Entrepreneurial Leadership as a Catalyst for Educational Innovation: A Bibliometric Review of Research Trends and Knowledge Structures

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Abstract. This study systematically maps the intellectual structure and research evolution of entrepreneurial leadership in the education sector from 2010 to 2025. Using bibliometric analysis on 105 Scopus-indexed documents processed through VOSviewer, the paper identifies publication trends, key authors, influential journals, and thematic clusters. The results reveal a continuous rise in scholarly output after 2020, reflecting growing recognition of innovation-driven and opportunity-oriented leadership in education. Three major knowledge clusters are identified: (1) entrepreneurial skills, innovation, and sustainable development (outcome-oriented dimension); (2) entrepreneurial leadership, entrepreneurship education, and social entrepreneurship (transformational dimension); and (3) entrepreneurial intention and learning (developmental dimension). The study conceptualizes entrepreneurial leadership as a multidimensional construct bridging entrepreneurship and leadership theories, linking individual initiative with institutional change. By highlighting its role in fostering adaptive, innovative, and socially responsible educational ecosystems, this research contributes to both theoretical integration and managerial practice. The implications emphasize how entrepreneurial leadership and cross-sector collaboration can enhance resilience and sustainability in educational services.

Keywords: entrepreneurial leadership, education sector, bibliometric analysis, VOSviewer

1. Introduction

In an era characterized by rapid technological advancement, demographic shifts, and disruptive global events, educational institutions face unprecedented pressures to innovate and remain competitive. Traditional leadership approaches which often rooted in hierarchical control and incremental change are increasingly insufficient to address the complexity of contemporary educational challenges, such as digital transformation, resource constraints, global competition, and evolving student needs (Mukhtar et al., 2025). Against this backdrop, entrepreneurial leadership has emerged as a compelling paradigm that integrates the opportunity-seeking behavior of entrepreneurs with the strategic vision and people-centered orientation of effective leaders (Shiferaw et al., 2023). Entrepreneurial leaders are distinguished by their ability to identify and exploit opportunities, mobilize resources creatively, and foster cultures of innovation and adaptability, making this leadership style particularly relevant to the education sector's current transformation (Machali et al., 2024).

The concept of entrepreneurial leadership, initially developed within the context of business and start-ups, has gained traction in education due to its potential to stimulate institutional renewal, enhance academic performance, and drive community engagement (Samsiah et al., 2024; Shiferaw et al., 2023). School principals, university administrators, and program directors are increasingly expected to act as opportunity creators and change agents, promoting innovative teaching methods, forging strategic partnerships, and diversifying funding streams. Recent global trends such as the integration of artificial intelligence in learning, the expansion of cross-border education, and the need for agile responses to crises like the Covid-19 pandemic underscore the necessity of leadership that is proactive, risk-tolerant, and strategically entrepreneurial (Olcott Jr et al., 2023).

Although scholarly interest in entrepreneurial leadership has increased notably, particularly across sectors, its application in the education sector remains fragmented and conceptually diverse (Sai et al., 2025). The literature spans a wide range of educational sub-contexts, from higher education leadership development (Meung, 2024) to empirical studies of entrepreneurial leadership at the school level (Machali et al., 2024). Recent syntheses highlight that the field lacks a unified, comprehensive framework capable of capturing its evolution, intellectual structure, and thematic trajectories (Cui et al., 2025). While existing reviews provide valuable conceptual insights (Harrison et al., 2016; Shiferaw et al., 2023), their focus often remains limited to specific contexts or attributes, and methodological choices, such as narrative reviews, constrain their ability to systematically map the intellectual structure of the domain. Consequently, critical questions (CQs) remain unanswered:

CQ1. How has research on entrepreneurial leadership in education evolved over time?
CQ2. Who are the most influential authors and journals?
CQ3. What are the dominant themes, and where are the gaps that warrant further exploration?

Bibliometric analysis provides a powerful methodological approach to address these questions by systematically mapping the scientific landscape of a field through quantitative evaluation of publication patterns, citation networks, and knowledge clusters (Manickam & Rozan, 2023). By applying bibliometric techniques to global research outputs, this study offers a comprehensive and data-driven overview of entrepreneurial leadership in the education sector, identifying influential works, emerging trends, and future research frontiers (Mukhtar & Abd Razak, 2024; Sreenivasan & Suresh, 2023). This evidence-based synthesis not only advances theoretical understanding but also equips policymakers, practitioners, and academic leaders with insights to guide strategic decision-making and foster innovative educational ecosystems.

2. Literature Review

2.1. Conceptualizing Entrepreneurial Leadership

Entrepreneurial leadership represents a leadership orientation that integrates entrepreneurial opportunity seeking behavior with the strategic, relational, and motivational functions of leadership. It

is characterized by the capacity to recognize opportunities, mobilize resources creatively, and inspire innovation within uncertain and dynamic environments (Renko et al., 2015). Entrepreneurial leaders serve as institutional change agents who pursue value creation and organizational renewal by combining vision, innovation, and calculated risk taking (Leitch & Volery, 2017).

Although entrepreneurial leadership shares several features with established leadership paradigms, it remains conceptually distinct in its behavioral orientation toward opportunity recognition and innovation-driven transformation. To clarify these distinctions, it is necessary to contrast entrepreneurial leadership with three frequently referenced constructs in educational leadership research: transformational, distributed, and instructional leadership.

(1) Transformational leadership emphasizes inspiring and motivating followers to transcend self-interest for collective goals through idealized influence, intellectual stimulation, and individualized consideration. While both transformational and entrepreneurial leaders articulate visionary change, transformational leadership focuses on motivation and empowerment within existing organizational systems. In contrast, entrepreneurial leadership extends beyond existing structures by identifying and exploiting new opportunities, markets, or pedagogical innovations that can redefine the system itself (Chandranathan, 2024).

(2) Distributed leadership centers on the shared enactment of leadership roles across members of an organization. It promotes collaboration and participative decision-making to enhance organizational learning and collective responsibility. Entrepreneurial leadership, while supportive of collaboration, integrates this shared participation with entrepreneurial agency that encourages individuals and teams to initiate ventures, experiment, and take strategic risks in pursuit of innovative outcomes (Simba & Thai, 2019).

(3) Instructional leadership primarily focuses on improving teaching quality and student learning outcomes through curriculum supervision, teacher development, and data-driven decision-making. Entrepreneurial leadership complements rather than replaces instructional leadership by expanding its scope from pedagogical improvement to strategic innovation. This approach links instructional enhancement to opportunity recognition, resource diversification, and engagement with the broader community or educational market (Machali et al., 2024).

These comparisons position entrepreneurial leadership as a multidimensional construct that bridges entrepreneurship and leadership theories. It operates at the intersection of innovation, risk management, and value creation, integrating proactive vision with strategic adaptability (Balasi et al., 2023; Hoang et al., 2023).

Entrepreneurial leadership integrates core entrepreneurship behaviors such as *opportunity recognition* (i.e., the ability to scan internal and external environments to identify emerging needs, market gaps, or innovative possibilities before competitors), *proactivity* (i.e., acting ahead of competitors by anticipating challenges and shaping the environment rather than merely reacting to it), *innovation* (i.e., a persistent drive to generate, champion, and implement novel ideas, products, or processes), *risk-taking* (i.e., willingness to commit resources to uncertain projects with potentially high rewards, balancing calculated risk with strategic foresight), *resource mobilization* (i.e., capacity to acquire, combine, and deploy financial, human, and technological resources creatively), and *visionary influence* (i.e., inspiring and motivating stakeholders to embrace change and align their efforts with a compelling entrepreneurial vision) to mobilize people and institutional resources toward change (Balasi et al., 2023; Renko et al., 2015). Leaders adopting this style are not only managers of existing operations but architects of new ventures (Udin & Dananjoyo, 2024).

Over the last decade, entrepreneurial leadership scholarship has shifted from treating the construct as a business-only phenomenon to framing it as a cross-sectoral leadership orientation applicable to public and educational organizations (Chandranathan, 2025; Harrison et al., 2016). Contemporary conceptual work emphasizes entrepreneurial leadership as a set of leader behaviors and institutional

practices that enable organizational renewal and value creation under conditions of uncertainty (Simba & Thai, 2019; Yang & Entebang, 2024a). This reconceptualization positions entrepreneurial leadership as adjacent to, yet distinct from, transformational and innovation leadership because it foregrounds opportunity-seeking and market-oriented resource strategies alongside pedagogical aims (Malibari & Bajaba, 2022; Renko et al., 2015).

2.2. Empirical Evidence in K–12 and Higher Education

Empirical studies demonstrate the relevance of entrepreneurial leadership across different levels of education. In primary education, comparative research across European countries shows that school principals engage in entrepreneurial behaviors such as innovation and strategic partnerships, with variations influenced by national autonomy and accountability contexts, which indicates strong institutional contingency effects (Balasi et al., 2023; Kousina et al., 2024). In higher education, research suggests that entrepreneurial leadership promotes knowledge entrepreneurship, entrepreneurial curricula, external partnerships, and alternative revenue generation, often through mediating factors such as knowledge sharing, school culture, and teacher efficacy (Aristana et al., 2024; Basit et al., 2024). Collectively, these studies indicate that entrepreneurial leadership is associated with institutional innovativeness and, indirectly, with performance outcomes, although the strength of these effects and the mediating mechanisms differ depending on the context (Ibrahim et al., 2024).

2.3. Mechanisms, Mediators, and Outcomes

Research increasingly examines how entrepreneurial leadership affects organizational outcomes. Recent studies identify common mediators such as organizational culture and innovation climate, knowledge sharing and intellectual capital, and educator self-efficacy (Alshawabkeh et al., 2024; Machali et al., 2024; Shiferaw et al., 2023). Moderating influences often include institutional autonomy, resource constraints, entrepreneurial orientation, and national policy regimes that shape leaders' capacity for innovation (Balasi et al., 2023; Brauckmann-Sajkiewicz & Pashiardis, 2022; Yang & Entebang, 2024b). For instance, entrepreneurial leadership tends to enhance teacher creativity, knowledge exchange, and institutional entrepreneurship when supported by an enabling culture and adequate autonomy, yet its effects are weakened where rigid accountability mechanisms or limited resources constrain experimentation (Kasim, 2021; Machali et al., 2024). Overall, these findings indicate that the efficacy of entrepreneurial leadership is contingent upon broader systemic factors, implying that its measurement should capture both individual leader behaviors and the institutional conditions that facilitate or inhibit entrepreneurial action (Ataei et al., 2024; Fuentelsaz et al., 2018).

3. Methodology

3.1. Research Design

This study adopted a bibliometric analysis approach to systematically examine global research trends, intellectual structure, and emerging themes on *entrepreneurial leadership in the education sector*. Bibliometric analysis enables the identification of publication patterns, influential authors, institutions, countries, and conceptual developments within a specific research domain (Mahniza et al., 2025; Suryantoro et al., 2023). The approach integrates quantitative mapping and qualitative interpretation to ensure both rigor and depth in understanding the field's evolution (Sreenivasan & Suresh, 2023).

3.2. Data Source and Search Strategy

All bibliographic data in this study were retrieved from the Scopus database in October 2025, covering publications indexed between 2010 and 2025. Scopus was chosen for its extensive peer-reviewed coverage, rich metadata, and multidisciplinary scope, ensuring data accuracy and reliability. The search, conducted using the query *"entrepreneurial leadership in education sector"* applied to titles, abstracts, and keywords, initially yielded 119 documents. After limiting the publication period

to 2010–2025, 105 documents remained for analysis.

The final dataset comprised 105 eligible documents analyzed in this study. Most were published in English (96.2%), followed by Spanish (1.9%), Italian (1.0%), Russian (1.0%), and Slovenian (1.0%). In terms of accessibility, 36 documents (34.3%) were available as open access, including 21 Gold (20.0%), 18 Green (17.1%), 6 Hybrid Gold (5.7%), and 5 Bronze (4.8%) publications. Regarding source types, journals dominated the dataset with 68 documents (64.8%), followed by books (18.1%), conference proceedings (9.5%), and book series (7.6%). By document type, articles represented the largest share with 66 publications (62.9%), followed by book chapters (16.2%), conference papers (9.5%), books (7.6%), reviews (1.9%), and conference reviews (1.9%).

3.3. Analytical Procedure

The bibliometric analysis was conducted using VOSviewer, a widely recognized software for constructing and visualizing bibliometric networks. This tool facilitated both performance analysis and science mapping. The performance analysis examined publication trends and identified the most influential sources, authors, institutions, and countries contributing to the field (Udin et al., 2025). Meanwhile, science mapping was employed to explore the intellectual and conceptual structure of the research domain through co-authorship, co-citation, and keyword co-occurrence analyses (Moral-Munoz et al., 2019; Sahal et al., 2024). In addition, a thematic evolution analysis was performed to trace the progression of research themes and the emergence of new directions over time.

4. Results and Discussion

Figure 1 presents the annual distribution of publications on entrepreneurial leadership in the education sector from 2010 to 2025. The data show a steady increase in scholarly interest over the past fifteen years, with minor fluctuations in earlier periods and a marked acceleration in recent years. Between 2010 and 2015, publication output remained modest, ranging from 1 to 5 documents per year, reflecting the early conceptual development of entrepreneurial leadership in educational contexts. The period between 2016 and 2019 showed gradual growth, with annual publications increasing from 3 to 8, indicating broader scholarly engagement and diversification of research settings, including schools, universities, and vocational institutions.

A significant rise occurred from 2020 onward, suggesting that the topic gained considerable academic momentum, possibly influenced by the global shift toward innovation, resilience, and adaptability in education during and after the Covid-19 pandemic. The number of publications reached its highest level in 2023 and 2024, with 15 documents each year, demonstrating sustained scholarly attention and the establishment of entrepreneurial leadership as a recognized subfield in educational research. In 2025, the dataset recorded 13 documents, suggesting a continued interest and potential for further expansion. Overall, the trend reveals a progressive and cumulative growth trajectory, confirming the increasing relevance of entrepreneurial leadership in addressing contemporary challenges within the education sector.
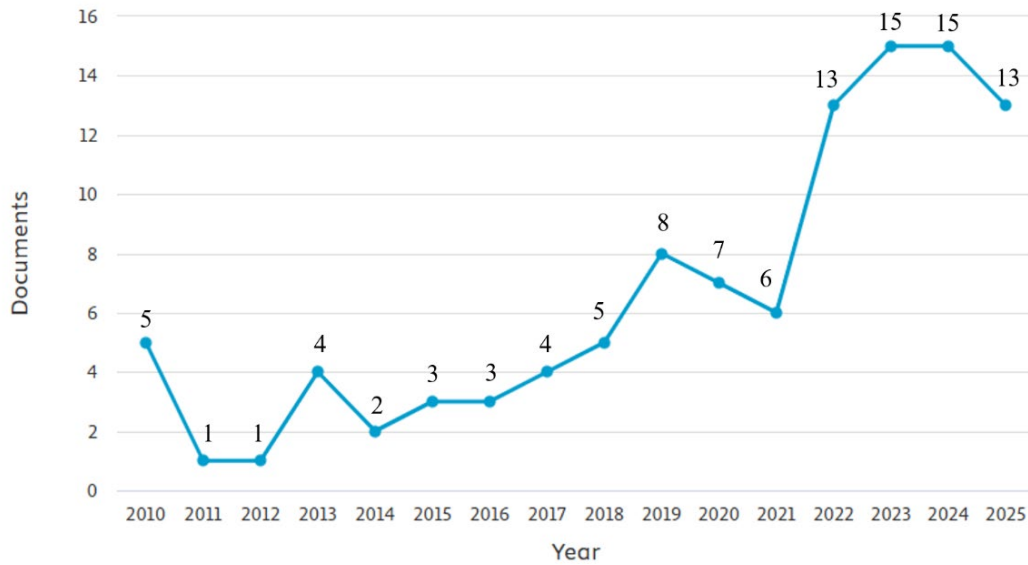
Fig. 1: Number of published documents by year

The analysis of subject areas reveals that research on entrepreneurial leadership in the education sector is highly interdisciplinary, encompassing various domains beyond management and education. The majority of studies were published within Business, Management and Accounting (50 documents; 47.6%) and Social Sciences (49 documents; 46.7%), indicating that the concept is predominantly discussed within managerial and educational contexts. A substantial portion also appears in Economics, Econometrics and Finance (34 documents; 32.4%), reflecting the growing interest in linking entrepreneurial leadership with economic performance, institutional sustainability, and financial decision-making in educational environments. Smaller but meaningful contributions are found in Engineering (14 documents; 13.3%), Decision Sciences (8; 7.6%), and Computer Science (7; 6.7%), suggesting that entrepreneurial leadership has increasingly been associated with innovation, technology integration, and data-driven decision-making in education.

Other disciplines contribute to a more holistic understanding of the topic, including Arts and Humanities (6; 5.7%), Environmental Science (5; 4.8%), Biochemistry, Genetics and Molecular Biology (4; 3.8%), Mathematics (4; 3.8%), and several minor fields such as Earth and Planetary Sciences (2; 1.9%), Energy (2; 1.9%), Health Professions (2; 1.9%), Medicine (2; 1.9%), Multidisciplinary (2; 1.9%), Physics and Astronomy (2; 1.9%), and Psychology (2; 1.9%). A few documents also appeared in Agricultural and Biological Sciences (1; 1.0%), Dentistry (1; 1.0%), Materials Science (1; 1.0%), and Pharmacology, Toxicology and Pharmaceutics (1; 1.0%). This distribution underscores the multidisciplinary nature of entrepreneurial leadership research in the education sector, bridging social, managerial, technological, and even scientific domains. The growing engagement across diverse disciplines suggests that entrepreneurial leadership is increasingly viewed as a cross-cutting competence vital for innovation, adaptability, and sustainability in educational institutions.

Table 1. The 5 highest cited articles

Rank	Document title	Authors	Source	Year	Citations
1	Entrepreneurial leadership in the English public sector: Paradox or possibility?	Currie, G., Humphreys, M., Ucbasaran, D., Mcmanus, S.	Public Administration, 86(4), pp. 987–1008	2008	125
2	The university's role in sustainable development:	Wakkee, I., van der Sijde, P., Vaupell,	Technological Forecasting and	2019	84

	Activating entrepreneurial scholars as agents of change	C., Ghuman, K.	Social Change, 141, pp. 195–205		
3	Advancing HEIs' third-mission through dynamic capabilities: the role of leadership and agreement on vision and goals	Stolze, A., Sailer, K.	Journal of Technology Transfer, 47(2), pp. 580–604	2022	36
4	Entrepreneurial leadership in schools: linking creativity with accountability	Brauckmann-Sajkiewicz, S., Pashiardis, P.	International Journal of Leadership in Education, 25(5), pp. 787–801	2022	30
5	Leadership and governance frameworks driving transformational change in an entrepreneurial UK university	Purcell, W.M., Chahine, T.	Leadership and Organization Development Journal , 40(5), pp. 612–623	2019	17

Table 1 presents the five most highly cited publications in the field of entrepreneurial leadership within the education sector, reflecting the most influential scholarly contributions that have shaped the domain. The most cited paper is *"Entrepreneurial leadership in the English public sector: Paradox or possibility?"* by Currie et al. (2008), published in Public Administration, with 125 citations. This pioneering work is foundational because it introduced the concept of entrepreneurial leadership in public educational contexts, addressing tensions between innovation and bureaucratic accountability. Its early publication date and placement in a high-impact journal explain its leading citation count. The second most cited article, Wakkee et al. (2019), titled *"The university's role in sustainable development: Activating entrepreneurial scholars as agents of change"*, received 84 citations. This study emphasizes universities as drivers of sustainability and innovation, highlighting the role of entrepreneurial academics in achieving institutional transformation. The third-ranked article by Stolze and Sailer (2022) focuses on dynamic capabilities and shared vision as enablers of entrepreneurial activity in higher education institutions. Despite being a recent publication, it has already garnered 36 citations, indicating strong and growing academic attention. The fourth article, Brauckmann-Sajkiewicz and Pashiardis (2022) in the International Journal of Leadership in Education, examines entrepreneurial leadership in schools, connecting creativity and accountability. With 30 citations, it underscores the growing importance of entrepreneurial leadership at the school level and its link to educational innovation. The fifth article, Purcell and Chahine (2019) in Leadership and Organization Development Journal, has 17 citations and focuses on transformational change and governance frameworks in entrepreneurial universities. This reflects the relevance of leadership and institutional structure in fostering an entrepreneurial academic environment.

Table 2. The 5 most prolific authors

Rank	Author	Affiliation	Documents	Citation	H-index
1	Blackmore, J.	Deakin University, Australia	2	25	34
2	Ateeq, A.	Gulf University, Bahrain	2	4	15
3	Hasan, M.	Universitas Negeri Makassar, Indonesia	2	3	6
4	Al-Hidabi, D.	International Islamic University Malaysia, Malaysia	2	4	5
5	Ibrahim, A.	A'Sharqiyah University, Oman	2	4	4

Table 2 identifies the five most prolific authors who have contributed to the body of knowledge on entrepreneurial leadership in the education sector, based on publication productivity, citation impact, and H-index values. The leading author, Blackmore, J. from Deakin University, Australia,

stands out with 2 publications, 25 citations, and an H-index of 34. Despite having the same number of publications as others in the list, Blackmore's considerably higher citation and H-index values indicate long-standing scholarly influence and international recognition in leadership and educational research. This suggests that her works have provided significant conceptual and empirical contributions that are widely referenced in the field. The second author, Ateeq, A. from Gulf University, Bahrain, also has 2 publications, accumulating 4 citations with an H-index of 15. Although the citation count is modest, the relatively high H-index reflects a broader academic footprint, suggesting active engagement in related leadership and management scholarship beyond the specific topic of entrepreneurial leadership in education. In third position, Hasan, M. from Universitas Negeri Makassar, Indonesia, has 2 publications, 3 citations, and an H-index of 6. This indicates an emerging research presence in the field, representing growing academic engagement from Southeast Asia in the global discourse on educational leadership. The fourth and fifth authors, Al-Hidabi, D. from International Islamic University Malaysia (IIUM) and Ibrahim, A. from A'Sharqiyah University, Oman, each contributed 2 publications, both with 4 citations, and H-index values of 5 and 4, respectively. Their inclusion highlights the increasing contribution of scholars from Islamic and Gulf institutions, emphasizing the regional diversification of research on entrepreneurial leadership within education.

Table 3. The 5 most productive journals

Rank	Journal	Publisher	Documents	Citations	H-index	SJR	Category
1	Cogent Business and Management	Cogent OA	3	4	56	0.596	Business, management and accounting (Q1)
2	Entrepreneurship and Regional Development	Taylor & Francis	2	172	119	1.353	Economics, econometrics and finance (Q1)
3	International Journal of Entrepreneurial Behaviour and Research	Emerald Publishing	2	90	101	1.354	Business, management and accounting (Q1)
4	Journal of Higher Education Policy and Management	Taylor & Francis	2	28	57	1.158	Social sciences (Q1)
5	Economic Research Ekonomska Istrazivanja	Taylor & Francis	2	17	65	0.798	Economics, econometrics and finance (Q1)

Table 3 presents the five most productive journals that have published research on entrepreneurial leadership within the education sector. The analysis considers the number of documents, total citations, H-index, and SCImago Journal Rank (SJR), offering insights into both the quantity and impact of publications across different disciplinary domains.

The most productive journal is *Cogent Business and Management* (published by Cogent OA), contributing 3 documents with 4 citations, an H-index of 56, and an SJR of 0.596. Although the citation count is relatively low, this journal's inclusion in Q1 (Business, Management, and Accounting) underscores its recognition as a reputable open-access platform that facilitates the dissemination of emerging topics, including entrepreneurial leadership in education. Its open-access model likely enhances visibility among diverse academic audiences. The second-ranked journal,

Entrepreneurship and Regional Development (Taylor & Francis), has 2 publications with a remarkable 172 citations, an H-index of 119, and an SJR of 1.353. This journal demonstrates high scholarly influence and citation impact, reflecting its strong position within the fields of Economics, Econometrics, and Finance. The high citation count indicates that the published works in this outlet are foundational and frequently referenced in studies linking entrepreneurship, leadership, and regional educational development. In third place, the *International Journal of Entrepreneurial Behaviour and Research* (Emerald Publishing) also contributed 2 papers, receiving 90 citations, with an H-index of 101 and an SJR of 1.354. This journal ranks within Q1 for Business, Management, and Accounting, emphasizing its academic rigor and leadership in entrepreneurship research. The strong citation metrics demonstrate that this journal serves as a central hub for conceptual and empirical advancements in entrepreneurial leadership theory and practice. The *Journal of Higher Education Policy and Management*, ranked fourth, is a Q1 journal in Social Sciences, with 2 documents, 28 citations, an H-index of 57, and an SJR of 1.158. Its inclusion highlights the growing recognition of entrepreneurial leadership as a strategic component in higher education governance and policy reform. The focus leans toward institutional management, leadership strategy, and academic innovation. Finally, *Economic Research – Ekonomska Istraživanja* (Taylor & Francis) also published 2 documents, garnering 17 citations, an H-index of 65, and an SJR of 0.798. As a Q1 journal in Economics, Econometrics, and Finance, it emphasizes the economic dimensions of educational entrepreneurship, bridging leadership practices with institutional and regional economic performance.
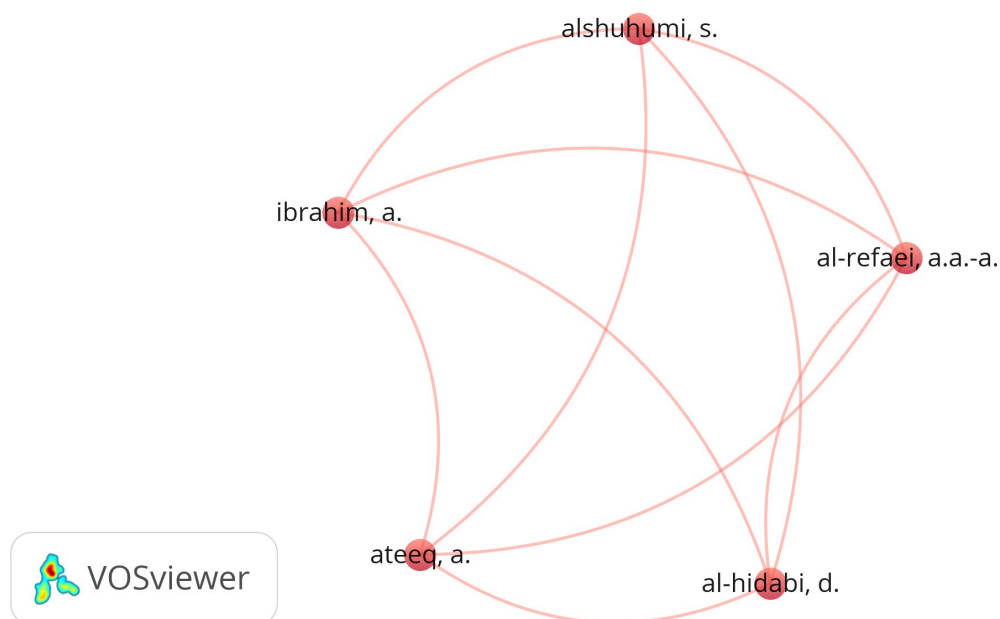

Fig. 2: Co-authorship network

Figure 2 presents the co-authorship network illustrating collaborative patterns among researchers in the field of entrepreneurial leadership in the education sector. The figure highlights a strong regional collaboration primarily centered in the Middle Eastern and Southeast Asian academic contexts, involving scholars from A'Sharqiyah University (Oman), International Islamic University Malaysia (IIUM), and Gulf University (Bahrain). Within this cluster, Ibrahim, A. from A'Sharqiyah University plays a pivotal role as a bridging author, linking researchers from Oman to those in Malaysia. Meanwhile, Al-refaei, A.A.A., Alshuhumi, S., and Al-Hidabi, D., all affiliated with IIUM, form a closely interconnected subgroup, indicating a productive intra-institutional collaboration that focuses on advancing research in leadership and educational innovation. Additionally, Ateeq, A. from Gulf University connects to this network through co-authorship, extending the collaborative reach to Bahrain. Collectively, this network signifies an emerging research alliance among Gulf and Islamic

universities, reflecting shared academic interests in promoting entrepreneurial and transformative leadership practices within educational institutions. Such regional cooperation underscores the growing recognition of entrepreneurial leadership as a strategic approach to fostering innovation and institutional growth in higher education.
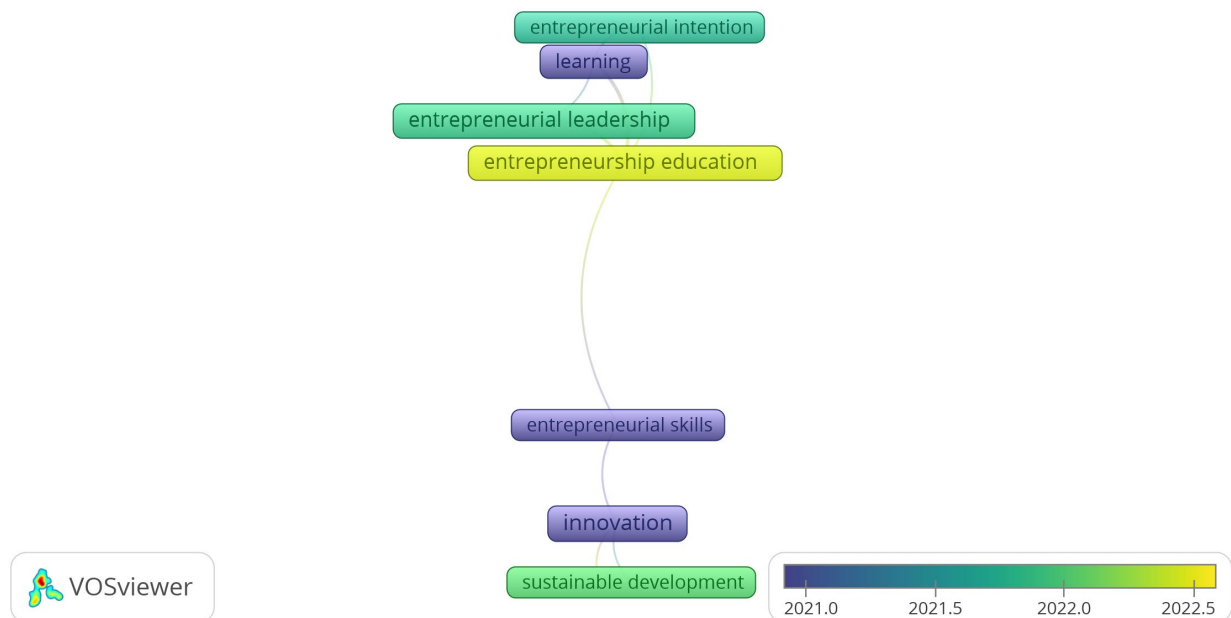

Fig. 3: Evolving research trends in entrepreneurial leadership

Figure 3: Evolving research trends in entrepreneurial leadership illustrates how the thematic focus of scholarly work on entrepreneurial leadership has evolved over time from 2010 to 2025. During the 2010–2020 period, research on entrepreneurial leadership primarily centered on entrepreneurial skills, learning, and innovation. This phase reflects the early conceptualization of entrepreneurial leadership as a catalyst for individual capability building and organizational creativity. Studies in this period emphasized how entrepreneurial leaders foster innovation, enhance problem-solving capacities, and nurture an entrepreneurial mindset among learners and employees. The focus was predominantly developmental, aiming to integrate entrepreneurial competencies within educational and organizational systems. In the 2021–2022 period, the scope of research expanded toward broader organizational and sustainability dimensions. Entrepreneurial leadership began to be associated with entrepreneurial intention, sustainable development, and business performance, indicating a shift from individual-oriented competencies to outcome-driven impacts. Scholars increasingly examined how entrepreneurial leadership influences organizational growth, environmental responsibility, and the alignment of leadership practices with sustainability goals. This stage represents a transition from capability enhancement to measurable performance and societal impact. In the 2023–2025 period, the research landscape further evolved to emphasize entrepreneurship education and social entrepreneurship. The trend demonstrates a growing recognition of the role of entrepreneurial leadership in shaping educational frameworks that nurture social innovation and community empowerment. This period highlights the integration of entrepreneurial leadership into teaching, curriculum design, and social value creation, suggesting a movement toward inclusivity and socially responsible leadership practices.
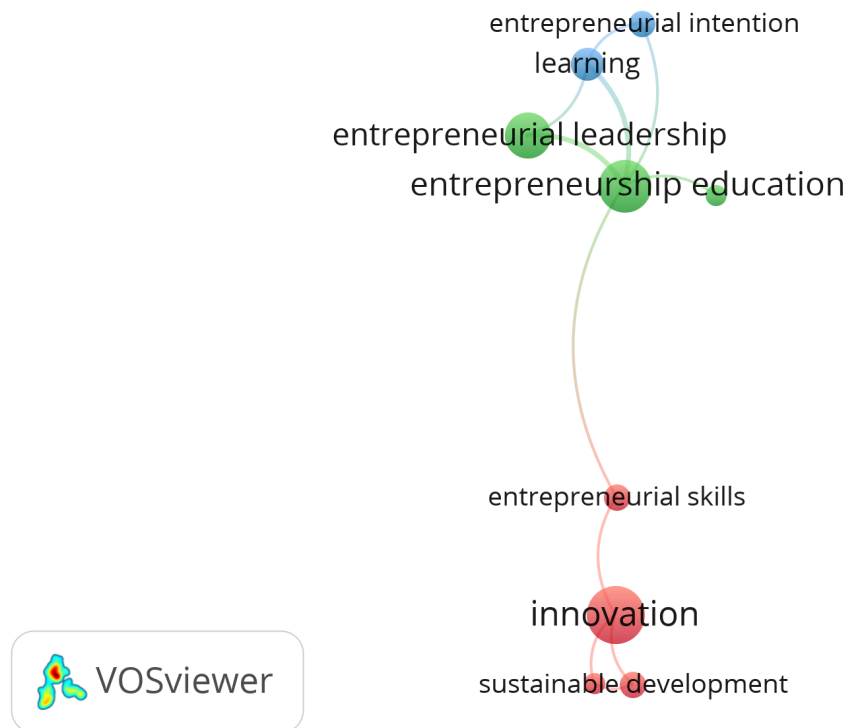
Fig. 4: Keywords co-occurrence network

Figure 4 visualizes the intellectual and conceptual structure of research on entrepreneurial leadership in the education sector. The figure consists of three interconnected clusters that reveal how core themes and research directions have developed and interacted across studies.

4.1. Cluster 1: Entrepreneurial Skills, Innovation, and Sustainable Development

The first cluster reflects the outcome-oriented dimension of entrepreneurial leadership. It emphasizes the role of educational leaders as catalysts for innovation, institutional performance, and sustainable progress. The close association among entrepreneurial skills, innovation, and sustainable development indicates that effective leadership requires the ability to connect creative problem-solving with strategic resource utilization. This finding supports the idea that entrepreneurial leadership goes beyond traditional administrative management by integrating innovation with long-term institutional goals.

The presence of sustainability-related keywords shows that entrepreneurial leadership is increasingly aligned with the principles of responsible management. Innovation is viewed not only as a tool for achieving efficiency but also as a means to generate social and environmental value. Studies such as Iqbal et al. (2025) and Ribeiro and Leitão (2024) confirm that sustainable development depends on leaders who possess the creativity and strategic foresight to harmonize organizational performance with social responsibility. Within the educational sector, this relationship translates into leadership practices that promote sustainability-oriented curricula, eco-innovation, and community engagement.

The cluster also reinforces the idea that entrepreneurial competencies, such as opportunity recognition, proactivity, and innovation capability, serve as mechanisms that translate leadership behavior into measurable institutional outcomes. Research by Alshurideh et al. (2024) and Jundulloh and Nasution (2024) provide empirical support for this link, demonstrating that entrepreneurial competence enhances sustainable organizational performance through innovation. Therefore, Cluster 1 suggests that entrepreneurial leadership should be conceptualized as both a behavioral orientation and a systemic capability that advances institutional adaptability and resilience.

4.2. Cluster 2: Entrepreneurial Leadership, Entrepreneurship Education, and Social Entrepreneurship

The second cluster represents the transformational and social dimension of entrepreneurial leadership. It demonstrates how leaders in education apply entrepreneurial principles to promote pedagogical innovation, institutional collaboration, and community impact. The close linkage between entrepreneurial leadership and entrepreneurship education highlights that educational institutions function as platforms for cultivating entrepreneurial mindsets among teachers, students, and administrators. This finding is consistent with Meung (2024), who emphasized that entrepreneurial leadership in education fosters creativity, initiative, and institutional renewal.

The inclusion of social entrepreneurship within this cluster extends the conceptual scope of entrepreneurial leadership beyond economic performance toward social value creation. Educational leaders increasingly act as facilitators of community empowerment, designing programs and initiatives that address social challenges through innovative educational solutions. This orientation aligns with the work of Ab Wahid et al. (2024), who argue that effective social entrepreneurship education depends on leadership that nurtures empathy, collaboration, and problem-solving abilities. By linking entrepreneurial leadership with social entrepreneurship, this cluster positions leaders as agents of societal transformation who align institutional missions with the pursuit of equity and sustainability.

From a theoretical perspective, Cluster 2 enriches the understanding of entrepreneurial leadership by situating it within a broader ecosystem of educational innovation and social responsibility. Entrepreneurial leadership in this sense is not limited to internal management processes but also involves external engagement with communities and stakeholders. This dual focus reinforces the idea that educational institutions are both centers of knowledge creation and drivers of social innovation. The integration of entrepreneurship education and social entrepreneurship within this cluster suggests that the most effective leaders are those who use entrepreneurial thinking to connect institutional growth with collective well-being.

4.3. Cluster 3: Entrepreneurial Intention and Learning

The third cluster illustrates the developmental and motivational dimension of entrepreneurial leadership. It focuses on how individual learning experiences, self-efficacy, and motivation contribute to the formation of entrepreneurial intention in educational settings. The connection between learning and entrepreneurial intention underscores the idea that leadership capability is cultivated through continuous learning and reflective practice (Cui et al., 2024; Islam & Asad, 2024). Motta and Galina (2023) demonstrated that experiential learning enhances entrepreneurial intention by strengthening self-confidence and opportunity recognition. This finding supports the notion that entrepreneurial leadership is a product of both individual development and institutional learning culture.

Within this cluster, the concept of learning extends beyond individual cognition to include collective processes of knowledge sharing and experimentation. Leaders who promote open communication and collaborative learning environments encourage innovation (Alshahrani et al., 2025) and adaptability across their institutions. The findings of Nayak et al. (2024) provide further support, showing that entrepreneurial intention is shaped by attitudes, perceived control, and behavioral learning experiences. Therefore, Cluster 3 highlights the importance of leadership development programs that emphasize experiential learning, problem-based activities, and reflective practice as key strategies for cultivating entrepreneurial leadership capabilities.

Cluster 3 also demonstrates that entrepreneurial leadership operates as a learning-oriented construct that evolves through experience and contextual adaptation. When educational leaders engage in reflective learning and promote innovation-oriented teaching, they create a continuous cycle of knowledge creation that enhances institutional resilience. This cluster thus contributes to understanding how entrepreneurial leadership functions as both a learning process and an outcome of

educational practice.

4.4. Integrative Interpretation of the Three Clusters

Together, the three clusters reveal a coherent theoretical structure that connects individual capability, institutional transformation, and social contribution. Cluster 1 emphasizes the development of entrepreneurial competencies that enhance innovation and sustainability. Cluster 2 highlights the transformational role of leadership in fostering entrepreneurship education and social value creation. Cluster 3 explains how learning processes and self-efficacy form the psychological foundation for entrepreneurial leadership behavior. The interaction among these clusters illustrates that entrepreneurial leadership functions across multiple levels, integrating personal motivation, organizational strategy, and societal responsibility.

At the micro level, entrepreneurial leadership emerges through individual learning, motivation, and self-efficacy. At the meso level, it operates through institutional innovation and collaborative management processes that strengthen performance and sustainability. At the macro level, it contributes to social transformation by linking education with entrepreneurship and sustainable development goals. The multidimensional interplay among these levels demonstrates that entrepreneurial leadership is not a static style but a dynamic capability enabling educational institutions to adapt, innovate, and contribute meaningfully to society.

5. Conclusion

The purpose of this study was to systematically map and evaluate global research on entrepreneurial leadership in the education sector from 2010 to 2025. The analysis revealed a steady increase in publications over the past fifteen years, indicating the growing academic and practical significance of entrepreneurial leadership in education. Research productivity accelerated notably after 2020, coinciding with global transformations that demand innovative and resilient leadership models in educational institutions. The bibliometric mapping identified three major thematic clusters. The first cluster integrates entrepreneurial skills, innovation, business performance, and sustainable development, highlighting the outcome-oriented and sustainability dimensions of entrepreneurial leadership. The second cluster focuses on entrepreneurial leadership, entrepreneurship education, and social entrepreneurship, emphasizing the educational and social transformation roles of entrepreneurial leaders in fostering innovation and societal value creation. The third cluster links entrepreneurial intention and learning, underscoring the motivational and developmental processes through which experiential learning shapes leadership behavior and opportunity recognition. Collectively, these findings demonstrate that entrepreneurial leadership research in education has evolved from conceptual development to applied and socially driven orientations. The field now encompasses pedagogical innovation, institutional transformation, and sustainable development, positioning entrepreneurial leadership as a crucial competence for guiding educational systems toward adaptability, inclusivity, and long-term impact.

The findings of this study make several theoretical contributions to the growing body of knowledge on entrepreneurial leadership. The bibliometric evidence reinforces the conceptualization of entrepreneurial leadership as a multidimensional construct that integrates opportunity recognition, innovation, and value creation within educational settings. This synthesis bridges the gap between entrepreneurship and leadership theories, demonstrating that entrepreneurial leadership operates not merely as a management function but as a dynamic behavioral orientation that drives institutional transformation. The evolution of research themes from innovation and skills development to sustainability and social entrepreneurship highlights the theoretical progression of entrepreneurial leadership toward a holistic paradigm that balances economic performance with social impact. This study also extends the theoretical boundaries of educational leadership by positioning entrepreneurial leadership as a critical construct for navigating uncertainty and complexity, providing a foundation for

future theory-building efforts that link entrepreneurial leadership with adaptive governance and innovation ecosystems in education.

The findings of this study offer several practical implications that can guide educational leaders, policymakers, and institutions in strengthening innovation capacity and organizational adaptability. Entrepreneurial leadership should be viewed not only as an individual competency but as an institutional capability that drives educational transformation. Therefore, leadership development programs need to focus on cultivating opportunity recognition, creativity, risk management, and innovation-oriented decision-making among principals, administrators, and faculty members. Leadership training should move beyond theoretical instruction toward experiential approaches that emphasize real-world problem-solving, innovation laboratories, and reflective learning to enable leaders to translate entrepreneurial ideas into sustainable educational initiatives.

At the institutional level, entrepreneurial leadership should be systematically embedded into strategic planning, governance, and organizational culture. Educational institutions are encouraged to establish innovation task forces, incubators, or cross-sector partnerships that connect academia, industry, and community stakeholders. Such initiatives can stimulate knowledge sharing, resource mobilization, and continuous experimentation that contribute to institutional renewal. Integrating entrepreneurial principles into governance frameworks also enables schools and universities to navigate resource constraints, enhance accountability, and achieve greater flexibility in responding to emerging challenges.

In terms of pedagogy and curriculum, the study highlights the need to integrate entrepreneurship education and social innovation into teaching and learning practices. Entrepreneurial leadership can inspire teachers to act as agents of innovation by designing experiential and problem-based learning environments that develop students' creativity, initiative, and collaborative skills. This approach aligns with the broader goal of transforming educational institutions into ecosystems that foster entrepreneurial mindsets and social responsibility among learners. Embedding entrepreneurial values in curricula can also strengthen the connection between education and societal needs, encouraging student engagement in community-based projects and sustainable development initiatives.

From a policy perspective, the results suggest the importance of creating enabling environments that support innovation-driven leadership practices. Policymakers should design frameworks that provide incentives for educational entrepreneurship, such as grants for innovative school projects, leadership innovation awards, and partnerships with private or non-profit organizations. National and regional authorities could also consider incorporating entrepreneurial leadership indicators into institutional evaluation systems to ensure that innovation, adaptability, and sustainability become central elements of educational quality assessment. Finally, the growing alignment between entrepreneurial leadership and sustainability agendas calls for greater attention to digital transformation and environmentally responsible practices. Investing in technology infrastructure, data-driven decision-making, and sustainability education will further enhance institutional resilience and social impact, ensuring that educational systems remain responsive to the rapidly changing global landscape.

While this study provides a comprehensive bibliometric overview of entrepreneurial leadership research in the education sector, several limitations should be acknowledged. The analysis was based exclusively on data retrieved from the Scopus database, which, although extensive and reliable, may not include relevant publications indexed in other databases such as Web of Science or Google Scholar (Donthu et al., 2021). Consequently, certain regional or non-English works might have been underrepresented. Bibliometric analysis also primarily captures quantitative relationships such as co-authorship, co-citation, and keyword co-occurrence but does not account for the qualitative depth of theoretical arguments or methodological innovation present in the literature (Van Eck & Waltman, 2023). Moreover, as the analysis covers the period 2010–2025, the results represent a snapshot of the

field's development within that timeframe. Given the rapid evolution of research on digital transformation, sustainability, and innovation in education, future trends may differ significantly from those observed in this study.

Future research can build upon the findings of this study in several meaningful ways. Scholars should complement bibliometric methods with systematic literature reviews, meta-analyses, or qualitative content analyses to capture deeper theoretical and contextual insights that bibliometric indicators alone cannot provide (Donthu et al., 2021). Further investigation is needed into the micro-level mechanisms through which entrepreneurial leadership influences teacher creativity, student outcomes, and organizational culture. Comparative and cross-cultural analyses should also be expanded to explore how entrepreneurial leadership manifests in diverse educational systems, particularly in developing regions where contextual challenges such as resource scarcity or policy rigidity may shape leadership practices differently. Finally, future research should examine the intersection between entrepreneurial leadership and emerging global agendas, including sustainability education, social innovation, and digital transformation (Kaihatu et al., 2024; Sahibzada et al., 2024). Investigating how entrepreneurial leadership drives socially responsible and technologically adaptive educational ecosystems will be vital for advancing theory and informing practice in the next decade.

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