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Artificial Intelligence in Social Entrepreneurship Research: A Bibliometric Analysis of Emerging Themes, Intellectual Structures, And Future Research Directions

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ABSTRACT

This study presents a bibliometric analysis of research on the intersection of artificial intelligence (AI) and social entrepreneurship using 72 Scopus-indexed publications. Although AI applications in social enterprises have expanded rapidly across management, information systems, engineering education, and sustainability studies, the intellectual structure of this emerging field has remained underexplored. Using VOSviewer, the study maps keyword co-occurrence networks to identify major research themes, temporal evolution, and research density. Five thematic clusters are identified: AI for social innovation and decision-making; entrepreneurship education and engineering pedagogy; digitalization and socio-economic effects; sustainable development and mission-driven entrepreneurship; and information systems and big data. Overlay visualization indicates that generative AI, machine learning, agent-based modeling, and computational decision support represent the most recent research frontiers, while sustainability and social enterprise constitute the field's established foundations. Density analysis further confirms social entrepreneurship and sustainable development as the core intellectual anchors, with AI-related topics showing increasing research momentum. Citation analysis identifies Popkova and Sergi (2020) as the most influential publication within the dataset. Overall, this study provides a systematic overview of the intellectual landscape of AI and social entrepreneurship research and highlights promising directions for future studies, particularly in generative AI applications, cross-national empirical research, and theory development for mission-driven enterprises.

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A. INTRODUCTION

Artificial intelligence (AI) has rapidly emerged as a transformative force across multiple domains of contemporary research and practice. Within social entrepreneurship a field concerned with the creation of social value through innovative organizational models AI presents both significant opportunities and unresolved theoretical questions (Popkova & Sergi, 2020). Social entrepreneurs increasingly deploy AI-enabled tools for impact measurement, stakeholder engagement, resource optimization, and opportunity identification in underserved markets. Despite this growing practical relevance, the academic literature at the intersection of AI and social entrepreneurship remains fragmented and lacks a systematic mapping of its intellectual structure.

Social entrepreneurship research has expanded substantially over the past two decades, drawing from management, sociology, public policy, and information systems. The field has evolved from examining basic definitions and typologies toward investigating the conditions under which social ventures create, scale, and sustain impact (Khan et al., 2022). The emergence of digital technologies and AI in particular has introduced a new layer of complexity, raising questions about how machine learning, predictive analytics, and generative AI alter the processes of opportunity recognition, resource mobilization, and value creation in social enterprise contexts (E. Kim & Jang, 2022), (Duong, 2025).

Bibliometric analysis offers a well-validated quantitative framework for mapping the intellectual structure of a research field (Alqahtani & Alqahtani, 2024). By examining keyword co-occurrence patterns, citation frequencies, and temporal trends in publication data, bibliometric methods can reveal which themes dominate current discourse, how the field has evolved over time, and where significant research gaps persist. Applied to the AI social entrepreneurship nexus, such analysis provides a structured foundation for identifying productive directions for future scholarship and for understanding how this interdisciplinary field is currently organized.

Despite the expanding body of work connecting AI and social entrepreneurship, no comprehensive bibliometric study has yet mapped this specific intersection. Existing reviews tend to either address AI in entrepreneurship broadly without distinguishing social dimensions (Alqahtani & Alqahtani, 2024), or examine social entrepreneurship without systematically engaging with AI as an enabling construct (Solaz et al., 2025). This gap motivates the present analysis, which aims to provide the first systematic bibliometric overview of research explicitly situated at the AI–social entrepreneurship interface.

This study uses publication data extracted from the Scopus database and employs VOSviewer to generate network, overlay, and density visualizations. The analysis seeks to identify dominant research themes and thematic clusters, trace the temporal evolution of key concepts, examine the most influential publications, and highlight emerging areas of scholarly inquiry. The findings are intended to support researchers in positioning new studies and to offer practitioners a clearer picture of what the evidence base currently covers and where it falls short.

B. RESEARCH METHOD

This study adopts a bibliometric methodology to examine the global research landscape at the intersection of artificial intelligence and social entrepreneurship. Bibliometric analysis is a quantitative approach that enables systematic evaluation of the intellectual structure of a research field by analyzing publication volumes, citation relationships, and keyword co-occurrence networks. This approach is well suited to the objectives of the present study, as it allows for objective, reproducible mapping of a

heterogeneous and rapidly expanding body of literature without the subjectivity inherent in narrative reviews.

Data were sourced from the Scopus database, selected for its comprehensive coverage of peer-reviewed literature across business, management, information systems, engineering, and social sciences. The search combined keywords including 'artificial intelligence,' 'social entrepreneurship,' 'AI,' 'machine learning,' 'social enterprise,' and 'social innovation.' No year restriction was applied to capture the full arc of the literature's development. Only documents written in English and classified as journal articles, conference papers, review articles, and book chapters were included. Following extraction, duplicate entries and records with insufficient bibliographic information were removed. The cleaned dataset of 72 publications served as the analytical foundation.

Bibliometric analyses were conducted using VOSviewer software. Keyword co-occurrence analysis was applied as the primary analytical technique, with a minimum keyword co-occurrence threshold to retain only statistically meaningful associations. The resulting network was examined across three visualization modes: the network visualization, illustrating thematic clustering and co-occurrence relationships; the overlay visualization, depicting temporal evolution of research themes based on average publication year; and the density visualization, representing relative research intensity around each keyword node (Alqahtani & Alqahtani, 2024), (Solaz et al., 2025). Citation analysis was also performed to identify the most influential publications, ranked by total citation count as reported in Scopus as of June 2026.

C. RESULTS AND DISCUSSION

Keyword Co-Occurrence Analysis

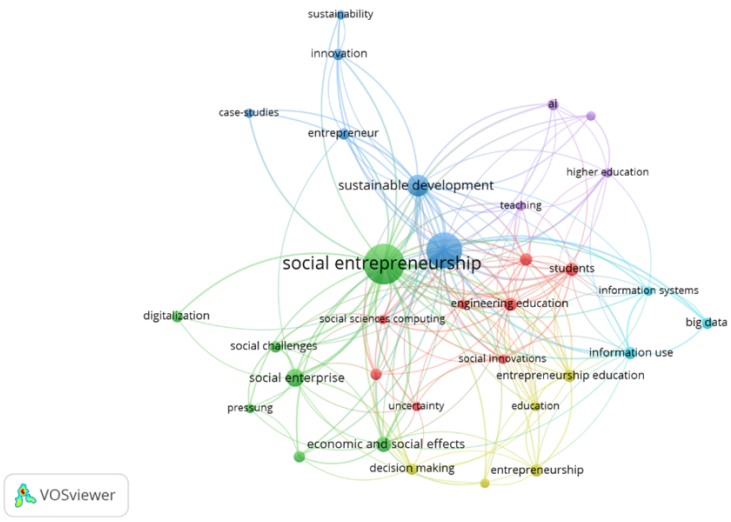

Figure 1. Network Visualization
Source: Data Analysis

Figure 1 presents the keyword co-occurrence network derived from bibliometric analysis of AI and social entrepreneurship research. The network displays an interconnected knowledge structure organized into five thematic clusters, distinguished by color. Node size reflects keyword frequency across the dataset, while edge thickness represents the strength of co-occurrence relationships between keyword pairs. At the center of the network, social entrepreneurship occupies the most prominent position, reflecting its role as the primary organizing construct. The green cluster encompassing social enterprise, social challenges, digitalization, economic and social effects, decision making, and entrepreneurship represents the socioeconomic and operational dimension of the field. This cluster captures research examining how digital

technologies and AI tools alter the structural and strategic conditions of social venture activity (Popkova & Sergi, 2020), (Khan et al., 2022).

The blue cluster groups sustainable development, innovation, entrepreneur, sustainability, and case studies, reflecting a research stream connecting AI enabled social entrepreneurship with long-term sustainability objectives. The density of connections between sustainable development and social entrepreneurship confirms that sustainability has emerged as a defining normative orientation of the field (C. Wang et al., 2026), (Kamaludin et al., 2026). The red cluster encompasses engineering education, students, teaching, and higher education, revealing a significant pedagogical dimension: researchers are examining how AI and social entrepreneurship themes are integrated into engineering and entrepreneurship curricula (Y. Chen et al., 2021), (Ng et al., 2024).

The yellow cluster associates entrepreneurship education, education, and entrepreneurship a closely related pedagogical grouping that overlaps with the red cluster but emphasizes broader educational contexts rather than engineering-specific programs. The cyan/teal cluster on the right side of the network groups information systems, big data, information use, and AI, capturing the technical infrastructure through which AI capabilities are operationalized in social enterprise contexts (J. Wang & Liu, 2019), (Offiong et al., 2025).

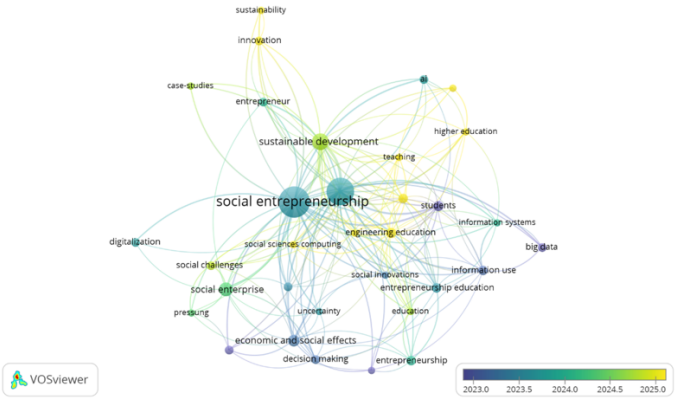

Figure 2. Overlay Visualization
Source: Data Analysis

Figure 2 presents the overlay visualization, where node color reflects the average publication year of articles associated with each keyword. Darker blue-purple tones indicate themes predominantly active in earlier years (approximately 2023 and before), while lighter green and yellow tones signal more recently active research themes (2024–2025). This temporal mapping reveals how scholarly attention has shifted over the study period.

Keywords rendered in darker tones including social enterprise, uncertainty, economic and social effects, and decision making reflect established research areas that were among the first to attract systematic investigation. These terms correspond to foundational work examining the structural and decision-theoretic dimensions of AI adoption in social enterprise contexts (E. Kim & Jang, 2022), (Maftah et al., 2023). Their darker coloration indicates mature thematic areas with sustained bodies of literature.

In contrast, terms appearing in lighter green and yellow including AI, teaching, students, higher education, and engineering education signal the most recently active research streams. This temporal pattern is particularly striking for AI itself, which appears as one of the most recent nodes, confirming that explicit AI-focused research within social entrepreneurship is a genuinely emerging phenomenon rather than an established tradition (Duong, 2025), (Capano et al., 2025). The pedagogical cluster (teaching, students) also appears in recent colors, suggesting that the integration of AI and social entrepreneurship themes in educational settings is a frontier opening in the current period.

Sustainable development occupies an intermediate temporal position, suggesting that while sustainability has been present in the discourse for several years, its connection to AI-enabled approaches is intensifying. This reflects broader global research trends linking digital technologies with sustainable development goals (C. Wang et al., 2026), (B & Ouchen, 2024).

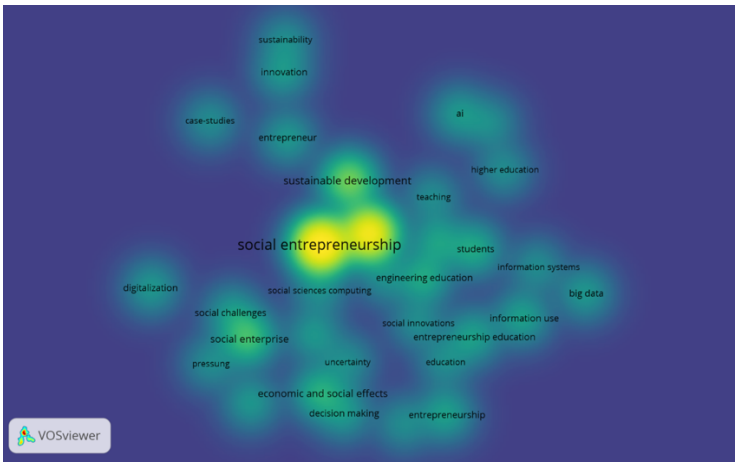

Figure 3. Density Visualization
Source: Data Analysis

Figure 3 presents the density visualization, where bright yellow regions indicate the highest co-occurrence concentration and research intensity, while green and blue areas reflect progressively lower density. The visualization reveals which concepts have attracted the greatest scholarly attention and constitute the most robust intellectual anchors within the literature.

The highest density zones, rendered in bright yellow, are concentrated around social entrepreneurship and sustainable development. These nodes represent the core of the literature, characterized by high individual keyword frequency and strong interconnectedness with surrounding conceptual domains. The intense concentration around social entrepreneurship confirms its status as the dominant organizing construct, drawing together multiple theoretical perspectives and empirical research streams (Popkova & Sergi, 2020), (Khan et al., 2022), (Solaz et al., 2025)

Moderate density areas in green surround entrepreneurship education, innovation, and social enterprise, indicating well-developed secondary research areas. The presence of engineering education within the moderately dense zone reflects the significant body of pedagogical research embedding social entrepreneurship and AI themes in curricula (Y. Chen et al., 2021), (Ng et al., 2024). Peripheral regions in blue—encompassing AI, big data, information systems, and information use represent frontier zones where scholarly activity is growing but has not yet achieved the concentration of the core clusters. These peripheral areas correspond precisely to the most recently active themes identified in the overlay visualization, confirming that AI-specific research within this field is still developing its intellectual foundations.

Citation Analysis

Table 1. Most Cited Article

Citations	Author and Year	Title	Publication
329	Popkova, E.G Sergi, B.S. (Popkova & Sergi, 2020)	Human capital and AI in industry 4.0. Convergence and divergence in social entrepreneurship in Russia	Journal of Intellectual Capital

46	Khan, R.U. Richardson, C Salamzadeh, Y. (Khan et al., 2022)	Spurring competitiveness, social and economic performance of family owned SMEs through social entrepreneurship; a multi-analytical SEM & ANN perspective	Technological Forecasting and Social Change
31	Chen, Y. et al (Y. Chen et al., 2021)	Innovation farm: Teaching artificial intelligence through gamified social entrepreneurship	Decision Sciences Journal of Innovative Education
20	Offiong, U.P. Szopik-Depczyńska, K. Ioppolo, G. (Offiong et al., 2025)	FinTech Innovations for Sustainable Development: A Comprehensive Literature Review and Future Directions	Sustainable Development
19	Liang, E.S. et al. (Liang & Bai, 2024)	Generative AI and the future of connectivist learning in higher education	Journal of Asian Public Policy
15	Kim, E. Jang, G.Y. Kim, S. H.(E. Kim & Jang, 2022)	How to Apply Artificial Intelligence for Social Innovations	Applied Artificial Intelligence
11	Ng, P.H.F. et al. (Ng et al., 2024)	Reimagining STEM Learning: A Comparative Analysis of Traditional and Service Learning Approaches	IEEE Transactions on Learning Technologies
9	Solaz, F.C. et al. (Solaz et al., 2025)	The digital divide in social entrepreneurship: A bibliometric analysis	Sustainable Technology and Entrepreneurship
6	Chen, J. et al. (J. Chen & Wang, 2024)	How Do Artificial Intelligence (AI) and Big Data (BD) Technologies Help Social Innovations?	Journal of Global Information Management
5	Duong, C.D. et al. (Duong, 2025)	Exploring the role of generative artificial intelligence (ChatGPT) adoption in digital social entrepreneurship: a serial mediation model	Social Enterprise Journal

Source: Scopus, 2026

Discussion

The findings of this bibliometric analysis reveal a research field that is simultaneously anchored in established social entrepreneurship theory and experiencing rapid expansion toward AI-specific themes. The network visualization confirms that social entrepreneurship functions as the central organizing construct, drawing together thematic clusters spanning socioeconomic analysis, sustainability, education, and information systems. This pluralism reflects the inherently interdisciplinary character of social

entrepreneurship research and the multiple pathways through which AI intersects with it (Popkova & Sergi, 2020), (E. Kim & Jang, 2022)

A particularly significant finding concerns the temporal positioning of AI as a keyword in the overlay visualization. Unlike sustainable development or social enterprise which appear in intermediate or earlier temporal zones. AI itself registers as one of the most recently active themes. This is not simply a function of the technology's recency; rather, it indicates that the academic community has only recently begun to engage with AI as a direct object of inquiry within social entrepreneurship research, rather than treating it as a background technical condition (Duong, 2025), (J. Kim, 2025) . This temporal lag creates both a research opportunity and a risk: the field may be building practical AI applications faster than theoretical frameworks for evaluating their social consequences.

The pedagogical cluster encompassing engineering education, students, and teachingemerging as a distinct and recently active thematic grouping is unexpected and deserves attention. It suggests that a substantial portion of AI–social entrepreneurship research is being produced within educational contexts, particularly in engineering and management programs exploring how AI-enabled social entrepreneurship can be taught and practiced by students (Y. Chen et al., 2021), (Ng et al., 2024). This raises questions about whether the field's empirical base is adequately grounded in the practices of operating social enterprises, or whether it is disproportionately shaped by pedagogical experiments and case studies from academic settings.

The density visualization's identification of sustainable development as a co-anchor alongside social entrepreneurship points to a normative dimension of the field that is often undertheorized. Research linking AI and social entrepreneurship is increasingly framed around sustainable development goals (SDGs), suggesting that scholars are positioning AI not merely as a tool for organizational efficiency but as an instrument of systemic social and environmental change (C. Wang et al., 2026), (Kamaludin et al., 2026), (B & Ouchen, 2024). This framing carries implications for how impact is measured and how success is defined in AI-enabled social ventures.

The citation analysis reinforces the observation that high-impact work in this field tends to combine computational methods with social and organizational theory. Works employing artificial neural networks, agent-based modeling, and machine learning alongside frameworks from social enterprise theory (Popkova & Sergi, 2020), (Khan et al., 2022), (E. Kim & Jang, 2022) are the most frequently cited, suggesting that methodological innovation is a key driver of scholarly influence. At the same time, the limited number of highly cited works and the recency of many indicates that the field has not yet produced a canonical set of theoretical foundations comparable to those in more established areas of entrepreneurship research.

Future research should address several gaps identified by this analysis. First, empirical studies grounded in the practices of operating social enterprises rather than educational simulations or case studies are needed to validate theoretical frameworks (Qiu et al., 2026). Second, the implications of generative AI and large language models for social entrepreneurship remain almost entirely unexplored in the current literature, representing a significant frontier (Duong, 2025), (Liang & Bai, 2024). Third, cross national and cross sectoral studies are needed to examine whether AI's role in social entrepreneurship varies systematically across institutional contexts, particularly comparing high-income and lower-income country settings (Popkova & Sergi, 2020), (Kamaludin et al., 2026)

D. CONCLUSION

This study presents a systematic bibliometric analysis of research at the intersection of artificial intelligence and social entrepreneurship, based on 72 publications indexed in the Scopus database. The findings demonstrate that this is a genuinely emerging field, structured around social entrepreneurship as a central intellectual anchor, with AI only recently becoming an explicit object of scholarly inquiry rather than a background technological assumption.

The keyword co-occurrence analysis identified five distinct thematic clusters AI for social innovation, entrepreneurship education, digitalization and economic effects, sustainable development, and information systems and big data each representing a coherent strand of inquiry with distinct theoretical commitments and methodological orientations. The overlay visualization confirmed that AI-specific themes, including generative AI, machine learning, and decision support systems, are among the most recently active in the dataset, confirming the frontier character of this research space. The density visualization established social entrepreneurship and sustainable development as the field's primary intellectual anchors, with AI-technical clusters positioned at the periphery but gaining momentum.

Citation analysis identified Popkova and Sergi (2020) as the most influential work, with 329 citations, followed by Khan et al. (2022) with 46, reflecting the field's early emphasis on macro-structural questions about AI, human capital, and economic performance. The dominance of methodologically innovative works combining computational approaches with social theory suggests that interdisciplinary methodological fluency is a key marker of high-impact scholarship in this area.

These findings carry clear implications for future research. The limited theoretical development of AI's role in social entrepreneurship, the underrepresentation of studies from operating social enterprises, and the near absence of research on generative AI in this context represent priority areas for future investigation. Scholars should also examine how institutional context, resource constraints, and social mission structures shape AI adoption patterns in social ventures. This study provides a structured map of the current literature and a data-grounded foundation for positioning such future research efforts.

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