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Sustainable Business Management in Higher Education Institutions: A Strategic Roadmap for Addressing Research Gaps and Shaping the Forthcoming Agenda

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ABSTRACT

This thematic review examines how the empirical literature has addressed sustainable business management (SBM) in higher education institutions (HEIs), identifies the thematic trajectories that have emerged, and diagnoses the existing gaps in order to inform the future research agenda. The analysis draws on a corpus of 107 studies published between 2020 and 2024, retrieved from Scopus and Web of Science. Using abstract-based semantic text mining with the BERTopic model, combined with a thematic mapping approach, the analysis uncovers 13 topics ranging across categories of scholarly impact namely influential, cross-cutting, deeply developed and emerging. The findings reflect both the potential of HEIs to act as catalysts for systemic sustainability and the ongoing existence of conceptual silos, methodological preferences and geographical imbalances. They also provide these institutions with evidence-based opportunities to refine curriculum, enhance multi-stakeholder engagement and strengthen institutional strategies for SBM, as a novel dynamic absent from existing review papers. At the same time, they equip policymakers and funding bodies with guidance about the inherent structural role of the higher education sector in driving transformative change.

1 | Introduction

Higher education institutions (HEIs) are an important source of sustainable development (SD) for the world via the practice of education, research, and governance (Leal Filho, Simaens, et al. 2023). In this study, SD is treated as the overarching paradigm that structures the role of HEIs in the international academic community. Within this perspective, we focus on how HEIs enact SD through sustainable business management (SBM). This is further supported by global agendas, such as the United Nations' Sustainable Development Goals (UN SDGs), where HEIs are represented in their contribution to complex development challenges.

HEIs do this, not just to satisfy international standards, but also to maximize systemic change (Tomasella et al. 2023). HEIs build their institutional reputation and international profile by

embedding SD within their teaching, research, and governance, enhancing their long-term robustness (Sachs and Clark 2017). HEIs embedding SD in their strategies will also drive innovation (Leal Filho, Sierra, et al. 2024). HEIs regard SD as a way of doing research on topics they care about, solving global challenges, and improving visibility (Leal Filho, Abubakar, et al. 2023). Research on SD will also help tackle pressing issues (Adach-Pawelus et al. 2021), while also providing tangible benefits to society (Décamps et al. 2021) and not just academia.

Financial and institutional incentives bolster this orientation. Governments and funding organizations are increasingly requiring HEIs to implement SD-oriented management strategies as a prerequisite for funding (Montenegro de Lima et al. 2020). Following the policy of incorporating SD into governance and resource management by HEIs allows them to maintain compliance, increase sustainability in finances, and optimize and strategically use their resources (Serafini et al. 2022).

HEIs are also expected to be accountable and contribute to the human social and environmental development in their local and global context (Aleixo et al. 2018). The scope of HEIs' contribution to SD includes awareness, but ultimately requires objectives and implementation of strategies that are systemic and take on the interconnectivity of social, economic, and environmental challenges (Leal Filho, Simaens, et al. 2023). This framework positions SD as a structural component of institutional development, embedded in curricula, governance, and planning for future infrastructure.

The commitment of HEIs to SD should be understood in a wider context of societal change (Leal Filho, Frankenberger, et al. 2021). HEIs should be seen as part of a larger ecosystem of institutions working together to resolve existing global problems like poverty and gender inequality, and more broadly climate change. HEIs' contributions are not only from actions that are research-driven, but also from efforts that are specifically tied to SD (Sachs et al. 2019). These contributions provide a form of leverage as HEIs play a systemic role in current and future societies.

Communication also has an important role in this commitment. HEIs communicate knowledge, raise awareness, and seek the participation of stakeholders (Adhikariparajuli et al. 2021). When facets of communication are embedded within institutional strategies, they contribute to an overall culture of SD and bring in external organizations to support long-term initiatives (Leal Filho, Ribeiro, et al. 2024).

The engagement of HEIs with the 2030 Agenda demonstrates the evolution of the SD paradigm. The Millennium Development Goals (2000–2015) were criticized for their government-centricity (Halisçelik and Soytas 2019), yet under the UN SDGs adopted in 2015, SD has been articulated within a more inclusive and holistic agenda considering economic, social, and environmental perspectives, and involving non-traditional actors such as HEIs (Pizzi et al. 2021).

Building on this background, this study examines how SD is integrated into the academic and operational practices of HEIs by exploring its articulation with the field of business management. While existing review papers on SD have produced valuable understandings, many of them have often been fragmented, showing barriers, conceptual frameworks, or assessment tools without demonstrating how these elements unite in the integrative framework of SBM. These studies examining SD in HEIs have been mostly examined using bibliometric analysis (Filho et al. 2025; Tafese and Kopp 2025; Osman et al. 2025; Veres et al. 2025; Omar and Abdullahi 2024; Zhavoronok et al. 2024; Li and Pu 2023; Hermann and Bossle 2020), systematic reviews or scoping reviews (Basheer et al. 2024; Almazroa et al. 2022; Abulibdeh et al. 2024; Avelar et al. 2022; Amaral et al. 2021; Boarin and Martinez-Molina 2022; Hueske and Guenther 2021; Berchin et al. 2021; Lim et al. 2022; Okoye et al. 2025; Sanchez-Carrillo et al. 2021; Serafini et al. 2022; Umar et al. 2024; Vargas-Merino et al. 2024), and integrative reviews or conceptual reviews (Omazic and Zunk 2021; Pizzutilo and Venezia 2021; Salvador and Comunian 2024; Singh and Segatto 2020; Tomasella et al. 2024).

For clarity, SBM in HEIs incorporates environmental, social, and economic sustainability into governance, institutional operations, and into the learning outcomes of the curriculum. It represents having new ways of thinking and acting to reduce environmental footprints in social equity, economic development and environmental health, while carrying on with research and education. The process involves operational practices, curriculum integration, stakeholder engagement, and ethical governance. The component elements include:

a. Operational sustainability which reduces energy and resource use, constructing green infrastructure, and have waste management systems;

b. Curriculum integration via sustainability for all business and management programs to inform the future leaders about making responsible decisions;

c. Stakeholder engagement involving students, staff, industry members, and community members in sustainability;

d. Ethical governance which demonstrates alignment of decision-making with global frameworks (e.g., UN SDGs) and are committed to transparency to inform the world on practices in the institution.

The originality of this study is twofold. First, it uses an abstract-based semantic text mining methodology to explore the empirical body of literature from 2020 to 2024, which enables it to account for recent developments. Second, based on articles from the Scopus and Web of Science (WoS) databases used, it mitigates selection biases while addressing a greater scope of empirical and geographical viewpoints. The study account represents meaning and thematic interrelations within a contextualized view of SBM, which is framed in HEIs to accentuate it as a more dynamic and integrated field of inquiry.

On this basis, the study addresses two guiding questions:

Q1. *How has the empirical literature examined SBM in HEIs, what thematic trajectories emerge and what forms of academic impact have emerged?*

Q2. *What gaps still exist that limit the empirical debates of SBM in HEIs, and how can their diagnosis inform the future research agenda?*

In responding to these questions, the research is formulated around five sections. Section 2 presents the overview of the evolving debates and the overview of the existing research on SBM in HEIs. Section 3 presents the methodological procedures applied. Section 4 delivers the key findings and critical discussion by examining research trends in SBM in HEIs and framing the forthcoming research agenda. Finally, Section 5 concludes the article by summarizing the main contributions and emphasizing implications for the future agenda.

2 | State of Knowledge and Evolving Scholarly Debates

This section has a full account of the knowledge landscape and current debates on SBM in HEIs. Subsection 2.1 will discuss its evolution and founding principles, where sub-subsection 2.1.1 reviews its emergence and institutional evolution and sub-subsection 2.1.2 examines its principles and frameworks that support its consolidation. Section 2.2 then turns to HEIs and examines how they have integrated and institutionalized SBM in their strategies and practices. Lastly, subsection 2.3 positions SBM in HEIs within the continuity of the existing review articles, and accentuates how the present contribution builds and complements existing studies.

2.1 | The Evolution and Structuring Principles of SBM

2.1.1 | The Emergence and Institutionalization of SBM

SBM has evolved into a primary framework for reconceptualizing organizational relations with society. This definition has been presented as a management approach embedded in a social, environmental and economic systems perspective to address multiple stakeholder expectations (Dyllick and Hockerts 2002; Van Kleef and Roome 2007). It is already foreshadowing what later became a central aspect in SD, generally across the trajectory of UN SDGs, the integration of environmental stewardship, social equity, and economic viability within a singular logic of governance (Van Tulder and Van Mil 2022). This early phrase makes clear that business cannot be divorced from its relational and ecological context and positions SBM not as simply a managerial framework, but as an orientation that balances performance with accountability.

Over time, SBM has also come to denote operational sustainability within practical aspects of reducing energy and resource use, utilizing green infrastructures, and implementing responsible waste management systems. Research has increasingly focused on ethical and normative dimensions of concepts related to SBM beyond these technical practices. Ernst et al. (2023) contend that while SBM is rooted in business administration, it also acknowledges ecological thinking and intergenerational responsibility, something that was anticipated by Bansal (2005). Their analysis tracks innovation through technologies and processes that evoke environmental stewardship while building social and economic sustainability. This reasoning demonstrates that SBM is not only technical, but also moral, which is also presented in Katz and Page (2012), who note that financial success cannot ignore social and environmental implications while aligned with what is known about financial returns for responsible practices (Orlitzky et al. 2003).

SBM has moved from being about value to being about value creation and value delivery in the international realm. It demands organizations to act or mobilize resources and adapt capabilities to competently deal with value and performance while being cognizant of the environmental, social, and economic outcomes of their actions. Institutions are embedding SD in business strategies as they are standardizing practices in markets or modifying models to suit varied contexts (Bonfanti et al. 2023). This trend corresponds with a wider analysis of sustainable business model innovation (Bocken et al. 2014; Geissdoerfer et al. 2018) and along with the strategic alignment of sustainability and competitiveness (Engert et al. 2016).

2.1.2 | Core Tenets and Guiding Frameworks of SBM

One of the core principles of SBM is the Triple Bottom Line (TBL). Elkington (1997) introduced the framework to assess performance beyond just shareholders and to include society and the environment. Additional analyses later narrowed down on the management side to demonstrate how organizations can better balance people, planet and profit (Hubbard 2009). Corporate Social Responsibility (CSR) is yet another foundation. Carroll (1999) spoke of CSR as a pyramid of responsibilities and Matten and Moon (2008) identified its institutional forms by county. Extant research has specified how CSR has defined ethical labor, philanthropy, community involvement, and environmental responsibilities at the mission level (Aguilera et al. 2007) and meta-analyses of CSR and financial linkages (Orlitzky et al. 2003).

Environmental stewardship is equally central to SBM. The natural resource-based view suggests that environmental resources, when managed strategically, can create a sustainable, long-term competitive advantage (Hart 1995). This notion is supported by research demonstrating that companies that perform well ecologically also outperform their competitors in profit (Russo and Fouts 1997) and that the proactive development of strategies for dealing with the environment strengthens capabilities that are valuable to the organization (Sharma and Vredenburg 1998).

Stakeholder engagement is another foundational element. Stakeholder theory portrays inclusiveness and dialogue as strategic assets, initially emphasized by Freeman (1984) and further developed by Donaldson and Preston (1995). Expanding on this basis, Mitchell et al. (1997) characterize stakeholder salience through the dimensions of power, legitimacy, and urgency. These concepts elucidate how results-oriented management serves as a decision-making approach that takes into account a range of stakeholders, including employees, suppliers, the community, and investors, thus improving accountability and social fairness.

SBM also requires long-term thinking. In this view sustainability is far more than a technical exercise. Sustainability is understood as a moral project that thinks of future generations, a point emphasized by Ernst et al. (2023), and explored further

by Bansal and DesJardine (2014). The intergenerational logic of SD shows we must think about the ecological and social consequences of decisions to plan for viability over time.

Innovation is another driver of sustainable competitiveness. Katz and Page (2012) identified how sustainable management sought to align financial success with social and environmental responsibility. Further work demonstrated sustainability is now the principal driver of business innovation (Nidumolu et al. 2009) and ecological economics pointed to eco-innovation as an important pathway (Rennings 2000).

These elements show that SBM represents both a strategic and ethical framework. SBM melds environmental, social, and economic sustainability into organizational governance and operations, and encourages organizational contributions to competitiveness, innovation, and world development. By aligning corporate practices with SD, SBM provides an avenue of development in a manner that balances profitability and responsibility while embedding organizations in the overall SD project, the main conceptual tenets of which are outlined in Figure 1.

2.2 | SBM and Its Institutionalization in HEIs

The international situation has enhanced the significance of SBM. The increasing indication of environmental destruction, acute social inequities, and constant economic instability means that sustainability is a structural necessity, not an optional alternative. In this situation, SBM is not just about reputation or compliance. It is a source of competitive advantage by aligning organizational legitimacy with global imperatives for change. The changes mark a broader transformation in how institutions structure value creation since sustainability is now embedded in the logic of competitiveness. Recent literature shows that this change further accelerates through stakeholder pressure and policy structures that reward enterprises for measurable contributions to sustainability rather than symbolic ones (Franco et al. 2022; Menon and Suresh 2022).

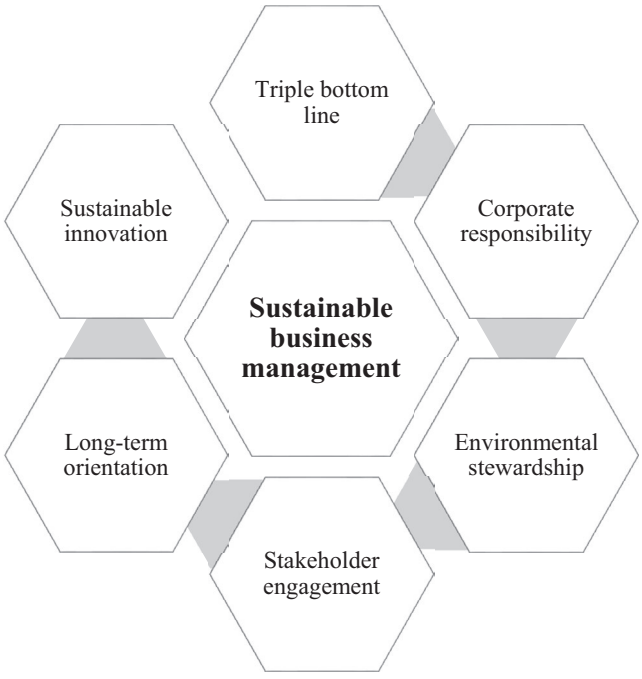

FIGURE 1 | Foundations of SBM.

HEIs have become important platforms where SBM principles can be incorporated, tested, and disseminated. Bhowmik et al. (2018) indicate HEIs have power in four areas, namely education, research, outreach, and internal management. Each of these areas provides many ways to embed SBM into the academic experience. García-Feijoo et al. (2020) claim that HEIs are responsible not only for the students' technical competencies, but also for developing citizens' sense of responsibility towards SD. The educational role demonstrates that SBM in HEIs is not just concerned with management practice, but with shaping cultural and civic identities. There is also evidence from Tomasella et al. (2023) and Lehtonen et al. (2022) that the use of experiential and values-based pedagogies within HEIs has enabled them to disseminate sustainability competences. However, there were gaps concerning systematic thinking and long-term angles. This points to a situation where SBM in HEIs is more than the integration of content, and rather HEIs need to reframe their teaching practices altogether to allow students to critically explore leadership and sustainable transitions.

The dedication to SBM of HEIs has intensified and focused on the UN SDGs. Jorgensen (2019) notes that higher education is moving closer to directly supporting the UN SDGs, while Leal Filho, Frankenberger, et al. (2021) note global-level efforts that shape these goals into meaningful practices. All these changes suggest that HEIs are not just passive recipients of the SD discussion, but rather committed actors, reinterpreting the international agendas through their organizational practices and education missions. Nevertheless, Amaral et al. (2023) find that organizational inertia and communication failures continue to hamper this visioning process, and that often HEIs face challenges in translating SD visions into operational practice. This ambiguity points to the need for adaptive capacities and knowledge brokers, as emphasized by Bäumle et al. (2023) who recognized their role in the socio-technical transition within HEIs.

The link between SBM and HEIs also connects to debates on quality management. Ali and Shastri (2010) remind us that effective higher education management involves curriculum design, teaching methodologies, assessment practices, and institutional governance. When read through the lens of the major SBM frameworks, these managerial functions take on a new meaning. HEIs are expected not only to manage internal quality but to embody SD as an organizational ethos, showing coherence between what they teach and how they operate. This dual role also serves to strengthen their strategic position as educators and stewards of future leaders, each showing others how to become the sustainable institution. Recent evaluation indicates that when HEIs embed SBM into the governance structure and operate activities, they gain reputation strength, stakeholder trust, visibility on impact assessments for ranking, and utilize clear performance measurements and interdisciplinary measuring reference points (Cottafava et al. 2022). While micro-level interventions designing behaviors of students and staff are happening, macro-level interventions designed at the institutional level ultimately achieve coherence as everyday practices aligned with strategic direction. Thus, the HEI contributes not only

to sustainability activism (Bien and Sassen 2020; Duong 2024; Maina et al. 2020; Nguyen et al. 2023).

Overall, there are three overlapping reasons why SBMs in HEIs matter. First, HEIs are living laboratories and can design, implement, and incorporate policies, curricula, and governance arrangements before seeking wider diffusion. Second, SBMs enable mission-strategy alignment of teaching, research, outreach, and internal management to achieve sustainability goals in turn providing legitimacy and sustainable competitive advantage (Bhowmik et al. 2018; Leal Filho, Frankenberger, et al. 2021). Third, HEIs institutionalizing SBMs through pedagogy, operations, and stakeholder partnerships, allow for speedier capability building of sustainable leadership, and create socially patterned value via skills, innovation and responsible organizational practice (Franco et al. 2022; Lehtonen et al. 2022; Tomasella et al. 2023).

2.3 | Situating SBM in HEIs Within the Continuity of Existing Review Studies

To establish the position of our thematic review, we examined approximately 30 review papers published between 2020 and 2025 in Scopus and WoS. Our analysis considered their research objectives, scope including time span, datasets, geographical coverage, and number of articles, methodological approaches, as well as the gaps and biases they identified such as limitations, underexplored regions or concepts, and dataset constraints. We also assessed their contribution to advancing theoretical knowledge. These 30 review papers illustrate a substantial effort to analyze the integration of SD within HEIs. Yet, they continue to leave notable blind spots at conceptual, thematic, and methodological levels.

Our research provides an original and complementary contribution. We therefore consider that our study does not replace existing review papers but complements them by offering a more targeted perspective on the integration of the SBM in HEIs.

2.3.1 | Dominant Methodological Approaches and Their Limitations

We observe that the review papers analyzed rely primarily on bibliometric approaches. Several of these contributions have mapped publication trends, collaboration networks, and dominant themes. This is the case for Filho et al. (2025), Osman et al. (2025), Tafese and Kopp (2025), Veres et al. (2025), Omar and Abdullahi (2024), Zhavoronok et al. (2024), Li and Pu (2023) and Hermann and Bossle (2020). These review papers provide an overview of institutional dynamics and leading scholars, but they often remain limited to quantitative findings without delving into the qualitative implications for policies and institutional governance.

Alongside these approaches, a number of contributions also employed systematic or scoping reviews as organizing tools to structure knowledge and provide typologies including the works of Abulibdeh et al. (2024), Almazroa et al. (2022), Amaral et al. (2021), Avelar et al. (2022), Basheer et al. (2024), Berchin et al. (2021), Boarin and Martinez-Molina (2022), Hueske and Guenther (2021), Lim et al. (2022), Okoye et al. (2025), Sanchez-Carrillo et al. (2021), Serafini et al. (2022), Umar et al. (2024) and Vargas-Merino et al. (2024). These review papers provide typologies of barriers, conceptual frameworks for governance, or assessment tools. Nonetheless, they include methodological weaknesses as they are solely reliant on a single database, employed identical methodologies, or focused on distinct cases.

Some contributions take an integrative or conceptual perspective from which to better develop specific niches. For example, Tomasella et al. (2024) review the integration of UN SDGs into marketing curricula, Salvador and Comunian (2024) review the intersection of institutions and creative industries, Pizzutilo and Venezia (2021) astutely design a conceptual framework for social responsibility maturity, Singh and Segatto (2020) introduce a novel reflection on relational capabilities, and Omazic and Zunk (2021) design a semi-systematic synthesis. In these cases, there is much to be desired, as they are often devoid of empirical strength, or inter-institutional validation.

Against this background, our study adopts a different orientation by using semantic text-mining techniques to identify conceptual patterns. By doing so, we complement the dominance of bibliometric mapping and systematic reviews with an approach that foregrounds meaning and thematic interrelations, while remaining anchored in the field of the SBM.

2.3.2 | Temporal Coverage and Captured Contexts

The existing review papers also vary in how far back in time they reach and for how long the period of time sampled. Some have long spans of time and provide a more general historical account, such as Tafese and Kopp (2025), who looked at more than 30 years of publications, Abad-Segura and González-Zamar (2021), who reviewed twenty-eight years, Boarin and Martinez-Molina (2022), who covered 35 years, Zhavoronok et al. (2024), who reviewed between 40 and 50 years, or Berchin et al. (2021), who tracked developments back to 1968. Although all the syntheses provide understandings on the structural development of the field, the studies may not effectively capture the shifts of the last couple of years, in particular those connected to the pandemic, digitalization, or artificial intelligence.

Other contributions exist that focus on fairly intermediate time intervals of 9 to 11 years, such as Amaral et al. (2021), Bautista-Puig and Sanz-Casado (2021), Filho et al. (2025), Osman et al. (2025), and Umar et al. (2024). These capture the changes that took place after the adoption of the UN SDGs, but broadly include scientific output. The final category of reviews is limited to shorter periods of 5 to 7 years such as Basheer et al. (2024), Lim et al. (2022), Okoye et al. (2025), Serafini et al. (2022) and Veres et al. (2025). These do a better job of capturing recent changes related to how COVID has affected knowledge mobilization, how digital practices have taken on a greater importance, or the introduction of new pedagogical tools.

In this paper, we follow this last orientation by choosing to limit our study by time (2020–2024). This time period situates our

contribution in a time of historical importance that has not yet been covered by previous review studies.

2.3.3 | Main Themes and Explored Niches

We observe that the literature is divided into several major thematic families. A first axis focuses on mapping scientific production and leading institutions, as shown for instance in the works of Filho et al. (2025) and Osman et al. (2025). A second axis concerns the assessment of performance and sustainability measurement tools, with contributions such as those by Basheer et al. (2024), Pizzutilo and Venezia (2021) and Umar et al. (2024). A third axis addresses pedagogy and curricula, exemplified by Boarin and Martinez-Molina (2022), Hermann and Bossle (2020), Lim et al. (2022), Sanchez-Carrillo et al. (2021) and Tomasella et al. (2024).

A fourth axis concentrates on digital and technological transformations, studied for example by Abulibdeh et al. (2024), Okoye et al. (2025), Omar and Abdullahi (2024), Veres et al. (2025) and Zhavoronok et al. (2024). Other niches include the role of creative industries, explored by Salvador and Comunian (2024), international declarations and initiatives such as the principles for responsible management education, analyzed by Avelar et al. (2022) and Berchin et al. (2021), as well as economic and social responsibility dimensions, discussed by Abad-Segura and González-Zamar (2021), Bautista-Puig and Sanz-Casado (2021) and Omazic and Zunk (2021).

While these thematic strands offer a comprehensive overview, any existing reviews explicitly address the SBM dimension of in HEIs. By highlighting this specific angle, our study positions itself in dialogue with the existing reviews while extending its thematic reach.

2.3.4 | Recurring Biases and Gaps

Our analysis spotlights several cross-cutting biases. Geographical biases are particularly pronounced, with an overrepresentation of Europe, China, and the United States, as noted by Bautista-Puig and Sanz-Casado (2021), Osman et al. (2025), Salvador and Comunian (2024) and Umar et al. (2024). Conversely, Africa and certain regions of Asia and Latin America remain largely marginalized, as emphasized by Basheer et al. (2024), Tafese and Kopp (2025) and Zhavoronok et al. (2024). We also observe thematic imbalances, with a predominance of environmental and economic dimensions, while social, managerial, and equity-related aspects remain underdeveloped. This observation is documented in particular by Basheer et al. (2024), Sanchez-Carrillo et al. (2021) and Tafese and Kopp (2025).

Methodological biases include a reliance on Scopus, noted by Osman et al. (2025) and Tafese and Kopp (2025), a lack of methodological diversity, underlined by Almazroa et al. (2022), and an excessive dependence on case studies or self-reported data, identified by Amaral et al. (2021) and Serafini et al. (2022). Finally, conceptual biases concern terminological ambiguities, highlighted by Tomasella et al. (2024), weaknesses in consolidated theoretical frameworks, noted by Almazroa et al. (2022), and a lack of interdisciplinary transversality, observed by Veres et al. (2025) and Mokski et al. (2023).

In response, our study is designed to overcome these recurrent limitations. By combining Scopus and WoS, and adopting a management-oriented focus, we frame SBM in HEIs through a lens that has so far received limited scholarly attention.

3 | Materials and Methods

The methodology section is structured as follows. First, in subsection 3.1, we look at the data foundations of the study, examining which bibliographic databases were used, data sources and how the corpus was composed, and what criteria were used to define eligibility for publications. Second, in subsection 3.2, we explain the methodological framework, explaining the analytical processes followed and the processes used to ensure statistical and systematic evaluation of the data. As an integrative synthesis, Figure 2 provides a schematic overview of the methodological process described in Section 3. In particular, it delineates the major steps involved, from data compilation to analytical evaluation, and offers a visual synthesis of the processes that were followed.

3.1 | Data Sources, Corpus Compilation, and Selection Criteria

Scopus and WoS are the two most used and recognized bibliographic databases for academic research (Pranckutė 2021; Zhu and Liu 2020). Both are multidisciplinary, selective indexing, and tracking citation, making them key databases for bibliometric analyses, research evaluation, and systematic reviews (Beriozovas et al. 2024; Sampieri et al. 2025; Saoualih, Safaa, and Moureau 2024). In this sense, their similarity is in their role as referenced sources of scholarly metadata for rigorous and reproducible research across research domains.

The matters in which they share similarities should not overshadow the differences that characterize their applicability in practice. WoS, a Clarivate Analytics project, is the original large-scale, international bibliographic source. WoS has been considered an important platform to assess journals and their impact (Li et al. 2018). WoS is made up of a modular structure, containing indexed collections based on features of materials or themes, with the Web of Science Core Collection (WoS CC) as the central collection. It contains six primary citation indexes namely SCIE, SSCI, A&HCI, CPCI, BKCI, with the ESCI being the latest edition (Carloni et al. 2018; Liu 2019; Pranckutė 2021). Institutional access often limits users to WoS CC as opposed to the full WoS platform. Since WoS CC and WoS do not necessarily contain common datasets, there is much variation across institutions and their results as shown (Liu 2019, 2021a, 2021b; Li and Liu 2020).

Scopus, which is administered by Elsevier, was established as a direct competitor to WoS in 2004 (Baas et al. 2020; Pranckutė 2021). Scopus differs from WoS in that the model is all-in-one. If a subscription is purchased, the user is able to access Scopus in its entirety without the limitations of modules.

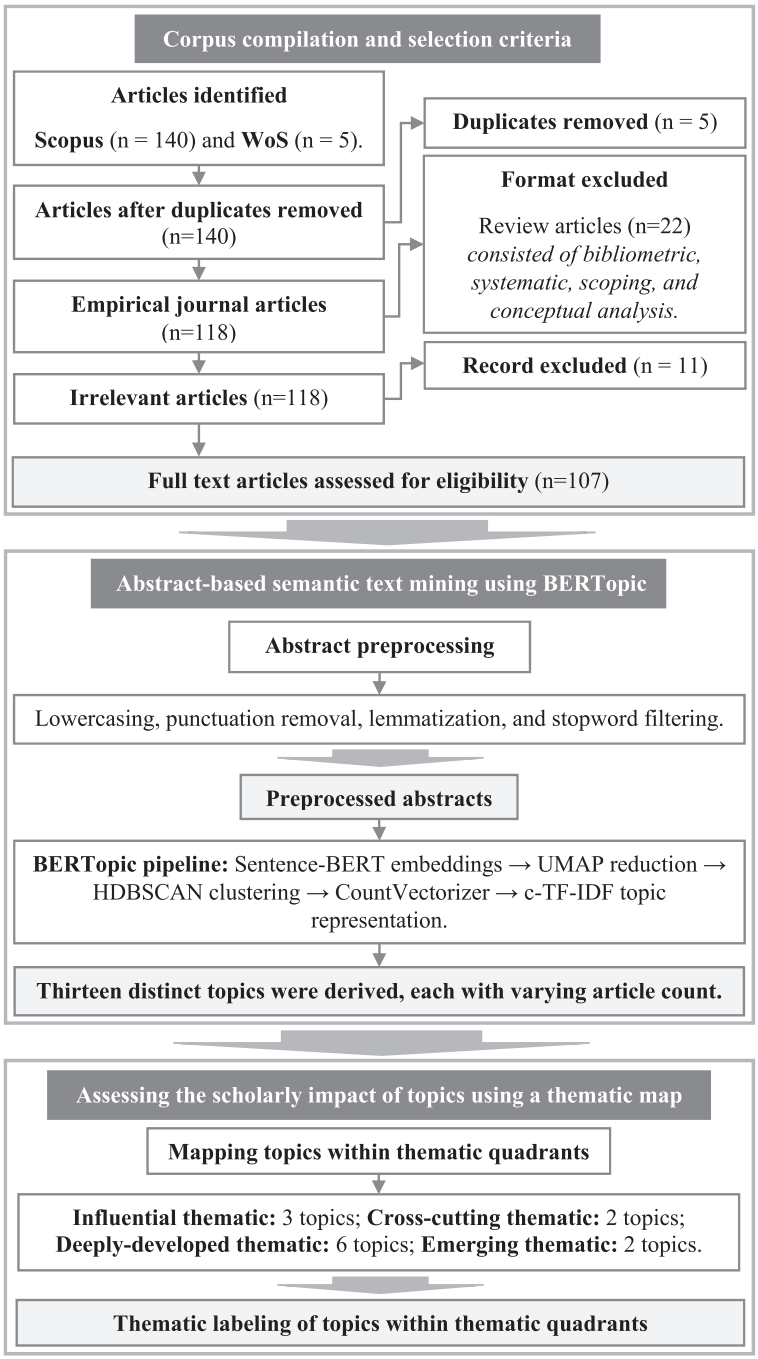

FIGURE 2 | Schematic overview of the methodological process.

Having all in one eliminates discrepancies across institutions, helping to enhance consistency and comparability. The advantages of Scopus include broad multidisciplinary coverage, frequent updates of citation information, and a citation tracking feature with powerful search capabilities.

This study uses Scopus and WoS as the main datasets for the study, and mixed use is particularly useful for management sciences as Scopus presents this field under *"Business, Management and Accounting"*, while Web of Science splits management sciences into two categories in *"Business"* and *"Management"*.

To be consistent, the data collection process was conducted on February 3, 2024, using searches with the following terms *"Higher Education Institutions"* and *"Sustainable Development"* for the years 2020–2024. The records were collected from the Scopus category noted above and from the two corresponding categories in WoS, which were then combined. The first term, used in Scopus and WoS, encompasses all HEIs, as well as universities, within a broader institutional context. The second term denotes a process of change aimed at the achievement of concrete sustainability goals. This processual approach is crucial to the study, as it helps us recognize work that links organizational practices to broader transformational dynamics. The workflow brought the two databases together, using different organizational schemes, and provided a consistent dataset to conduct analysis. Search strategy and filtered article counts are displayed in Table 1, and the filtering criteria are included in Table 2.

TABLE 1 | Identifying the eligibility and relevance of empirical studies.

Feature	Scopus	Web of science
Search parameters	*"Higher Education Institutions"* and *"Sustainable Development"* in Title, Abstract, Keywords.	
Filters applied	Years: 5-year period (2020–2024) Disciplinary Coverage: Scopus – *"Business, Management and Accounting"*; WoS – *"Business"* and *"Management"*. Document Type: Peer-reviewed journal publications reporting empirical findings. Language: English	
Documents identified	140 articles founded	5 articles founded
Final selection	107 articles after excluding: 5 duplicates, 22 reviews papers (*bibliometric, systematic, scoping, and conceptual*) and 11 irrelevant studies.	

Source: Authors.

TABLE 2 | Selection criteria for empirical studies.

Criterion	Inclusion	Exclusion	Explanation
Thematic relevance	The terms *"higher education institutions"* and *"sustainable development"* can be identified in the authors' titles, abstracts, and keywords.	Lacks explicit reference to both terms.	Ensures direct relevance to the research topic.
Source credibility	Indexed in Scopus and WoS.	Articles from other databases.	Ensures that articles are reviewed and published in legitimate journals.
Publication period	Articles issued during 2020–2024	Articles published outside this timespan.	Focuses on recent trends.
Geographic scope	Covers geographical views on the topic on a global scale.	—	Ensures inclusive global analysis.
Research type	Peer-reviewed empirical studies.	Theoretical and gray literature.	Give priority to research grounded in real-world data.
Disciplinary focus	Studies within business management field.	Articles from unrelated disciplines.	Aligns with the research focus on business management field.
Language	Written in English.	Articles in other languages.	Facilitates worldwide accessibility for researchers
Uniqueness of data	Only one version of each study.	Duplicate publications.	Prevents redundancy and ensures original contributions.

Source: Authors.

Corpus compilation and filtration from Scopus and WoS were integrated into a single Excel file using Python. Eligible studies were retained and non-eligible ones removed after abstract screening. Python also supported the development and application of our methodological approach, as described in subsection 3.2. It facilitated data processing and visualization thanks to its efficiency with large datasets, automation functions, and extensive libraries. Moreover, its customizable visualizations enhanced both the clarity of the data and the communication of results.

3.2 | Methodological Framework Used

This study employs topic modeling, a natural language processing technique that identifies underlying topics in a collection of texts. The method is particularly useful for text corpora that consist of scientific abstracts because abstracts provide a concise summary of the research questions, the methods employed, and the results (Saoualih, Perkumienė, et al. 2025).

The literature groups topic modeling methods into three main families, namely matrix-based, probabilistic, and embedding-based methods. Matrix-based methods, such as Non-Negative Matrix Factorization (Sampieri et al. 2024) and Latent Semantic Analysis, take a term-document matrix and factor it to find latent word co-occurrences (Evangelopoulos et al. 2012). The approach works better with semi-structured or reasonably sized datasets, and with pre-processing techniques like TF-IDF weighting, allows for easy extraction of clear and distinct topics. That being said, matrix-based approaches are limited with shorter, noisy texts, and by the nature of linear decomposition in matrix-based formulations, there may be limits to the depth of the semantic relation in topic modeling, resulting in less coherent outputs (Egger and Yu 2022).

Probabilistic models, such as Latent Dirichlet Allocation, visualize documents as mixtures of topics composed of a distribution over words (Saoualih, Safaa, Bouhatous, et al. 2024). Probabilistic models can effectively represent sparse data with respect to topics, are conceptually straightforward, and for these reasons, they are common in many studies concerned with text analysis. However, in the simplification inherent in probabilistic models, we must be cautious of oversimplifications, since short texts or datasets with weak co-occurrence patterns can create loose, ambiguous topic clusters with a lot of overlap. More complex versions of these probabilistic models such as the Hierarchical Dirichlet Process (Dai and Storkey 2014) and correlated topic models (Xun et al. 2017), both provide the flexibility to incorporate complex topic relationships but also require more complex models and may lose interpretability.

Embedding-based methods use dense vector representations of documents and words better able to represent contextual meaning and its relationships. Their flexible representations are less subject to many of the pitfalls faced with approaches based on matrix or probabilistic techniques that also generated meaningful outputs, especially when working with unstructured or noisy corpora. Yet, they are computationally intensive, still require tuning of hyperparameters, and even the would-be usable results may remain difficult to interpret even with visualizations or clustering steps.

3.2.1 | Stage 1: Abstract-Based Semantic Text Mining Using BERTopic

To overcome these limitations, this study applied BERTopic, an embedding-based model suited to short, dense texts. Embedding-based methods, such as BERTopic, mark a significant advancement by using transformer-based embeddings like BERT to capture semantic relationships (Saoualih, Shen, et al. 2025). BERTopic performs well with short, context-rich texts, generating coherent topics and automatically determining the optimal number of topics with little manual input (Saoualih, Perkumienė, et al. 2025). Still, it is computationally intensive and often produces many topics that need substantial manual refinement (Kirilenko and Stepchenkova 2025). In this study, BERTopic was selected for its capacity to extract semantically rich topics from short, context-dependent texts such as scientific abstracts. The algorithm follows a five-step process:

1. **SBERT embedding**

$$V_i = \mathrm{SBERT}\left(\mathrm{Sentence}_i\right) \tag{1}$$

Sentence-BERT (SBERT) transforms each sentence i into an embedding vector V_i that encodes deep semantic features, creating the basis for subsequent clustering.

2. **UMAP dimensionality reduction**

$$u_i = \mathrm{UMAP}\left(v_i\right) \tag{2}$$

Through, Uniform Manifold Approximation and Projection (UMAP), high-dimensional embeddings v_i are mapped into reduced dimensional vectors u_i, with Euclidean distance preserves the integrity of both local neighborhoods and global.

3. **HDBSCAN clustering**

$$d\left(u_i, u_i\right) = \sqrt{\sum_{k=1}^{d}\left(u_{ik} - u_{jk}\right)^2} \tag{3}$$

Hierarchical Density-Based Spatial Clustering of Applications with Noise (HDBSCAN) detects dense regions within the reduced space, grouping them into clusters. Euclidean distance serves two purposes here, namely identifying cluster boundaries and quantifying similarity between vectors u_i and u_j, with d denoting the reduced dimensionality.

4. **CountVectorizer tokenization**

$$\mathrm{Count}_{t,c} = \sum_{j \in c}\sum_{i=1}^{N_j} 1\left(t_i = \mathrm{t}\right) \tag{4}$$

Each cluster c is then vectorized through token frequency counts. For a given term t, $\mathrm{Count}_{t,c}$ expresses the number of occurrences across all documents j in that cluster, where N_j represents the total terms in document j.

5. **c-TF-IDF topic representation**

$$c - \mathrm{TF} - \mathrm{IDF}_{t,c} = \mathrm{TF}_{t,c} \cdot \mathrm{IDF}_t \tag{5}$$

Class-based TF-IDF assigns importance to terms that define a cluster relative to the corpus. $\mathrm{TF}_{t,c}$ denotes how often term t appears in class c. The inverse document frequency is given by $\mathrm{IDF}_t = \log\left(\frac{N}{1+\mathrm{DF}_t}\right)$ with N the total number of documents and DF_t the number containing t.

3.2.2 | Stage 2: Assessing the Scholarly Impact of Topics Using a Thematic Map

Following the extraction of latent themes with BERTopic, the analysis progressed into a structural evaluation stage using a thematic map. This tool creates a strategic frame for classifying topics and interpreting their scholarly impact within academic discourse. BERTopic captures coherent and semantically rich topics but does not reveal how they connect to each other or how strongly they contribute to the overall structure. Thematic mapping addresses this gap by positioning topics in a two-dimensional space defined by density and centrality, turning raw topic outputs into a diagnostic framework.

Density reflects the internal cohesion of a topic:

$$\mathrm{Density}\ (T) = \frac{1}{N_T\left(N_T - 1\right)}\sum_{i=1}^{N_T}\sum_{j=i+1}^{N_T}\cos\left(\vec{d}_i, \vec{d}_j\right) \tag{6}$$

It is computed as the average pairwise cosine similarity between documents showing how semantically similar the texts in topic T are. In this case, N_T is the number of documents in the topic, $\vec{d}_i$ and $\vec{d}_j$ are the TF-IDF vector representations, and $\cos\left(\vec{d}_i, \vec{d}_j\right)$ is the cosine similarity.

Centrality indicates a topic's importance by measuring how its documents relate to the centroid:

$$\text{Centrality}\,(T) = \frac{1}{\frac{1}{N_T}\sum_{i=1}^{N_T} \parallel \vec{d}_i - \vec{C} \parallel} \tag{7}$$

$\vec{C}$ is the centroid, the mean vector of all documents in the topic. The expression $\parallel \vec{d}_i - \vec{C} \parallel$ gives the Euclidean distance between document i and the centroid. Topics whose documents are located nearer to $\vec{C}$ score higher in centrality.

Density and centrality are each normalized to an intervallic range [0, 1] to facilitate comparative calculations:

$$\text{Normalized Metric} = \frac{\text{Metric} - \min\,(\text{Metric})}{\max\,(\text{Metric}) - \min\,(\text{Metric})} \tag{8}$$

Normalization ensures consistent evaluation across topics and clearer visualization.

This stage translates the calculated metrics into a typology of five topic classes:

- *Influential topics*: central to the field and drive theoretical, empirical, and methodological advances.
- *Cross-cutting topics*: integrated into multiple domains, connecting interdisciplinary debates.
- *Deeply developed topics*: specialized but largely disconnected from wider academic conversations.
- *Emerging topics*: at early stages, attracting attention but not yet recognized as central.
- *Peripheral topics*: marginal to discourse, with limited connections and attention.

By clarifying both structure and position, the classification links analytical findings to strategic priorities and supports more informed decision-making.

4 | Key Findings and Critical Discussion

This section provides an overview of the main findings and a critical discussion of the research trends demonstrating the application of SBM in HEIs. Subsection 4.1 maps trends in topics and their impact on academic literature before detailing the geographic and publication trends and also the historic development of conceptual structures. Subsection 4.2 subsequently synthesizes the discussions and positions the upcoming research agenda, offering a critical interpretation of the findings and highlighting future research directions.

4.1 | Mapping Topics Trends and Their Scholarly Impact

Figure 3 depicts the 13 different topics based primarily on the sources of publication and the countries in which the research was conducted. While the statistics were generated from the 50 journals and countries to ensure that the data presents the most representative and comparable aspects of SBM in HEIs.

This distribution illustrates that the most represented contexts are *Portugal* (10.47%), *United Kingdom* (9.52%) and *Germany* (9.52%) which indicates a strong European concentration of the debate surrounding SBM in HEIs. In addition, *India* (5.71%), *Spain* (4.76%), *Vietnam* (4.76%), *Brazil* (3.81%), *Australia* (3.81%), and *Egypt* (3.81%) contribute some articles, while other regions such as *Canada, Ukraine, South Africa*, and *the United States* are relatively invisible. This pattern shows both some diversification across contexts in SBM research as well as a current geographical imbalance since many regions of the Global South are under-represented.

In terms of publication distribution, the *Journal of Cleaner Production* clearly dominates with 25.71%, then lowers down to the *IEEE Transactions on Engineering Management* (3.81%) and *International Journal of Management Education* (3.81%). Other outlets make contributions, but on a slightly smaller scale, like *Sustainability Accounting, Management and Policy Journal* (2.86%), *Bottom Line* (1.90%), *International Journal of Educational Management* (1.90%), and *Technological Forecasting and Social Change* (1.90%).

Additionally, there is a long tail of specific journals, including the *Journal of Business Research, Journal of Sustainable Tourism, Business Strategy and the Environment, Management Decision, Journal of Technology Transfer*, and *International Journal of Energy Sector Management*, that together reported less than 1% of purified publications, which suggests fragmentation and diffusion in the overall work as well.

To that extent, the escapable dual dynamic in the field of SBM in HEIs is substantiated by both concentration in a small number of highly visible platforms and the continuing dispersion across a broad array of disciplinary outlets. This suggests that there is confirmation of the consolidation of SBM in some specific publication venues combined with the diversification of views across multiple academic communities.

Figure 4 builds off the analysis provided in Figure 3 and demonstrates the most popular author keywords over the range from 2020 to 2024. The keywords that reoccurred the most often included "*sustainability*," "*sustainable development*", "*sustainable development goals*", "*higher education*", and "*higher education institutions*". These recurring terms reinforced the prominent position of both sustainability and higher education as a context in the literature on SBM in HEIs.

In addition to these dominating keywords, a number of more specific terms are evident in the mix, including "*education for sustainable development*", "*digitalization*", "*employability*", "*waste management*", and "*university social responsibility*" among others. Other notions with frequent occurrence include "*sustainability reporting*", "*systems thinking*", "*design thinking*", "*innovation pedagogy*", "*social innovation*", "*waste prevention*", "*curriculum mapping*", and "*university governance*." Overall, the distribution of keywords helps us understand how the literature combines broad SBM in HEIs debates with specific themes and institutional practices.

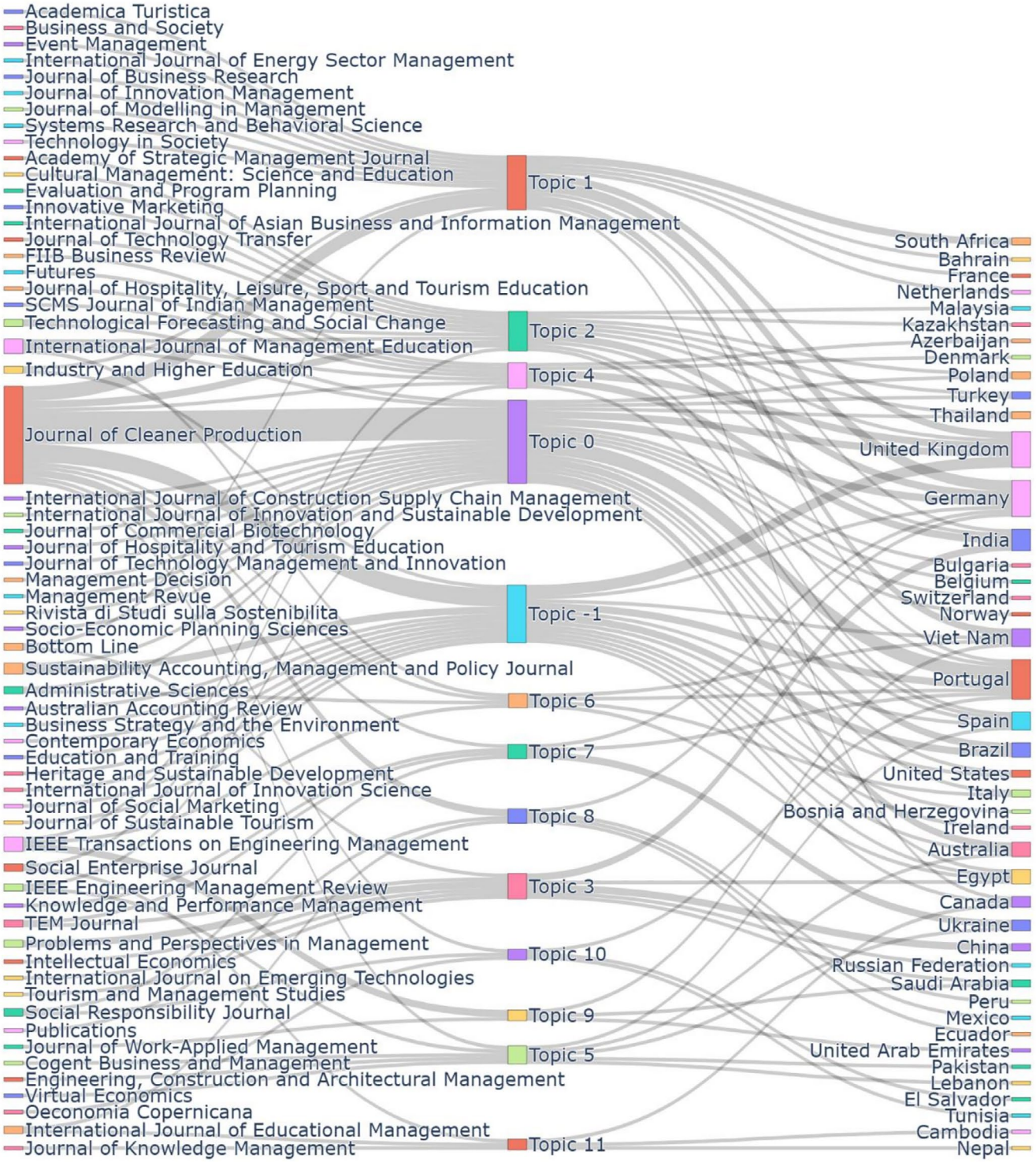

FIGURE 3 | Mapping of topics according to publication sources and countries.

Through semantic clustering using transformer-based sentence embeddings in combination with HDBSCAN density optimization, topics were generated from the pre-processed abstracts for the literature review. This inductive and unsupervised arrangement allowed the thematic structures to surface from the corpus rather than being predetermined. The co-authors undertook this process with extensive cross-validation. This validation was done by demonstrating that transformer-based embeddings created semantic relations that were much richer than keyword co-occurrences, HDBSCAN was able to adapt to heterogeneous topic distributions and effectively cope with outliers, and the abstracts highlighted clustering that described the primary contributions of studies.

These actions emphasized the clustering process's integrity and fidelity while affirming that the thematic map in Figure 5 depicted the underlying configuration of the literature. The figure also illustrates the academic significance of topics by identifying

FIGURE 4 | Keywords used by authors over the last decade according to each topic.

the intersection of density and centrality observations. Each topic appears as a bubble, whose size relates to the volume of studies, and the position within the quadrants identifies the level of thematic development.

As research progresses, topics may shift between quadrants, evolving through stages such as emergence, development, influence, and cross-cutting. While a decline phase is theoretically possible, it is not evident in our results. This dynamic

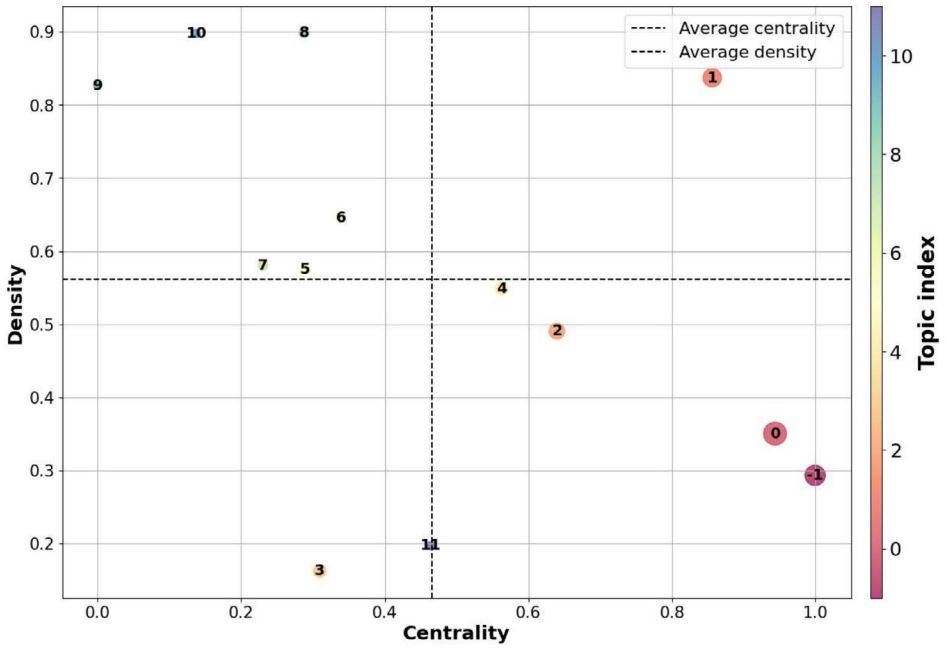

FIGURE 5 | Thematic map of topics distribution by density and centrality.

progression is organized into four key phases, as outlined in Table 3.

Building on previous findings, Table 4 presents a thematic overview of empirical studies, categorizing them by identified topics. Over the past 5 years, 13 major topics have emerged within this framework. The following subsection examines their significance and potential impact.

4.2 | Thematic Round-Ups of the Discussions and Framing the Forthcoming Agenda

In this subsection we will follow up on the topics Lardy laid out in Table 4, while carefully carving out the gaps in empirical literature and laying out precise directions for a future research agenda. In Sub-Subsection 4.2.1 there will be discussions of influential themes. In Sub-Subsection 4.2.2 there will be discussions of cross-cutting themes. In Sub-Subsection 4.2.3 there will be discussions of deeply developed themes. In Sub-Subsection 4.2.4 there will be discussions of emerging themes. The results of these discussions will be helpful both in articulating the strengths and blind spots evident in current scholarship and in organizing a way forward for a more coherent, integrative, and global agenda for the future growth of SBM in HEIs.

4.2.1 | Influential Thematic Areas

4.2.1.1 | Sustainable Energy Transition and Ecological Behaviors in HEIs (Topic 1). Dent et al. (2024) illustrate how HEIs could provide an anchor to cultural and creative industries in the UK and consider the capability approach to display how resources become opportunities for communities rather than merely having value. That institutional perspective resonates with Shabalala (2023), who focuses on HEIs and cultural heritage tourism in South Africa and poverty alleviation, making direct reference to related academic engagements of achieving UN SDGs 1, 8, and 11. The complementarity of these studies articulates both a shared focus on stakeholder integration and an added heritage dimension providing sustainability debates with a broadened context beyond Europe.

Another avenue of research focuses on individual behavior change. Duong (2024) examines energy-saving behaviors among Vietnamese students, utilizing the theory of planned behavior and the norm activation model, and finds that peer influence and media campaigns have a role in influencing sustainable behaviors. This

TABLE 3 | Classification of topics by developmental stage and academic significance.

Quadrants	Topics status	Topics revealed
Bottom-left[a] (*Low density, Low centrality*)	Emerging topics	Topic 3; Topic 11
Top-left (*High density, Low centrality*)	Well-developed topics	Topic 5; Topic 6; Topic 7; Topic 8; Topic 9; Topic 10
Top-right (*High density, High centrality*)	Influential topics	Topic 1; Topic 2; Topic 4
Bottom-right (*Low density, High centrality*)	Cross-cutting topics	Topic −1; Topic 0

[a]No topics in the results met the conditions for being classified as peripheral, which would represent the limiting case where both density and centrality equal zero.
Source: Authors.

TABLE 4 | Mapping of perspectives from empirical advances in SBM in HEIs (2020–2024).

Topic index	Studies	Thematization	Academic importance
1	(Duong 2024; Dent et al. 2024; Nguyen et al. 2023; Shabalala 2023; Bäumle et al. 2023; Amaral et al. 2023; Franco et al. 2022; Kirst and Schroth 2022; Easter et al. 2022; Paucar-Caceres et al. 2022; Menon and Suresh 2022; Cottafava et al. 2022; Al Dhaen 2021; Bien and Sassen 2020; Maina et al. 2020).	Sustainable energy transition and ecological behaviors in HEIs.	*Influential thematic areas*
2	(AlShamsi et al. 2024; Cembranel et al. 2023; Eustachio et al. 2024; Gelashvili et al. 2024; Hernández-Diaz et al. 2021; Hiran and Dadhich 2024; Jumasseitova et al. 2024; Klein et al. 2022; Krishnasamy et al. 2023; Salleh et al. 2020; Yuan et al. 2023).	Emerging technologies and innovative management for SD in HEIs.	
4	(Cherian and Francis 2021; Leal Filho et al. 2022; Lehtonen et al. 2022; Phi and Clausen 2021; Sierra and Rodriguez-Conde 2021; Tomasella et al. 2023; Warrier et al. 2021).	Innovative HEIs for leadership and systems thinking in SD.	
−1	(Kim and Comunian 2024; Tašaković and Büyükdağlı 2024; Pereira de Morais et al. 2024; Leal Filho, Salvia, and Eustachio 2023; Lopes et al. 2023; Hübscher et al. 2022; Fawehinmi et al. 2022; Maheshwari and Nayak 2022; Tien et al. 2022; Sierra et al. 2022; Hauser and Ryan 2021; Zizka et al. 2021; Leal Filho, Frankenberger, et al. 2021; Saha et al. 2021; Herzner and Stucken 2020; McGrath et al. 2021; Minutolo et al. 2021; Elmassah et al. 2020).	Integrating UN SDGs through interdisciplinary education and HEIs policies.	*Cross-cutting thematic areas*
0	(Adib 2024; Daskalova-Karakasheva et al. 2024; Leal et al. 2024; Pacheco et al. 2024; João et al. 2023; Puertas et al. 2023; Albanese et al. 2022; Zulkifli 2023; Pontelli et al. 2023; Sieg et al. 2023; Wolf et al. 2022; Seidu et al. 2022; Chiang and Chen 2022; Aleixo et al. 2021; Ribeiro et al. 2021; Janssens et al. 2021; Atici et al. 2021; Zizka and Varga 2021; Tasdemir and Gazo 2020; Gomes et al. 2021; Corrêa et al. 2020; Khan and Henderson 2020).	SD in HEIs through policies, partnerships, and entrepreneurship.	
5	(Jammoul et al. 2023; Liashenko et al. 2021; Rehmani et al. 2022; Torrijos et al. 2021; Udawatta et al. 2021).	Innovative interdisciplinary strategies for campus waste management and SD.	*Deeply-developed thematic areas*
6	(Bui et al. 2024; Caputo et al. 2021; de Matos Pedro et al. 2021; Nazneen et al. 2023).	HEIs' role in communication, SD, and regional impact.	
7	(Dreval et al. 2022; Jürgens et al. 2023; Monteiro et al. 2024; Smolennikov et al. 2024).	HEIs' academic, environmental, and economic contributions to global SD.	
8	(Álvarez-Munoz et al. 2024; Leal Filho, Amaro, et al. 2021; Leal Filho, Wall, et al. 2021; Vallaeys et al. 2022).	Institutional efforts to integrate and assess SD in HEIs.	
9	(Jabeen 2022; Nguyen et al. 2024; Almuaqel 2022).	Aligning HEIs curricula with UN SDGs and inclusive education in evolving pedagogy.	
10	(Gallardo-Vázquez et al. 2024; Ouragini and Ben Hassine Louzir 2024; Santos et al. 2020).	Integrating social responsibility into HEIs policies for student satisfaction and UN SDGs.	
3	(Kaur and Kaur 2023; Said and Kamel 2023; Yu et al. 2023; Pu et al. 2022; Strielkowski et al. 2022; Mittal et al. 2022; El Haggar and Alshammary 2020).	Sustainable digital transformation in HEIs for skills and employability post-pandemic.	*Emerging thematic areas*
11	(Adhikari and Shrestha 2023; Belcher et al. 2022; Sok et al. 2023).	Knowledge management and social practices for education and SD in HEIs.	

Source: Authors.

micro-level approach has been enhanced with Nguyen et al. (2023) examining how university-based events help to develop social enterprise and the UN SDGs in Vietnam. Although these studies provided some valuable context in Asia, they raise concern about their short-term focus and event-driven behaviors relative to scalability and impact in the long term.

Institutional barriers continue to be a significant issue. Amaral et al. (2023) outline organizational rigidities and failures of communication at the University of Coimbra in Portugal and emphasize the potential for adaptive institutional cultures. Similarly, Bäumle et al. (2023) underline the role of knowledge intermediaries in Germany and their ability to partially link actors when they are engaging in socio-technical transitions. Both contributions suggest that organizational innovation is contingent on the agency of intermediaries as well as the structural agency of universities, and yet they both have a dominant emphasis on Europe and little exploration of institution types from the Global South.

The significance of multi-stakeholder collaboration is emphasized by Franco et al. (2022) in relation to Belgium and the Netherlands as well as Menon and Suresh (2022) in relation to India. These authors explore co-creation with stakeholders as a driver of innovations for UN SDGs, with the first study providing a structural mapping of drivers of different levels of sustainability through interpretive modeling, and focusing on government and leadership. In unison, these studies underscore both the analytical richness of applying both structural and participatory perspectives but also the difficulty of comparing across different contexts and methodological heritages.

Methodological diversity is also evident in the work of Cottafava et al. (2022) who identify an interdisciplinary sustainability index based on quantitative measures of UN SDG-related research at the University of Turin. This is a marked departure from the qualitative work of Amaral et al. (2023) and Nguyen et al. (2023), both of which showcase the ongoing fragmentation between measurement frameworks and situated case studies.

Strategically, Al Dhaen (2021), Bien and Sassen (2020) and Ransom Maina et al. (2020) advance the dialogue on organizational cultures and activism. Their studies range from information management in HEIs in Bahrain, discursive resistance strategies in German universities and fossil-fuel divestment campaigns in Canada. Collectively, they reflect the importance of institutional strategy, organizational narrative and collective agency in shaping sustainability, while revealing a disproportionate distribution of evidence across regions in the context of Africa and Global South spaces still under represented.

These contributions illustrate the capacity for HEIs to take simultaneous action at the community, behavioral, institutional, and strategic levels. However, the literature is not unified in its conceptual frameworks for developing sustainability activities, with behavioral theories, structural approaches, and capability lenses being applied independently. Similarly, methodological biases abound, ranging from too few case studies in some instances to an absence of longitudinal data in others, preventing generalizability. The predominance of European contexts and the relative absence of Global South contexts create a geographical imbalance which privileging one location over another undermines the universalist claims made in the sustainability debates.

On the basis of the preceding discussion, Figure 6 is employed as an analytical matrix to address these research gaps and to advance the agenda of SBM in HEIs.

4.2.1.2 | Emerging Technologies and Innovative Management for SD in HEIs (Topic 2). AlShamsi et al. (2024) examined the adoption of blockchain in the United Arab Emirates through a combined application of the protection motivation theory and the expectation confirmation model and reported user satisfaction as critical and focused on it, while ignoring institutional barriers, and other systemic issues. This focus on user engagement was also developed by Hiran and Dadhich (2024) in India when they evaluated cloud-edge technology with structural equation modeling and artificial neural networks, and articulated socio-cultural elements as predominant issues. These studies demonstrate the paths afforded by technology-specific models but also underscore the tendency to fragment across these studies, in relation to the broader governance, and policy issues they neglect to address.

A more global lens is adopted by Eustachio et al. (2024), who consider the adoption of Principles for Responsible Management

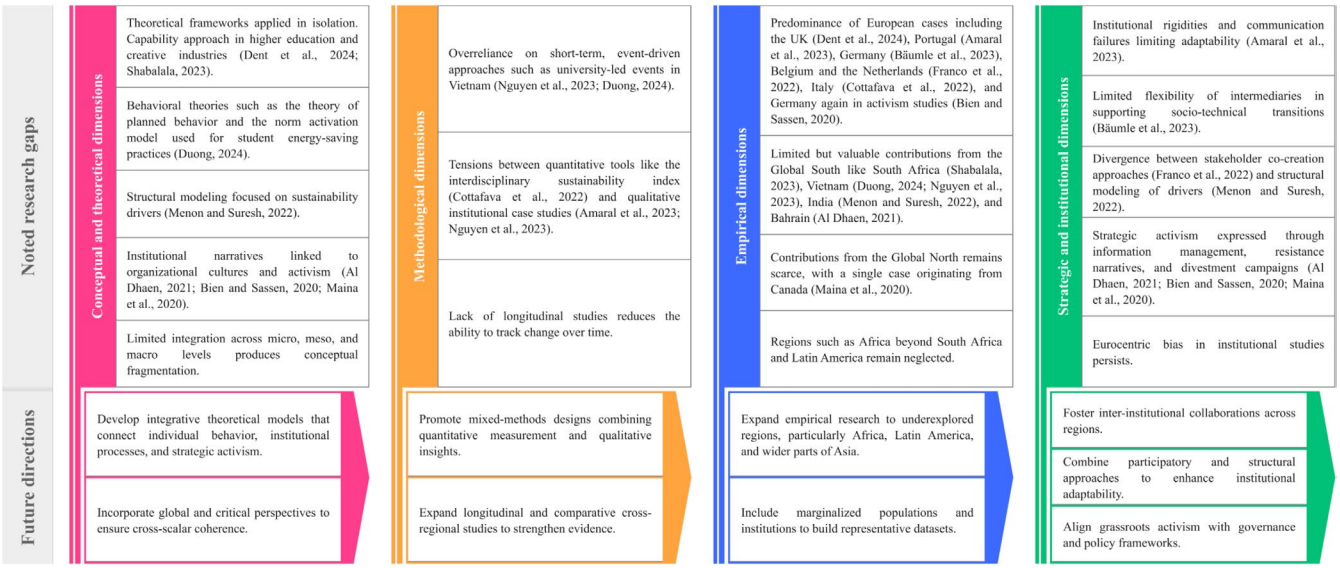

FIGURE 6 | Analytical matrix of topic 1 for addressing research gaps and advancing the agenda of SBM in HEIs.

Education in business schools which span 104 countries. The authors found that signatory schools had stronger integration of sustainability, but there is still uncertainty about how anything scalable can be adopted in the context of signatory schools, underlining the continued divide between institutions with a formal global affiliation and those without. In addition to that, in Spain, Gelashvili et al. (2024) considered social media's contribution to sustainability in the context of universities and higher education using PLS-SEM as a data analysis technique. While they found strong social and environmental impacts, they also found a weak economic impact. While the study suggested that digital platforms can be useful tools for engagement, it did not consider the potential risks of misinformation, and inequity in the access and use of digital technologies, which would facilitate some limitations in the robustness of their conclusions.

One other key consideration for engagement is the aspect of stakeholder engagement. Jumasseitova et al. (2024) explore alumni involvement in environmental, social and governance developments in Kazakhstan, whereas Yuan et al. (2023) present mobile payments and sustainability consumption in China, illustrating that perceived ease of use and usefulness reduce risk perceptions. Both contributions present a focus on participation and behavior change. Still, they illustrate different stakeholder groups and leave unanswered questions about integrating findings into comprehensive sustainability strategies.

Equity and inclusion are another strand. Cembranel et al. (2023) presented a model with multiple criteria for integrating gender and sexuality dimensions within Brazilian universities and Krishnasamy et al. (2023) illustrated various ways in which cultures may enable or disable the empowerment of female faculty in Indian HEIs. Together, they pointed out that inclusion was a dimension of sustainability, but regrettably, they were mostly contextual and not cross-regionally comparative which limited the generalizability of their conclusions.

Several contributions also link sustainability to management frameworks and measurement tools. Klein et al. (2022) examined Lean management efficiencies and sustainability in Brazilian and Portuguese HEIs, underscoring leadership and continuous improvement. Hernández-Diaz et al. (2021) designed a holistic tool for measuring sustainability in Colombian Universities, while Salleh et al. (2020) mapped success factors and challenges in Malaysian HEIs through a SEM model. Collectively, they illustrate the continued advancements made in operationalizing sustainability assessment, but point out methodological limitations and biases as many assessments remained specific to cases and therefore, lack longitudinal legitimacy.

These contributions show that technological innovation, stakeholder engagement, inclusiveness, and management frameworks are core to sustainability advancement in HEIs. Yet, the academic literature is characterized by conceptual fragmentation, empirical short-term designs, and geographical imbalances with the Global South being largely absent except for discrete contributions from Kazakhstan, Brazil, India, and Malaysia. Notably, while presented as policy-related, many claims are underpinned by description rather than analysis, which diminishes their potential to contribute towards meaningful transformative institutional change.

Drawing on the discussion developed above, we use Figure 7 as an analytical matrix to tackle these gaps and guide the research agenda of SBM in HEIs.

4.2.1.3 | Innovative HEIs for Leadership and Systems Thinking in SD (Topic 4). Tomasella et al. (2023) show that hands-on approaches in the United Kingdom support leadership aligned with the UN SDGs by developing knowledge, values, and emotional intelligence; however these approaches downplay competencies like systemic thinking needed for leadership in long-term sustainability. In Finland, Lehtonen et al. (2022) demonstrate the value of experiential learning with multidisciplinary design courses, but introduce structure and framework that account for theory-practice relationships, real-world problem solving, and reflective practice. Together these studies demonstrate experiential learning as a major mechanism

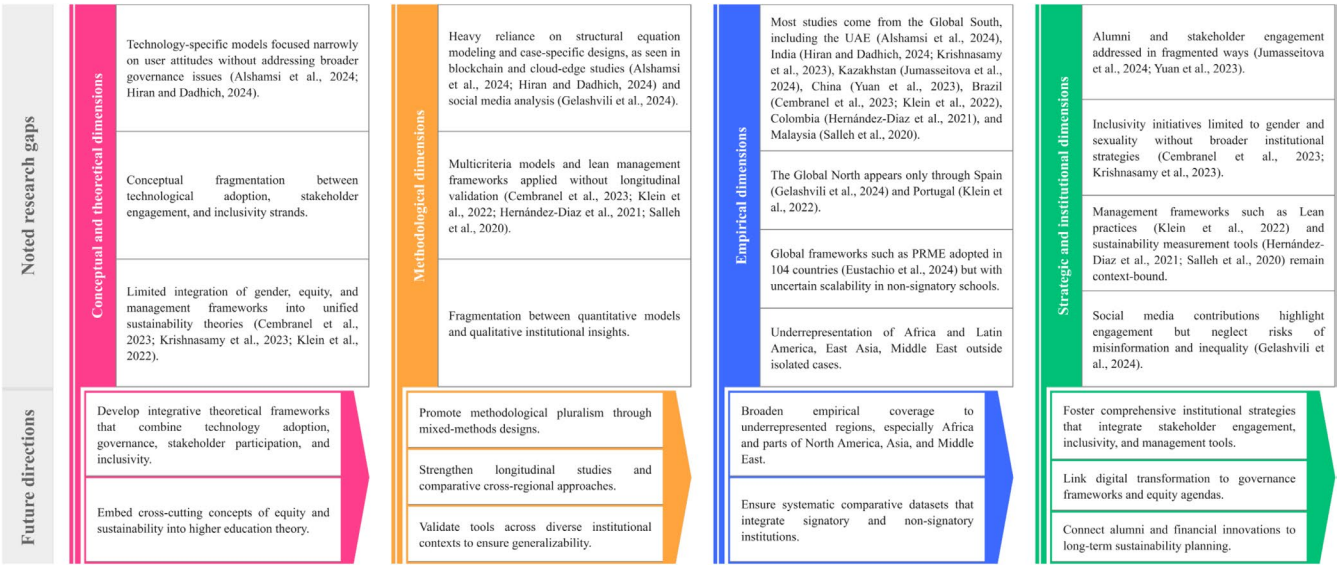

FIGURE 7 | Analytical matrix of topic 2 for addressing research gaps and advancing the agenda of SBM in HEIs.

for agency but demonstrate inconsistent emphasis on the breadth of sustainability competences.

Beyond pragmatically based learning models, some contributions emphasize other aspects of Education for Sustainability. Leal Filho et al. (2022) foreground spirituality, based on a cross-country survey of academic staff, and note widespread acknowledgment of its importance. However, limited training opportunities and lack of a conceptual framework weaken the explanatory power of the dimension, and the reliance on self-reporting data limits generalizability. This is in stark contrast to the more practice-based conceptual frameworks identified by Tomasella et al. (2023) and Lehtonen et al. (2022), demonstrating conceptual differences across the area.

Active learning has also been utilized through active pedagogies. Sierra and Rodriguez-Conde (2021) demonstrated how online role-playing games were used to teach the UN SDGs through microfinance. Phi and Clausen (2021) argued that design- and values-based learning in tourism education promotes creativity, systems thinking, and teamwork. Both authors highlight the benefits of active learning, but only Phi and Clausen (2021) note the institutional changes needed to use these methods, indicating a gap in addressing the structural barriers.

Additionally, the literature also includes recognition of emotional and interpersonal skills. Warrier et al. (2021) describe an emotional intelligence resource for resilience during COVID-19. They show that self-awareness, self-regulation and adaptability create a level of dexterity to achieve learning in uncertainty in the learning environment. This provides additional support to Tomasella et al. (2023) about emotional intelligence. However, the findings are still located in the pandemic context and therefore only an evaluation of the temporal aspect of the context. Further, Cherian and Francis (2021) evaluated mentoring within Indian HEIs and provided a model based on communication and conflict management. Although the article adds to the leadership development debate it provides evidence through only a regional context, and they express a recommendation for the model to be further tested beyond the context of Indian HEIs.

These contributions accentuate that innovative and engaging education for sustainability increasingly consists of experiential learning approaches, value-based frameworks, and emotional capabilities. The field still suffers from conceptual fragmentation and it is also plagued by methodological biases (e.g., focusing on short-term data, self-reported data), and geographic bias such as the overrepresentation of Northern European contexts and lack of evidence from Global South contexts. The case studies make important contributions to developing pedagogical models of great value, although they differ in how they analyze work done and more doubt remains as to how to put the various topics of systemic change, institutional responsiveness and globalness in sustainable leadership education together.

In light of the foregoing, Figure 8 provides an analytical matrix designed to bridge the identified gaps and foster the advancement of SBM research in HEIs.

4.2.2 | Cross-Cutting Thematic Areas

4.2.2.1 | Integrating UN SDGs Through Interdisciplinary Education and HEIs Policies (Topic –1). Tašaković and Büyükdağlı (2024) show that there are better text-similarity algorithms that also improve the assessment of teaching effectiveness as opposed to keyword searching methods, but they also pointed out that a lack of scalability suggests a gulf between technological potential and institutional capacity in resource-poor HEIs. Likewise, studies of resource efficiencies, such as Pereira de Morais et al. (2024) on light emitting diode uptake in Portugal, promote the economic advantages of their research, but struggle to evaluate structural constraints, such as the initial costs of investment and the reluctance to change the status quo, both of which are crucial for policy relevance.

FIGURE 8 | Analytical matrix of topic 4 for addressing research gaps and advancing the agenda of SBM in HEIs.

Kim and Comunian (2024) include an attention to institutional strategy, with a view to long-term planning for HEIs, dealing with Astana's creative industry, compared to short-term opportunistic political outcomes. This is congruent with Leal Filho, Simaens, et al. (2023), who show through surveys in 65 countries the importance of local partnerships for dealing effectively with the UN SDGs, a similar scope as those discussed here. These studies discuss partnerships in a structural and collaborative way, which is agreed upon as important. hHowever, the broad designs of the studies remain descriptive to some degree, and are limited in providing evidence for how institutions are working together in formalized ways to create measurable tracks of success.

Research in the Global South generates valuable if still overlooked evidence. Lopes et al. (2023) acknowledge personality traits as determinants of sustainable entrepreneurship in Angola, while Maheshwari and Nayak (2022) uncover gender barriers in higher educational institutions in Vietnam highlighting the need for family support and leadership skills but failing in their intention of addressing systemic inequalities. Fawehinmi et al. (2022) broaden this perspective in Malaysia by linking employee behaviors to eco-friendly attitudes, but again their finding not including students limits the extent to which it might be generalizable. Collectively these contributions accentuate the relevance of evidence based on context, but one that remains misrepresented by the evidence poor and too often small-scale or single country based.

Pedagogical innovations also feature prominently. As an example, Hübscher et al. (2022) demonstrate that project-based learning supports the awareness of the UN SDGs within Germany but this form of pedagogy is resource-heavy, which raises questions about whether it is scalable. Sierra et al. (2022) showed the benefits of virtual exchanges towards learners' support of sustainability, but it itself has technological constraints. Earlier illustrations such as Herzner and Stucken (2020) regarding student engagement and McGrath et al. (2021) regarding tourism simulations show evidence for the effectiveness of learner engagement. Despite this evidence, a number of these sources present a snapshot of the learner experience rather than longitudinal impacts, which diminishes the argument around longer behavioral change.

Several of these strands direct their attention to governance and accountability. For example, Hauser and Ryan (2021) offer frameworks for mapping partnerships, although these would presumably need to change for those outside of PRME-affiliated schools. Zizka et al. (2021) report that US-based STEM universities target environmental and socio-economic targets, although this mission is still some way off. Leal Filho et al. (2021) provide a UN SDG curriculum framework, and Saha et al. (2021) connect carbon reporting to emissions audits in the United Kingdom. These studies show that commitments at the institutional level vary substantially in depth and enforcement. Other contributions, like Minutolo et al. (2021) on reporting, or Elmassah et al. (2020) on formal and informal learning, emphasize accountability or education, but they, collectively, reveal variation in methodological rigor, typically more descriptively than analytically.

These contributions reaffirm the multidimensional nature of HEIs in advancing sustainability from the use of technologies, embedding curricula for UN SDGs, facilitating behavior change, as well as institutional accountability. Nonetheless, there are still notable challenges arising from conceptual fragmentation, methodological constraints, and a near overwhelming domination of European and US-centric studies. Evidence from the Global South, although increasing in countries such as Angola, Vietnam, and Malaysia, remains limited to the niche and is a critical limitation on the claim's universality of many of the findings. The field also struggles with the tension between short pedagogical experiments and long-term structural transformation, raising the question of how we scale and sustain these innovations in ways that encourage transformative effect.

Based on the preceding discussion, Figure 9 is mobilized as an analytical matrix that responds to these gaps and contributes to shaping the SBM research agenda in HEIs.

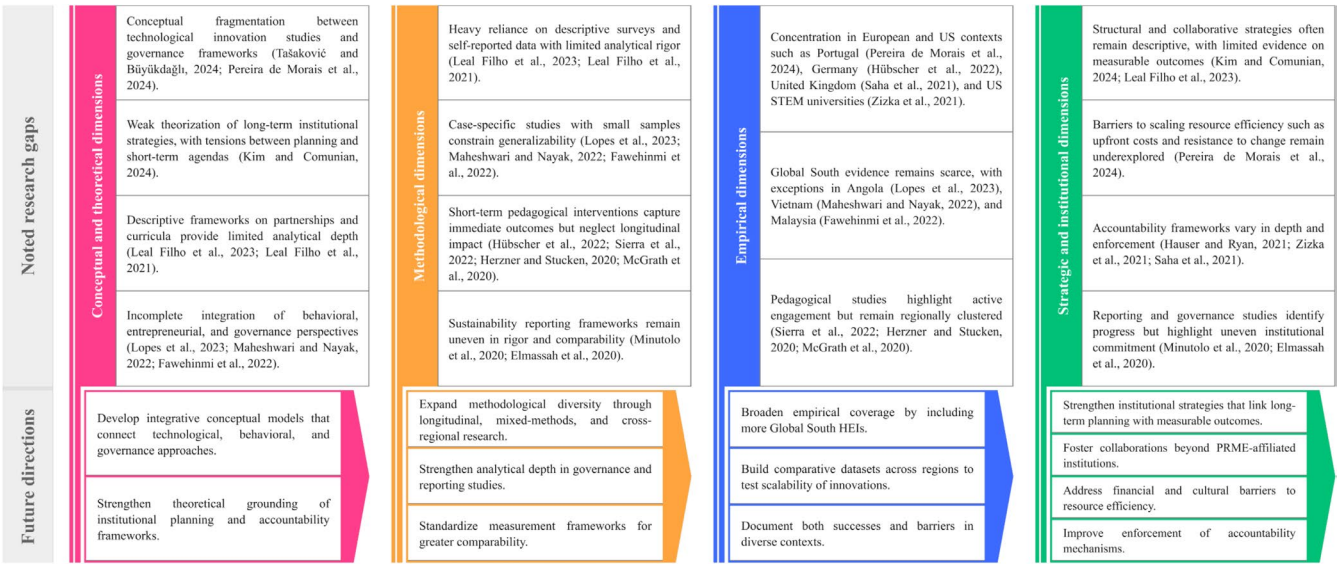

FIGURE 9 | Analytical matrix of topic –1 for addressing research gaps and advancing the agenda of SBM in HEIs.

4.2.2.2 | SD in HEIs Through Policies, Partnerships, and Entrepreneurship (Topic 0). Pacheco et al. (2024) demonstrate that dimensions of entrepreneurial orientation have a significant impact on university development in Portugal, moderated by market orientation and the UN SDGs. However, due to the limits of the national context of the study, the generalizability of its findings is reduced. Adib (2024) also describes complementary perspectives regarding business simulations in Egypt, and the study found that students found changes or the concepts of active learning increased sustainability attitudes, but did not study or measure behavioral change and longer-term impacts, which brings into question the idea of the sustainability of pedagogical innovation.

Policy and institutional frameworks emerge as essential elements for sustainability integration. Daskalova-Karakasheva et al. (2024) describe a leadership model for addressing legal challenges in respect of sustainable procurement in Bulgaria, but their suggestions can only be as good as the national legal systems capable of implementing them. Leal et al. (2024) show that teachers in Portugal are able to embed sustainability into their lectures and projects, but they also showed institutional and resource limitations, which suggest a gap between the commitment of individuals and the support of the system. The broader policy overall helps to identify the tensions. Lopes and Oliveira (2023), for example, identified frameworks that supported sustainable business strategies in Portugal, and evidence of weak uptake in construction. Puertas et al. (2023) prompted by GreenMetric data from Spain and Italy, suggested that while broader waste policies and transport policies raised sustainability awareness, they had not been evaluated longitudinally. Albanese et al. (2022) took a different approach by using a macroeconomic perspective, noting that subsidies gave rise to sustainability for the short term, while education offered longer-lasting benefits, a position that appears contrary to Zulkifli (2023), who drew attention to corporate entrepreneurship in Australia. Collectively, these contributions highlight the importance of institutional and policy support, but they diverged regarding the balance of short-term incentives with structural change.

Evidence from the Global South provides valuable, albeit fragmented perspectives. Pontelli et al. (2023) cite misalignment between environmental actions in Brazilian public universities and the SDGs, while Sieg et al. (2023) note limited resources inhibiting eco-innovation in Polish HEIs but a developing role of incubators to enhance partnerships with industry. Seidu et al. (2022) evidence a gap between sustainable knowledge and academic, and professional sustainability for UK surveyors, which indicates a disconnect between what is learnt in educational settings and being put into practice in workplaces. Research from Taiwan, Brazil, and Belgium, specifically Chiang and Chen (2022), Ribeiro et al. (2021), and Janssens et al. (2021), states that focused curricula and activities on campus can work to improve individuals' skills and engagement, but the provision of short-term assessments limits the attention paid to sustainable behaviors developed as a result, or the robustness of any impact.

Despite the extensive media focus on pedagogical innovations, they remain problematic in terms of scale and comprehensiveness. For example, Wolf et al. (2022) describe learning factories as helpful in promoting teaching about SD and the circular economy, although they acknowledge that learning factories typically focused on a production phase only. There are similar limitations in regard to more awareness-type options discussed by Zizka and Varga (2021) with regard to Swiss hospitality students and Tasdemir and Gazo (2020) regarding US wood industry programmes that provide awareness but lack development related to conceptual understanding and transversal competences. Research from Portugal, Brazil, and the US (Gomes et al. 2021; Corrêa et al. 2020; Khan and Henderson 2020) confirmed steps forward in curriculum integration, yet also highlighted the continuing lack of teacher education for educators, and of systemic change.

These contributions confirm that HEIs have the potential to act as enabling agents of sustainability through entrepreneurship, policy, and education. However, the field remains fragmented due to different disciplines, context-specific research methods like a single case or comparative case studies, and the predominance of European contexts, with the Global South being represented primarily by a small number of case studies primarily in Brazil, Egypt, and Vietnam. Methodological limits from excessive reliance on surveys, self-reported data, and snapshots of the sustainability competences warranted less rigorous analysis. Further, unsolved conceptual ambiguity in defining sustainability competences prevents consensus. Regardless, the studies from five continents indicate that HEIs will need to undertake structural change, demonstrate long-term evaluation, and evidence inter-regional knowledge transfer, if they are going to contribute to SBM as intended.

Building on the previous discussion, we employ Figure 10 as an analytical matrix to address the gaps identified and push forward the research agenda of SBM in HEIs.

4.2.3 | Deeply-Developed Thematic Areas

4.2.3.1 | Innovative Interdisciplinary Strategies for Campus Waste Management and SD (Topic 5). Jammoul et al. (2023) illustrate the possibilities for digital solutions in managing chemical waste such as ChemSorter, showing the potential for real-time data management for sustainability, but they never fully explore the risks of data security, system failure, or challenges of instituting such systemic change at resource-constrained organizations, which limits the transferability of the findings more generally. Rehmani et al. (2022) similarly promote digital recruitment systems to reduce paper waste in Pakistan, aligning with worldwide trends in digital transformation, while overlooking the socio-cultural barriers to adoption and failing to balance the environmental costs of digitalization like e-waste and energy consumption that severely complicate the assertion of sustainability.

Larger institutional and regional frameworks also relate to collaboration and harmonize policies. Liashenko et al. (2021) recommend a transport and logistics cluster in Ukraine to incentivize other arrangements for explicitly multimodal interaction among HEIs, businesses and government services, underscoring joint efforts to support sustainable outcomes. However, also of concern to the status of their framework, is that it remains conceptual without much empirical evidence and inadequate assessment of the political and economic restraints on

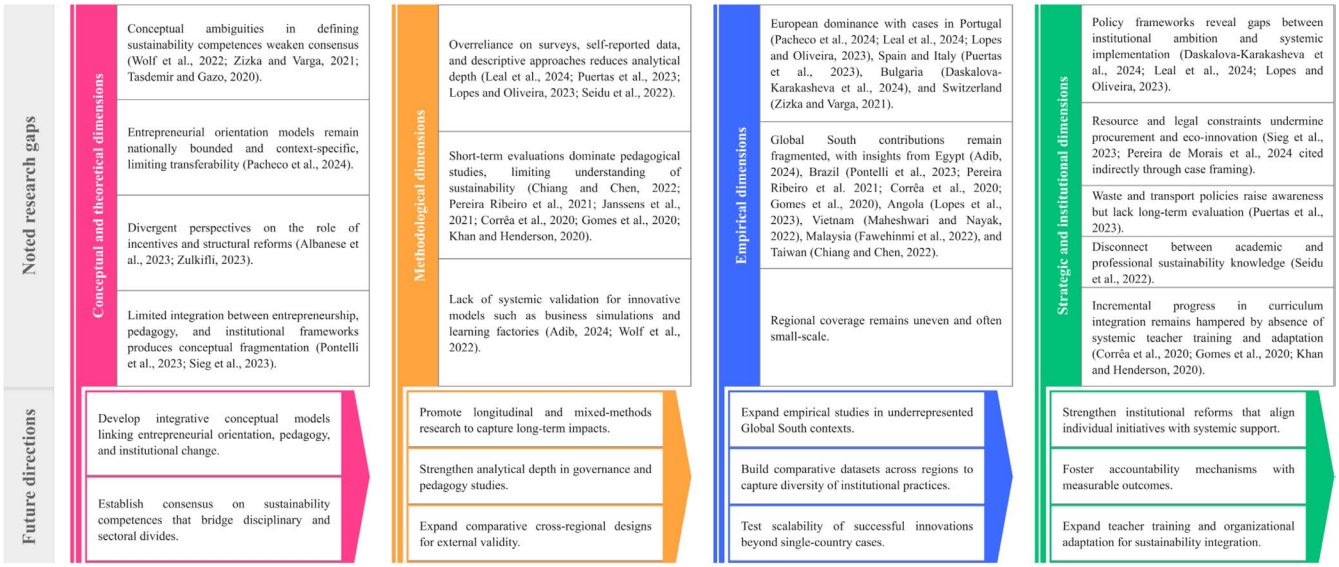

FIGURE 10 | Analytical matrix of topic 0 for addressing research gaps and advancing the agenda of SBM in HEIs.

multi-stakeholder collaboration in transitional political contexts. Other practical interventions, such as the composting systems analyzed afford opportunities. Torrijos et al. (2021) identified the educational and economic advantages for events on the composting experiences at the University of A Coruña, although there was no clear cost–benefit analysis and little deliberative awareness of transferability, undermining policy contributions.

Ultimately, critical views of established practices show practical limitations in existing sustainability frameworks. Udawatta et al. (2021) reviewed waste management practices in Australian Green Star-certified buildings, and asserted a shift from minimization practices to regenerative practices and strategies. The analysis moves the theoretical conversation forward. However, the use of qualitative data, as well as the lack of a practical roadmap, diminishes the generalizability and applicability of the paper's findings.

These contributions evidence that HEIs are often the testing grounds for innovation in terms of sustainable waste management and education. Nevertheless, the literature is based largely on descriptive case study research, short-term evaluative studies, or design case studies that focus on context-specific practices and this limits cumulative learning. Contributions from Europe and Australia are dominant contributions but there is value in exploring the contributions from Pakistan and Ukraine as well, as they offer under-explored perspectives of waste and sustainability practices in the Global South. The field needs improved theoretical synthesis, stronger empirical design, and longitudinal data that direct attention to the subsequent impacts of digital tools, networks, and regenerative practices in waste management on campus transformation.

From the above discussion, Figure 11 serves as an analytical matrix aimed at filling these gaps and advancing the scholarly agenda on SBM in HEIs.

4.2.3.2 | HEIs' Role in Communication, SD, and Regional Impact (Topic 6). Bui et al. (2024) indicate that Vietnamese HEIs embed sustainability in business and management education through motivations, leadership and cultural considerations, and internal communications. Even though the study attends to the internal aspects of sustainability, its qualitative approach does not allow for generalization to broader contexts or external drivers like government regulation and internationalization collaboration and therefore lacks certain explanatory power. In another context, Nazneen et al. (2023) suggest that university social responsibility in Saudi HEIs engages with collaboration, entrepreneurial orientation and knowledge sharing. As this article has a large sample size with quantitative data, it strengthens its empirical basis. However, the lack of qualitative perspectives limits how students and faculty explain USR, and the authors' focus on Saudi Arabia limits transferability to other regions.

de Matos Pedro et al. (2021) address the connection between HEIs and regional development, but do not address how HEIs transform their sustainability agenda into specific collaborations, nor do they attend to the conflict of interest and resource constraints which often inform regional prospects. While Caputo et al. (2021) observe that GRI-formatted sustainability reports increase transparency and tend to increase stakeholder engagement, their assumption that public reporting creates stakeholder re-engagement raises questions concerning selective disclosure and whether stakeholder re-engagement leads to any genuine changes of behavior or transformations of institutional structures.

These contributions suggest that HEIs are continuing to frame themselves as agents of sustainability through education, social responsibility and reporting. Still, the area is unbalanced in terms of approaches, as there has been a tendency to overuse either solely method-detailed qualitative or survey-based methods, and it is unbalanced geographically because there is little cross-region evidence as most of the evidence is limited to a specific national context. Moreover, because there is little longitudinal evidence countenancing whether sustainability is embedded, it seems very tenuous. Policy or practice considerations are often associated, where the evidence supports the

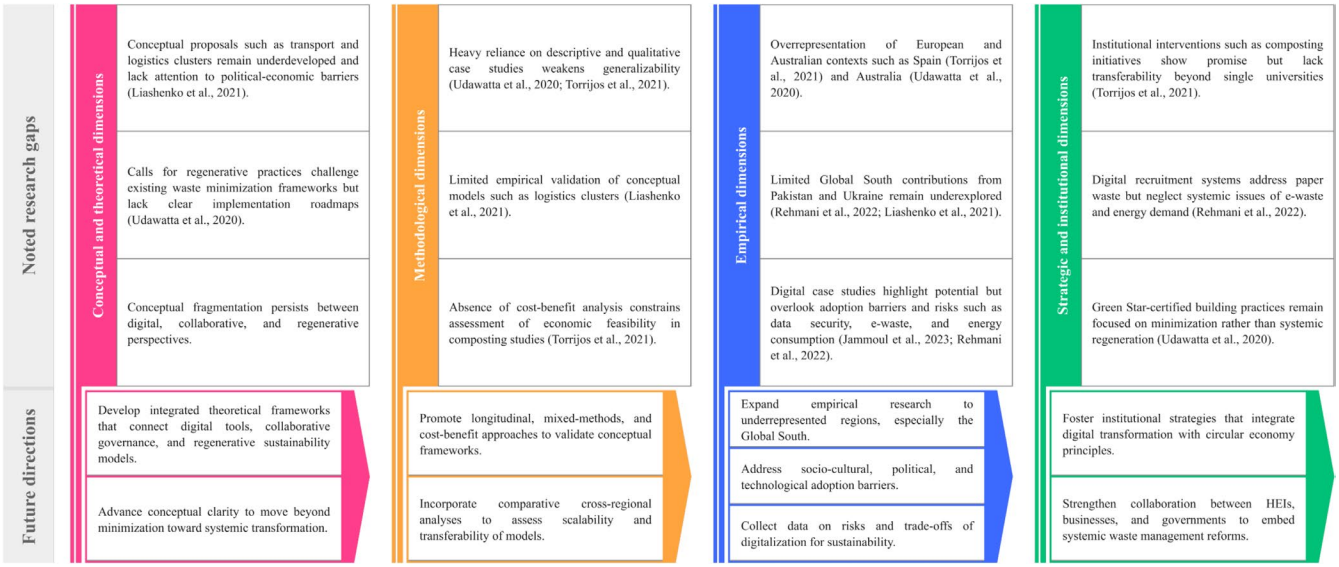

FIGURE 11 | Analytical matrix of topic 5 for addressing research gaps and advancing the agenda of SBM in HEIs.

allegations, alongside a lack of sufficient evidence to draw conclusions about practices for SBM globally.

Relying on the discussion developed so far, we refer to Figure 12 as a matrix framework to engage with these gaps and promote the research agenda of SBM in HEIs.

4.2.3.3 | HEIs' Academic, Environmental, and Economic Contributions to Global SD (Topic 7). Smolennikov et al. (2024) provide strong regression analysis evidence linking greater Times Higher Education Impact Rankings scores to progress on UN SDGs 3, 8, 11, and 16. Though impressive and statistically compelling, what their study does not examine are the processes through which universities facilitate eventual national progress (e.g., advocacy on appropriate government policy, partnership development, dissemination of research to stakeholders) and if there are obstacles (e.g., lack of resources, institutional inertia) preventing universities from effectively contributing to national SDGs progress. Similarly, Monteiro et al. (2024) report on survey responses of universities in Portugal, identifying that they all provide some level of disclosure on UN SDG information, and that quite a bit of reporting is done by larger public universities. While their examination of transparency is a step in the right direction, relying on public disclosures does not consider the ways that the act of communicating contributes to shaping stakeholder behavior and institutional change. Thus, the impact does not fully explain their findings.

Environmental sustainability has also been analyzed through methodological innovations. Jürgens et al. (2023) develop a life cycle assessment framework used at Leibniz University Hannover, where they found transport, infrastructure, and energy as the main impact categories of their assessment with practical recommendations. However, the limitations of their study result from their single-institution approach, so transferability and generalizability are restricted. The authors do not address the costs associated with the life cycle assessment, or operational issues in the process of conducting their assessment, which mitigates the policy relevance of the study, particularly for resource-constrained universities.

Economic contributions to society are examined by Dreval et al. (2022) through the adoption of bibliometric, correlation and regression methods complemented by surveys for linkages between university rankings and national GDP. The strength of the study is their collection of data through different methodological approaches, but the authors also neglect qualitative aspects of how rank influences institutional and course choice, what negative influences may arise from reliance on rank and achieving it over educational quality, or reinforcing inequality hierarchies.

The contributions elucidate the diverse ways in which universities are supporting sustainability through rankings, transparency, environmental assessments, and taking advantage of their potential domestic and global economic power. Yet, the literature suffers, too, from a narrow reliance on single country data or single institution data, a failure to consider longitudinal views, limited studies in the Global South, and even limited cross-regional data. While the results have some important policy implications, claims are often too descriptive and there is a need for more comparative cross-regional and mixed-methods studies that managers and governments can use to show how universities can act genuinely and equitably towards global sustainability.

Following the points discussion above, Figure 13 is introduced as an analytical matrix to tackle the highlighted gaps and extend the SBM research agenda in HEIs.

4.2.3.4 | Institutional Efforts to Integrate and Assess SD in HEIs (Topic 8). Álvarez-Munoz et al. (2024) provide a compelling example of how Ecuador's 2010 Ley Orgánica de Educación Superior catalyzed a significant shift in publication output, but did not consider research quality, interdisciplinarity or intended or unintended social impacts, nor did it identify unintended effects, such as publish or perish pressures which raise important ethical and equity considerations between institutions. While Vallaeys et al. (2022) take a wider regional view and propose a dynamic model of university social responsibility in Latin America, finding alignment with the UN SDGs,

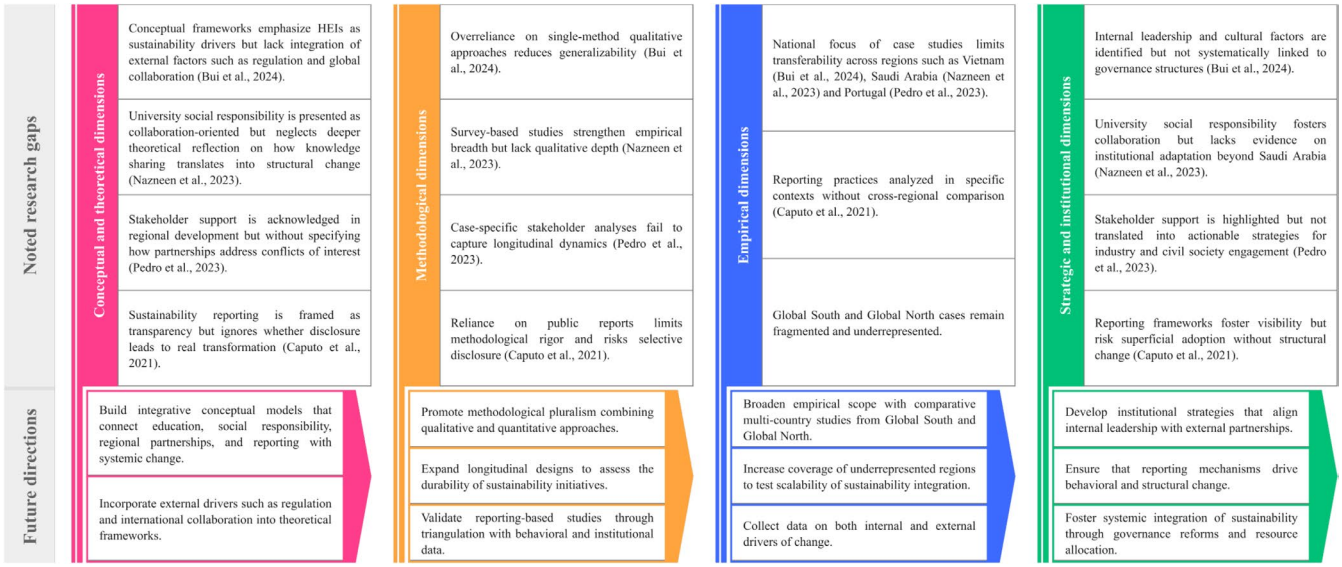

FIGURE 12 | Analytical matrix of topic 6 for addressing research gaps and advancing the agenda of SBM in HEIs.

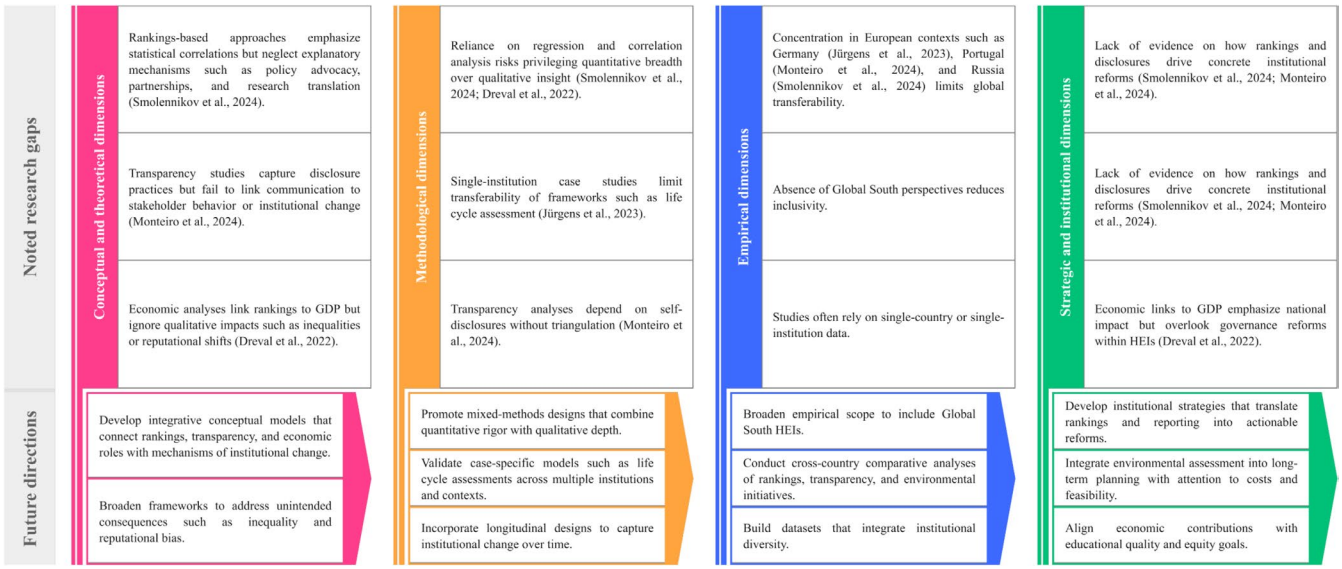

FIGURE 13 | Analytical matrix of topic 7 for addressing research gaps and advancing the agenda of SBM in HEIs.

their analysis is limited as it does not discuss what institutional themes resonate with respect to external stakeholders such as domestic and foreign governments and industries, nor is the regional analysis generalizable to other regions.

On a global scale, Leal Filho, Wall, et al. (2021) examine patterns of sustainability research through the world-wide survey of sustainability activities and publications of HEIs, distinguishing obstacles and paths to institutional contribution. Though the survey raised questions about geographical disparities, particularly resource-constrained settings, it did not sufficiently address mitigation or resilience to structural barriers (e.g., insufficient funding or entrenched institutional resistance). As with Leal Filho, Amaro, et al. (2021), note that more than 80% of Latin American HEIs address sustainability concerns, mainly related to campus operation. Yet, their analysis is largely descriptive with little evidence for curriculum design, research agendas, and community engagement that could be employed for larger social transformation.

These contributions emphasize significant policy and institutional movements toward embedding sustainability within higher education. Nevertheless, they share methodological and conceptual limitations including reliance on descriptive or survey-based studies, a lack of a longitudinal perspective, and an inadequate interrogation of societal outcomes. Evidence from Latin American and Ecuadorian cases far exceeds that from other locations. There is an apparent absence of studies from other regions, particularly in the Global South. Theoretical models such as USR provide a useful point of reference from which to begin. They would benefit from greater engagement with external stakeholders and refined linkages to SBM. Overall, whereas institutionalizing sustainability is widely becoming an accepted practice, empirical evidence of the transformative effect of sustainability on society, governance, and labor remains sporadic and very often inconclusive.

In continuation of the preceding discussion, Figure 14 operates as an analytical matrix to overcome these research gaps and contribute to the development of the SBM agenda in HEIs.

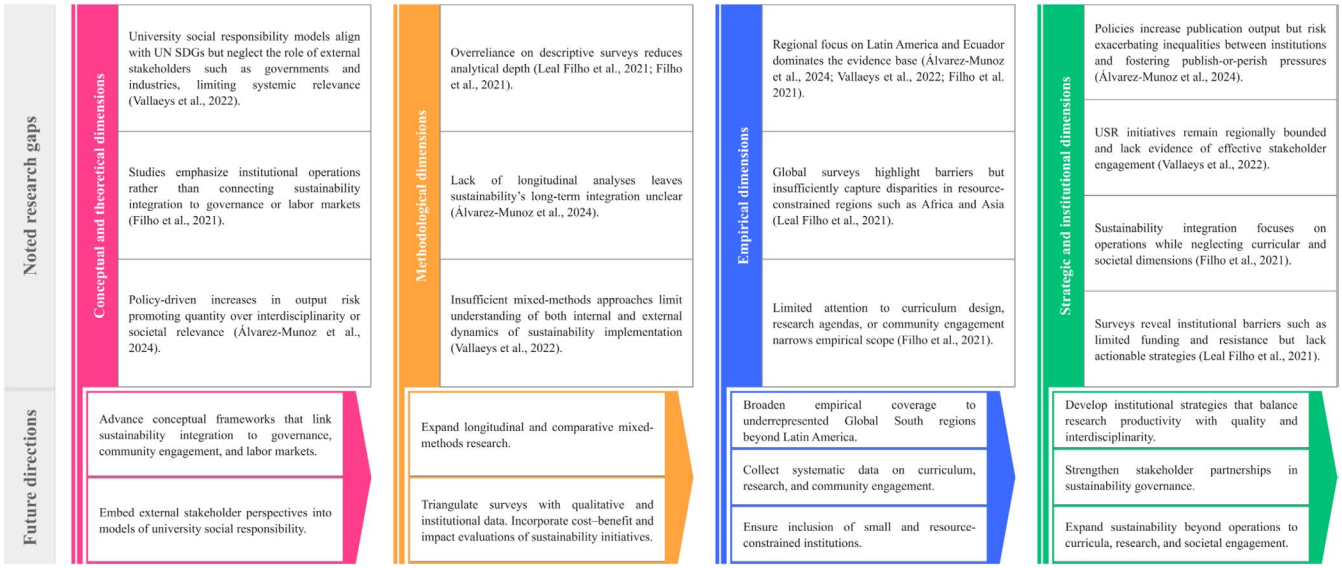

FIGURE 14 | Analytical matrix of topic 8 for addressing research gaps and advancing the agenda of SBM in HEIs.

4.2.3.5 | Aligning HEIs Curricula With UN SDGs and Inclusive Education in Evolving Pedagogy (Topic 9). Jabeen (2022) reveals that while UK teaching staff see the value of integrating the UN SDGs, a lack of clear guidelines and institutional momentum inhibits their efforts, and the qualitative nature of the study restricts the ability to generalize findings, specifically exploring the leadership and policy dimensions. Supporting evidence from Nguyen et al. (2024) reveals that problem-based learning can map onto all 17 UN SDGs. However their study identified imbalances in implementation and specifically, had no consideration for barriers to implementation, such as those in resource-constrained countries, nor did they consider the role of stakeholder engagement or reporting mechanisms.

Inclusive education adds yet another layer of complexity. Almuaqel (2022) demonstrates that UK faculty responsiveness to students with intellectual disabilities promotes an inclusive environment, but the specificity of the study limits consideration of other disabilities and ignores all structural factors for example, institutional policies, resources, or full faculty development, which are fundamental in order to scale inclusive acts.

These contributions illuminate those curricula that can serve both sustainability and inclusion. However, the literature illustrates a methodological imbalance of small qualitative samples with little mixed-methods triangulation. There remain conceptual ambiguities in defining what a meaningful integration of UN SDGs and inclusive pedagogy entails. Despite the literature claiming a global scope, studies remain concentrated geographically in the UK and do not include comparative developments from the Global South. The absence of a longitudinal perspective further undermines understanding of whether integration has produced any longer-term institutional or wider societal change. Despite frequent references to policy and managerial implications in the literature, empirical evidence to back up such claims on transformative change is limited, supporting a stronger set of frameworks and cross-regional evidence to connect curricula, inclusivity, and SBM in a more persuasive way.

On the strength of what has been discussed, Figure 15 functions as an analytical matrix to respond to the identified gaps and support the advancement of SBM in HEIs.

4.2.3.6 | Integrating Social Responsibility Into HEIs Policies for Student Satisfaction and UN SDGs (Topic 10). Ouragini and Ben Hassine Louzir (2024) establish evidence that Tunisian HEIs are involved in philanthropic and academic responsibilities. Nonetheless, the limited scope of their study excluded national variability and did not capture the constraining conditions limiting the scaling of these practices like institutional resistance and lack of resources. Similarly, Gallardo-Vázquez et al. (2024) found that students from Colombian HEIs value empathy and solidarity within the framework of the UN SDGs. Yet, this study was limited to calculations of students' support for these principles and not how those principles manifest into policies at the institutional level or the types of social impact being realized, leaving the significant benefit of empathy and solidarity devoid of meaning.

Santos et al. (2020) augment the connection between USR and student satisfaction by demonstrating that institutional USR creates a positive influence on education quality and service perceptions in Portugal. Their methodology was sound, but their directive use limited the findings to a single institution and did not explore the impact of USR on larger outcomes such as employability, community development, or institutional stature, thus limiting the usefulness of these findings in terms of policy.

These contributions support the argument that USR can legitimize higher education's role in sustainability in addition to enhancing the student experience. However, while the literature contributes to the emerging field of USR, it is weakened by methodological imbalance, relying either on narrow case studies or structural equation modeling, preventing in-depth analysis. Geographically, much of the literature is made up of single-country, disparate cases, and while the Global South has surfaced in examples from Tunisia and Colombia, no comparative understandings have emerged. The absence of longitudinal

FIGURE 15 | Analytical matrix of topic 9 for addressing research gaps and advancing the agenda of SBM in HEIs.

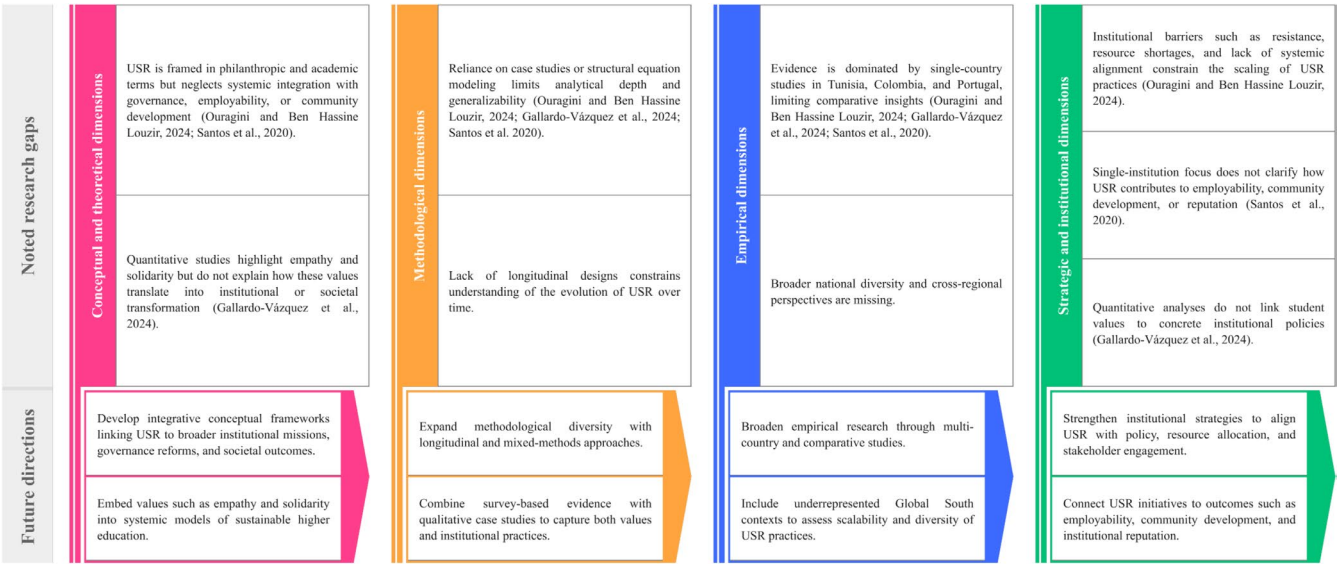

FIGURE 16 | Analytical matrix of topic 10 for addressing research gaps and advancing the agenda of SBM in HEIs.

aspects limits insights into how USR strategies develop along distinct timelines over time. Although these studies signal rich policy and managerial implications, the claims made about the transformative potential of USR lack greater support in empirical evidence.

Grounded in the discussion above, Figure 16 is adopted as an analytical matrix to address existing gaps and to drive forward the research agenda on SBM in HEIs.

4.2.4 | Emerging Thematic Areas

4.2.4.1 | Sustainable Digital Transformation in HEIs for Skills and Employability Post-Pandemic (Topic 3). Yu et al. (2023) evidence that digital employment policies in China enhance students' employability, agency, and intent, but their analysis does not include anyone who did not experience digital work, and could not reference the larger labor market, so the basic findings cannot be generalized more broadly. We also see similar gaps in some studies of academic staff. Said and Kamel (2023) show that digital leadership exhibited by academics from Egypt encourages or, in some instances, actively promotes proactive and innovative behaviors among academics; however, they did not deal with the idea of resistance to change or verify whether there are implications for their students or for the perception of the reputation of the institution.

The link between human resource practices and digital adaptability is addressed by Kaur and Kaur (2023) in India who establish that their use of high-performance work practices as an antecedent to improving job performance through person-job fit. Their longitudinal design offers some strengths regarding valid assessment and conclusions, yet it lacks qualitative details that address employee satisfaction, which weakens employees'

interpretative understanding of their work context and does have a national context. More converged visions of digital learning environments such as the research by Pu et al. (2022) during COVID identified changes to teacher, platforms and networks, but the overall findings depended on social media data and lack rigor, and did not adequately consider the resultant risks for the institution and society such as digital inequality.

Regional analyses confirm these mixed findings. Strielkowski et al. (2022) report barriers and generational differences in technology adoption in Czech and Russian universities, but they do not address educational equity or workforce readiness and focused solely on educational actors. Mittal et al. (2022) showed that learning analytics in India increased employability skills, although the small sample size and absence of longitudinal follow-up made it problematic to draw conclusions about career impact over time. Evidence from the Global South also finds support from El Haggar and Alshammary (2020) who found that a training initiative in Saudi Arabia improved innovation and employability of graduates. Yet, the study continues to be limited since they focused on institutional outcomes rather than impacts on the economy or broader labor market.

These contributions demonstrate that digital transformation can improve learning outcomes and employability through policies, leadership, and new teaching tools. Nevertheless, the existing literature is plagued by methodological biases concerning surveys, social media, and small or region-specific samples, as well as issues of conceptual fragmentation that separate digital leadership, human resources, and teaching innovations rather than recognize them systemically. The absence of comparative and longitudinal studies, while also a limitation with regard to the weak coverage of the Global South apart from isolated cases in China, India, Egypt, and Saudi Arabia, reduces the universality of the claims we can make. While the policy implications for sustainable SBM are often emphasized, the empirical evidence to date is limited and does not allow us to establish whether digital transformation leads to long-term and equitable outcomes for employability.

As a synthesis of the above, Figure 17 provides an analytical matrix that both addresses research gaps and facilitates progress in the SBM agenda within HEIs.

4.2.4.2 | Knowledge Management and Social Practices for Education and SD in HEIs (Topic 11). Sok et al. (2023) have revealed how structural barriers in Cambodia, such as tuition fees, the limited size of scholarships, and limited academic programs undermine gender equality in higher education. Although the research was successful in identifying some considerable enrollment inequalities, it does not consider labor market outcomes or other regional factors, thus reducing exportability beyond the Cambodian space. Likewise, in Nepal, Adhikari and Shrestha (2023), while promoting knowledge management as the fulcrum to generate intellectual capital and interdisciplinary frameworks for sustainable education did not consider how knowledge management influences curricular design, or how knowledge generation is enacted in local community engagement. As such their cultural frame explanation is limited, and the findings have been limited to the Nepalese system.

More sweeping discussions of interdisciplinary and its effect on society were provided by Belcher et al. (2022), where transdisciplinary doctoral research was presented as an opportunity for social innovation and a means of changing policy. Although capacity building in procedural contributions is showcased, and presents possibilities, drawing from three doctoral projects limits its scope and fails to account for institutional constraints, like resistance to change, that are necessary to consider when scaling these approaches.

There are contributions that provide evidence that inclusive funding, knowledge management, and transdisciplinary practices can make higher education more significant in sustainability. However, these contributions are still too descriptive and too reliant on context, including limited theoretical integration and comparative power across regions. The evidence from Cambodia and Nepal provides valuable Global South

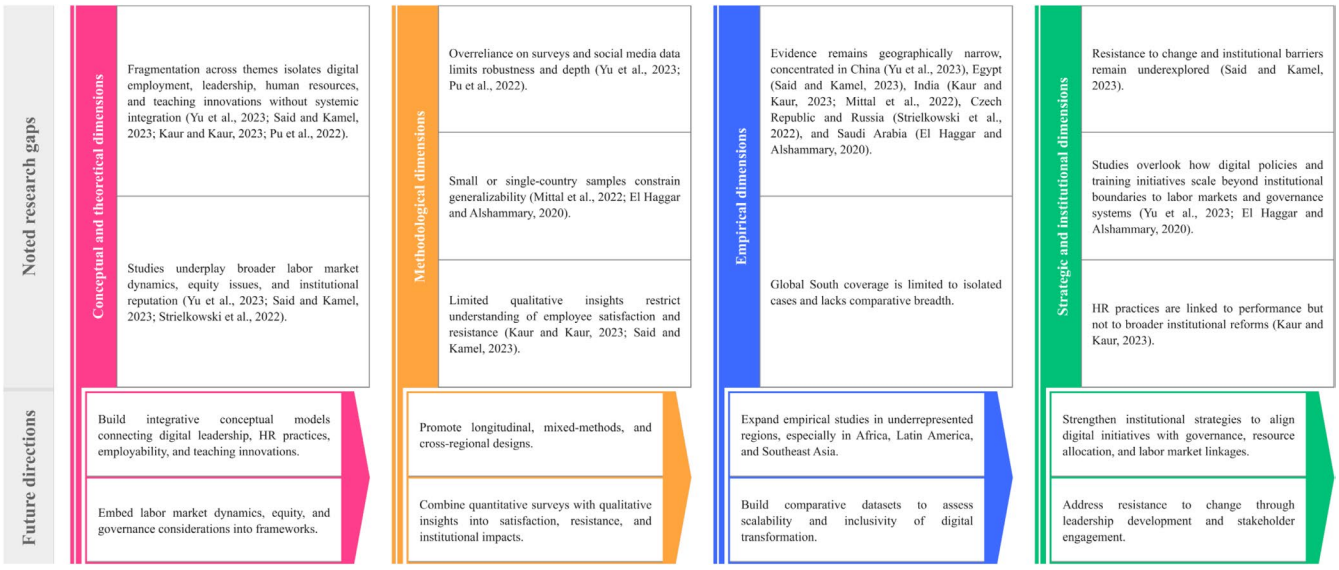

FIGURE 17 | Analytical matrix of topic 3 for addressing research gaps and advancing the agenda of SBM in HEIs.

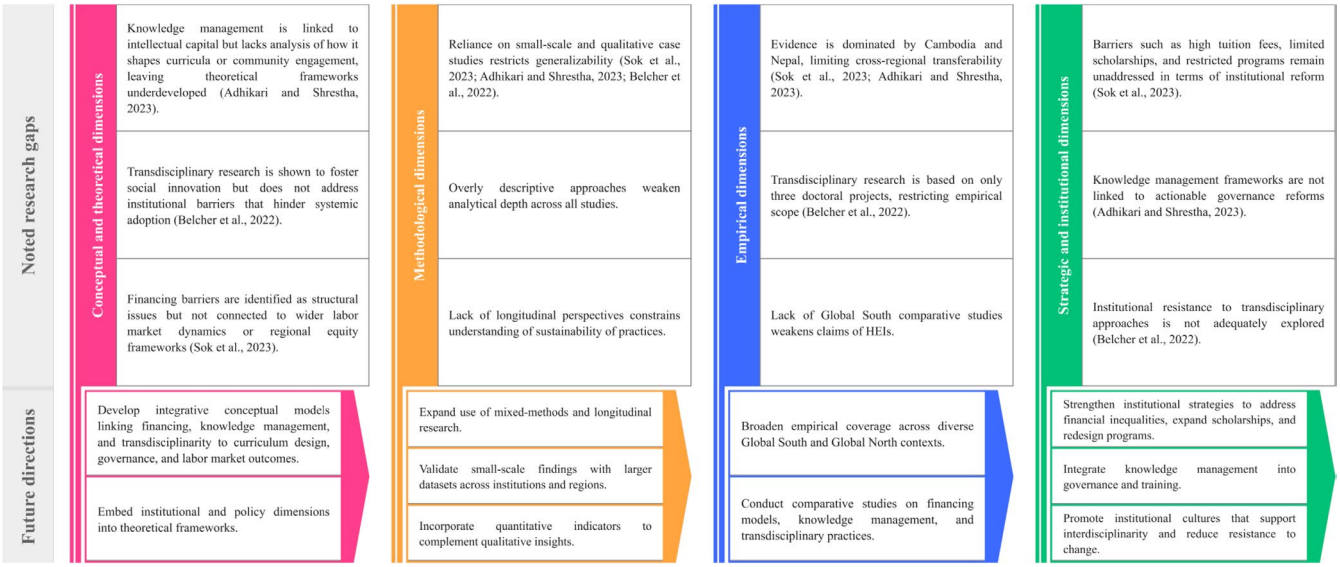

FIGURE 18 | Analytical matrix of topic 11 for addressing research gaps and advancing the agenda of SBM in HEIs.

perspectives. However, methodological limitations, such as reliance on smaller-scale or qualitative case studies, lessen generalizability. The lack of longitudinal analysis means we also have very little evidence to suggest these practices will lead to systemic change. Although important considerations, the policy implications of these studies to education and the SBM field are important, yet claims for their transformative potential are only weakly supported by empirical evidence.

Taking into account the preceding discussions, we use Figure 18 as an analytical matrix to deal with these gaps and to strengthen the research agenda on SBM in HEIs.

5 | Conclusion

This research provided an analysis of recent empirical contributions made to SBM in HEIs by applying an abstract-based semantic text mining and thematic mapping approach. The thematic analysis resulted in the identification of 13 areas of inquiry, organized over four thematic trajectories, which provide a systematic representation of the way in which the field has developed from 2020 to 2024.

Three topics stand out as particularly influential. Sustainable energy transition and ecological behaviors, emerging technologies and innovative management, and education for leadership and systems thinking are the foundation of recent research, and the motivation for theoretical and empirical advances. However, their importance points to a consolidation of focus that could restrict an inquiring space that may give attention to equally relevant areas. Two additional topics play a cross-cutting impact by linking governance, pedagogy, and institutional practices. The integration of sustainability goals through education and policy, alongside partnerships and entrepreneurship, illustrates how SBM can bridge fragmented debates. Yet, these topics are often presented with limited analytical depth, reducing their potential to support broader theoretical integration.

Six topics are more deeply developed but remain relatively isolated. Work on waste management, communication and regional impacts, institutional assessment frameworks, curricular alignment, academic contributions, and social responsibility demonstrates depth and specialization but suffers from weak interconnections with the central debate. This isolation reflects one of the field's major weaknesses which is specialized research advances knowledge within niches but contributes little to a cumulative understanding of SBM. Finally, two topics remain in an early stage of development. Digital transformation for skills and employability and knowledge management for sustainability highlight emerging opportunities but remain conceptually fragile and empirically limited. Without stronger foundations and comparative validation, they risk remaining peripheral.

These findings show a domain of uneven growth. Some pathways race ahead while others lie fallow, leading to imbalances in environmental and economic dimensions juxtaposed with social and managerial dimensions, shortcomings in geographic coverage with Europe and Asia virtually the exclusive focus and significant under-representation in terms of articles from less prevalent regions, such as Africa and Latin America, and a lack of methodological variation, since most studies draw evidence from cases considered in isolation and are limited to the short term without regard for institutional change over time.

The methodological approach of this study also has limitations. The reliance on only Scopus and WoS to provide quality excluded non-indexed and non-English studies, which poorly captures diversity. Limiting the analysis to only English-language publications also created the problem of regional bias. The usage of only the abstract to derive data is again a limit, in relation to the semantics of language, as pithy abstracts seldom contain all the intricacies made evident in full articles. BERTopic itself is sensitive to data quality, which amplifies these shortcomings, and the interpretation of clusters inevitably introduces an element of subjectivity, even when cross-validation among co-authors is employed. The thematic map adds another limitation. While effective for visualizing density and centrality, it provides only

a static picture and does not capture the dynamic evolution of themes. The temporal scope of the study, focused on the last 5 years from 2020 to 2024, also risks overlooking longer-term trajectories that continue to shape institutional change.

Despite these constraints, this research gives a current and critical account of the map of SBM within HEIs. It points to strengths, but also inequalities avowing that the area is becoming consolidated. However, some elements of integration, inclusivity, and methodological strength remain problematic. Addressing inequalities means valuing future interdisciplinary studies, strengthening the links between the specific and transversal, while also drawing attention to regions that remain absent from the discussion. Longitudinal and comparative studies are also required to ensure we adequately capture how SBM practices may be institutionalized over time. At the same time, a more systematic cross-thematic comparison between emerging, well-developed, influential, and cross-cutting thematic areas would be a worthwhile extension for subsequent research.

This research ultimately clarifies the structure of SBM research in HEIs indicating pathways, neglected opportunities, and some priorities for what lies ahead. It builds an evidence base for the academic community, politicians, and practitioners in order to refine agendas, balance policy, and bolster institutionalization. In bringing together current weaknesses and diversity, SBM in HEIs retains potential for vitality and to achieve coherence as a global, representative field and is then capable of making a difference.

Conflicts of Interest

The authors declare no conflicts of interest.

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