

SDG-ORIENTATION OF SUSTAINABLE DIGITAL ENTREPRENEURSHIP RESEARCH

Onur Demirel^{1*}, Nihan Yıldırım²

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¹ Istanbul Technical University, Graduate School, Department of Management, Turkey

² Istanbul Technical University, Faculty of Management, Department of Management Engineering, Turkey

*Corresponding Author:

Onur Demirel

Email:

demirelo19@itu.edu.tr

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ABSTRACT

This research aims to contribute to the knowledge on the linkages between Sustainable Development Goals (SDGs), Twin Transition agenda (TT), and the entrepreneurship concept by exploring the SDG-orientation of digital sustainable entrepreneurship (DSE) research in accordance with bibliometric indicators. First, a bibliometric analysis was conducted on 39 articles, selected by PRISMA method from 229 retrieved publications on the Scopus database. Second, a conceptual content analysis was executed on full-text publications using keyword analysis to identify the SDG-orientation of DSE research. Findings suggest that, SDG3 (Good Health and Well-being) is the highest and SDG14 (Life below Water) is the least discussed goal by DSE research. Prioritizing the environmentally related goals, DSE research also differs from the total SDG-related literature in terms of SDG-orientation. Further, stronger preference for qualitative approaches and higher emphasis on the digital social entrepreneurship concept is observed within DSE field. Moreover, majority of DSE publications are authored by European authors and sourced by European journals. Drawing on each bibliometric data, this paper represents (1) SDGs addressed by DSE research, (2) the number of DSE publications with SDG-specific keywords as an indicator to SDG-orientation, and (3) orientation across environmental, social and economic pillars. As one of the first analysis on SDG-orientation of DSE research, this study helps identify the evolution, research gaps and scholarly collaboration opportunities within the field of research.

Keywords: sustainability, sustainable development goals, SDGs, twin transition, digital transition, digital sustainable entrepreneurship, bibliometrics, conceptual content analysis

1. INTRODUCTION

Following SDGs outlined by the UN (2015), the EU declared the TT vision (EC JRC, 2022). With the declaration of the EU, the “green transition” concept was coined referring to realization of sustainability, and the term “digital transition” to promote the utilization of digital technologies in the achievement of sustainability results. Further, the EU also defined green digital solutions to be delivered by small and medium-sized organizations and startups for a healthy ecosystem to enable competition and innovation (EC JRC, 2022). As an intersection of sustainability, entrepreneurship, and digital technological innovation concepts, scholarly interest has also increased towards digital sustainable entrepreneurship (DSE) research, which points

to the employment of digital technologies (Andersen et al., 2021; Bednarčíková & Repiská, 2021; Xu et al., 2022) by entrepreneurial action (Cohen & Winn, 2007; Greco & De Jong, 2017; Koe et al., 2014; Soubotina et al., 2004; Weidinger et al., 2014) in achieving SDGs (Berawi, 2019) through sustainability (Andersen et al., 2021; Bednarčíková & Repiská, 2021; Gregori & Holzmann, 2020; Xu et al., 2022;).

In that respect, we consider DSE an umbrella term covering types of sustainability-oriented digital entrepreneurship models. In the definition of sustainable entrepreneurship by Schaltegger & Wagner (2011), refer to the concepts of sustainable entrepreneurship, social entrepreneurship, green entrepreneurship, eco-entrepreneurship and environmental entrepreneurship (Koe et al., 2014; Kraus et al., 2018; Raudeliuniene et al., 2014; Schaltegger & Wagner, 2011; Tunçalp & Yıldırım, 2022). In brief, DSE is the sustainability-oriented entrepreneurship type that employs digital technologies towards creating sustainable solutions to grand challenges (Figge et al., 2002; Poldner et al., 2017).

In DSE context, the research is rare, and most of them are limited to review articles as the study of Holzmann and Gregori (2023) that explores the impacts of digital technologies on sustainable entrepreneurship, and the publication of Baranauskas and Raišienė (2022) who reconceptualizes the multi-level side effects and outcomes of digital entrepreneurship within sustainability to define scholarly trends. However, the SDG-orientation of DSE research is still an undiscovered area.

Mapping SDG-orientation of DSE research using bibliometrics with publication statistics, this review enriches the academic discourse by posing unique research questions to illuminate the connections between the research on DSE and SDGs. Defining research gaps and collaboration possibilities within the research areas are among the aims of this article. “

In addition to a comparison of the SDG-orientation of DSE field to the total SDG-related literature, this study aims to explore the SDG-orientation of DSE literature per the publications' year, origin, the concepts used for referring to sustainability-oriented entrepreneurship, methodological approaches employed, publication sources and citation performance, by seeking answers to the following research questions:

1. How does the SDG-orientation of DSE research differ from the SDG-related total literature?
2. How does the SDG-orientation of DSE research evolve over time?
3. How does the SDG-orientation of DSE research differ geographically and among countries?
4. How does the SDG-orientation of DSE research vary by the concepts referring to sustainability-oriented entrepreneurship?
5. How does the SDG-orientation of DSE research differ by methodological approaches?
6. How does the SDG-orientation of DSE research vary by publication sources?
7. How does the SDG-orientation of top-ten cited DSE publications distribute?

The following sections include a literature review, methodologies, findings and discussion, and research conclusions. The research also aims to illuminate future DSE and sustainability-related research.

2. LITERATURE REVIEW

2. 1. POLITICAL BACKGROUND OF SDGS AND TWIN TRANSITION

Accepted by 193 members of the UN, the 2030 Agenda provides 17 SDGs (Table 1) to be accomplished by 2030 (UN, 2015) so the planet does not face undesired and irreversible ecological, social, and economic problems (UN ECLAC 2022). According to the TT declaration of the EU, digital technologies are defined as the key to environmental, social, and economic sus-

tainability (EC JRC, 2022). In this respect, TT's vision, namely the "green digital transition," seeks to realize "green transition," which reflects the aim to achieve sustainability, and "digital transition," which reflects the focus on the employment of digital technologies to attain sustainability (EC JRC, 2022). Consequently, digital technologies are dominantly positioned as the key to transforming and empowering economies and society (EC JRC, 2022). Moreover, small and medium-sized organizations and startups are critical in validating a healthy ecosystem that enables competition and innovation through sustainability (EC JRC, 2022).

Table 1. Sustainable Development Goal (SDG) Definitions

SDGs	Title
1	No Poverty
2	Zero Hunger
3	Good Health and Well-being
4	Quality Education
5	Gender Equality
6	Clean Water and Sanitation
7	Affordable and Clean Energy
8	Decent Work and Economic Growth
9	Industry Innovation and Infrastructure
10	Reduced Inequalities
11	Sustainable Cities and Communities
12	Responsible Consumption and Production
13	Climate Action
14	Life Below Water
15	Life on Land
16	Peace, Justice and Strong Institutions
17	Partnerships for the Goals

Source: UN (2015)

2. 2. SUSTAINABILITY, INNOVATION AND DIGITAL TECHNOLOGIES

The concept of innovation, which is traditionally economic and profit-oriented (Drucker P., 1985; OECD, 2010a; Schumpeter J, 1934), is also considered as a driving force for sustainability (Bonilla et al., 2018; Carayannis & von Zedtwitz, 2005; Cordova & Celone, 2019; European Commission, 2017; Gault, 2016; Kivilä et al., 2017; Kroll et al., 2019; Lüdeke-Freund, 2020; Maier et al., 2020; Miklian & Hoelscher, 2018; OECD, 2010b, 2010a, 2018; UN et al., 2015; UN DESA, 2022). On the other hand, digital technologies as artifacts (Gregori & Holzmann, 2020) hold a valuable potential in enabling sustainability-oriented radical and incremental innovations (Andersen et al., 2021; Bednarčíková & Repiská, 2021; Xu et al., 2022), and offer both entrepreneurial (Gregori & Holzmann, 2020) and socio-environmental (Xu et al., 2022) opportunities in the development of sustainable practices and value propositions (Andersen et al., 2021; Gregori & Holzmann, 2020). In that respect, digital technologies, at the center of digital technological innovations (Sahut et al., 2021) have a transformative role (Nishant et al., 2020) in embedding environmental, social, and economic objectives (Bednarčíková & Repiská, 2021; Xu et al., 2022) as defined to reinforce green transitions by the TT vision of the EU (EC JRC, 2022).

2. 3. DIGITAL SUSTAINABLE ENTREPRENEURSHIP

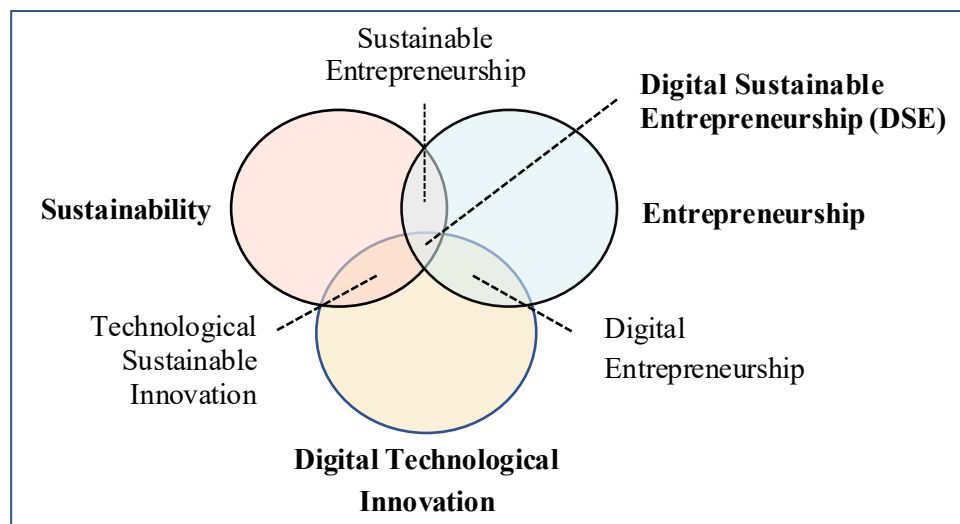
The concept of entrepreneurship, which has been defined as (1) the source of innovation (Greco & De Jong, 2017; Schumpeter J, 1934; Soubbotina et al., 2004; Tzeng, 2009) and concerned with (2) implementation (OECD, 2018) and (3) diffusion of innovations (Rogers, 1962) is defined as a key to sustainable development (Azam Roomi et al., 2021; Cohen & Winn, 2007; Dixon & Clifford, 2007; Greco & de Jong, 2017; Hoogendoorn et al., 2019; ICC, 2012; Koe, Majid, et al., 2014; Rahdari et al., 2016; Soubbotina et al., 2004; Weidinger et al., 2014; Xu et al., 2022; Zeng, 2018), and the SDGs (Entrepreneurship Monitor, 2022). Consequently, the conventional concept of entrepreneurship (Drucker P., 1985; Schumpeter J, 1934; Soubbotina et al., 2004) has diversified such as the concept of social entrepreneurship (Bacq & Alt, 2018; Cordova & Celone, 2019; Miklian & Hoelscher, 2018; Mitzinneck & Besharov, 2019; Raudeliuniene et al., 2014; Schaltegger & Wagner, 2011; York et al., 2016; Zeng, 2018), environmental entrepreneurship (Dean & McMullen, 2007; Keogh & Polonsky, 1998; Schaltegger & Wagner, 2011; York et al., 2016), eco-entrepreneurship (Mars & Lounsbury, 2009; Moon, 2018; Schaltegger & Wagner, 2011; Gajović, 2024), green entrepreneurship (Kraus et al., 2018; O'Neill & Gibbs, 2016; Raudeliuniene et al., 2014) and sustainable entrepreneurship or sustainopreneurship (Aghelie et al., 2016; Nosratabadi et al., 2019; Schaltegger & Wagner, 2011). It also observed that related concepts may also be used interchangeably or cover one another. For instance, concept of green entrepreneurship is defined as a form of sustainable entrepreneurship (Koe et al., 2014; Kraus et al., 2018; Raudeliuniene et al., 2014; Schaltegger & Wagner, 2011), while these concepts are also used interchangeably (Dixon & Clifford, 2007; Koe et al., 2014; Schaltegger & Wagner, 2011; Shepherd & Patzelt, 2011). Environmental entrepreneurship concept is considered to be covered by sustainable entrepreneurship (Dean & McMullen, 2007; Kimuli et al., 2020; Kraus et al., 2018), while these concepts can also be used interchangeably (Cohen & Winn, 2007; Dean & McMullen, 2007; Dixon & Clifford, 2007; Hockerts & Wüstenhagen, 2010). Moreover, it is defined that social entrepreneurship concept also holds similarities with the concept of sustainable entrepreneurship (Azam Roomi et al., 2021; Choi & Majumdar, 2014; Hockerts & Wüstenhagen, 2010; Kimuli et al., 2020; Kraus et al., 2018; Lüdeke-Freund, 2020; Muñoz & Cohen, 2018; Schaltegger & Wagner, 2011), while the concept of sustainable entrepreneurship is also identified as a progression of eco-entrepreneurship (Lüdeke-Freund, 2020; Schaltegger & Wagner, 2011). As mentioned, this research considers sustainable entrepreneurship an umbrella term covering sustainability-oriented entrepreneurship models.

Besides, digital technologies as digital technological innovations (Sahut et al., 2021) are defined to support new types of business models (EC, 2015) and transform the entrepreneurial opportunities (Nambisan, 2017) in the era of digitalization (Kraus et al., 2019). Digital entrepreneurship, which holds the spirit and culture around digital innovation (Bican & Brem, 2020), is frequently defined as a combination of entrepreneurial action and digital technologies (Mohamad et al., 2025; Nambisan, 2017; Sussan & Acs, 2017). As an enabler of digital technological innovations (Sahut et al., 2021), digital entrepreneurship also demonstrates the capability to disrupt (Sussan & Acs, 2017) and transform existing businesses (EC, 2015; Kraus et al., 2019; Zhao, 2016), influence the formation of novel regulations (Sussan & Acs, 2017) and drive social and economic value by creating or employing digital technologies (Al-Abbadi et al., 2025; EC, 2015; Elhassan, 2025).

Rather than the concept of sustainable entrepreneurship, which is defined as bringing together the ideas, people, money, resources, and artifacts (Figge et al., 2002; Poldner et al., 2017), or the concept of digital entrepreneurship, which is identified as bringing together entrepreneurial action and digital technologies (Nambisan, 2017; Sussan & Acs, 2017), the concept of DSE is defined to bring the entrepreneurial action, digital artifacts and sustainability logic together

(Gregori & Holzmann, 2020; Lüdeke-Freund, 2020; Xu et al., 2022). In that respect, DSE offers new practices and value propositions (Andersen et al., 2021; Gregori & Holzmann, 2020) which bring radical and incremental solutions to sustainability concerns (Xu et al., 2022), the transformation of societies and economies (EC JRC, 2022) and achievement of SDGs (Berawi, 2019). Based on this theoretical background, our research also considers DSE as an umbrella term, as the concept of sustainable entrepreneurship (Schaltegger & Wagner, 2011) covering types of sustainability-driven entrepreneurship models (Parrish, 2008) such as sustainable entrepreneurship, social entrepreneurship, green entrepreneurship, eco-entrepreneurship and environmental entrepreneurship (Koe et al., 2014; Kraus et al., 2018; Raudeliuniene et al., 2014; Schaltegger & Wagner, 2011; Tunçalp & Yıldırım, 2022) and additionally employs digital technologies (Figge et al., 2002; Poldner et al., 2017) in achieving economic, social, and environmental sustainability and SDGs (Berawi, 2019). Figure 1 represents the intersection of concepts regarding digital sustainable entrepreneurship.

Figure 1. Concept of Digital Sustainable Entrepreneurship



Source: Author's contribution derived from the work of Gregori and Holzmann (2020), Schaltegger and Wagner (2011), and EC (2015)

In the current state of academic research, two review papers are published within the DSE research (Table 2). Examining related reviews, (1) Holzmann and Gregori (2023) apply a systematic approach to 89 articles out of 162 publications retrieved from the Web of Science (WoS) database. Exploring the impact of digital technologies on sustainable entrepreneurship, Holzmann and Gregori (2023) classify common themes within DSE research, including enabling value for the environment and society, venture viability, stakeholder inclusion, and entrepreneurs as individuals. Moreover, this research also examines the gaps for future research within the contexts of the evolution of business models, value proposition, value creation, and value capture.

Table 2. Review Articles within DSE Research

Authors	Number of Included Articles	Timeline of the Review	Research Focus and Key Contributions
Holzmann and Gregori	89	1990 - 2022	* Explores the impact of digital technologies on sustainable entrepreneurship. * Identifies four common themes in DSE research: (1) environmental and social impact, (2) venture viability, (3) stakeholder engagement, and (4) individual entrepreneurship.
Baranauskas and Raišienė	338	2011 - 2021	* Reconceptualize multi-level side effects of sustainability-oriented digital entrepreneurship, * Projects digital entrepreneurship shaping sustainability and digital business ecosystems.

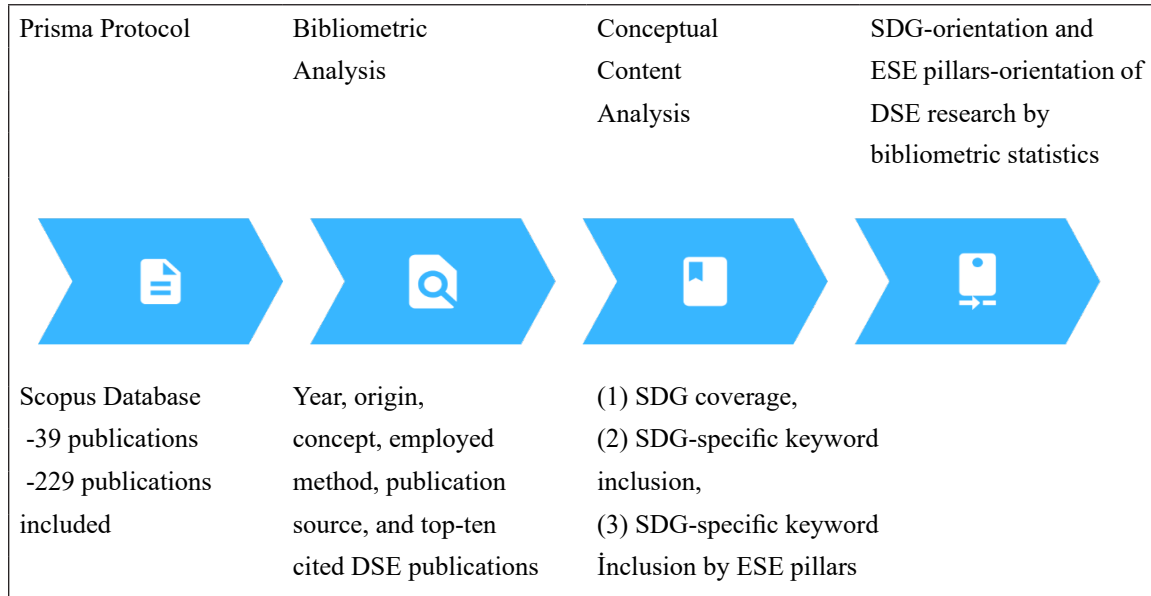
Source: Author's research results/contribution

Later is (2) the research of **Baranauskas and Raišienė (2022)**, aims to reconceptualize the multi-level side effects and project how digital entrepreneurship shapes sustainability and digital business ecosystems. This research represents the influence of digital entrepreneurship within publications that combine both the concepts of digital entrepreneurship and sustainability. **Baranauskas and Raišienė (2022)** adopt the conceptual contributions framework (CCF) and conceptual modeling framework within the reconceptualization process by applying a scoping review and a descriptive case study. Filtering the most influential one hundred papers from the Semantic Scholar Database, publications with fifty or more citations from the Google Scholar database, and publications from the Microsoft Academic database, with a date range of 2011 to 2021, for each keyword that consists of sustainable entrepreneurship, technological entrepreneurship, and digital entrepreneurship respectively. Considering a total of 449 publications, **Baranauskas and Raišienė (2022)** consider 141 publications for the sustainable entrepreneurship keyword, 114 publications for the digital entrepreneurship keyword, 83 publications for the technological entrepreneurship keyword, define sustainability within the digital entrepreneurship domain, and establish the Triple Bottom Line concept within the DSE context. The research also enlightens future research on the impact of digitally sustainable entrepreneurial opportunities within organizations and practical implementation. Future research is also explained to emphasize continuously synthesizing theoretical frameworks to define the effects and enactment of related opportunities within the digital sustainable value framework.

3. METHODOLOGY

The methodology employed in this study has four main steps: (1) “Preferred Reporting Items for Systematic Reviews and Meta-Analysis” (PRISMA) Protocol, (2) bibliometric analysis, (3) conceptual content analysis on SDG-orientation of DSE research within bibliometric statistics, and (4) Thematic analysis on environmental, social, and economic (ESE) pillars-orientation of DSE research (**Kostoska & Kocarev, 2019**) (Figure 2).

Figure 2. Research Flow



Source: Authors' work

3. 1. PRISMA PROTOCOL

PRISMA protocol has been conducted as a set of guidelines enabling the reporting of systematic reviews and meta-analyses (Moher et al., 2009). The publication data is retrieved from Scopus, as the database offers reliable citation tracking, broad multidisciplinary coverage, and standardized metadata which are valuable for ensuring consistency and reproducibility in bibliometric analysis. Further, as this research considers DSE as an umbrella term, a comprehensive literature review has been conducted to ensure comprehensive coverage of each relevant concept and to uncover the political (EC JRC, 2022) or natural digitalized versions of related concepts. Consequently, the search query includes the concepts of sustainable entrepreneurship, eco-entrepreneurship, green entrepreneurship, environmental entrepreneurship, social entrepreneurship, and socio-environmental entrepreneurship, and synonyms and semantic keywords (Figure 3), which is applied with no geographical and with no date filters on 3rd of November 2023. As a result, 229 publications are identified.

Figure 3. Scopus Database Search Query

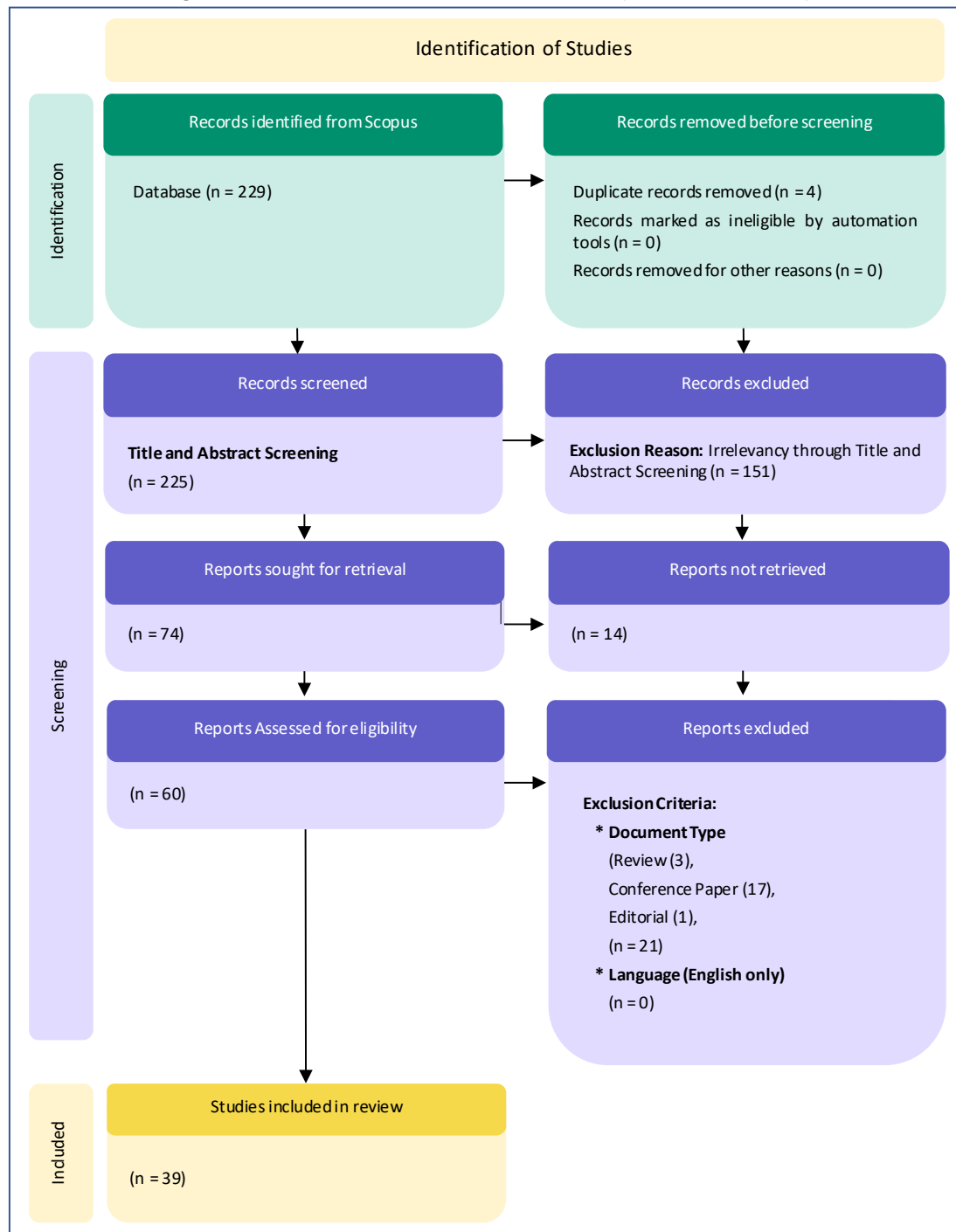
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( TITLE-ABS-KEY ( "sustainable entrepreneurship" ) OR TITLE-ABS-KEY ( "sustainable startup" ) OR TITLE-ABS-KEY ( "sustainable start-up" ) OR TITLE-ABS-KEY ( "eco-entrepreneurship" ) OR TITLE-ABS-KEY ( "eco entrepreneurship" ) OR TITLE-ABS-KEY ( "ecopreneurship" ) OR TITLE-ABS-KEY ( "eco-startup" ) OR TITLE-ABS-KEY ( "eco-start-up" ) OR TITLE-ABS-KEY ( "green entrepreneurship" ) OR TITLE-ABS-KEY ( "green startup" ) OR TITLE-ABS-KEY ( "green start-up" ) OR TITLE-ABS-KEY ( "environmental entrepreneurship" ) OR TITLE-ABS-KEY ( "environmental startup" ) OR TITLE-ABS-KEY ( "environmental start-up" ) OR TITLE-ABS-KEY ( "social entrepreneurship" ) OR TITLE-ABS-KEY ( "social startup" ) OR TITLE-ABS-KEY ( "social start-up" ) OR TITLE-ABS-KEY ( "socio-environmental entrepreneurship" ) OR TITLE-ABS-KEY ( " socio-environmental startup" ) OR TITLE-ABS-KEY ( " socio-environmental start-up" ) AND TITLE-ABS-KEY ( "digitalization" ) OR TITLE-ABS-KEY ( "digital" ) OR TITLE-ABS-KEY ( "industry 4.0" ) OR TITLE-ABS-KEY ( "twin transition" ) OR TITLE-ABS-KEY ( "twin-transition" ) OR TITLE-ABS-KEY ( "twin transitions" ) OR TITLE-ABS-KEY ( "twin-transitions" ) ) )
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Source: Authors' work

In the publication identification, the filtering process removed duplications (4), irrelevant sources by title and abstract screening (151), inaccessible and unavailable publications (14), excluded document types (21 in total; review (3), conference paper (17), editorial (1)). Finally, 190 publications were excluded, and 39 were included, as presented in Figure 4.

Publications, including the concept of DSE as an operational variable, have been considered relevant and included in the title and abstract screening step. In this step, the relevance of the DSE concept explored in the publications is specified as a focus on small- or medium-sized, independent, entrepreneurial action that employs digital technologies in creating sustainability-oriented value propositions.

Figure 4. Identification of DSE Publications (PRISMA Method)



Source: Author's work derived from Page et al. (2021)

3. 2. BIBLIOMETRIC ANALYSIS

The bibliometric analysis has been employed to uncover the patterns of academic knowledge creation and dissemination (Donthu et al., 2021; Ellegaard & Wallin, 2015; Yalçinyiğit & Karaçay, 2025) in the DSE field, including the year, origin, the concepts referring to sustainability-oriented entrepreneurship, employed methods and source of selected 39 DSE publications by PRISMA. In addition, top-cited DSE publications are also analysed. Further, Biblioshiny, a web interface of bibliometrix R-package, has been employed to conduct the co-occurrence analysis on DSE research.

3. 3. CONCEPTUAL CONTENT ANALYSIS

A conceptual content analysis is a systematic process in analysing the presence and/or frequency of specific keywords or keyword phrases within textual documents (Sabharwal et al., 2018). The conceptual content analysis of selected 39 DSE publications has two main phases: First, SDG-specific search queries are downloaded from Scival, Elsevier Data Repository (Jayabalasingham et al., 2019) which were built and augmented with a machine learning (ML) model by Elsevier's data science teams, but which does not include SDG-specific search query for SDG17 (Partnerships for the Goals) and brings a limitation to the research to exclude SDG17 (Partnerships for the Goals). Followingly, each SDG-specific search query is split into keywords or keyword phrases considering “AND”, “OR,” and “AND NOT” operators, and “*” and “?” wildcards. In this step, “*” wildcards were removed, and keywords with “?” wildcards are edited with applicable versions to support the characteristics of the Google Sheets “find” command (Table 3).

Table 3. Formulation of Wildcards through Splitting Process of SDG-specific Search Queries

SDG2	? Operator	Original	Edited	Edited
		fertili?er	fertilizer	fertiliser
	* operator	malnourish* , undernourish*		
SDG3	* operator	health* , disease* , illness* , medicine* , polio* , vaccin* , cancer* , diabet* , suicid*		
SDG5	* operator	girl*		
SDG6	* operator	contamina* , sanit* , sewer*		
SDG7	* operator	renewable*		
SDG8	* operator	microfinanc* , micro-financ* , micro-credit* , microcredit* , microenterprise* , micro-enterprise*		
SDG9	* operator	microenterprise* , micro-enterprise*		
SDG10	? Operator	Original	Edited	Edited
		economic marginali?ation	economic marginalization	economic marginali-sation
	* operator	discriminatory law*		
SDG11	? Operator	Original	Edited	Edited
		urbani?ation	urbanization	urbanisation
	* operator	metropoli* , town* , municipal* , slum* , pollutant*		
SDG13	* operator	hazard* , island* , megacit* , atmospher* , emission*		
SDG14	* operator	coast* , eutrophicat*		
SDG15	* operator	biodivers* , bioeconom* , bio-econom* , deforest* , desertif* , ecosystem* , poach* , wetland* , mountain* , dryland*		
SDG16	? Operator	Original	Edited	Edited
		democrati?ation	democratization	democratisation
	* operator	genocid* , homicid* , murder* , refugee* , terroris*		

Source: Author's work

Second, Google Sheets software, equivalent to Microsoft Excel, has been employed to conduct conceptual content analysis of full-text publications. For conducting keyword analysis on full-text publications, (1) each keyword phrase or keyword and (2) full-texts of each publication are placed into Google Sheets software, (3) the software is formulated to define the publications that include keyword and keyword phrases (which will be referred as keywords hereinafter) to identify SDG-orientation of DSE publications. The reason for formulating the software to analyze the inclusion of SDG-specific keywords rather than the frequency of SDG-specific keywords within DSE research is to define the number of publications with SDG-specific keywords. Moreover, each number of publications with SDG-specific keywords data by bibliometric statistics is also analyzed through environmental, social and economic pillars of **Kostoska and Kocarev (2019)** to identify the pillars-orientation of DSE research (Table 4).

Table 4. SDGs Clustered into Environmental, Social and Economic Pillars

Environmental Pillar		Social Pillar		Economic Pillar	
6	Clean Water and Sanitation	4	Quality Education	1	No Poverty
7	Affordable and Clean Energy	5	Gender Equality	2	Zero Hunger
12	Responsible Consumption and Production	10	Reduced Inequalities	3	Good Health and Well-being
13	Climate Action	11	Sustainable Cities and Communities	8	Decent Work and Economic Growth
14	Life Below Water	16	Peace, Justice and Strong Institutions	9	Industry Innovation and Infrastructure
15	Life on Land	17	Partnerships for the Goals		

Source: **Kostoska and Kocarev (2019)**

4. RESULTS

This research includes (1) SDG-orientation of DSE research considering (2) bibliometric statistics of the area of research. The results of the conceptual content analysis include (a) SDGs covered by DSE publications, (b) the number of DSE publications with SDG-specific keywords that reflects the distribution of 233 SDG coverages by 39 DSE publications, as the indicator to SDG-orientation, (c) the number of DSE publications with SDG-specific keywords by environmental, social, and economic pillars, relative to each bibliometric statistic as (a) year, (b) origin, (c) related concepts, (d) methodology, (e) source, and (f) top cited DSE publications, as represented in Table 5. In addition, the results of the conceptual content analysis also cover (1) the SDG-orientation of DSE research and the comparison to total SDG literature and (2) the Co-Occurrence Analysis of DSE research.

Table 5. Coverage of Each Sub-Section of Conceptual Content Analysis by Year, Origin, Concept, Methodology, Source and Top Cited Publications

Conceptual Content Analysis	Bibliometric Statistics					
	Year	Origin	Concept	Method	Source	Top Cited
SDG coverage of DSE publications	+	+	+	+	+	+
Number of DSE publications with SDG-specific keywords	+	+	+	+	+	+
Number of DSE publications with SDG-specific keywords by environmental, social, and economic pillars	+	+	+	+	+	+

Source: Author's work

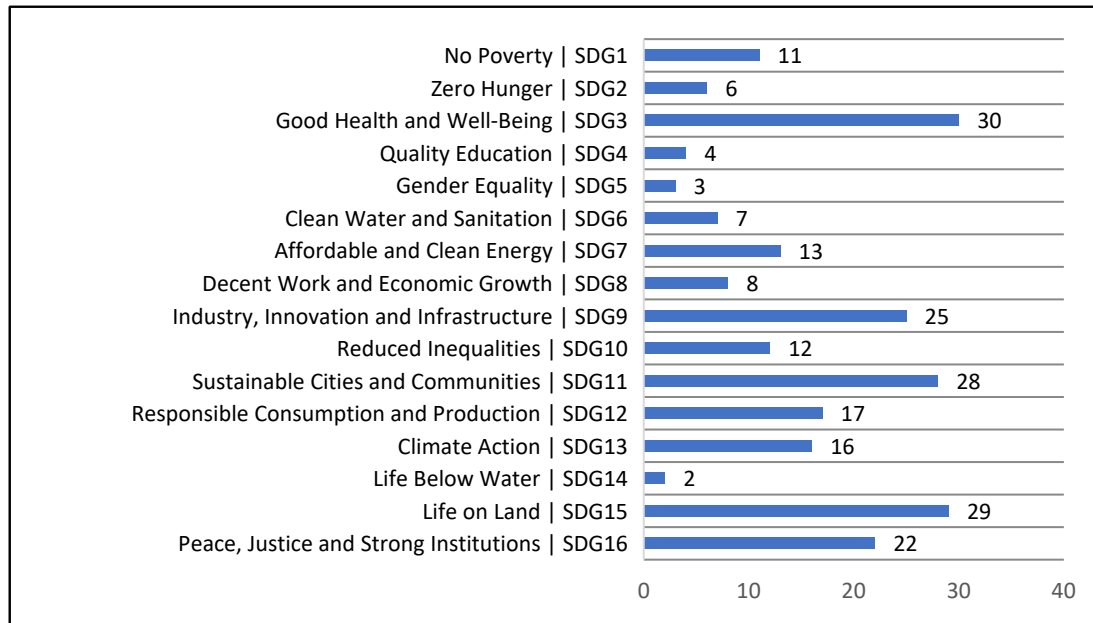
4. 1. SDG-ORIENTATION COMPARISON TO THE TOTAL SDG LITERATURE

Based on the conceptual content analysis the SDG-orientation on DSE research showed the following basic patterns:

- All SDGs are represented by DSE research.
- All DSE publications include at least one keyword from one specific SDG.
- Almost all publications refer to multiple SDGs. Consequently, in 39 DSE papers, SDG are represented 233 times, resulting in an average of 5,97 SDGs to be referred by per publication.
- 97% of selected publications include keywords from at least two separate SDGs, while 92% include keywords from at least three separate SDGs, yet only one publication (Ghatak et al., 2023) includes keywords solely from one SDG (SDG8 - Decent Work and Economic Growth).
- 77% of DSE publications include at least one SDG3-specific keyword (Good Health and Well-being), while 74% include at least one SDG15-specific keyword (Life on Land).

Figure 5 also shows the distribution of 233 SDG coverages by 39 DSE publications, representing the SDG-orientation of DSE research. The figure also highlights the prominence of SDG3 (Good Health and Well-Being) with the highest number of publications with keyword occurrence, which is closely followed by SDG15 (Life on Land) and SDG11 (Sustainable Cities and Communities) respectively. Other notable SDGs include SDG9 (Industry, Innovation, and Infrastructure) and SDG16 (Peace, Justice, and Strong Institutions). Conversely, only 2 publications include keywords from SDG14 (Life Below Water) which receives the least attention by DSE research. Meanwhile, SDG5 (Gender equality) and SDG4 (Quality Education) appear to be relatively underrepresented by DSE papers respectively.

Figure 5. SDG-orientation of DSE Publications

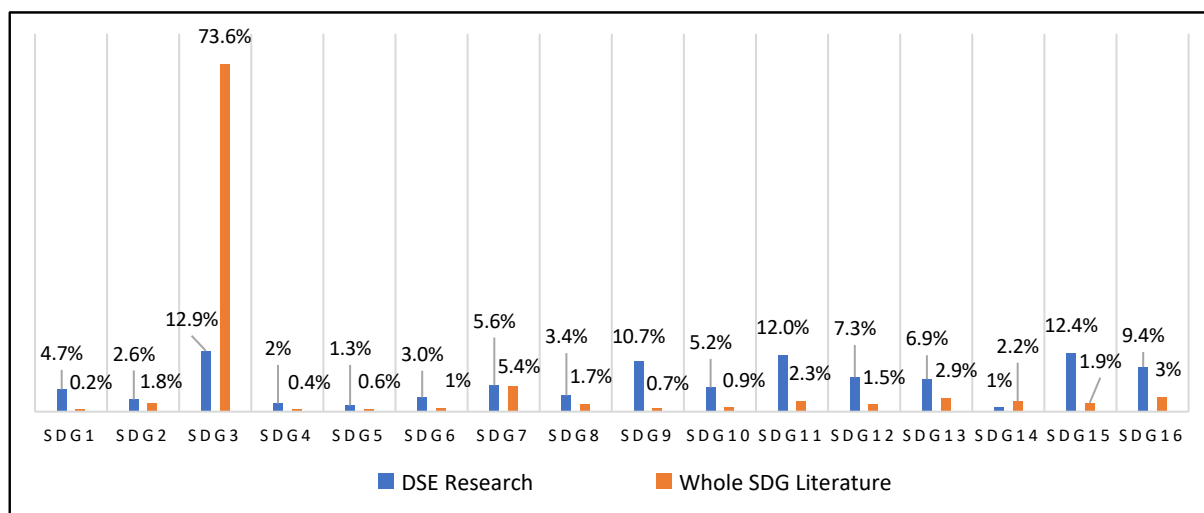


Source: Author's calculation

To compare the number of publications with SDG coverage of DSE research and the whole output from SDG-referring literature, the Scopus database is also searched with SDG-specific search queries of Elsevier Data Repository (Jayabalasingham et al., 2019) with no additional filters and with the same date of data retrieval. Considering a normalized number of SDG-specific keyword-included publications, 74% of the total SDG literature includes keywords from

SDG3 (Good Health and Well-being), which is also dominant within DSE research (Figure 6). Nevertheless, considering the expected dominance of SDG3 (Good Health and Well-being) on the total SDG literature (Sianes et al., 2022), research on DSE behaves more heterogeneously for the normalized number of SDG-specific keywords in publications. Besides, SDG3 (Good Health and Well-being) also provides the highest difference between DSE research and the total SDG literature within normalized numbers of publications with SDG-specific keywords (Figure 6). Following SDG3 (Good Health and Well-being), SDG15 (Life on Land), and SDG9 (Industry, Innovation, and Infrastructure) have the highest differences in SDG-specific keywords by publications, respectively. At the same time, normalized values of DSE research dominate the total SDG-related literature for all SDGs, excluding SDG3 (Good Health and Well-being). On the other hand, SDG7 (Affordable and Clean Energy), SDG5 (Gender Equality), SDG4 (Quality Education), SDG14 (Life below Water), and SDG8 (Decent Work and Economic Growth) also hold the lowest difference between total SDG research and DSE research outputs by normalized values, respectively (Figure 6).

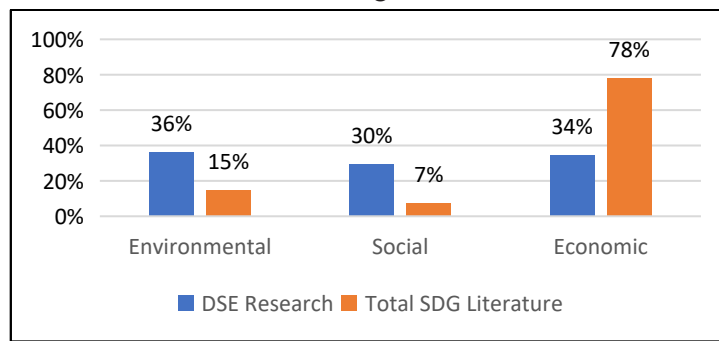
Figure 6. SDG-orientation Comparison of DSE Research and the Total SDG Literature by Normalized Numbers



Source: Author's calculation

Reflecting on environmental, social, and economic pillars classification of Kostoska and Kocarev (2019) and, considering the normalized number of publications with SDG-specific keywords, DSE research is more homogenous than the total SDG literature (Figure 7). SDGs from the environmental pillar receive the highest scholarly attention, closely followed by the economic and social pillars within DSE research. Nevertheless, the economic pillar attracts the highest attention in the total SDG literature. The social pillar draws the least academic attention both from DSE research and the total SDG literature (Figure 7).

Figure 7. SDG-orientation Comparison of DSE Research and the Total SDG Literature by Normalized Numbers through ESE Pillars



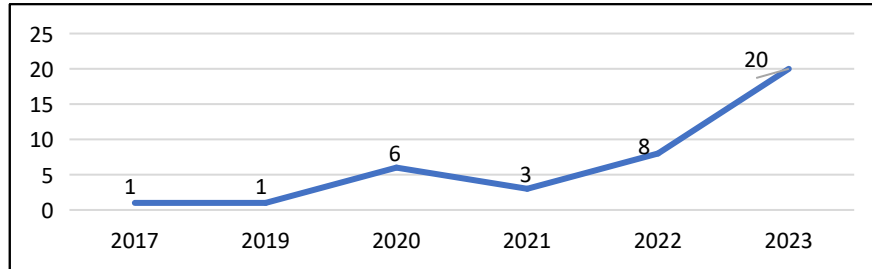
Source: Author's calculation based on SDG pillars of [Kostoska and Kocarev \(2019\)](#)

Further sections represent the bibliometric analysis and the conceptual content analysis of DSE publications, which indicate the SDG-orientation of DSE research in parallel to bibliometric statistics.

4. 2. SDG-ORIENTATION BY YEAR

No date limitation is applied in the Scopus database search, and 2017 occurred as the starting milestone for DSE research with the first available publication. A notable trend of increase has been observed in DSE research over the past few years. 2023 has been the most productive period for the growing field of research, which holds 51% of the total number of publications within the area (Figure 8). In that respect, it is conceivable that research on DSE attracted increasing scholarly interest in the last two years, especially given TT's declaration of the EU's vision ([EC JRC, 2022](#)) (Figure 8).

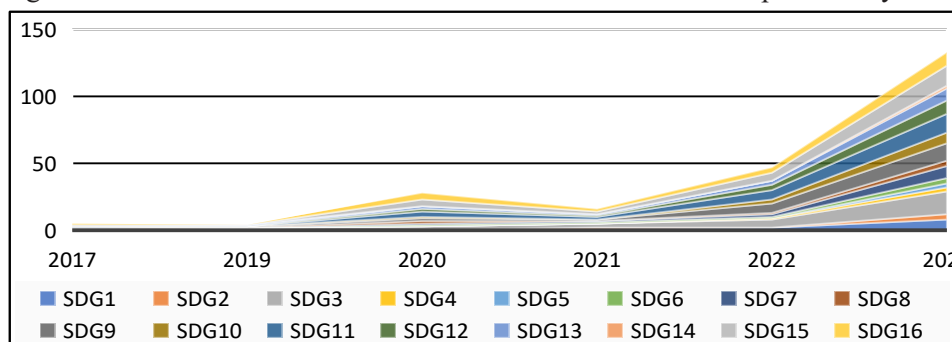
Figure 8. Growth in the Annual Number of DSE Publications



Source: Author's calculation

The annual number of publications with SDG-specific keywords increases in parallel to the rising number of DSE publications (Figure 9). Within the growing field of research, 57% of number of publications with SDG-specific keywords is observed by the publications of 2023, while %20 is observed by 2022, 7% is observed by 2021, and 12% is observed by 2020 (Figure 9).

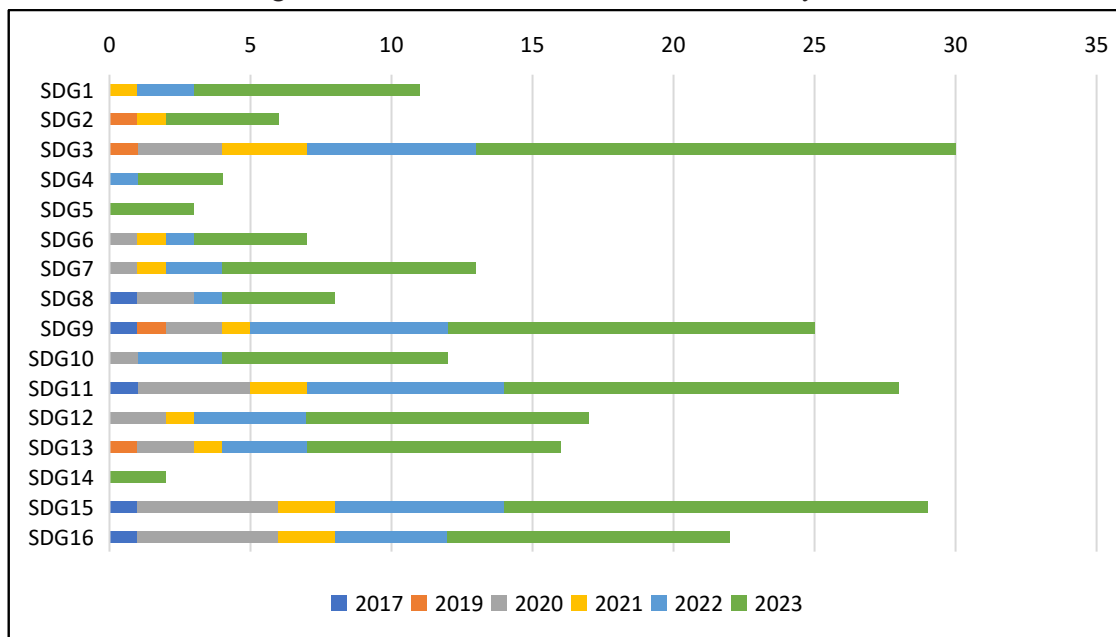
Figure 9. Growth in Annual Number of Publications with SDG-specific Keywords



Source: Author's calculation

2023 has been the first year that DSE publications include keywords from all SDGs. 85% of 2023 DSE publications include at least one SDG3-specific keyword (Good Health and Well-being), while 75% include at least one SDG15-specific keyword (Life on Land). Moreover, 2023 has been the first year that DSE research included keywords from SDG5 (Gender Equality) and SDG14 (Life below Water). On the other hand, SDG9 (Industry, Innovation and Infrastructure) is the only goal which is covered by DSE research in each year of publication. Moreover, DSE publications include keywords from SDG3 (Good Health and Well-being), SDG11 (Sustainable Cities and Communities), SDG13 (Climate Action), SDG15 (Life on Land) and SDG16 (Peace, Justice and Strong Institutions) through 5 separate years of publication (Figure 10).

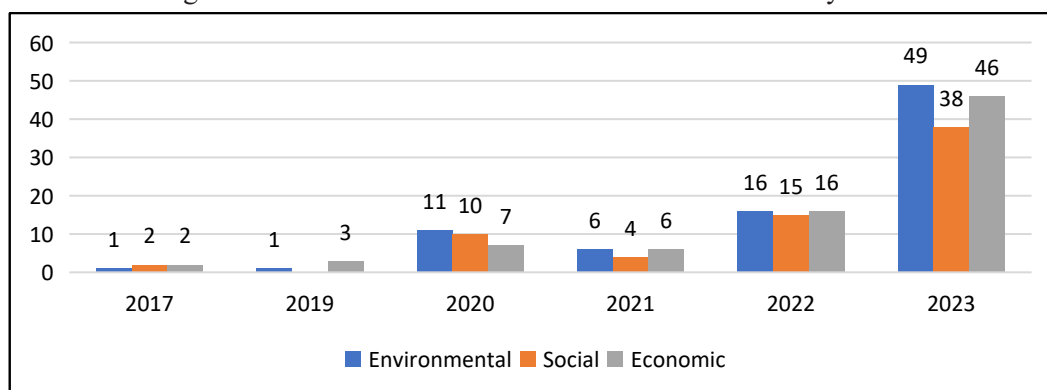
Figure 10. SDG-orientation of DSE Research by Years



Source: Author's calculation

Considering the SDG classification of [Kostoska and Kocarev \(2019\)](#), a yearly increase is observed with a balanced distribution across the environmental, social and economic pillars, especially starting by 2021. The environmental pillar has brought greater scholarly attention primarily by the years 2020 and 2023, which underscores a robust and growing commitment within the academic community to advance the research that supports the achievement of the SDGs, with a solid emphasis on the environmental pillar in recent years, while economic pillar attracts equal attention by 2021 and 2022 with environmental pillar (Figure 11).

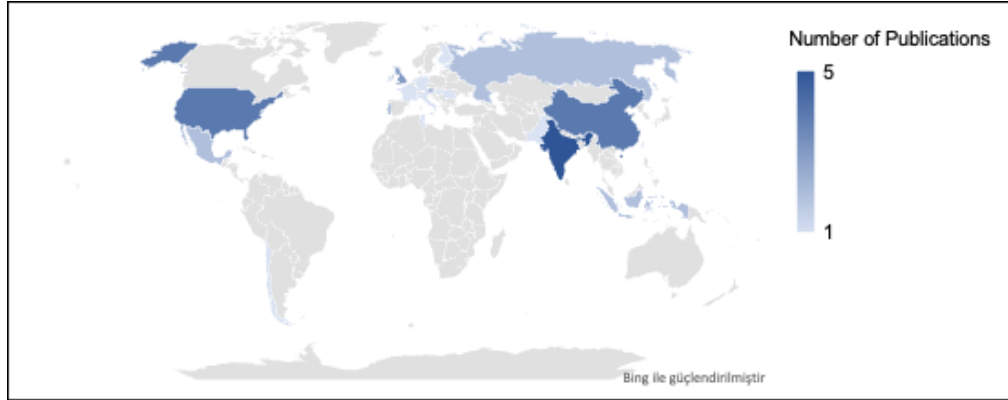
Figure 11. ESE Pillars-orientation of DSE Publications by Years

Source: Author's calculation based on SDG pillars of [Kostoska and Kocarev \(2019\)](#)

4. 3. SDG-ORIENTATION BY GEOGRAPHICAL ORIGIN

Considering the contact addresses of corresponding authors as the origin of publications, 41% of DSE publications originate from 12 different European countries from 22 countries in our sample (Figure 12 and Table 6). Further, 44% of European publications were published in 2023, while 19% were published in 2022. The single DSE publication of 2017 also originates from the Netherlands, and the single publication of 2019 originates from Italy.

Figure 12. Country-Based Origin of DSE Publications



Source: Author's calculation

33% of DSE research originates from Asian countries, including India as most productive individual country with 5 DSE publications, and China, with 4 DSE publications. Following Asia, 15% of publications originate from North America which holds 6 publications, while 4 DSE publications originate from the USA, which is also followed by the United Kingdom with 3 publications (Table 6).

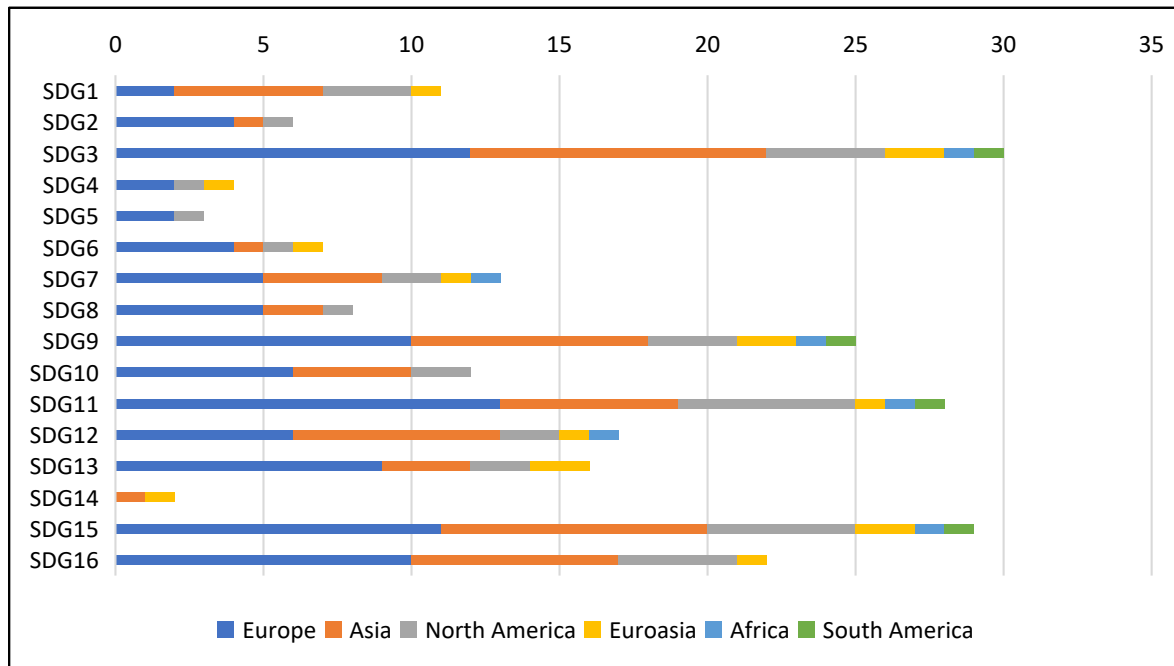
Table 6. Country-Based Origin of DSE Publications

Europe				16	Asia		13	North America		6	South America		1
United Kingdom	3	Germany	1		India	5		USA	4		Chile	1	
Austria	2	Hungary	1		China	4		Mexico	2		Africa	1	
Portugal	2	Ireland	1		Indonesia	2		Eurasia	2		Tunisia	1	
Estonia	1	Italy	1		Pakistan	1		Russian Federation	2				
Finland	1	Netherlands	1		Taiwan	1							
France	1	Romania	1										

Source: Author's calculation

43% of total number of publications with SDG-specific keywords also originate from European publications (Figure 13). In terms of number of publications with SDG-specific keyword inclusion, European publications are dominant to publications from other regions on each specific SDG, excluding SDG1 (No Poverty), SDG12 (Responsible Consumption and Production) and SDG14 (Life below Water). SDG14 (Life below Water) is the only SDG which is not covered by any European DSE publication. Asia holds 29% of total number of publications with SDG-specific keywords. However, they do not cover SDG4 (Quality Education) and SDG5 (Gender Equality), while the region leads number of publications that refer to SDG1 (No Poverty) and SDG12 (Responsible Consumption and Production) (Figure 13).

Figure 13. SDG-orientation of DSE Publications by Geographical Regions

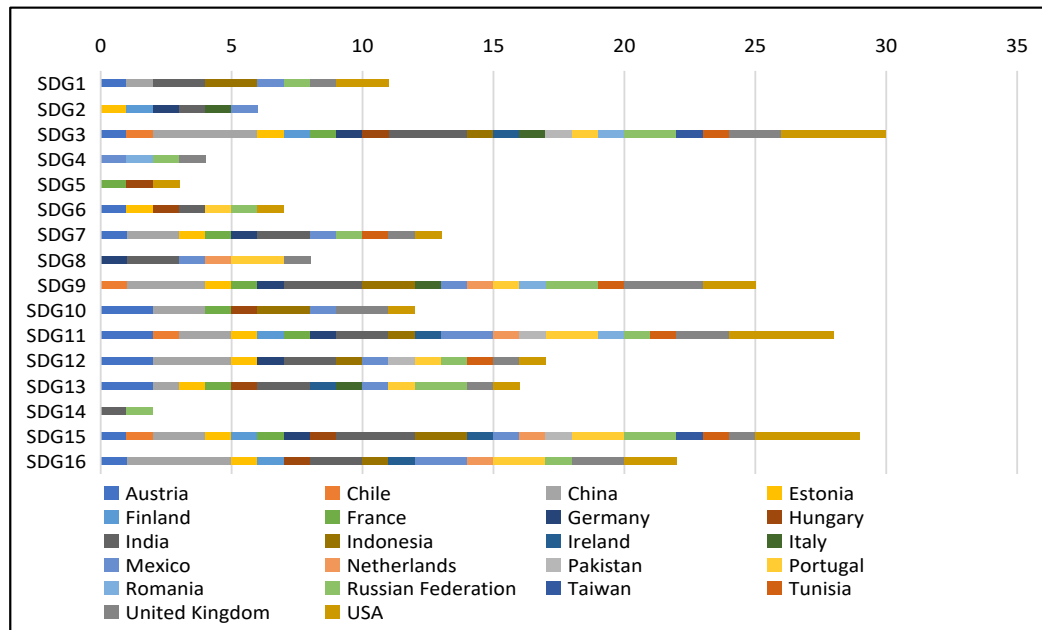


Source: Author's calculation

India is the leading individual country with the highest number of publications with SDG-specific keyword inclusion, and with the widest variety of 13 separate SDGs covered by publications, excluding SDG4 (Quality Education), SDG5 (Gender Equality), and SDG10 (Reduced Inequalities) (Figure 14). Further, China holds 10% of total number of publications with SDG-specific keywords covering 10 separate SDGs, excluding SDG2 (Zero Hunger), SDG4 (Quality Education), SDG5 (Gender Equality), SDG6 (Clean Water and Sanitation), SDG8 (Decent Work and Economic Growth) and SDG14 (Life below Water). North America holds 16% of publications with SDG-specific keywords, covering 12 SDGs, excluding SDG2 (Zero Hunger), SDG4 (Quality Education), SDG8 (Decent Work and Economic Growth), and SDG14 (Life below Water). Holding 7% of publications with SDG-specific keywords, the Russian Federation as an Eurasian country, covers 12 SDGs, excluding SDG2 (Zero Hunger), SDG5 (Gender Equality), SDG8 (Decent Work and Economic Growth), SDG10 (Reduced Inequalities) (Figure 14).

Regarding the origin of the publications, the widest range of individual countries have referred to SDG3 (Good Health and Well-being), SDG15 (Life on Land), and followed by SDG11 (Sustainable Cities and Communities), showing the geographically diverse scholarly attention. Respectively, SDG14 (Life below Water) is only referred by publications from India and the Russian Federation (Figure 14).

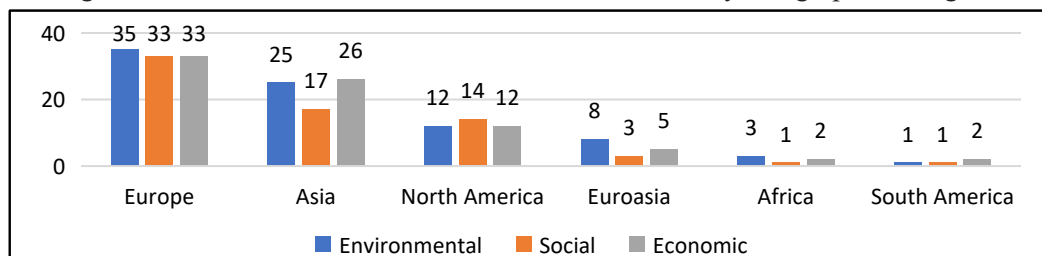
Figure 14. SDG-orientation of DSE Publications by Countries



Source: Author's calculation

Considering the environmental, social, and economic pillars classification of [Kostoska and Kocarev \(2019\)](#), Europe has the highest number of publications with SDG-specific keywords in each pillar, and publications are fairly distributed among the pillars. Still, the environmental pillar has a slightly higher focus by European, Eurasian and African publications. In publications from North America, the social pillar is dominant; in publications from Asia and South America, the economic pillar is dominant (Figure 15).

Figure 15. ESE Pillars-orientation of DSE Publications by Geographical Regions

Source: Author's calculation based on SDG pillars of [Kostoska and Kocarev \(2019\)](#)

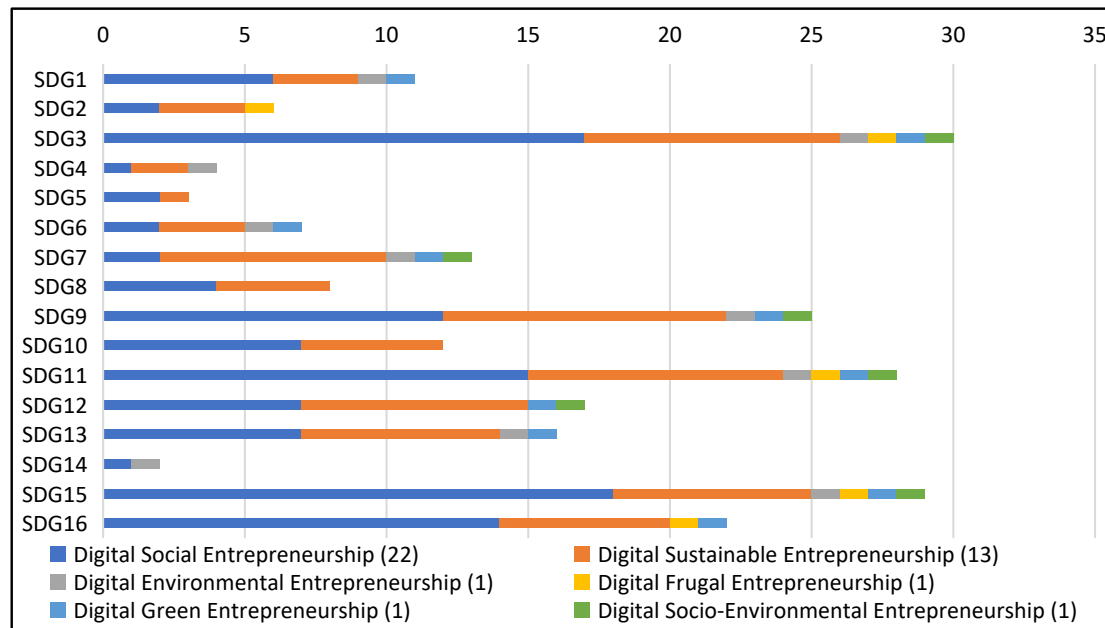
4. 4. SDG-ORIENTATION BY SUSTAINABLE ENTREPRENEURSHIP CONCEPTS

Figure 16 represents an additional manually conducted conceptual analysis of DSE publications' titles, abstracts, and author keywords. The study considers sustainability-oriented digital entrepreneurship concepts in our search query employed on the Scopus database within the bibliometric analysis. The figure also indicates the number of DSE publications within each conceptual cluster in brackets.

Consequently, 56% of DSE publications represent the digital social entrepreneurship concept. Related publications cover SDG-specific keywords from each separate SDG and cover 50% of total number of publications with SDG-specific keywords. Moreover, 33% of DSE publications represent the digital sustainable entrepreneurship concept, which also covers 36% of publications with SDG-specific keywords from each separate SDG, excluding SDG14 (Life below Water), which is also mentioned as the least covered SDG within DSE research. Moreover, the

publication of Musona (2021) that relates to the concept of digital frugal entrepreneurship is also observed to take place in DSE research even the concept is not included in our search query (Figure 16).

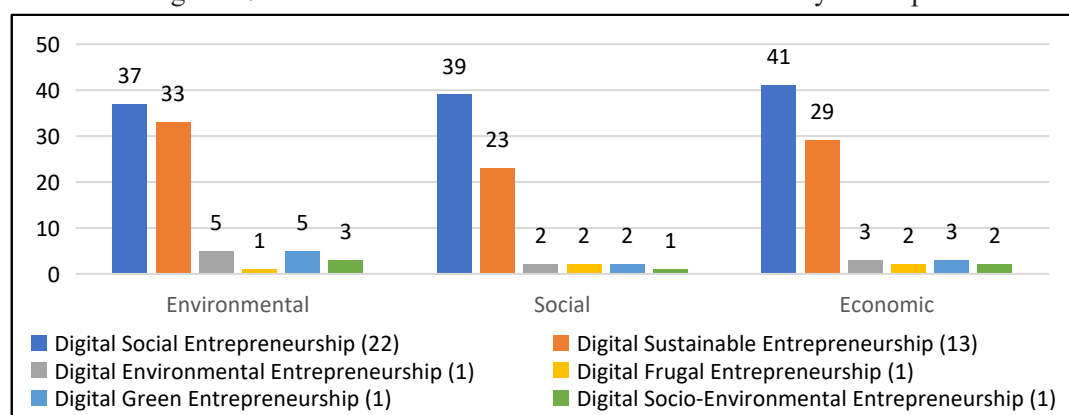
Figure 16. SDG-orientation of DSE Publications by Sustainability-oriented Entrepreneurship Concepts



Source: Author's calculation

Per the pillars of Kostoska and Kocarev (2019), the publications on the digital social entrepreneurship concept cover SDG-specific keywords from the economic, social, and environmental pillars, respectively. On the other hand, publications with the digital sustainable entrepreneurship concept come next for each pillar, and mainly represent SDG-specific keywords from the environmental pillars (Figure 17).

Figure 17. ESE Pillars-orientation of DSE Publications by Concepts



Source: Author's calculation based on SDG pillars of Kostoska and Kocarev (2019)

4. 5. SDG-ORIENTATION BY METHODOLOGICAL APPROACHES

85% of DSE publications are empirical, while five conceptual papers and one review paper appear in the selected sample of 39 DSE publications. Empirical research papers in the field reveal a higher preference for qualitative approaches, representing 46% of DSE publications. 44% of qualitative publications utilized the case study method. 28% of DSE research adopts quantitative methodologies, while 10% adopts mixed-method integrating qualitative and quantitative methods (Table 7).

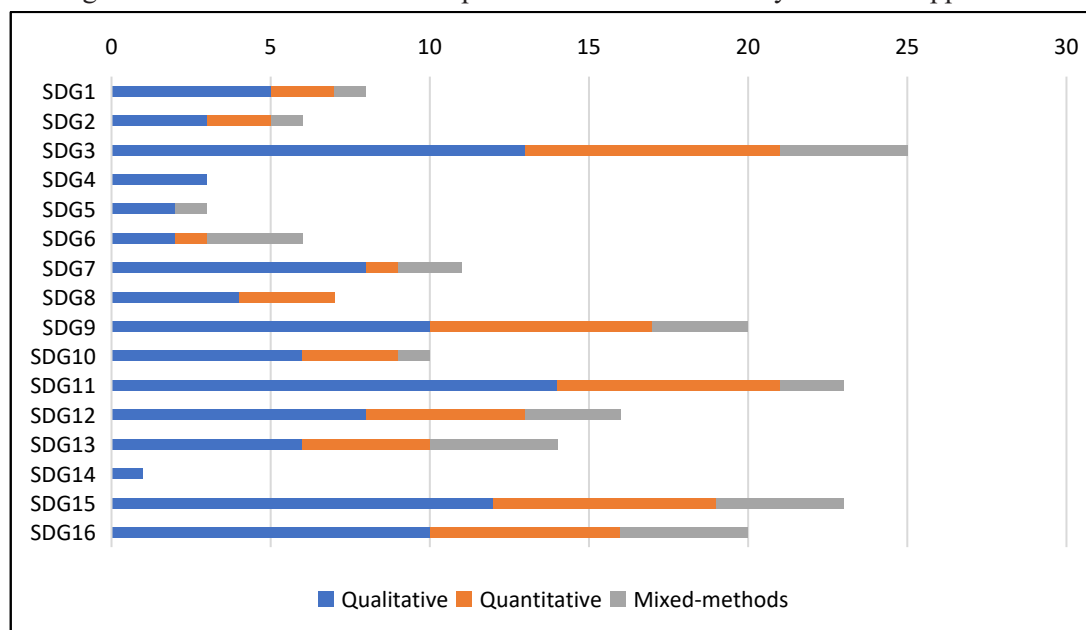
Table 7. Number of Empirical Publications within Methodologies Adopted

Research Approach	Number of Publications
Qualitative	18
Quantitative	11
Mixed-method	4

Source: Author's calculation

Figure 18 highlights the diverse distribution of methodological approaches regarding the number of empirical publications. In that respect, 196 SDG-specific keywords are identified by 33 empirical DSE publications in our sample, which indicates an average of 5,9 SDGs to be covered by each empirical DSE publication. Each SDG is represented and dominated by qualitative publications, excluding SDG6 (Clean Water and Sanitation), which is dominated by mixed-method researches. DSE publications that adopt to quantitative or mixed-method research methodologies both cover keywords from 13 separate SDGs, and do not cover any keywords from SDG4 (Quality Education) or from SDG14 (Life Below Water). Moreover, quantitative publications do not cover keywords from SDG5 (Gender Equality), and publications with mixed-methods do not cover keywords from SDG8 (Decent Work and Economic Growth). Publications that adopt quantitative approaches hold no dominance for any SDGs regarding the number of publications with SDG-specific keywords (Figure 18).

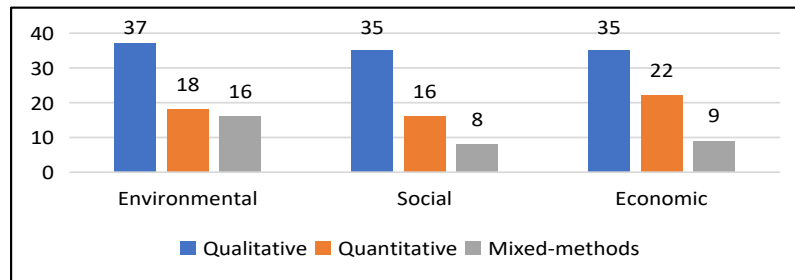
Figure 18. SDG-orientation of Empirical DSE Publications by Research Approaches



Source: Author's calculation

Qualitative researches, emphasizing the significance of the approach in addressing complex sustainability related issues, hold the highest frequency across all pillars, and tend to distribute equally on each pillar, while environmental pillar is identified to have slightly stronger influence. Publications with quantitative methodologies which play a crucial role in providing numerical insights, also hold significant number of SDG-specific keywords, and tend to focus more on economic, environmental and social pillars respectively. Moreover, publications that employ mixed-methods, that indicate a preference for combining qualitative and quantitative approaches, are less frequently represented on each pillar, and show higher interest to environmental, economic and social pillars respectively (Figure 19).

Figure 19. ESE Pillars-orientation of DSE Publications by Research Methodologies

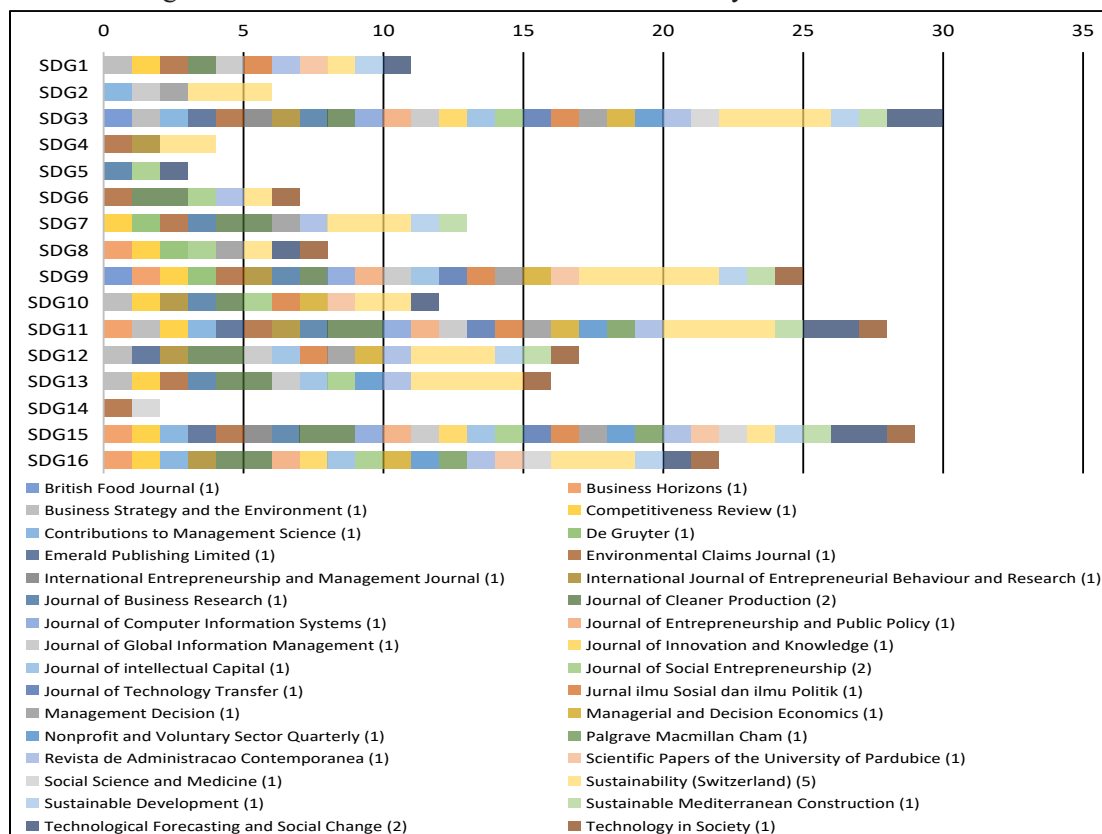


Source: Author's calculation based on SDG pillars of [Kostoska and Kocarev \(2019\)](#)

4. 6. SDG-ORIENTATION BY SOURCE

Figure 20 provides a detailed overview about the sources of publications, highlighting the number of publications with SDG-specific keywords across various journals within DSE research. The figure also represents the number of publications in brackets within each source title. In that respect, Sustainability (Switzerland), as the most prominent source within DSE research, holds the highest number of publications (5) and the number of publications with SDG-specific keywords (37), covering 14 separate SDGs, and also holds the highest SDG-specific keyword inclusion rate per SDGs covered. The Journal of Cleaner Production, with 2 publications, also holds the second highest number of publications with SDG-specific keywords (18) from 11 separate SDGs, which also holds the second highest SDG-specific keywords rate per SDGs covered. Moreover, Technological Forecasting and Social Change, with the third highest number of publications with SDG-specific keywords (11), covers 8 separate SDGs by 2 publications. Also, the Environmental Claims Journal covers 10 separate SDGs with 1 publication, while the related source of publication holds 1 SDG-specific keywords rate per SDG covered (Figure 20).

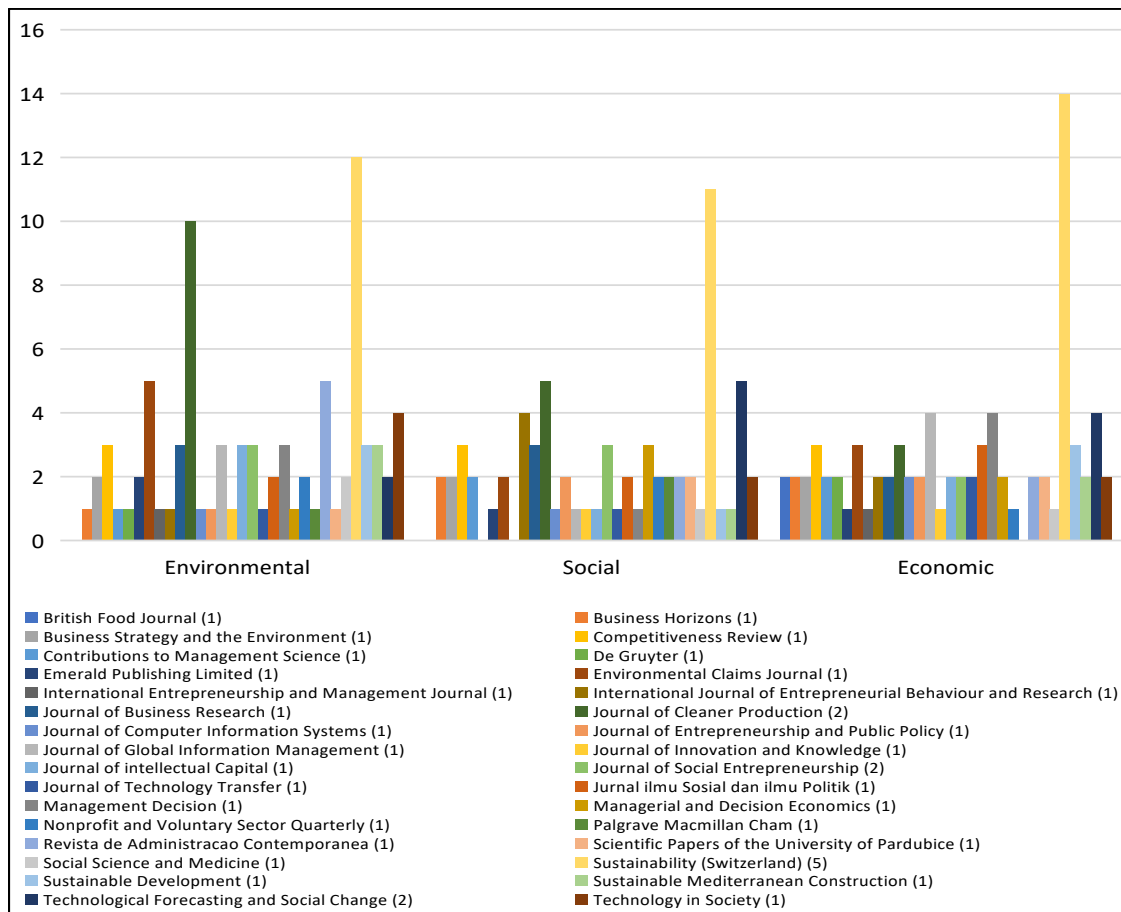
Figure 20. SDG-orientation of DSE Publications by Publication Sources



Source: Author's calculation

Sustainability (Switzerland) holds 16% of total number of publications with SDG-specific keywords (Figure 20), and is the most frequent publisher addressing all three pillars reflecting on the classification of **Kostoska and Kocarev (2019)** (Figure 21). Further, the Journal of Cleaner Production holds 8% of publications with SDG-specific keywords (Figure 20) and follows Sustainability (Switzerland) in environmental and social pillars (Figure 21). Moreover, the environmental pillar is neglected by 1, the social pillar by 3, and the economic pillar by 1 source of publication. The British Food Journal, is the only source of publication that focuses on a single pillar, and includes keywords solely from the economic pillar (Figure 21).

Figure 21. ESE Pillars-orientation of DSE Publications by Publication Sources through Economic, Social, and Environmental Pillars



Source: Author's calculation based on SDG pillars of **Kostoska and Kocarev (2019)**

4. 7. SDG-ORIENTATION OF TOP CITED PUBLICATIONS

Aiming to dive deeper into the field of DSE research, this section mainly focuses on the 10 most frequently cited DSE publications on the Scopus database in terms of authors, title, years, publication sources, research type and adopted methodologies, and citation data on the related database.

Observed by our research that top cited DSE publications hold at most 188 and at least 7 citations on the Scopus database. 40% of top cited papers are published in 2020, while 40% are published after 2020. Sustainability (Switzerland) and Journal of Social Entrepreneurship are the only sources that hold multiple publications within top-ten cited DSE researches. Considering all the top-ten Scopus cited DSE publications as empirical, 50% is observed to adopt quantitative methodologies while 30% adopts qualitative and 20% adopts mixed research methodologies (Table 8). Also noted by our research that 50% of top-ten cited publication benefits from interview or survey as data collection methods. Moreover, 70% of top-ten cited publications

represent digital social entrepreneurship concept while 30% adopt to digital sustainable entrepreneurship concept. In addition, 40% of top-ten cited publications originate from United Kingdom considering the contact addresses of corresponding authors as the origin of publications.

Table 8. Top-Ten Scopus Cited Publications

Authors	Title	Year	Publication Source	Research Type	Scopus Citation
Popkova E.G., Sergi B.S.	Human capital and Ai in industry 4.0. Convergence and divergence in social entrepreneurship in Russia	2020	Journal of Intellectual Capital	Mixed-methods	188
Gregori P., Holzmann P.	Digital sustainable entrepreneurship: A business model perspective on embedding digital technologies for social and environmental value creation	2020	Journal of Cleaner Production	Qualitative	55
De Bernardi P., Bertello A., Venuti F.	Online and on-site interactions within alternative food networks: Sustainability impact of knowledge-sharing practices	2019	Sustainability (Switzerland)	Quantitative	40
Torres P., Augusto M.	Digitalisation, social entrepreneurship and national well-being	2020	Technological Forecasting and Social Ch.	Quantitative	25
ibáñez M.J., Guerrero M., Yáñez-Valdés C., Barros-Celume S.	Digital social entrepreneurship: the N-Helix response to stakeholders' COVID-19 needs	2022	Journal of Technology Transfer	Quantitative	23
Tajvidi R., Tajvidi M.	The growth of cyber entrepreneurship in the food industry: virtual community engagement in the COVID-19 era	2021	British Food Journal	Qualitative	18
Langley D.J., Zirngiebl M., Sbeih J., Devoldere B.	Trajectories to reconcile sharing and commercialization in the maker movement	2017	Business Horizons	Qualitative	16
Ghatak A., Chatterjee S., Bhowmick B.	intention Towards Digital Social Entrepreneurship: An integrated Model	2020	Journal of Social Entrepreneurship	Quantitative	13
Faludi J.	How to Create Social Value Through Digital Social innovation? Unlocking the Potential of the Social Value Creation of Digital Start-Ups	2023	Journal of Social Entrepreneurship	Mixed-methods	9
Xu G., Hou G., Zhang J.	Digital Sustainable Entrepreneurship: A Digital Capability Perspective through Digital innovation Orientation for Social and Environmental Value Creation	2022	Sustainability (Switzerland)	Quantitative	7

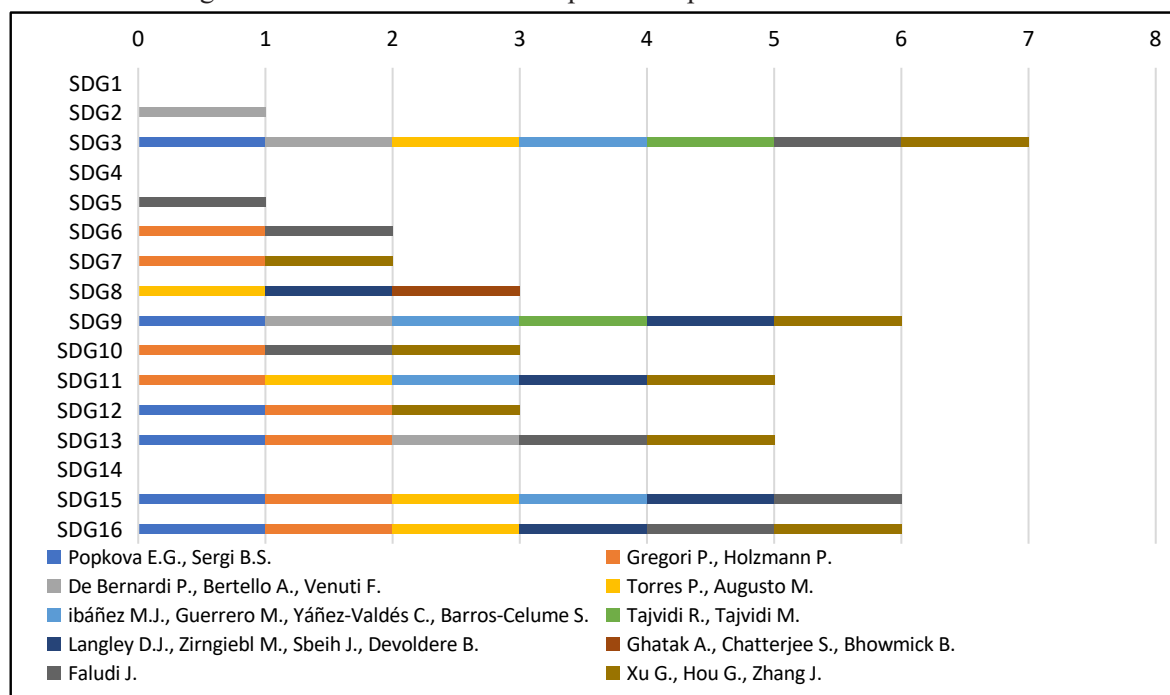
Source: Author's work

In total, 50 SDG coverages are identified by top-ten Scopus-cited DSE publications, which

results in an average of 5 separate SDGs to be covered by each paper. Also, 70% of the top-ten cited publications include keywords related to SDG3 (Good Health and Well-being). Moreover, keywords from SDG9 (Industry, Innovation and Infrastructure), SDG11 (Sustainable Cities and Communities), SDG13 (Climate Action), SDG15 (Life on Land) and SDG16 (Peace, Justice and Strong Institutions) are represented by 50% of top-ten cited DSE publications. However, none of the top-ten publications cover any SDG-specific keywords from SDG1 (No Poverty), SDG4 (Quality Education) and SDG14 (Life below Water) (Figure 22).

Popkova and Sergi (2020), published by the Journal of Intellectual Capital, holds the highest number of citations on Scopus database. The related publication which emphasizes the significant impact of their mixed-methods research includes keywords from SDG3 (Good Health and Well-being), SDG9 (Industry, Innovation and Infrastructure), SDG12 (Responsible Consumption and Production), SDG13 (Climate Action), SDG15 (Life on Land) and SDG16 (Peace, Justice and Strong Institutions) (Table 8 and Figure 22). **Gregori and Holzmann (2020)**, published by the Journal of Cleaner Production follow the former in terms of citation count with their qualitative research, representing keywords from 8 separate SDGs. Also, the quantitative study of **De Bernardi et al. (2019)** published by Sustainability (Switzerland), has the third-highest number of citations on the Scopus database while representing 4 separate SDGs. Moreover, the quantitative research of **Torres and Augusto (2020)** published by the Technological Forecasting and Social Change, with the fourth-highest number of citations on the Scopus database, covers keywords from 5 separate SDGs. On the other hand, while the publication of **Ghatak et al. (2023)**, which is the only publication with keywords from a single SDG only represents SDG8 (Decent Work and Economic Growth) (Table 8 and Figure 22).

Figure 22. SDG-orientation of Top-Ten Scopus Cited DSE Publications

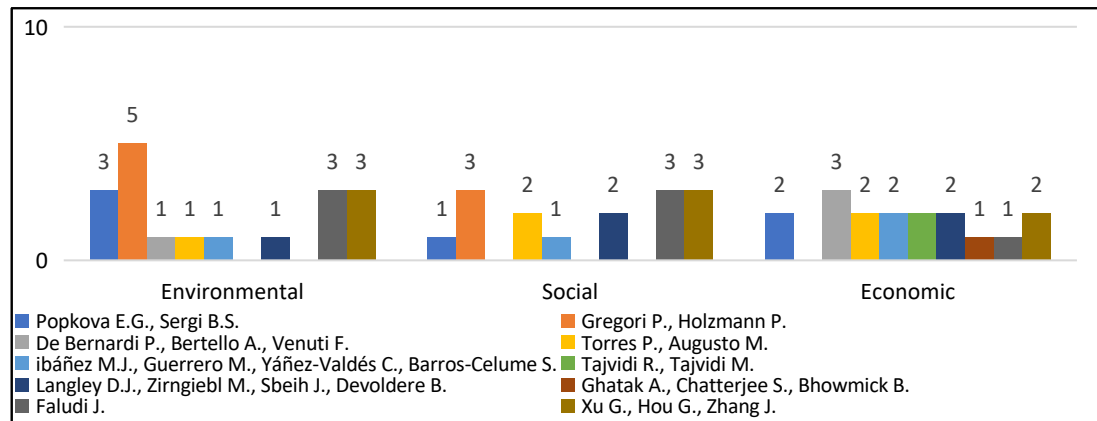


Source: Author's calculation

60% of top-ten cited DSE publications hold keywords from all pillars. Also, 80% include SDG-specific keywords from multiple pillars, while 20% include SDG-specific keywords solely from the economic pillar. In that respect, the publication of **Gregori and Holzmann (2020)** with the highest number of SDG-specific keywords, represents keywords from 5 separate SDGs solely on the social pillar and 3 separate SDGs on the environmental pillar, and no keywords

from the SDGs within the economic pillar. On the other hand, the publication of **De Bernardi et al. (2019)** holds the highest number of SDGs on the economic pillar (Figure 23).

Figure 23. ESE Pillars-orientation of Top-Ten Scopus Cited DSE Publications

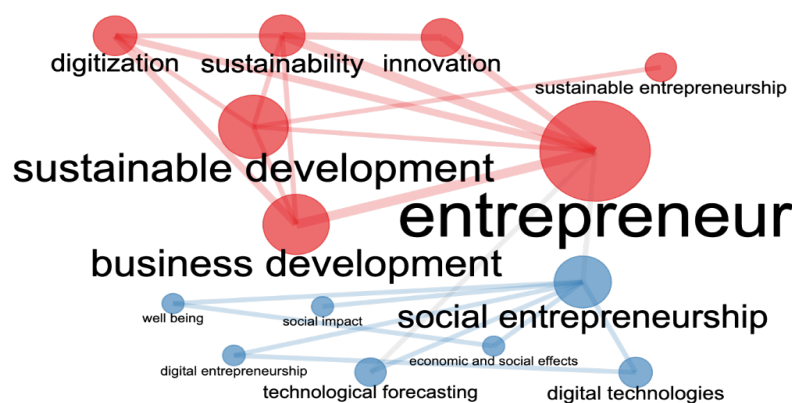


Source: Author's calculation based on the study of **Kostoska and Kocarev (2019)**

4. 8. CO-OCCURRENCE ANALYSIS FOR DSE RESEARCH

The co-occurrence network analysis was conducted using Biblioshiny software. A related section of our analysis provides an outlook on the interconnections of the key terms represented by 39 DSE publications (Figure 24), in which larger node sizes highlight the concepts and terms with higher frequency and reflect their central role in shaping the scholarly interest in DSE research. The results of our analysis consider the concept of “entrepreneur” at the center as a core concept, which is closely linked to other concepts such as “sustainable development,” “business development,” “sustainability,” “digitalization,” “innovation” and “sustainable entrepreneurship” in the red cluster, that points to the integration of traditional entrepreneurial objectives with sustainability, considering the concepts of innovation and digitization as key enablers. On the other hand, the blue cluster includes concepts such as “social entrepreneurship,” “digital technologies,” “technological forecasting,” “digital entrepreneurship,” “economic and social effects,” “social impact,” and “well-being,” and reflect the societal dimension, where social entrepreneurship and digital technologies come together to create transformative solutions for well-being and social impact (Figure 24).

Figure 24. Co-Occurrence Network Analysis of DSE Research



Source: Author's work

5. DISCUSSION

By the increasing importance of sustainability-oriented entrepreneurship in empowering efforts towards achieving global sustainable development goals and the growing interlinkages between digitalization and sustainability, digital sustainable entrepreneurship has gained importance. Understanding the theoretical roots and trends in digital sustainable entrepreneurship is crucial for conceptualizing the DSE context and guiding the development of its theoretical frameworks that can inspire practices and policies. However, the conceptual content analysis and bibliometric research on digital sustainability entrepreneurship are still rare. Moreover, the SDGs and DSE linkages have never been explored, at least to our knowledge. To fulfil this research gap, this study delved into the DSE research with a conceptual content analysis based on the bibliometric approach applied the Scopus publication data in this field.

Our conceptual content analysis revealed that SDG3 (Good Health and Well-being), SDG15 (Life on Land), SDG11 (Sustainable Cities and Communities) and SDG9 (Industry Innovation and Infrastructure) are the most frequently covered SDGs by DSE publications, respectively. In the systematic literature review of the most employed and newly developed approaches by academic research to support the achievement of SDGs in an EU context, [Trane et al., \(2023\)](#) point out that SDG7 (Affordable and Clean Energy), SDG13 (Climate Action), SDG12 (Responsible Consumption and Production), SDG11 (Sustainable Cities and Communities), SDG15 (Life on Land) and SDG6 (Clean Water and Sanitation) attract the highest scholarly interest respectively, while SDG14 (Life Below Water) and SDG5 (Gender Equality) are the least covered SDGs. [Raman et al., \(2023\)](#) analyzing how business research maps to SDGs, reveal that SDG3 (Good Health and Well-being) and SDG7 (Affordable and Clean Energy) are the most popular SDGs within the field of research, while SDG6 (Clean Water and Sanitation), SDG14 (Life Below Water), SDG1 (No Poverty) and SDG2 (Zero Hunger) attracted relatively lower interest from the scholars. On the other hand, considering the pillars segmentation of [Kostoska and Kocarev \(2019\)](#), DSE research tends to cover more SDGs from the environmental, economic, and social pillars respectively. [Trane et al., \(2023\)](#) indicated that the environmental and economic pillars attract higher interest from scholars, respectively, and the SDGs that reflect the social pillar require higher levels of attention. Also, the research of [Raman et al., \(2023\)](#) indicates that higher academic focus relates to the economic, social, and environmental pillars, respectively. In that respect, our analysis complies with the results of [Trane et al. \(2023\)](#) but opposes with the results of [Raman et al., \(2023\)](#).

DSE research had its first publication in 2017. On the other hand, bibliometric research on the concept of SE, showed that the years of 1992 ([Sarango-Lalangui et al., 2018](#)), 1999 ([Moya-Clemente et al., 2021](#)), 2002 ([Sreenivasan & Suresh, 2023](#); [Terán-Yépez et al., 2020](#)), 2005 ([Perwitasari et al., 2023](#)), and 2009 ([Rosário et al., 2022](#)) become the milestone for the area of research. In SE, a significant increase in the number of publications started in 2006 ([Sarango-Lalangui et al., 2018](#)), 2015 ([Moya-Clemente et al., 2021](#); [Sreenivasan & Suresh, 2023](#)), and in 2017 ([Perwitasari et al., 2023](#)), which possibly brings diversification of research areas within the field. Moreover, bibliometric research on digital entrepreneurship (DE) dates back to 1993 ([Purnomo et al., 2020](#)), 1999, ([Y. Zhai et al., 2022](#)), 2012 ([Fernandes et al., 2023](#)) and 2015 ([Fernandes et al., 2022](#)). The year that DE research gained momentum is also defined as 2015 ([Purnomo et al., 2020](#); [Y. Zhai et al., 2022](#)), 2017 ([Fernandes et al., 2022](#)) and as 2020 ([Fernandes et al., 2023](#)). As a novel field that intersects the areas of SE and DE and adopts a newly declared political background, it is considerable for the area of DSE research to start later than the areas of SE and DE and tend to grow by 2020.

Our research indicates that the European and Asian regions have the highest number of pub-

lications in DSE research. Also, considering a SE lens, most of the bibliometric researches indicate Europe (Konys, 2019; Moya-Clemente et al., 2021; Perwitasari et al., 2023) has the highest number of publications, while the USA (Thananusak, 2019) is also pointed. With a DE lens, Europe (Fernandes et al., 2022; Purnomo et al., 2020) and the USA (Y. Zhai et al., 2022) are also defined as the most active regions regarding the number of publications. On the other hand, the individual countries that hold the highest number of publications within DSE research have been indicated as India (5), China (4), USA (4), and United Kingdom (3), respectively, by our research. Yet, considering the SE context, bibliometric researches indicate that the United Kingdom (Konys, 2019; Terán-Yépez et al., 2020; Thananusak, 2019), USA (Thananusak, 2019), Germany (Perwitasari et al., 2023), Netherlands (Moya-Clemente et al., 2021) as the countries with the highest number of publications. For DE research, the most active country is the USA (Purnomo et al., 2020; Y. Zhai et al., 2022) and Italy (Fernandes et al., 2022). As a result, Europe and the USA are leading regions in SE, DE, and DSE research, while Asian countries adapted to the field earlier.

Our research reveals that Sustainability (Switzerland) is the most productive journal in parallel to the study of Terán-Yépez et al., (2020), whereas Konys (2019) points that Sustainability (Switzerland) shares the top rank with the Journal of Cleaner Production, which is solely defined as the most productive source by other bibliometric SE researches (Moya-Clemente et al., 2021; Perwitasari et al., 2023; Sarango-Lalangui et al., 2018; Sreenivasan & Suresh, 2023; Thananusak, 2019). Further, Thananusak (2019) defines the Journal of Business Venturing as the most productive SE source. On the other hand, the bibliometric researches on DE, Sustainability (Switzerland) (Fernandes et al., 2023; Y. Zhai et al., 2022), Small Business Economics, and Research Technological Forecasting and Social Change (Paul et al., 2023) are pointed as the most productive sources of publications. Our research also reveals that Intellectual Capital has the highest impact on the area of DSE research, whereas the Journal of Business Venturing (Sreenivasan & Suresh, 2023; Terán-Yépez et al., 2020), the Journal of Cleaner Production (Moya-Clemente et al., 2021), and Strategic Management Journal (Sarango-Lalangui et al., 2018) are pointed by the bibliometric researches on the area of SE, and Technological Forecasting and Social Change (Y. Zhai et al., 2022) is pointed in the area of DE. In conclusion, we can argue that Sustainability (Switzerland) and the Journal of Cleaner Production are valuable sources of research that intersect in the area of sustainability-oriented digital entrepreneurship research.

None of the top cited SE scholars intersect with the top cited DSE authors (Konys, 2019; Moya-Clemente et al., 2021; Perwitasari et al., 2023; Sreenivasan & Suresh, 2023; Terán-Yépez et al., 2020; Thananusak, 2019). Also, the majority of the bibliometric papers on DE, do not point to any DSE authors (Fernandes et al., 2022; Paul et al., 2023; Y. Zhai et al., 2022), excluding the work of Fernandes et al., (2023) that covers the study of Gregori and Holzmann (2020), and the study of De Bernardi et al., (2019). Moreover, our findings on methodological approaches in the top-cited DSE publications contrast with Thananusak's (2019) research, which is the only bibliometric SE study that analyzes the methodological approaches in the existing literature. Thananusak's study also indicates that only 25% of the top 20 publications employ empirical research. In comparison, 40% of the top 20 cited empirical SE publications adopt quantitative approaches, while 60% use qualitative methods. On the other hand, Paul et al.'s (2023) research, which analyzes the entire DE literature, shows that 47.5% of publications adopt quantitative methods, 42.5% employ qualitative approaches, and 10% use mixed methods. It highlights similar trends with the top ten DSE publications. In this regard, the top cited DSE publications exhibit similarities and distinctions between DE and SE research.

On the other hand, the co-occurrence analysis of our research reveals “entrepreneur” as a core concept in DSE research. Considering the bibliometric research on SE, “sustainable entrepre-

neurship” (Konys, 2019; Perwitasari et al., 2023; Sarango-Lalangui et al., 2018; Sreenivasan & Suresh, 2023; Terán-Yépez et al., 2020), “sustainability” (Rosário et al., 2022; Thananusak, 2019), and “sustainable innovation” (Moya-Clemente et al., 2021) concepts take place at the center of related research. Further, only the analysis of Sreenivasan and Suresh (2023) include the “data” keyword related to “digital”. Considering a DE lens, “digital entrepreneurship” (Fernandes et al., 2022; Purnomo et al., 2020) and “entrepreneurship (Fernandes et al., 2023) concepts are identified as the core concepts of co-occurrence analysis of bibliometric research. Conversely, co-occurrence analysis on DE (Fernandes et al., 2022; Purnomo et al., 2020) do not include keywords about sustainability, but the research of Fernandes et al., (2023) include “Sustainable Development Goals,” “sustainable development,” and “social entrepreneurship” keywords. Consequently, research on DSE is observed to be inspired by both the research fields of SE and DE in time.

6. CONCLUSIONS AND IMPLICATIONS

6. 1. RESEARCH CONCLUSIONS

Increasing attention towards sustainability, political alignments such as the SDGs (UN, 2015) and TT framework of the EU (EC JRC, 2022), and the academic support such as Scival to enable SDG-specific search queries by the Elsevier Data Repository (Jayabalasingham et al., 2019), an increase in scholarly motivation and research is observed that also resulted in an increase in numbers of publications and the intext SDG-specific citations, and benefit to improvement of discoverability and impact ranking of SDG-specific publications (Meschede, 2020). Proceeding in the light of TT vision of the EU (EC JRC, 2022) and employing SDG-specific search queries of Elsevier (Jayabalasingham et al., 2019), we analyzed the SDG-orientation of DSE research using bibliometric statistics.

In that respect, our research not only conducted the conceptual content analysis on the SDG-orientation of the area of DSE research (n = 39) but also illustrated similarities and differences with the total SDG-related literature, and the structure of academic research including years, geographical origin, concepts, methodological approaches, and publication sources, and examined the top cited DSE publications in detail. Consequently, our paper reveals that each DSE publication includes at least one specific keyword from at least one specific SDG, and all DSE publications except one include keywords from multiple SDGs. DSE publications cover keywords from 5,97 separate SDGs on average. Our results also indicate that, SDG3 (Good Health and Well-being) is the most explored SDG by DSE research and the total SDG-referring literature. However, its linkages to entrepreneurship are significantly lower on DSE research, indicating the need for a higher orientation towards health-tech and entrepreneurship in theory and practice. We also identified that SDG14 (Life below Water) is the least discussed SDG by DSE publications, SDG1 (No Poverty) as the least addressed SDG by the total SDG-referring literature. Our study also reveals that DSE research considers 2017 as a milestone with the first publication in the area and SDG9 (Industry, Innovation and Infrastructure) has always been in the agenda, while SDG3 (Good Health and Well-being), and SDG15 (Life on Land) showed the most significant increase till the date of data retrieval. However, growth in environmental, economic, and social pillars has followed a similar pattern over time. Moreover, slightly less than half of the DSE publications, and 60% of top-ten cited DSE publications is observed to originate from European countries, which are also dominant in each pillar, aligning with the EU’s TT vision (EC JRC, 2022), even if no geographic filters were applied in the search process. Our results also reveal that Asia produced the most DSE research output referring SDG1 (No Poverty) and SDG12 (Responsible Consumption and Production). This may be due to the region’s intense manufacturing activities and the high population facing poverty and low-in-

come. Also, SDG3 (Good Health and Well-being), SDG15 (Life on Land), and SDG11 (Sustainable Cities and Communities) have the widest coverage by individual countries that reflects the cross-national focus for related SDGs, respectively. Oppositely, SDG14 (Life below Water) is observed to be covered by publications from India and the Russian Federation. Our results also indicate that digital social entrepreneurship is the most dominant concept, bearing more than half of the DSE publications sampled, which mainly cover SDG-specific keywords from the economic and social pillars, respectively. It is followed by the digital sustainable entrepreneurship concept (which is the focus and preference of this study), that focuses more on the SDGs from the environmental and economic pillars. Further, the concept of digital frugal entrepreneurship is also observed in DSE research that is not included in our search query. Further, 85% of DSE publications adopt empirical research methodologies, and each empirical DSE publication covers keywords from an average of 5,9 SDGs. representing a higher preference for qualitative approaches, methodological orientation vary by SDG-orientation, such as the qualitative DSE publications refer to all SDGs, but none of the publications that adopt to quantitative and mixed-methods refer to SDG4 (Quality Education) and SDG14 (Life Below Water). Also observed that the publications that adopt to qualitative and mixed-methods dominantly refer to SDGs from the environmental pillar, and quantitative publications dominantly refer to SDGs from the economic pillar. Moreover, our research also reveals that Sustainability (Switzerland) has been the most productive source with the highest number of publications and the dominant publication source for all pillars focusing on SDGs from the economic, environmental and social pillars respectively. On the other hand, the publication of Popkova and Sergi (2020) which the Journal of Intellectual Capital publishes has been the top-cited DSE publication. Consequently, it is observed that the SDG-orientation of DSE publications differs in terms of years, origin, concept, methodology, and sources of publications.

In that respect, our findings enrich the academic discourse by posing valuable research questions and providing a dual analytical framework by integrating conceptual content analysis with bibliometric research methods. The analysis of SDG-orientation enables us to understand how research on digital sustainable entrepreneurship practices align with SDGs, offering insights into the theoretical intersections of sustainability, entrepreneurship, and digital technologies. Our approach not only identifies the existing knowledge but also discovers the gaps, empowering further theoretical advancements and interdisciplinary studies within the field of research.

From a practical perspective, actionable insights from our findings bring valuable guidance for policymakers, entrepreneurs, and scholars. This research mainly equips stakeholders with clues and recommendations that foster innovation through environmental, social, and economic sustainability. Additionally, our bibliometric analysis provides an overview of influential research and emerging trends within the field and enables practitioners to leverage the most impactful knowledge resources.

6. 2. RESEARCH LIMITATIONS

This study has several limitations that should be acknowledged. First, the SDG-specific search queries of Elsevier Data Repository (Jayabalasingham et al., 2019) does not include a search query for SDG17 (Partnerships for the Goals), consequently our research excludes SDG17. Second, our research employed Scopus, as the database offers accurate citation tracking, extensive multidisciplinary coverage, and consistent publication descriptors which are valuable for ensuring consistency and reproducibility in bibliometric research, as mentioned in the methodology section.

6. 3. FURTHER RESEARCH

Future research directions include developing strategies that address SDGs with limited scholarly interest within DSE research. Also, a relational conceptual analysis can be implemented in DSE research to determine its patterns and interpretations. Moreover, a conceptual content analysis on sustainable entrepreneurship can be implemented to compare with DSE to identify the differences and similarities between the two research areas. Further, considering a practical lens, DSE initiatives and real-world case studies can be examined through their alignment with SDGs. In addition, future research could also expand the dataset by employing additional databases such as Web of Science, IEEE, and Google Scholar, as well as grey literature, conference proceedings, and dissertations, to provide a more exhaustive view of the research field.

Declarations

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REFERENCES

- Aghelie, A., Sorooshian, S., & Azizan, N. A. (2016). Research Gap in Sustainopreneurship. *Indian Journal of Science and Technology*, 9(12). <https://doi.org/10.17485/ijst/2016/v9i12/77648>
- Al-Abbadi, L. H., Alshawabkeh, R., Alkhazali, Z., Al-Aqrabawi, R., & Rumman, A. A. (2025). Business Intelligence And Strategic Entrepreneurship For Sustainable Development Goals (SDGs) Through: (Green Technology Innovation And Green Knowledge Management). *ECONOMICS - Innovative and Economics Research Journal*, 13(1). <https://doi.org/10.2478/eoik-2025-0013>
- Andersen, A. D., Frenken, K., Galaz, V., Kern, F., Klerkx, L., Moutaen, M., Piscicelli, L., Schor, J. B., & Vaskelainen, T. (2021). On digitalization and sustainability transitions. *Environmental Innovation and Societal Transitions*, 41, 96–98. <https://doi.org/10.1016/j.eist.2021.09.013>
- Azam Roomi, M., Manuel Saiz-Alvarez, J., Coduras, A., Galindo-Martín, M.-A., Méndez-Picazo, M.-T., & Castaño-Martínez, M.-S. (2021). *Measuring Sustainable Entrepreneurship and Eco-Innovation: A Methodological Proposal for the Global Entrepreneurship Monitor (GEM)*. <https://doi.org/10.3390/su13074056>
- Bacq, S., & Alt, E. (2018). Feeling capable and valued: A prosocial perspective on the link between empathy and social entrepreneurial intentions. *Journal of Business Venturing*, 33(3), 333–350. <https://doi.org/10.1016/j.jbusvent.2018.01.004>
- Baranauskas, G., & Raišienė, A. G. (2022). Transition to Digital Entrepreneurship with a Quest of Sustainability: Development of a New Conceptual Framework. In *Sustainability (Switzerland)*, 14(3). MDPI. <https://doi.org/10.3390/su14031104>
- Bednarčíková, D., & Repiská, R. (2021). Digital Transformation in the Context of the European Union and the Use of Digital Technologies as a Tool for Business Sustainability. *SHS Web of Conferences*, 115, 01001. <https://doi.org/10.1051/shsconf/202111501001>
- Berawi, M. A. (2019). The role of industry 4.0 in achieving Sustainable Development Goals. *International Journal of Technology*, 10(4), 644–647. <https://doi.org/10.14716/ijtech.v10i4.3341>
- Bican, P. M., & Brem, A. (2020). Digital Business Model, Digital Transformation, Digital Entrepreneurship: Is there a sustainable “digital”? *Sustainability (Switzerland)*, 12(13). <https://doi.org/10.3390/su12135239>
- Bonilla, S. H., Silva, H. R. O., da Silva, M. T., Gonçalves, R. F., & Sacomano, J. B. (2018). Industry 4.0 and sustainability implications: A scenario-based analysis of the impacts and challenges. *Sustainability (Switzerland)*, 10(10). <https://doi.org/10.3390/su10103740>
- Choi, N., & Majumdar, S. (2014). Social entrepreneurship as an essentially contested concept: Opening a new avenue for systematic future research. *Journal of Business Venturing*, 29(3), 363–376. <https://doi.org/10.1016/j.jbusvent.2013.05.001>
- Cohen, B., & Winn, M. I. (2007). Market imperfections, opportunity and sustainable entrepreneurship. *Journal of Business Venturing*, 22(1), 29–49. <https://doi.org/10.1016/j.jbusvent.2004.12.001>
- Cordova, M. F., & Celone, A. (2019). SDGs and innovation in the business context literature review. *Sustainability (Switzerland)*, 11(24). <https://doi.org/10.3390/su11247043>
- De Bernardi, P., Bertello, A., & Venuti, F. (2019). Online and on-site interactions within alternative food networks: Sustainability impact of knowledge-sharing practices. *Sustainability (Switzerland)*, 11(5). <https://doi.org/10.3390/su11051457>
- Dean, T. J., & McMullen, J. S. (2007). Toward a Theory of Sustainable Entrepreneurship: Reducing Environmental Degradation Through Entrepreneurial Action. *Journal of Business Venturing*, 22(1), 50–76. <https://doi.org/10.1016/j.jbusvent.2005.09.003>
- Dixon, S. E. A., & Clifford, A. (2007). Ecopreneurship - A new approach to managing the triple bottom line. *Journal of Organizational Change Management*, 20(3), 326–345. <https://doi.org/10.1108/09534810710740164>
- Drucker P. (1985). *Innovation and Entrepreneurship*. <https://doi.org/10.1057/jit.1986.24>

- EC. (2015). *Transformation of European Industry and Enterprises A report of the Strategic Policy Forum on Digital Entrepreneurship*. <https://doi.org/10.2760/977331>
- EC JRC. (2022). *Towards a Green & Digital Future: Key Requirements for Successful Twin Transitions in the European Union*. <https://doi.org/10.2760/977331>
- Elhassan, T. (2025). Green Technology Innovation, Green Financing, and Economic Growth in G7 Countries: Implications for Environmental Sustainability. *ECONOMICS - Innovative and Economics Research Journal*. <https://doi.org/10.2478/eoik-2025-0023>
- Entrepreneurship Monitor, G. (2022). *Global Entrepreneurship Monitor 2021/2022 Global Report: Opportunity Amid Disruption*. <https://www.gemconsortium.org/file/open?fileId=50900>
- European Commission. (2017). *Strengthening Innovation in Europe's Regions: Strategies for Eesilient, Inclusive and Sustainable Growth*. <https://cohesiondata.ec.europa.eu/themes>
- Fernandes, C., Ferreira, J. J., Veiga, P. M., Kraus, S., & Dabić, M. (2022). Digital entrepreneurship platforms: Mapping the field and looking towards a holistic approach. *Technology in Society*, 70. <https://doi.org/10.1016/j.techsoc.2022.101979>
- Fernandes, C., Pires, R., & Gaspar Alves, M. C. (2023). Digital Entrepreneurship and Sustainability: The State of the Art and Research Agenda. *Economies*, 11(1). <https://doi.org/10.3390/economies11010003>
- Figge, F., Hahn, T., Schaltegger, S., & Wagner, M. (2002). The sustainability balanced scorecard - Linking sustainability management to business strategy. *Business Strategy and the Environment*, 11(5), 269–284. <https://doi.org/10.1002/bse.339>
- Gajović, A. (2024). Digitalization of the European Green Deal (EGD) and Sustainable Development Goals (SDG) - A Factor in Empowering Sustainable Local Projects: A Review of Literature and Potential Achievements. *Collection of papers new economy*, 2(1), 129-146. <https://doi.org/10.61432/CPNE0201129g>
- Gault, F. (2016). *Defining and Measuring Innovation in all Sectors of the Economy: Policy Relevance*. <https://www.oecd.org/sti/blue-sky-2016-agenda.html>
- Ghatak, A., Chatterjee, S., & Bhowmick, B. (2023). Intention Towards Digital Social Entrepreneurship: An Integrated Model. *Journal of Social Entrepreneurship*, 14(2), 131–151. <https://doi.org/10.1080/19420676.2020.1826563>
- Greco, A., & De Jong, G. (2017). *Sustainable entrepreneurship: Definitions, Themes and Research Gaps*. <https://research.rug.nl/en/publications/sustainable-entrepreneurship-definitions-themes-and-research-gaps>
- Gregori, P., & Holzmann, P. (2020). Digital sustainable entrepreneurship: A business model perspective on embedding digital technologies for social and environmental value creation. *Journal of Cleaner Production*, 272. <https://doi.org/10.1016/j.jclepro.2020.122817>
- Hockerts, K., & Wüstenhagen, R. (2010). Greening Goliaths versus emerging Davids - Theorizing about the role of incumbents and new entrants in sustainable entrepreneurship. *Journal of Business Venturing*, 25(5), 481–492. <https://doi.org/10.1016/j.jbusvent.2009.07.005>
- Holzmann, P., & Gregori, P. (2023). The promise of digital technologies for sustainable entrepreneurship: A systematic literature review and research agenda. In *International Journal of Information Management*, 68. Elsevier Ltd. <https://doi.org/10.1016/j.ijinfomgt.2022.102593>
- Hoogendoorn, B., van der Zwan, P., & Thurik, R. (2019). Sustainable Entrepreneurship: The Role of Perceived Barriers and Risk. *Journal of Business Ethics*, 157(4), 1133–1154. <https://doi.org/10.1007/s10551-017-3646-8>
- ICC. (2012). *Green Economy Roadmap: A Guide for Business, Policymakers and Society*. <https://ic-cwbo.org/news-publications/policies-reports/icc-green-economy-roadmap-a-guide-for-business-policymakers-and-society-2012/>
- Jayabalasingham, B., Boverhof, R., Agnew, K., & Klein, L. (2019). *Identifying research supporting the United Nations Sustainable Development Goals*, Elsevier Data Repository, VI. <https://doi.org/10.17632/87txkw7khs.1>

- Keogh, P. D., & Polonsky, M. J. (1998). *Environmental Commitment: a Basis for Environmental Entrepreneurship?* <https://doi.org/10.1108/09534819810369563>
- Kimuli, S. N. L., Orobia, L., Sabi, H. M., & Tsuma, C. K. (2020). Sustainability intention: mediator of sustainability behavioral control and sustainable entrepreneurship. *World Journal of Entrepreneurship, Management and Sustainable Development*, 16(2), 81–95. <https://doi.org/10.1108/WJEMSD-12-2019-0096>
- Kivilä, J., Martinsuo, M., & Vuorinen, L. (2017). Sustainable project management through project control in infrastructure projects. *International Journal of Project Management*, 35(6), 1167–1183. <https://doi.org/10.1016/j.ijproman.2017.02.009>
- Koe, W.-L., Majid, A., & Izaidin, &. (2014). Socio-Cultural Factors and Intention towards Sustainable Entrepreneurship. In *Eurasian Journal of Business and Economics* (Vol. 7, Issue 13). <https://www.ejbe.org/EJBE2014Vol07No13p145KOE-MAJID.pdf>
- Konys, A. (2019). Towards sustainable entrepreneurship holistic construct. *Sustainability (Switzerland)*, 11(23). <https://doi.org/10.3390/su11236749>
- Kostoska, O., & Kocarev, L. (2019). A novel ICT framework for sustainable development goals. *Sustainability (Switzerland)*, 11(7). <https://doi.org/10.3390/su11071961>
- Kraus, S., Burtscher, J., Vallaster, C., & Angerer, M. (2018). Sustainable entrepreneurship orientation: A reflection on status-quo research on factors facilitating responsible managerial practices. *Sustainability (Switzerland)*, 10(2). <https://doi.org/10.3390/su10020444>
- Kraus, S., Palmer, C., Kailer, N., Kallinger, F. L., & Spitzer, J. (2019). Digital entrepreneurship: A research agenda on new business models for the twenty-first century. In *International Journal of Entrepreneurial Behaviour and Research*, 25(2), 353–375. Emerald Group Holdings Ltd. <https://doi.org/10.1108/IJEBr-06-2018-0425>
- Kroll, C., Warchold, A., & Pradhan, P. (2019). Sustainable Development Goals (SDGs): Are we successful in turning trade-offs into synergies? *Palgrave Communications*, 5(1). <https://doi.org/10.1057/s41599-019-0335-5>
- Lüdeke-Freund, F. (2020). Sustainable Entrepreneurship, Innovation, and Business Models: Integrative Framework and Propositions for Future Research. *Business Strategy and the Environment*, 29(2), 665–681. <https://doi.org/10.1002/bse.2396>
- Maier, D., Maier, A., Aşchilean, I., Anastasiu, L., & Gavriş, O. (2020). The Relationship Between Innovation and Sustainability: A Bibliometric Review of the Literature. *Sustainability (Switzerland)*, 12(10). <https://doi.org/10.3390/SU12104083>
- Mars, M. M., & Lounsbury, M. (2009). Raging Against or with the Private Marketplace?: Logic Hybridity and Eco-Entrepreneurship. *Journal of Management Inquiry*, 18(1), 4–13. <https://doi.org/10.1177/1056492608328234>
- Meschede, C. (2020). The sustainable development goals in scientific literature: A bibliometric overview at the meta-level. *Sustainability (Switzerland)*, 12(11). <https://doi.org/10.3390/su12114461>
- Miklian, J., & Hoelscher, K. (2018). A New Research Approach for Peace Innovation. *Innovation and Development*, 8(2), 189–207. <https://doi.org/10.1080/2157930X.2017.1349580>
- Mitzinneck, B. C., & Besharov, M. L. (2019). Managing Value Tensions in Collective Social Entrepreneurship: The Role of Temporal, Structural, and Collaborative Compromise. *Journal of Business Ethics*, 159(2), 381–400. <https://doi.org/10.1007/s10551-018-4048-2>
- Mohamad, Z., Alim, N. S. S. M., Rashid, N. K. A., Hassim, N. H. C., Anang, Z., Abdullah, S., & Nasir, A. (2025). The Impact of Digital Entrepreneurial Competencies, Digital Literacy and Government Support on Digital Entrepreneurship Using Regression Analysis. *ECONOMICS - Innovative and Economics Research Journal*. <https://doi.org/10.2478/eoik-2025-0025>
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., Liberati, A., & Altman, D. G. (2009). *Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement*. <https://doi.org/10.1136/bmj.b2535>
- Moon, C. J. (2018). Contributions to the SDGs Through Social and Eco Entrepreneurship: New Mind-

- sets for Sustainable Solutions. In *Contemporary Issues in Entrepreneurship Research*, 8, 47–68. Emerald Group Publishing Ltd. <https://doi.org/10.1108/S2040-724620180000008008>
- Moya-Clemente, I., Ribes-Giner, G., & Chaves-Vargas, J. C. (2021). Sustainable entrepreneurship: An approach from bibliometric analysis. *Journal of Business Economics and Management*, 22(2), 297–319. <https://doi.org/10.3846/jbem.2021.13934>
- Muñoz, P., & Cohen, B. (2018). Sustainable Entrepreneurship Research: Taking Stock and looking ahead. *Business Strategy and the Environment*, 27(3), 300–322. <https://doi.org/10.1002/bse.2000>
- Nambisan, S. (2017). Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship. *Entrepreneurship: Theory and Practice*, 41(6), 1029–1055. <https://doi.org/10.1111/etap.12254>
- Nishant, R., Kennedy, M., & Corbett, J. (2020). Artificial intelligence for sustainability: Challenges, opportunities, and a research agenda. *International Journal of Information Management*, 53. <https://doi.org/10.1016/j.ijinfomgt.2020.102104>
- Nosratabadi, S., Mosavi, A., Shamshirband, S., Zavadskas, E. K., Rakotonirainy, A., & Chau, K. W. (2019). Sustainable Business Models: A Review. In *Sustainability (Switzerland)*, 11(6). MDPI. <https://doi.org/10.3390/su11061663>
- OECD. (2010a). *Ministerial Report on the OECD Innovation Strategy: Innovation to Strengthen Growth and Address Global and Social Challenges*. [https://one.oecd.org/document/C/MIN\(2010\)4/en/pdf](https://one.oecd.org/document/C/MIN(2010)4/en/pdf)
- OECD. (2010b). *The OECD Innovation Strategy : Getting a Head Start on Tomorrow*. OECD. <https://doi.org/10.1787/9789264083479-en>
- OECD. (2018). *Oslo Manual: Guidelines for Collecting, Reporting and Using Data On Innovation*. OECD. <https://doi.org/10.1787/9789264304604-en>
- O'Neill, K., & Gibbs, D. (2016). *Rethinking Green Entrepreneurship - Fluid Narratives of the Green Economy*. <https://doi.org/10.1177/0308518X16650453>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. In *The BMJ*, 372. BMJ Publishing Group. <https://doi.org/10.1136/bmj.n71>
- Parrish, B. D. (2008). *Sustainability-Driven Entrepreneurship: A Literature Review*. Sustainability Research Institute SCHOOL OF EARTH AND ENVIRONMENT. https://www.see.leeds.ac.uk/file-admin/Documents/research/sri/workingpapers/SRIPs-09_01.pdf
- Paul, J., Alhassan, I., Binsaiif, N., & Singh, P. (2023). Digital entrepreneurship research: A systematic review. *Journal of Business Research*, 156. <https://doi.org/10.1016/j.jbusres.2022.113507>
- Perwitasari, D., Nurrahmawati, A., & Susanto, H. (2023). A Comprehensive Dataset for Bibliometric Analysis of Sustainable Entrepreneurship with Augmented Bibliometric Approach. *Jurnal Manajemen Teori Dan Terapan | Journal of Theory and Applied Management*, 16(2), 417–436. <https://doi.org/10.20473/jmtt.v16i2.45794>
- Poldner, K., Shrivastava, P., & Branzei, O. (2017). Embodied Multi-Discursivity: An Aesthetic Process Approach to Sustainable Entrepreneurship. *Business and Society*, 56(2), 214–252. <https://doi.org/10.1177/0007650315576149>
- Popkova, E. G., & Sergi, B. S. (2020). Human capital and AI in industry 4.0. Convergence and divergence in social entrepreneurship in Russia. *Journal of Intellectual Capital*, 21(4), 565–581. <https://doi.org/10.1108/JIC-09-2019-0224>
- Purnomo, A., Susanti, T., Sari, A. K., Firdaus, M., & Dewi, R. (2020). A study of digital entrepreneurship through bibliometric visualizing from 1993 to 2019. *Proceedings of 2020 International Conference on Information Management and Technology, ICIMTech 2020*, 911–915. <https://doi.org/10.1109/ICIMTech50083.2020.9211270>
- Rahdari, A., Sepasi, S., & Moradi, M. (2016). Achieving sustainability through Schumpeterian social entrepreneurship: The role of social enterprises. *Journal of Cleaner Production*, 137, 347–360.

- <https://doi.org/10.1016/j.jclepro.2016.06.159>
- Raman, R., Lathabhai, H., Mandal, S., Kumar, C., & Nedungadi, P. (2023). Contribution of Business Research to Sustainable Development Goals: Bibliometrics and Science Mapping Analysis. *Sustainability (Switzerland)*, 15(17). <https://doi.org/10.3390/su151712982>
- Raudeliuniene, J., Tvaronavičiene, M., & Dzemyda, I. (2014). Towards economic security and sustainability: key success factors of sustainable entrepreneurship in conditions of global economy. *Journal of Security and Sustainability Issues*, 3(4), 71–79. <https://etalpykla.vilniustech.lt/handle/123456789/146103>
- Rogers, E. M. (1962). How Research Can Improve Practice: A Case Study. *Theory Into Practice*, 1(2), 89–93. <https://doi.org/10.1080/00405846209541785>
- Rosário, A. T., Raimundo, R. J., & Cruz, S. P. (2022). Sustainable Entrepreneurship: A Literature Review. In *Sustainability (Switzerland)*, 14(9). MDPI. <https://doi.org/10.3390/su14095556>
- Sabharwal, M., Levine, H., & D’Agostino, M. (2018). A Conceptual Content Analysis of 75 Years of Diversity Research in Public Administration. *Review of Public Personnel Administration*, 38(2), 248–267. <https://doi.org/10.1177/0734371X16671368>
- Sahut, J. M., Iandoli, L., & Teulon, F. (2021). The age of digital entrepreneurship. *Small Business Economics*, 56(3), 1159–1169. <https://doi.org/10.1007/s11187-019-00260-8>
- Sarango-Lalangui, P., Santos, J. L. S., & Hormiga, E. (2018). The development of sustainable entrepreneurship research field. *Sustainability (Switzerland)*, 10(6). <https://doi.org/10.3390/su10062005>
- Schaltegger, S., & Wagner, M. (2011). Sustainable entrepreneurship and sustainability innovation: Categories and interactions. *Business Strategy and the Environment*, 20(4), 222–237. <https://doi.org/10.1002/bse.682>
- Schumpeter J. (1934). *The Theory of Economic Development*. <https://archive.org/details/theoryofeconomic0000schu>
- Shepherd, D. A., & Patzelt, H. (2011). The New Field of Sustainable Entrepreneurship: Studying Entrepreneurial Action Linking “What Is to Be Sustained” With “What Is to Be Developed.” *Entrepreneurship: Theory and Practice*, 35(1), 137–163. <https://doi.org/10.1111/j.1540-6520.2010.00426.x>
- Sianes, A., Vega-Muñoz, A., Tirado-Valencia, P., & Ariza-Montes, A. (2022). Impact of the Sustainable Development Goals on the academic research agenda. A scientometric analysis. *PLoS ONE*, 17(3 March). <https://doi.org/10.1371/journal.pone.0265409>
- Soubbotina, T. P., World, T., & Washington, B. (2004). *Beyond Economic Growth An Introduction to Sustainable Development Second Edition WBI LEARNING RESOURCES SERIES*. <https://openknowledge.worldbank.org/entities/publication/284c9c6c-69e3-5ab9-ade3-73f6840f55bf>
- Sreenivasan, A., & Suresh, M. (2023). Exploring the contribution of sustainable entrepreneurship toward sustainable development goals: A bibliometric analysis. *Green Technologies and Sustainability*, 1(3), 100038. <https://doi.org/10.1016/j.grets.2023.100038>
- Sussan, F., & Acs, Z. J. (2017). The digital entrepreneurial ecosystem. *Small Business Economics*, 49(1), 55–73. <https://doi.org/10.1007/s11187-017-9867-5>
- Terán-Yépez, E., Marín-Carrillo, G. M., Casado-Belmonte, M. del P., & Capobianco-Uriarte, M. de las M. (2020). Sustainable entrepreneurship: Review of its evolution and new trends. *Journal of Cleaner Production*, 252. <https://doi.org/10.1016/j.jclepro.2019.119742>
- Thananusak, T. (2019). Science mapping of the knowledge base on sustainable entrepreneurship, 1996–2019. In *Sustainability (Switzerland)*, 11(13). MDPI. <https://doi.org/10.3390/su11133565>
- Torres, P., & Augusto, M. (2020). Digitalisation, social entrepreneurship and national well-being. *Technological Forecasting and Social Change*, 161. <https://doi.org/10.1016/j.techfore.2020.120279>
- Trane, M., Marelli, L., Siragusa, A., Pollo, R., & Lombardi, P. (2023). Progress by Research to Achieve the Sustainable Development Goals in the EU: A Systematic Literature Review. In *Sustainability (Switzerland)*, 15(9). MDPI. <https://doi.org/10.3390/su15097055>

- Tunçalp, D., & Yıldırım, N. (2022). Sustainable Entrepreneurship: Mapping the Business Landscape for the Last 20 Years. *Sustainability*, 14(7), 3864. <https://doi.org/10.3390/su14073864>
- Tzeng, C. H. (2009). A review of contemporary innovation literature: A Schumpeterian perspective. In *Innovation: Management, Policy and Practice*, 11(3), 373–394. <https://doi.org/10.5172/impp.11.3.373>
- UN. (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development*. https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E
- UN DESA. (2022). *SDG Good Practices: Second Edition*. <https://sdgs.un.org/publications/sdg-good-practices-2nd-edition-2022>
- UN ECLAC. (2022). *A decade of action for a change of era Fifth report on regional progress and challenges in relation to the 2030 Agenda for Sustainable Development in Latin America and the Caribbean*. <https://repositorio.cepal.org/handle/11362/47746>
- UN, GRI, & WBCSD. (2015). *SDG Compass: The guide for business action on the SDGs*. <https://unglobalcompact.org/library/3101>
- Weidinger, C., Fischler, F., & Schmidpeter, R. (2014). *Sustainable Entrepreneurship*. <https://doi.org/10.1007/978-3-642-38753-1>
- Xu, G., Hou, G., & Zhang, J. (2022). Digital Sustainable Entrepreneurship: A Digital Capability Perspective through Digital Innovation Orientation for Social and Environmental Value Creation. *Sustainability*, 14(18), 11222. <https://doi.org/10.3390/su141811222>
- Yalçinyiğit, S., & Karaçay, G. (2025). A glimpse into employee proactive behavior: the followership perspective. *Current Psychology*. <https://doi.org/10.1007/s12144-025-08048-8>
- York, J. G., O’Neil, I., & Sarasvathy, S. D. (2016). Exploring Environmental Entrepreneurship: Identity Coupling, Venture Goals, and Stakeholder Incentives. *Journal of Management Studies*, 53(5), 695–737. <https://doi.org/10.1111/joms.12198>
- Zeng, J. (2018). Fostering path of ecological sustainable entrepreneurship within big data network system. *International Entrepreneurship and Management Journal*, 14(1), 79–95. <https://doi.org/10.1007/s11365-017-0466-3>
- Zhai, Y., Yang, K., Chen, L., Lin, H., Yu, M., & Jin, R. (2022). *Digital Entrepreneurship: Global maps and trends of research*. <https://doi.org/10.1108/JBIM-05-2021-0244>
- Zhao, A. (2016). *Digital Entrepreneurship: Research and Practice*. <https://eprints.staffs.ac.uk/6274/1/DigitalEntrepreneurship-ResearchandPractice.pdf>