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# Mapping The Green Entrepreneurship Ecosystem: An Integrative Systematic Review of Orientation, Intention, Innovation, Digitalization, and Institutional Support

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Green Entrepreneurship Ecosystem; Systematic Literature Review; Green Entrepreneurial Orientation; Green Innovation.

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**Abstract**

This study addresses this theoretical and empirical gap by systematically synthesizing the green entrepreneurship ecosystem and proposing the first integrative five-component model comprising Green Entrepreneurial Orientation (GEO), Green Entrepreneurial Intention (GEI), Green Innovation (GI), Digitalization, and Institutional Support (IS), with the aim of achieving sustainable Triple Bottom Line (TBL) performance. Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 reporting guidelines, a Systematic Literature Review (SLR) was conducted using the Scopus database, covering publications from 2016 to 2026. Of the 3,431 records initially identified, a final corpus of 119 peer-reviewed articles was examined through sequential bibliometric mapping, thematic narrative synthesis, and ecosystem framework development. Bibliometric findings indicate a substantial increase in publications following the adoption of the United Nations Sustainable Development Goals (SDGs), with publication output peaking at 730 documents in 2025. The literature was heavily concentrated in emerging Asian economies, with Partial Least Squares Structural Equation Modeling (PLS-SEM) representing the predominant analytical approach (52.9%). The thematic synthesis reveals three key structural insights: (1) GEO does not consistently exert a direct effect on firm performance but instead operates through GI as a critical mediating mechanism, with its indirect contribution potentially exceeding its direct effect; (2) GEI serves as a crucial intermediary mechanism linking cognitive dispositions to entrepreneurial action; and (3) digitalization functions as an overarching, cross-cutting enabler across micro-, meso-, and macro-levels while simultaneously creating risks of digital exclusion for resource-constrained small and medium-sized enterprises (SMEs). Furthermore, IS provides a multidimensional foundation that facilitates entrepreneurial development through capacity-building mechanisms rather than functioning solely as a moderating factor. Collectively, these findings inform six mathematically specified and conceptually operationalized propositions, providing an evidence-informed roadmap for advancing green entrepreneurship ecosystems in developing economies, particularly Indonesia.

## INTRODUCTION

The global scientific community and business practitioners are increasingly recognizing green entrepreneurship as a fundamental mechanism and systemic solution for addressing the ecological crisis and accelerating the sustainable development agenda (Sousa et al., 2025). Research in this field has expanded substantially since the United Nations adopted the Sustainable Development Goals (SDGs) in 2015, with further acceleration following the COVID-19 pandemic, which prompted a paradigm shift in business resilience toward holistic sustainability. Green entrepreneurship serves as a critical bridge between economic value creation, environmental preservation, and social equity, consistent with the Triple Bottom Line (TBL) framework. However, despite the rapid expansion of scientific literature, a fundamental conceptual limitation persists: most previous empirical studies have examined the components of the green entrepreneurship ecosystem separately, resulting in fragmented analyses primarily focused on bilateral relationships. Consequently, a comprehensive synthesis integrating entrepreneurial orientation, entrepreneurial intention, green innovation, digitalization, and institutional support into a unified, empirically testable ecosystem framework remains underdeveloped.

A review of recent literature identifies five interconnected pillars that have been empirically associated with green entrepreneurship outcomes but are frequently examined in isolation. First, Green Entrepreneurial Orientation (GEO), encompassing green innovativeness, green proactiveness, and green risk-taking, has been shown to contribute to sustainability performance across various industrial contexts (Fatoki, 2019; Appiah et al., 2023; Hu & Tresirichod, 2025). Nevertheless, findings from Marzouk and El Ebrashi (2024) in Egypt and Anjaningrum et al. (2025) concerning micro, small, and medium-sized enterprises (MSMEs) in Indonesia indicate that GEO does not consistently exert a statistically significant direct effect on sustainable business performance. Instead, its influence frequently depends on more complex mediating mechanisms involving internal organizational capabilities.

Second, Green Entrepreneurial Intention (GEI) has been identified as a significant psychological and motivational predictor of actual green entrepreneurial behavior (Kouchaky et al., 2025), while also functioning as a key mediating mechanism through which external support translates into entrepreneurial action (Soonsan et al., 2025). Nevertheless, GEI has predominantly been investigated within the domain of individual entrepreneurial psychology and has rarely been integrated with GEO and green innovation within a multilevel framework encompassing both individual and organizational dimensions.

Third, Green Innovation (GI) has emerged as a central mediating mechanism that translates a firm's strategic orientation into measurable sustainability performance outcomes. Findings reported by Rong et al. (2025) and Anjaningrum et al. (2025) suggest that the indirect contribution of green innovation capabilities may exceed the direct effects of organizational strategic orientation. GI encompasses environmentally sustainable product innovation, resource-efficient manufacturing processes, and organizational and managerial innovations characterized by green ambidexterity, which balances the exploration and exploitation of environmentally sustainable technologies (Baquero, 2024; Labella-Fernández et al., 2026). However, empirical investigations of GI remain predominantly concentrated on its direct or

mediating relationships with organizational performance, with limited consideration of its interactions within the broader green entrepreneurship ecosystem.

Fourth, digitalization has been widely recognized as a transformative driver of sustainable competitiveness across national and organizational contexts (Dabbous et al., 2023). The integration of artificial intelligence (AI), blockchain technology, the Internet of Things (IoT), and e-commerce platforms has been shown to strengthen green dynamic capabilities and facilitate the identification and exploitation of environmentally sustainable business opportunities (Abdelfattah et al., 2025; Jalil et al., 2025; Polas et al., 2022; Wang et al., 2023). Nevertheless, digitalization has rarely been systematically incorporated alongside the other four components within an integrated green entrepreneurship ecosystem framework. This limitation represents a significant empirical gap, particularly regarding the mechanisms through which digitalization influences Green Entrepreneurial Intention (GEI) and subsequent entrepreneurial behavior.

Fifth, Institutional Support (IS), encompassing environmental regulations, access to green financing, university-based entrepreneurship education, and sociocultural norms, has been recognized as a critical external determinant of green business development (Savastano et al., 2025; Demirel et al., 2019; Aljohani, 2026). However, many existing structural models conceptualize institutional factors primarily as exogenous variables or moderators, thereby overlooking their broader foundational role in shaping entrepreneurial ecosystems, strengthening adaptive capabilities, facilitating knowledge transfer, and enabling sustainable innovation (Habib et al., 2020; Jin & Chorda, 2025).

The fundamental research gap addressed by this study is systemic and multidimensional. Existing conceptual frameworks, including that proposed by da Rocha et al. (2022), remain largely theoretical and have not adequately incorporated digitalization as a cross-level enabling mechanism connecting individual, organizational, and institutional dimensions. Furthermore, the call by Demirel et al. (2019) for a holistic green entrepreneurship ecosystem framework that accounts for the distinctive characteristics of emerging economies remains insufficiently addressed. A particularly important gap concerns the limited empirical examination of the potentially reciprocal relationship between digitalization and GEI. Theoretically, digital platform adoption may expand access to information about environmentally sustainable entrepreneurial opportunities, strengthen entrepreneurial self-efficacy, and facilitate the formation of green entrepreneurial intentions. Conversely, stronger green entrepreneurial intentions may encourage individuals to adopt digital technologies that support the identification, development, and commercialization of sustainable business opportunities. Nevertheless, these potential reciprocal mechanisms remain insufficiently established within existing empirical research.

In response to these systemic gaps, this study formulates four interrelated research questions: (RQ1) How does the existing literature conceptualize the relationships among GEO, GEI, and sustainable performance, and what mediating mechanisms consistently explain these relationships? (RQ2) To what extent has GI been investigated as a central mechanism linking entrepreneurial orientation and intention to Triple Bottom Line (TBL) performance? (RQ3) How does digitalization function as an ecosystem component that facilitates, strengthens, or accelerates relationships among the identified dimensions? (RQ4) How does IS shape the

dynamics of the green entrepreneurship ecosystem, and what integrative framework can simultaneously incorporate all five components?

This study offers three principal contributions to the green entrepreneurship literature. First, it provides a comprehensive Systematic Literature Review (SLR) that systematically maps the relationships among the five pillars of the green entrepreneurship ecosystem—GEO, GEI, GI, digitalization, and IS—while explicitly distinguishing established relationships, emerging relationships, and critical research gaps involving insufficiently examined or untested mechanisms. Second, it develops an integrative Green Entrepreneurship Ecosystem (GEE) model that brings together these five components within a unified conceptual framework informed by the Natural Resource-Based View (NRBV), Institutional Theory, Entrepreneurial Ecosystem Theory, and Digital Transformation Theory. Third, the study formulates six operationalizable theoretical propositions that can be translated into empirically testable hypotheses, thereby establishing a structured roadmap for future research. This framework is particularly relevant to developing economies, including Indonesia, where the predominance of MSMEs, rapid digital economic transformation, and institutional heterogeneity create distinctive opportunities and challenges for the development of sustainable entrepreneurial ecosystems.

## METHOD

### Research Design

This study employed a Systematic Literature Review (SLR) design following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) reporting guidelines to ensure methodological transparency, rigor, and reproducibility (Page et al., 2021). The approach was selected to systematically identify, evaluate, and synthesize the expanding body of literature on green entrepreneurship while minimizing potential selection and reporting biases.

The study adopted a sequential integrative approach comprising three analytical stages: (1) quantitative bibliometric analysis to examine publication trends, geographic distribution, and methodological characteristics of the selected studies (Sklavos et al., 2022); (2) thematic narrative synthesis to identify relationships among key constructs and address the four research questions (RQ1–RQ4) (Demirel et al., 2019); and (3) ecosystem framework synthesis to integrate the findings into a coherent conceptual model and formulate empirically testable propositions.

### Research Protocols and Eligibility Criteria

The literature search and selection protocol is designed a priori before the execution of data collection begins to minimize the confirmation bias of researchers, following the methodological rules of Saeed & Dangelico (2026). This protocol includes the formulation of operational limits of research questions, the determination of keywords and Boolean operators, measurable inclusion and exclusion criteria, and standard data extraction forms.

The eligibility criteria for articles are strictly determined based on six inclusion criteria and four exclusion criteria as summarized in Table 1. The publication time span is limited to the period 2016–2026 to capture the shift in research paradigm after the declaration of the UN SDGs (September 2015) as well as the integration of contemporary digital technologies.

**Table 1.** Inclusion and Exclusion Criteria for SLR Research

| Code | Criteria Dimensions | Description and Methodological Rationalization |
|---|---|---|
| **INCLUSION CRITERIA** | | |
| I-1 | Publication Period | 2016–2026. Capturing the post-adoption literature acceleration of the UN SDGs (end of 2015) and the wave of sustainable industrial digitalization transformation. |
| I-2 | Document Type | Peer-reviewed scientific journal articles and review articles. Excludes conference proceedings, book chapters, editorials, technical reports, and introductory notes. |
| I-3 | Language | Full English to maintain standardization of terminology and international conceptual comparability. |
| I-4 | Thematic Relevance | Substantively, it discusses one or more components of the ecosystem: (a) GEO, (b) GEI, (c) Green Innovation, (d) Green Digitalization, and/or (e) Institutional Support. |
| I-5 | Subject Area | Indexed by Scopus in the fields of Business, Management and Accounting and/or Economics, Econometrics and Finance. |
| I-6 | Full-Text Accessibility | Full-text manuscripts are available through open access, institutional subscriptions, or verified preprint repositories. |
| **EXCLUSION CRITERIA** | | |
| E-1 | Terminological Inconsistencies | The use of the word ‘entrepreneur’ or ‘green’ outside the context of green entrepreneurship as a business phenomenon and micro/macroeconomics. |
| E-2 | Data Duplication | Articles that are double-listed in the search database. |
| E-3 | Manuscript Inaccessible | Articles with full manuscripts cannot be obtained after all institutional search channels and online repositories have been used. |
| E-4 | Beyond the Business/Economic Domain | Articles classified purely in pure environmental engineering science, pure agronomy, or natural sciences without a slice of business management. |

Source: Developed by the author based on the SLR protocol (2026).

**Data Sources and Search Strategies**

The Scopus database is used exclusively as the primary source of research data based on four strategic considerations: (1) Scopus is the largest multidisciplinary global indexing database covering more than 25,000 reputable active journals, covering all domains of management, business, and economics; (2) Provides complete standardized bibliographic metadata (titles, abstracts, author keywords, affiliations, citations); (3) Has consistent subject area filtering features; and (4) The use of a single, comprehensive database eliminates distortions of cross-platform metadata aggregation thereby ensuring methodological alignment.

The search strategy is designed to maximize recall (search scope) by maintaining high precision on the TITLE-ABS-KEY field using a formal Boolean lookup string:

**TITLE-ABS-KEY ("green entrepreneurship" OR "green entrepreneur*")**

The search was conducted in May 2026 and resulted in an initial population of 3,431 documents which were then exported into a structured metadata (.csv) format for the selection stage.

**Article Selection Process Based on PRISMA 2020**

The article filtering process was carried out in stages through five phases of PRISMA 2020: (1) Initial Identification: Boolean string search resulted in 3,431 articles; (2) Implementation of Metadata Filter: Limitation of the 2016–2026 period, journal article document type, and English language through Scopus' built-in feature maintained 1,747 articles (1,684 excluded articles); (3) Title and Abstract Filtering: Substantive feasibility check and absence of duplication resulted in 428 articles that passed (1,319 articles were excluded because they were not thethematically relevant); (4) Eligibility Verification: Verification of Business, Management & Accounting and Economics classifications resulted in 177 eligible articles (251 articles outside the excluded domain); and (5) Determination of the Final Corpus (Included): A search of the complete manuscript through access to Scopus, Unpaywall, and institutional repositories successfully downloaded 119 full manuscript articles (58 articles were not fully accessible). Thus, these 119 scientific articles were designated as the final corpus that was analyzed in depth.

**Data Extraction and Quality Assessment**

All 119 articles were extracted into a comprehensive data matrix that included bibliographic information (authors, year, journal, quartile, country, research design, unit of analysis, sample size) and substantive information (ecosystem components studied, basic theory, independent/mediator/moderator/dependent variables, β path coefficient values, $R^2$, Variance Accounted For/VAF, and key empirical findings). The validity of the findings was maintained through checking methodological consistency and suitability of operationalization variables in each study.

**Data Analysis Methods**

Data analysis was carried out sequentially through three integrated stages: (1) Bibliometric Analysis: Measuring the dynamics of annual publication trends, country geographic productivity, and the distribution of research methodology design using bibliometric software and spreadsheets; (2) Thematic Narrative Synthesis: Conducting an in-depth qualitative interpretation of the empirical findings of 119 articles to answer RQ1, RQ2, RQ3, and RQ4 in a structured manner; and (3) Ecosystem Framework Synthesis: Building an inter-component linkage matrix, formulating an integrative model of the Green Entrepreneurship Ecosystem (GEE Model), and deducing six operational theoretical propositions that are ready to be tested in future empirical research.

## RESULTS AND DISCUSSION

**Bibliometric Characteristics of the Research Corpus**

The results of a bibliometric analysis of 119 corpus articles prove that the green entrepreneurship literature is experiencing very rapid non-linear growth. This development is divided into two main phases: Phase 1 (1979–2018) which is a period of slow and flat growth with an annual publication volume of below 200 global documents; and Phase 2 (2019–2026)

which marks an exponential acceleration. Global publications jumped from 230 papers in 2019 to 300 (2020), 395 (2021), 557 (2022), and reached a peak of 730 documents in 2025, before recording 238 documents in mid-2026. This pattern confirms that green entrepreneurship has transformed from a niche topic to a mainstream global strategic management research.

Geographically, the contribution of global publications is dominated by China (more than 510 documents), followed by India (390 documents), the United States (320 documents), the United Kingdom (275 documents), Malaysia (190 documents), and Indonesia in sixth place (190 documents). In the final corpus of this study (n = 119), the distribution of research contexts is concentrated in developing Asian countries: China (26 articles), multi-country studies (18 articles), Indonesia (9 articles), Vietnam (7 articles), Pakistan (7 articles), India (6 articles), and Ghana (5 articles). This shift in the epicenter of research from the West to Asia reflects the high urgency of the green transition in countries with massive industrial environmental pressures.

Judging from the research methodology, the corpus was absolutely dominated by a quantitative survey approach based on Structural Equation Modeling (SEM) with a cumulative proportion of 64.7%. A total of 63 articles (52.9%) used Partial Least Squares SEM (PLS-SEM) and 14 articles (11.8%) used Covariance-Based SEM (CB-SEM/AMOS). Panel data and econometric approaches were used by 18 articles (15.1%), qualitative and mixed-methods studies accounted for 11.8%, fsQCA (Fuzzy-Set Qualitative Comparative Analysis) approach accounted for 3.4%, and the rest were meta-analyses and bibliometric studies (Table 2). The dominance of PLS-SEM proves the methodological readiness of this discipline in testing complex structural models with multidimensional latent variables.

**Table 2.** Design Distribution and Research Methodology of the SLR Corpus (n = 119)

| Research Design/Methodology | Number of Articles (n) | Percentage (%) |
|---|---|---|
| Quantitative Survey — PLS-SEM (SmartPLS) | 63 | 52,9 % |
| Quantitative Survey — CB-SEM (AMOS / LISREL) | 14 | 11,8 % |
| Data Panel / Macro Econometrics | 18 | 15,1 % |
| Qualitative (Case Study, In-Depth Interview) | 9 | 7,6 % |
| Mixed-Methods (Quantitative & Qualitative) | 5 | 4,2 % |
| Fuzzy-Set Qualitative Comparative Analysis (fsQCA) | 4 | 3,4 % |
| Meta-Analysis / Systematic Literature Review | 4 | 3,4 % |
| Pure Bibliometric/Conceptual Analysis | 2 | 1,7 % |
| **Total Corpus Analyzed** | **119** | **100,0 %** |

Source: Data extraction of 119 articles of the Scopus corpus (2026).

## Synthesis of RQ1: The Chain of Relationships of GEO, GEI, and Sustainable Performance

Green Entrepreneurial Orientation (GEO) was the most dominant construct studied in 87 out of 119 articles (73.1%). The classic dimension of GEO refers to Miller's three pillars: green innovation, green proactivity, and green risk courage (Fatoki, 2019). Follow-up studies expand this dimension to five pillars by adding green autonomy and competitive aggressiveness in

Indonesian batik MSMEs (Anjaningrum et al., 2025). The findings of fsQCA by Jin & Chorda (2025) on startups in Shanghai prove that the formation of GEO is configured by innovation capabilities, normative pressures, internal environmental commitments, and regulatory coercive pressures.

Regarding its relationship with sustainable business performance (TBL Performance), the literature shows sharp empirical inconsistencies. Some studies confirm the existence of a strong positive direct influence between GEO and company performance (Baquero, 2024; Ling et al., 2026; Hu & Tresirichod, 2025). However, crucial studies by Marzouk & El Ebrashi (2024) in Egypt and Anjaningrum et al. (2025) in Indonesia prove that the direct effect of GEO on TBL performance is not significant; the influence is entirely indirectly mediated. This inconsistency confirms that GEO works as a strategic resource disposition that requires explanatory variables (mediators) to produce real performance.

Green Entrepreneurial Intention (GEI) was researched in 38 articles (31.9%) with the dominance of the Theory of Planned Behavior (TPB) framework (50% of the GEI studies). The relationship of intention (GEI) to real green entrepreneurial behavior (GEB) was strongly confirmed across various studies: Kouchaky et al. (2025) proved GEI as the strongest predictor of GEB beyond capabilities and opportunities; Soonsan et al. (2025) confirmed GEI as the strongest mediator in the serial pathway of university support to GEB; while Mawardi et al. (2025) emphasized that intentions require government institutional support to manifest into real business actions. However, simultaneous integration between GEO and GEI in a single ecosystem causal chain is still very limited.

**Synthesis of RQ2: Green Innovation as a Mechanism for Mediating TBL Performance**

Green Innovation (GI) was studied in 79 articles (66.4%) and identified as the most established mediation mechanism in the GEO chain towards TBL performance. Saeed & Dangelico (2026) meta-analysis of 182 independent samples confirms that green product innovation is a distinctive category that demands specific technological capabilities and green market orientation. The GI typology is divided into: green product innovation, green process innovation, managerial/organizational innovation, and ambidextrous green innovation that integrates exploration and exploitation (Baquero, 2024).

Cross-study evidence shows that GI consistently mediates the influence of GEO on the economic, social, and environmental dimensions of TBL performance (Table 3). The most monumental finding is presented by Rong et al. (2025), who prove that the contribution of green innovation capabilities ($f^2 = 0.732$) substantially exceeds the direct effect of GEO on entrepreneurial success. This places GI not just a passive intermediary variable, but an active amplifier of the company's strategic value. In addition, Appiah et al. (2023) revealed that the environmental dimension of TBL responds to green innovation much faster and more strongly than the economic and social dimensions, indicating an asymmetric effect of GI.

**Table 3.** Empirical Evidence of the Mediated Role of Green Innovation in the Corpus of Literature

| Researcher & Year | Tested Structural Pathways | Types of Mediation & Key Findings |
|---|---|---|
| Momayez et al. (2023) | GEO → GI → Environmental & Organizational Performance | Significant Partial Mediation |
| Appiah et al. (2023) | GEO → GI → TBL Performance (Economic, Social, Environmental) | Partial Mediation (The strongest environmental effect) |
| Baquero (2024) | GEO → Ambidexterity Innovation → Green Performance | Partial Mediation via Exploitation & Exploration |
| Anjaningrum et al. (2025) | GEO → Green Knowledge Management → Ambidexterity Innovation → Sustainable Performance | Full Sequential Mediation |
| Rong et al. (2025) | GEO → GI Capabilities → Entrepreneurial Success | Partial Mediation (GI's contribution exceeds the direct effect of GEO) |
| Dahri et al. (2025) | GEO/Green Intellectual Capital → GI → TBL Performance | Significant Partial Mediation |
| Abdelfattah et al. (2025) | Green Dynamic Capabilities → GI → Electronics Innovation | Partial Mediation with AI Adoption Moderation |
| Rustiarini et al. (2022) | Intellectual Capital → GI → Sustainability & Financial Performance | Significant Partial Mediation |
| Majali et al. (2022) | Green Transformational Leadership → GEO → Green Product Innovation → MSME Performance | Significant Serial Mediation |

Source: Comparative synthesis of the corpus of empirical literature (2026).

**RQ3 synthesis: The Position and Role of Digitalization in the Ecosystem**

Digitalization was researched in 26 articles (21.8%) covering broad domains: Artificial Intelligence (AI), blockchain, e-commerce, big data analytics, IoT, and Digital Human Resource Management (D-HRM). Dabbous et al. (2023) presented comparative macro evidence in 34 countries that the Digitalization Index (I-DESI) increases entrepreneurial activities and sustainable competitiveness. At the specific technology level, blockchain has been shown to drive GEO through digital knowledge sharing (Jalil et al., 2025) and act as a mediator of green innovation adoption with an $R^2$ value of 91.2% (Polas et al., 2022). Wang et al. (2023) show that e-commerce drives urban green innovation through entrepreneurial vitality and investment agglomeration. In addition, Abdelfattah et al. (2025) prove that AI adoption moderates and strengthens the relationship between dynamic capabilities and green innovation.

Although digitalization has been explored in a variety of conceptual positions (Table 4), there is a crucial paradox: digitalization serves as an accelerator of system efficiency, but at the same time it is a barrier to exclusion for MSMEs that are poor in digital literacy (Sklavos et al., 2024; Hustera et al., 2025). Most importantly, no single study has 58odelled digitalization together with GEO, GEI, GI, and IS simultaneously.

**Table 4.** The Position and Role of Digitalization in Previous Research Models

| Researcher & Year | Digital Technology | Position in the Model | Key Findings/Mechanisms |
|---|---|---|---|
| Dabbous et al. (2023) | I-DESI (Digital Index) | Antecedents & Mediators | Digitalization encourages entrepreneurial activities towards sustainable competitiveness in 34 countries. |
| Jalil et al. (2025) | Blockchain Technology | Background GEO | Blockchain encourages GEO via digital knowledge sharing (the effect is stronger on Gen Z than on Gen Y). |
| Polas et al. (2022) | Blockchain Technology | Mediator GI | The intention of blockchain adoption mediates the sustainability orientation towards GI with a variance of $R^2$ = 91.2%. |
| Wang et al. (2023) | Platform E-Commerce | GI Antecedents | E-commerce encourages urban green innovation through entrepreneurial vitality and capital agglomeration. |
| Abdelfattah et al. (2025) | Artificial Intelligence (AI) | Moderator GDC & GI | AI adoption strengthens the GDC pathway → GI (β = 0.172) and GI → electronic innovation (β = 0.164). |
| Zhang et al. (2024) | Environmental Big Data | Conditional Antecedents | Disclosure of emissions data increases GI by 5% only in companies that have strong GEOs. |
| Sklavos et al. (2024) | Digital Transformation | Ecosystem Enabler & Barrier | The absence of HR digital skills is the main obstacle for agro-food MSMEs. |
| Setyaningrum et al. (2023) | Digital HRM (D-HRM) | Performance Antecedents | D-HRM directly affects supply chain performance; GEO does not mediate the relationship. |

Source: Synthesis of literature from 119 SLR corpus articles (2026).

**Synthesis of RQ4: Institutional Support as a Pillar of the Ecosystem**

Institutional Support (IS) was studied in 67 articles (56.3%) covering formal regulations, green finance, university incubators, and sociocultural norms. Savastano et al. (2025) proved that formal institutions are the most dominant external factor in the growth of green agricultural MSMEs (β = 0.434), surpassing technological and physical infrastructure factors. Interestingly, the influence of external regulations and support is indirect: Liu et al. (2025) prove that environmental regulation requires the mediation of resource commitment to encourage green supply chains; Soonsan et al. (2025) prove that university support must go through self-efficacy and intention (GEI) before it becomes a real action. In addition, Makki et al. (2020) identified that the absence of stakeholder collaboration is the highest driving barrier that triggers other obstacles.

**Linkage Matrix Between Ecosystem Components**

A comprehensive synthesis of all corpus findings resulted in a Linkage Matrix between components of the Green Entrepreneurship Ecosystem (Table 5). Each relationship is classified by its evidentiary status: Established (supported ≥ 3 consistent independent studies), Emergent (1–2 diverse studies or findings), and Untested (untested research gaps).

**Table 5.** Inter-Component Matrix of Green Entrepreneurship Ecosystem

| From \ To | GEO | GEI | GI | Digitization | TBL Performance |
|---|---|---|---|---|---|
| GEO | — | Emerging (2 studies) | **Established (≥11 studies)** | Emerging (2 studies) | **Established (≥7 studies; none non-significant)** |
| GEI | Emerging (2 studies) | — | **Established (3 studies via GEB)** | Untested (Critical Gap) | Emergent (2 studies via real behavior) |
| GI | **Established (≥5 mediation studies)** | **Established (3 studies)** | — | Emerging (3 studies) | **Established (≥12 consistent studies)** |
| Digitization | **Established (3 studies: blockchain)** | Untested (Critical Gap) | **Established (4 studies: AI, e-com, data)** | — | **Established (3 studies: I-DESI, index)** |
| IS | **Established (≥5 regulatory studies)** | **Established (≥5 university studies)** | **Established (≥4 regulatory studies/data)** | Emergent (2 fintech studies) | **Established (≥5 direct & indirect studies)** |

Source: Synthesis of the literature matrix of 119 corpus articles (2026).

The linkage matrix in Table 5 confirms three fundamental patterns: (1) The relationship between GEO → GI and GI → TBL performance is the most established causal backbone in the literature; (2) The relationship between GEI and Digitalization is the most critical theoretical and empirical gap (untested) that has never been directly tested in an integrated model; and (3) Institutional Support has proven to be strong at the level of bilateral relations, but has never been positioned together in a single integrated ecosystem model.

## Discussion

### GEO–GEI–Performance Causal Chain: Beyond Bilateral Relations

The inconsistency of GEO's direct influence on TBL performance—where studies on large manufacturers in China and the UAE recorded positive direct effects (Baquero, 2024; Ling et al., 2026), while studies on MSMEs in Egypt and Indonesia rejected it (Marzouk & El Ebrashi, 2024; Anjaningrum et al., 2025)—brings profound theoretical implications for the Natural Resource-Based View (NRBV). In the context of the limited resources of developing countries, GEO is not a capability that automatically results in a competitive advantage, but rather a potential strategic disposition that requires conversion-mediated capabilities, such as green innovation and green knowledge management, to produce real sustainable performance.

On the other hand, the integration of GEI into the ecosystem dismantles an important psychological paradox. As revealed by Le et al. (2023), understanding environmental issues without being accompanied by entrepreneurship education can actually reduce the self-efficacy of prospective entrepreneurs because they feel that ecological problems are too massive to overcome. This is where the crucial position of GEI as a causal bridge lies: the strategic orientation of the institution must be converted into a belief of personal intentions before it is realized into innovative actions.

**Green Innovation: From a Single Mediating Variable to an Ecosystem Reinforcer**

The finding that the contribution of green innovation capabilities goes beyond the direct effects of entrepreneurial orientation (Rong et al., 2025) confirms that GI functions as an active amplifier in the ecosystem. In addition, the findings of the ambidexterity of green innovation (Baquero, 2024) demand a firm distinction between exploitative innovation (gradual refinement of green processes) and exploratory innovation (creation of radical green technology solutions). In MSMEs in Indonesia, reliance on exploitative innovation is still dominant (Anjaningrum et al., 2025), indicating the need for external ecosystem support to drive a leap towards radical exploration.

**Digitalization: Strategic Accelerators and the Paradox of Digital Exclusion**

The cross-level synthesis proves that digitalization operates simultaneously at the micro level (enhancement of dynamic capabilities via AI; Abdelfattah et al., 2025), meso level (vitality of innovation via e-commerce platforms; Wang et al., 2023), and macro level (sustainable productivity via digital index; Dabbous et al., 2023). However, the paradox of digitalization demands vigilance: increasingly complex digitalization risks marginalizing grassroots entrepreneurs and rural MSMEs who lack digital literacy (Sklavos et al., 2024). In Indonesia, where the digital infrastructure gap between islands is still real, digitalization should be positioned as an inclusive accelerator that facilitates the identification of green opportunities, not as an absolute requirement that weeds out small business actors (Aditi et al., 2025).

**Institutional Support: The Foundation for Capability Building and Collaboration**

The empirical findings of Savastano et al. (2025) that formal institutions are the most influential drivers for green MSMEs refute the reductionist treatment of IS as a sole moderator. IS operates in layers through the mechanism of cognitive capability and motivation formation (capability building), not just coercive regulatory pressure (Aljohani, 2026; Soonsan et al., 2025). The absence of collaboration across sectors (government, universities, banks, and industry) has proven to be the root of the failure of the green entrepreneurship ecosystem (Makki et al., 2020). The triple helix model that is adaptive to local cultural characteristics has proven to be the most conducive institutional configuration for the development of green ecosystems in Indonesia (Rahmawati et al., 2023).

**Integrative Green Entrepreneurship Ecosystem Model (GEE Model)**

Based on an in-depth conceptual synthesis of the four research questions, this study constructs the Green Entrepreneurship Ecosystem Model (GEE Model). The architecture of this model places Institutional Support as the foundation pillar of the ecosystem; Green Entrepreneurial Orientation (GEO) as the strategic disposition of the organization; Green Entrepreneurial Intention (GEI) as a cognitive motivational bridge; Green Innovation (GI) as a strengthening mediation mechanism; Digitalization as a cross-level enabler that intensifies all interactions; and Triple Bottom Line (TBL) Performance as the final sustainability output.

**GEE Model Theoretical Propositions: A Future Empirical Research Roadmap**

From the architecture of the GEE Model, six measurable propositions are formulated that can be directly operationalized into empirical research hypotheses (Table 6):

**P1 – Amplificatory Mediation**

GEO does not directly affect TBL performance in developing MSMEs, but rather works through the mediation of Green Innovation (GI) capabilities whose contribution goes beyond the direct effects of GEO itself (H1a: GEO has no significant direct effect on TBL; H1b: GI mediates the relationship between GEO and TBL; H1c: GI's contribution to TBL is greater than the direct effect of GEO).

**P2 – Causal Bridge**

Green Entrepreneurial Intention (GEI) serves as a motivational causal bridge that converts GEO's strategic disposition into tangible actions of green innovation (H2a: GEO has a significant positive effect on GEI; H2b: GEI has a significant positive effect on GI behavior).

**P3 – Digitalization Enabling**

Digitalization acts as a crosscutting enabler that strengthens the relationship between GEO → GI and GI → TBL, but the reinforcing moderation effect is more significant in companies with mature digital capabilities than MSMEs with digital gaps (H3a: Digitalization positively moderates the GEO → GI pathway; H3b: Digitalization positively moderates the GI → TBL pathway; H3c: The moderation effect of digitalization varies based on the level of internal digital capabilities).

**P4 – Digitalization-Intention Nexus**

Digitalization strengthens the formation of GEI through expanding access to green opportunity information, digital social networks, and platform-based business models (H4a: Digital capabilities have a positive effect on GEI; H4b: Digital platform access mediates the relationship between IS and GEI; H4c: The relationship between digitalization and GEI is moderated by digital literacy).

**P5 – Multidimensional Institutional Support**

Institutional Support is not a single moderator, but rather a multidimensional pillar that influences GEO and GEI through internal capability building and self-efficacy, where the effectiveness of which varies depending on the alignment of regulative, normative, and cultural-cognitive pillars (H5a: IS has a positive effect on GEO; H5b: IS has a positive effect on GEI through self-efficacy; H5c: The influence of IS varies between regulatory and cultural pillars).

**P6 – Complete GEE Model Superiority**

The simultaneous integration of the five ecosystem components (IS, GEO, GEI, GI, and Digitalization) has a statistically higher predictive power ($R^2$ TBL Performance) than a partial model that ignores one of the components (H6: The 5-component ecosystem model has superior predictive power over the partial model in the nested PLS-SEM comparison model).

**Table 6.** Summary of the Six Propositions of GEE Models and Empirical Testing Hypotheses

| No. | Conceptual Propositions | Key Statements & Key References | Literature Proof Status |
|---|---|---|---|
| **P1** | GEO → GI → TBL (Amplifier Mediation) Performance | GEO has no direct effect; GI mediates and exceeds the direct effects of GEO. (Marzouk & El Ebrashi, 2024; Anjaningrum et al., 2025; Rong et al., 2025; Appiah et al., 2023) | Established (≥ 11 consistent studies) |
| **P2** | GEO → GEI → GI (Causal Bridge) | GEI converts GEO's strategic disposition into innovative action; the strongest predictor of entrepreneurial behavior (β = 0.410). (Kouchaky et al., 2025; Soonsan et al., 2025) | Emergent (Requires integrative testing) |
| **P3** | Digitalization Moderates the GEO–GI-TBL Path | Digitalization intensifies the relationship between GEO → GI and GI → TBL; MSMEs with minimal capabilities face the risk of exclusion. (Dabbous et al., 2023; Abdelfattah et al., 2025; Zhang et al., 2024) | Emergent (3–4 separate studies) |
| **P4** | Digitization of GEI → (Most Critical Gap) | Digitalization strengthens GEI via access to information, social networks, and business platforms. It has not been tested in 119 corpus articles. (Polas et al., 2022; Jalil et al., 2025) | Untested (Most original Gap) |
| **P5** | IS as a Capability Based Foundation Pillar | IS operates via internal capability development (β = 0.434); regulative, normative, and cognitive pillars have an unbalanced influence. (Savastano et al., 2025; Aljohani, 2026; Liu et al., 2025) | Established bilateral; need simultaneous testing |
| **P6** | GEE Integrative Model (5 Components) Delivers the Highest TBL | The simultaneous integration of the five pillars of the ecosystem results in a superior predictive power ($R^2$) of TBL performance compared to the partial model. (Anjaningrum et al., 2025; Appiah et al., 2023; Baquero, 2024) | Untested (Major original contribution) |

Source: Synthesis of GEE ecosystem model propositions from 119 SLR corpus articles (2026).

**Relevance and Contextual Implications for Indonesia**

The findings of this study have very high contextual relevance for Indonesia. The characteristics of Indonesia's ecosystem are characterized by the dominance of MSMEs (accounting for more than 60% of GDP), entrepreneurial motivation that is still dominant driven by short-term economic needs (necessity-driven) rather than pure ecological awareness (Sulastiningsih et al., 2023), and the digital infrastructure gap between Java Island and outside Java.

From a practical policy perspective, there are three strategic implications for Indonesia: (1) Planting and strengthening green entrepreneurship orientation (GEO) in start-ups must be prioritized in line with environmental regulatory enforcement, as coercive regulations have proven ineffective in companies that do not have a GEO (Zhang et al., 2024); (2) Institutional support (IS) of the government and universities should be focused on the formation of green

entrepreneurial self-efficacy and practical vocational training through a triple helix scheme rooted in local wisdom (Nuringsih & Nuryasman, 2021; Rahmawati et al., 2023); and (3) Digitalization must be managed as an instrument of inclusive acceleration through the provision of rural internet infrastructure and e-commerce literacy, so that micro-enterprises in the agriculture and handicraft sectors can participate in the green market without being eliminated by digital barriers (Aditi et al., 2025).

**Research Limitations and Future Research Agenda**

This study has three openly acknowledged methodological limitations: (1) Exclusive reliance on the Scopus database and English-language documents has the potential to exclude high-quality studies in other databases or local-language articles; (2) A total of 58 articles (32.8%) that are not accessible in full manuscripts may give rise to potential document selection bias; and (3) Qualitative narrative synthesis in SLR still contains elements of subjective interpretation of researchers even though the PRISMA protocol has been strictly applied.

Based on the evaluation of the literature gap, four future research agendas were formulated: (1) Simultaneous empirical testing of the GEE Model using second-order PLS-SEM on cross-sectoral and cross-regional MSME samples in Indonesia; (2) Explicit empirical testing of the relationship between Digitalization → GEI as the most original literature gap identified; (3) Implementation of longitudinal research to capture the temporal evolution of interactions between ecosystem components that cannot be detected by cross-cutting survey designs; and (4) In-depth investigation of the ambidexicity of green innovation in the sustainable manufacturing and services industry sectors.

## CONCLUSION

This study systematically mapped the green entrepreneurship ecosystem through a comprehensive review of 119 peer-reviewed journal articles selected from 3,431 records identified in the Scopus database between 2016 and 2026, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) reporting guidelines. The synthesis addressed four research questions and identified a fundamental gap in the existing literature: the absence of a comprehensively empirically validated framework integrating Green Entrepreneurial Orientation (GEO), Green Entrepreneurial Intention (GEI), Green Innovation (GI), Digitalization, and Institutional Support (IS) within a unified green entrepreneurship ecosystem model.

The findings indicated that GI served as a critical mediating mechanism linking entrepreneurial orientation to measurable Triple Bottom Line (TBL) performance; GEI functioned as a psychological mechanism translating entrepreneurial motivations and attitudes into behavioral intentions that could subsequently lead to entrepreneurial action; digitalization operated as a cross-cutting enabler that facilitated innovation while simultaneously creating risks of digital exclusion among resource-constrained micro, small, and medium-sized enterprises (MSMEs); and IS provided an institutional foundation that strengthened adaptive capabilities and supported sustainable entrepreneurial development. The proposed integrative Green Entrepreneurship Ecosystem (GEE) model and six empirically testable theoretical propositions established a coherent conceptual framework and a structured research agenda for future empirical investigations. These contributions also provided valuable insights for

developing evidence-based policies aimed at strengthening green entrepreneurship ecosystems and advancing sustainable development, particularly in emerging economies such as Indonesia.

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**CONFLICT OF INTEREST**

The authors declare that there are no conflicts of interest in this study. The authors also have no commercial or financial relationships with any party that could potentially influence the conduct of the research, the analysis of the results, or the presentation of the findings in this manuscript.

**AUTHOR CONTRIBUTION**

Marianus Saldanha Neno[1]: Conceptualization, Methodology, Data curation, Investigation, Formal analysis, Project administration, Visualization, Writing – original draft, Writing – review & editing.

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**GENERATIVE ARTIFICIAL INTELLIGENCE USAGE STATEMENT**

In preparing this manuscript, the authors used Artificial Intelligence (AI) technology to a limited extent, solely to assist with grammar improvement and language accuracy checks. All ideas, analyses, and substantive content of the manuscript are entirely the result of the authors' own intellectual work and remain their full responsibility.

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