sharing
Cluster 7	Benefit, Category, Cognitive Learning, Contest Innovation, Crowdfunding, Idea

	Crowdsourcing, Incentive Mechanism, Innovation Management, Innovative Idea, Invalid Response, Knowledge Management, Reason, Sharing, Sme, User Motivation
Cluster 8	Cognitive Response, Dissertation, Form, Gamified Crowdsourcing, Investigation, Manufacturing, Microtask Crowdsourcing, Nature, Online Crowdsourcing Community, Product Design, Product Design Quality Control, Reaction, Solver Engagement, Stimulus Organism Response, Visual Content Analysis
Cluster 9	Area, Barrier, Crowdsourcing Process, Crowdsourcing Science, Driver, Enabler, Equity Crowdfunding, Integrative Perspective, Investment Process, Investors Decision
Cluster 10	Approach, Commercial, Crowdsourcing Application, Dynamics, Future, Isr, Shelf, Social Networking, Social Networking Technology, Vgi
Cluster 11	Base, Definido Este Termino, Desarrollado Una, El Caso, Iniciativa, Inteligencia Colectiva, Ocho Elementos Crowdsourcing, Que Al Crowdsourcing Respecta
Cluster 12	Crowdsourcing Performance, Experiment, Lack, Relationship, Requirement, Software Crowdsourcing Design, Task Design
Cluster 13	Influencing Factor, Speech Quality Assessment

The results of the Network Visualization Analysis show that many small nodes represent the keywords generated from the analysis, as shown in Figure 2. This visualization shows that there are still many research gaps that exist today. A lot of crowdsourcing-related research is needed to fill these research gaps. For example, the crowdsourcing node "Software Crowdsourcing Design" has not been connected to the crowdsourcing node "Extrinsic Motivation". More research is needed to explain the causality of each node. The explanation of the causal relationship generated by this research will generate scientific knowledge that can understand, explain, and control crowdsourcing.

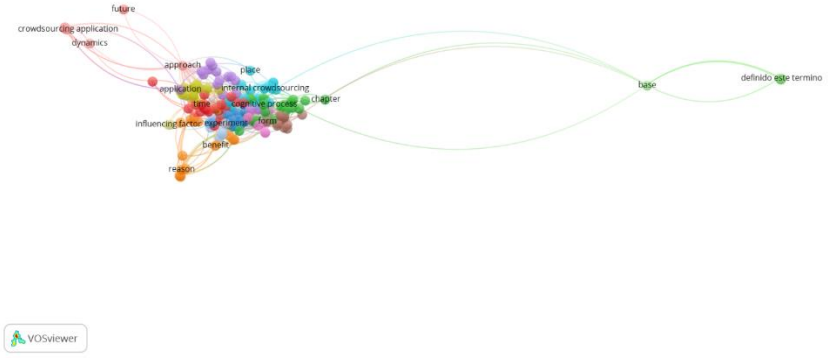

Fig 2. Network Visualization in Crowdsourcing

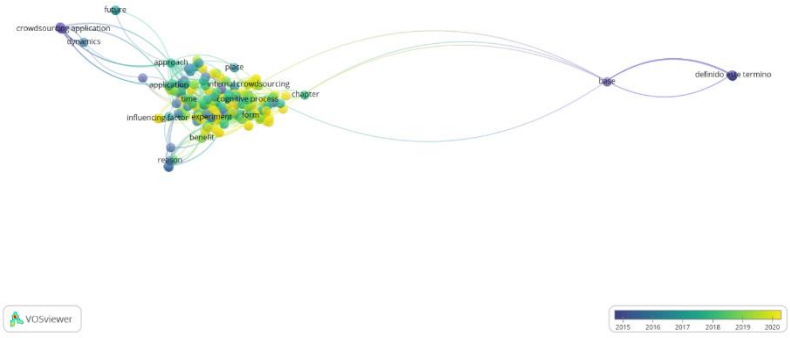

Fig 3. Overlay Visualization in Crowdsourcing

Figure 3 shows that most themes have a bright yellow node colour. The yellow colour indicates that most of the articles published are around 2020. Based on the results of this analysis, it can be assumed that the themes related to crowdsourcing are the most recent.
Based on the Overlay Visualization, themes related to crowdsourcing are the most recent studies. According to the previous data, research on product crowdsourcing in general has been significant since 2018.

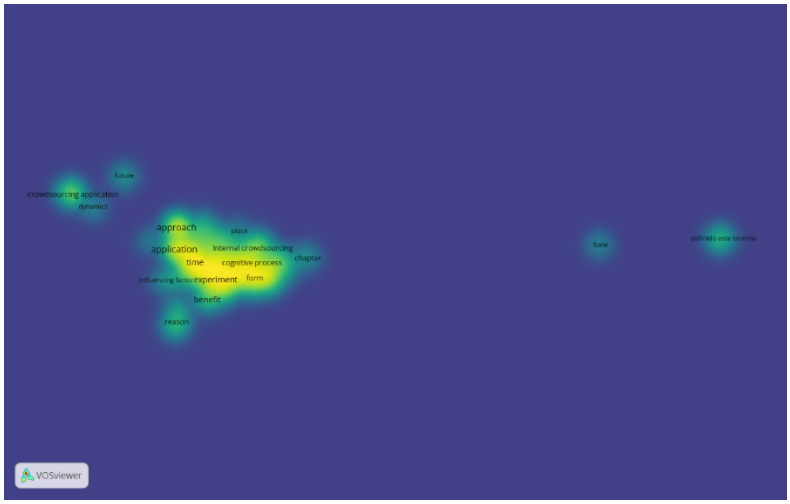

Fig 4. Overlay Visualization in Crowdsourcing

Figure 4 shows the research on crowdsourcing, with most of the focus on the approach. This can be seen from the bright yellow areas that reflect the high density of subthemes such as "approach", "application", and "internal crowdsourcing". These themes are at the centre of attention in crowdsourcing research. At the same time, other areas with lower density, such as "base" and "definido este termino", indicate that there is still potential for further development and research in these subthemes.

5. Conclusions

Bibliometric analysis shows that the scientific mapping of the role of crowdsourcing in the 5.0 era still has many research gaps. This gap allows future researchers to continue research in this area. Several themes are recommended for further research related to the role of crowdsourcing.

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