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FINTECHS' ROLE IN SDGS ACHIEVEMENT – A SYSTEMATIC REVIEW OF SCIENTIFIC RESEARCH

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ABSTRACT: The paper aims to review FinTechs' landscape in the context of their impact on countries' sustainable development reflected by SDG goals. The systematic literature review (SLR) applied the PRISMA methodology. It proved the worldwide systematically increasing scientific interest in surveying FinTechs and their contribution to SDGs' achievement. This trend has not yet been observed in Europe. Only a few papers directly refer to the relationship between FinTechs' and SDGs' achievement in European countries. Most of the research is qualitative. The topics range from conceptual framework to specific accomplishments of FinTech projects undertaken mainly by governments. They mostly refer to poverty alleviation through financial inclusion. The results of the systematic review of scientific research have shed light on the existing academic literature embracing both FinTech and SDGs issues, explored emerging trends in current research, and identified the main areas for further investigation.

KEYWORDS: FinTechs, financial technology, SDGs, systematic literature review (SLR), PRISMA methodology

Introduction

Digital technologies have been transforming the financial sectors for decades. The emergence of digitalisation has caused the implementation of new financial products and services offered not only by traditional banking institutions but also by non-banking institutions such as financial technology companies (FinTechs). The spread of FinTechs' market activity, as well as their growing popularity and acceptance among consumers, motivated researchers to analyse their influence on the financial market and sustainability. Most scholars agree that the scale and scope of FinTechs' development could be treated as digital disruption, which significantly impacts the financial ecosystem (Bittini et al., 2022). The current transformations and adjustments in the financial system influence the economy and many aspects of individuals', societies', and entities' everyday lives. Undoubtedly, the market activity of any entity operating in this system can have an enormous social impact.

As a result, FinTechs are becoming more and more interesting subjects of scientific research. As there is still no commonly accepted definition of this phenomenon, assessing the impact of its development on the economy and society remains challenging. The impact of FinTechs on countries' sustainable development, reflected in the achievement of Social Development Goals (SDGs), is a relatively new field of research. Designing the framework for such research requires a state-of-the-art analysis in this field.

The paper aims to review the scientific studies on FinTechs' landscape in the context of their impact on countries' sustainable development reflected by the SDG goals. Achieving this general objective requires addressing the following research questions:

Q1: How does scientific research on FinTechs' impact on the economy and society reflect social consequences?

Q2: How has scientific interest in FinTechs' social impact changed over the last two decades?

Q3: What are the key features of the studies analysed (subject, spatial scope, key target of paper's contribution and type)?

Q4: What SDGs are referred to in the studies related to FinTechs?

To synthesise the content and methodologies applied in studies concerning FinTechs' social impact and their contribution to SDG's achievement, a systematic literature review (SLR) was used. The SLR followed the PRISMA methodology and covered all papers available in open access in the Web of Science (WoS), Scopus and Lens databases from the first registered publication until September 2023. The following tools were used for content analysis of the extracted articles: Microsoft Excel and Microsoft Access for data processing; Adobe Acrobat Reader Pro for combining multiple documents; and Python code (using the module FitZ) for highlighting keywords within the combined document.

The paper is structured as follows: the first section presents the FinTech phenomenon, the social impact, and sustainability as reflected by the achievement of SDGs' goals. The second section describes the study methodology. The third section includes the data collection and analysis. This section is followed by the results and discussion section, summarising the content of the studies analysed. The paper finishes with the conclusions section, including remarks for further research.

FinTechs and Social Impact – literature review

FinTechs can be defined from two perspectives. The first approach refers to the different combinations of finance and technology, focusing on technologies' implementation in the financial sector (Arner et al., 2015; Schueffel, 2016; KPMG, 2018). The research following this approach refers to banks' technological cooperation with players outside the financial sector (Kerényi & Molnár, 2017), changes in financial products, services, and financial innovations (FSB, 2017; Dimler et al., 2018; Glavanits, 2020) and eliminating or reducing costs in financial intermediation (Das, 2018). Among other scientific interests are new business models applied by FinTechs, defined as entities using technology, operating, and offering products in the financial system. Those entities include banking and non-banking institutions that can compete, cooperate or have a cooperative relationship. The second approach emphasises new market players (entrants) involved in financial markets that rapidly reshape financial products and services (World Economic Forum, 2017). Following this approach,

FinTechs are defined as market participants outside the traditional financial system that recently entered a market, use innovative technologies, and change financial providers' business models (Bărbulescu et al., 2021). The traditional financial system includes commercial and investment banks, insurance companies, brokerages, and other regulated entities operating in financial markets. Applying this approach to define FinTechs means excluding those entities and focusing on non-licensed ones using innovative technology, such as banks (EY, 2019). This paper applies the second approach and the definition accepted by the World Economic Forum (2017). As a result, the research focuses on studies related to the social impact of new market players applying technology in finance (referred to in this paper as FinTechs), with special attention paid to the achievement of SDGs' goals.

Today, FinTechs address all main areas of financial market activities, offering a wide range of financial services and products (Stamegna & Karakas, 2019). The research related to FinTechs' impact on the economy and society mostly analyses how they interrupt traditional banks' operating activity. Following Christensen's disruptive theory (2016), new market players effectively compete with traditional players by providing accessible and cost-effective goods and services to customers. The research results provide evidence for the fact that increased competition forces banks to be more efficient (Goetz, 2018) and develop digital products and services by acquiring FinTech firms (Li et al., 2017) or incorporating their products and services into their business models (Hornuf et al., 2021). Another field of interest related to FinTechs' impact is financial and banking system safety. In this field, authors discuss the role of financial regulatory and supervisory authorities and governments in supporting and/or controlling their development, concluding that most FinTech companies as private entities disclose a limited amount of information to the public, which makes the comparison and assessment demanding. Thus, it is time to consider formulating national and regional frameworks for further FinTech development (FSB, 2017; Gromek, 2018). The social impact of FinTechs and their contribution to achieving Sustainable Development Goals (SDGs) is a relatively new field of research. The 17 SDGs, with 169 targets and over 240 indicators to measure performance and progress, were approved by the United Nations (UN) within the 2030 Agenda on September 27 2015 (UN, 2015). The first two articles related to FinTech and SDGs were published in 2017. Generally, the authors agree on FinTechs' potential to support SDGs' achievement, but this relationship is generally discussed. Some papers examine FinTechs' contribution to financial inclusion (Ferrata, 2019; Le et al., 2019; Arner et al., 2020; Gálvez-Sánchez et al., 2021; Chu et al., 2023). Ferrata (2019) pointed out the role of a digital approach to financial inclusion and concluded that basing financial inclusion on digital finance had delivered good results in recent years. Similarly, Chu et al. (2023) agreed that digitalisation, with its competitive advantages and rapid growth, can be a powerful tool to foster financial inclusion and sustainable development. Le et al. (2019) stated that utilisation of FinTech and their cooperation with other entities can contribute to financial inclusion. This is in line with Arner et al. (2020), who argued that FinTech is the key driver for financial inclusion and has the potential to support the SDGs with a progressive approach to the development of underlying infrastructure to support digital financial transformation. The bibliometric analysis on financial inclusion (Gálvez-Sánchez et al., 2021) stressed the current great interest in developing a more accessible financial system, especially through the use of digital money (FinTech) as an instrument to promote financial inclusion. Other authors focus on a particular technology (for example, blockchain) potential (Dziatkovskii et al., 2022; Jiang et al., 2022; Cao & Nguyen, 2023) or investments (Chueca Vergara & Ferruz Agudo, 2021; Kurnoga et al., 2022; Siemionek-Ruskań et al., 2022). Dziatkovskii et al. (2022), based on the analysis of the key academic research players and the evolution of blockchain in different fields, provided comments on several directions to guide practitioners in developing a sustainable global blockchain roadmap in education science. Jiang et al. (2022) analysed 42 literature reviews. The findings include mapping impact-based interlinkage of blockchain and SDGs and a systematic overview of drivers and barriers to adopting blockchain for sustainability. The authors concluded that blockchain, combined with other technologies, has great potential to empower numerous applications and act as a catalyst to achieve potentially all SDGs. Cao and Nguyen (2023) summarised the experience of implementing Fintech in some high-ranked countries. The papers focusing on investments refer to sustainable (green financing) or compare equity and ESG indices. They analyse particular FinTech solutions or companies, concluding that there is still a need for greater standardisation in both the format and the metrics of ESG reporting and sustainability reports, as well as the implementation of different systems and technologies to detect and prevent greenwashing practices (Chueca Vergara & Ferruz

Agudo, 2021). Others conduct surveys on green finance awareness (Siemionek-Ruskań et al., 2022). Kurnoga et al. (2022) research findings evidenced that ESG factors are important for corporate financial performance and risk. Higher ESG scores are related to higher profitability and affect firm value. Moreover, firms with better governance suffer smaller negative firm value responses. There are two studies that provide evidence for relationships between a favourable environment for sustainable development of the FinTech industry and some SDG achievements in European countries (Pauliukevičienė & Stankevičienė, 2021; Pauliukevičienė & Stankevičienė, 2022). The first study applied PEST analysis to survey how the environment supports FinTech development. The findings of the correlation analysis between the overall FinTech PEST environment and SDGs confirmed a statistical link between the FinTech PEST environment and SDG4, SDG8, SDG9, and SDG16. In the second paper, the authors assessed the contribution of SDGs to sustainable Fintech industry development using the pilot study. The study established that the main driver for SDG 8 is adults with accounts at a financial institution, the main driver for SDG 9 is the population using the internet, the main driver for SDG 4 is PISA score, and the main driver for SDG 16 is Corruption Perception Index (Pauliukevičienė & Stankevičienė, 2022). Only a few papers directly refer to the relationship between FinTechs and particular SDGs' achievement. Most of them analyse the role of FinTechs in achieving SDG1 – No poverty (Le et al., 2019; Appiah-Otoo & Song, 2021; Glavina et al., 2021; Ali et al., 2022; Mufaidah, 2022; Tay et al., 2022; Trimulato, 2022; Rafiuddin et al., 2023). Others estimate FinTechs' potential to raise funds to contribute to SDGs' achievements (Hinson et al., 2019; Michael & Latkovska, 2021; Michael, 2020). They conclude that FinTechs' activity may impact three sources of funds – taxes, SDG-related ventures, and traditional funding through innovations and new business models. It is necessary to mention that a considerable amount of literature has focused on innovative financial tools such as crowdfunding, green bonds, social bonds, and catastrophe bonds. Furthermore, financial inclusion and microfinance were also explored as financial tools to overcome gender inequalities and social exclusion in developing countries (Rizzello & Kabli, 2020).

Some articles include a review of studies related to FinTechs. Those papers analyse the literature from the perspective of research objectives and questions. They present what is known about FinTechs, research methodologies applied so far, and directions for further research. In those papers, the systematic literature review has proved to be a valuable contribution to understanding the scope, measurements, impact size, and determinants to synthesise with the particular area's future research agenda. Jourdan et al. (2023) presented a comprehensive survey of the methodologies employed in fintech literature related to financial technology (fintech) and information systems, while Ozili (2023) discusses digital finance research. Other reviews focus on financial inclusion (Gálvez-Sánchez et al., 2021; Tay et al., 2022; Harahap et al., 2023) or FinTech and Islamic finance literature (Alshater et al., 2022; Trimulato, 2022; Trimulato et al., 2022; Harahap et al., 2023). To the authors' best knowledge, this is the first systematic literature review referring to FinTechs' contribution to SDGs' achievement.

Research methods

The systematic literature review followed the PRISMA methodology and included five stages: defining the review concept and strategy, specifying the SLR methodology, data collection, data analysis, discussion and conclusion. The tasks undertaken at each stage are presented in Table 1.

In the first stage, the authors designed the systematic literature review strategy. According to the strategy, the scope of the research is as follows:

- Subject: FinTechs defined as new market participants outside the traditional financial system that recently entered a market (new market players), use innovative technologies and change financial providers' business models.
- Object: A synthetic analysis of scientific articles related to FinTechs and their social impact on countries' sustainable development reflected by the SDG goals (disclosed in English in open access journals), identification of research gaps and examination of further research directions (following the PRISMA methodology).
- Spatial (geographical) scope: Not limited.
- Time horizon: Since publishing the first paper until September 2023.

Table 1. The SLR stages and tasks

Stage	Tasks
Stage 1. Defining the review concept and strategy	<ul style="list-style-type: none"> • Defining the review scope – rationale and objectives • Defining the initial search strategy • Selecting databases • Describing the rationale for database selection
Stage 2. Specifying the SLR methodology	<ul style="list-style-type: none"> • Specifying the eligibility criteria for the inclusion and exclusion • Specifying the methods used to collect and screen data • Deciding which automation tools will be used in the process • Specifying the methods used to assess the risk of bias • Specifying how studies will be grouped for the syntheses
Stage 3. Data collection	<ul style="list-style-type: none"> • Selecting data • Removing repeated records • Describing records identified from databases • Describing records removed before screening • Describing records screened
Stage 4. Data analysis	<ul style="list-style-type: none"> • Describing the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review using a flow diagram • Presenting studies' characteristics • Making a list and defining all outcomes for which data were sought
Stage 5. Discussion and conclusion	<ul style="list-style-type: none"> • Providing a general interpretation of the results in the context of other evidence • Discussing any limitations of the evidence included in the review • Discussing any limitations of the review processes used • Discussing implications of the results for practice, policy, and future research

As a result, the review includes all scientific articles that refer to FinTechs' social impact and SDGs. No limitation concerning the journals, scientific fields, or publications' year was applied.

The analysis covers resources indexed by databases with the support of Lens. The comparisons between Web of Science (WoS) and Scopus and other available databases show that they cover the majority of documents presented in other databases without weaknesses, such as the lack of full text, incompleteness and inaccuracy of citation links, and missing citation links. WoS and Scopus overperformed their alternatives in quality (UN, 2015; Dimity et al., 2020; Thatrsarani et al., 2021; Harahap et al., 2023; Murshed et al., 2023). Web of Science is the world's oldest, most widely used, and authoritative database of research publications and citations. It was founded in 1964 as the Science Citation Index (SCI). Based on the SCI, it has expanded its selective, balanced, and complete coverage of the world's leading research to cover around 34,000 internationally influential journals today. The current index incorporates the Science Citation Index, Social Sciences Citation Index, the Arts & Humanities Citation Index, the Conference Proceedings Citation Index, the Book Citation Index, and the Emerging Sources Citation Index. WoS is a selective, structured, and balanced database with complete citation linkages and enhanced metadata that supports a wide range of information purposes (Birkle et al., 2020). WoS forsakes quantity for quality (Dimity et al., 2020). Scopus is intended to be the largest possible database of research items of sufficient quality. It was launched in 2004 by Elsevier, describing Scopus as the most comprehensive overview of the world's research outputs. Scopus includes journals, trade journals, book series, books, conference proceedings, and patents in science, technology, medicine, social science, arts and humanities. Today, it contains items from more than 23,400 journals, 290 trade journals, and 850 book series. It balances quantity for quality (Dimity et al., 2020). Both bases focus on publications as the primary scientific output, which is in line with this paper's scope. The selected databases are commonly considered adequate for systematic research reviews.

Additionally, the search was supported by Lens, an aggregator of metadata, which sources, merges and links diverse open knowledge sets, including scholarly works. The Lens, formerly Patent Lens, is an online patent and academic literature search facility provided by Cambia, an Australia-based non-profit organisation. Its database supports the four primary functions of the Lens, which are to discover, analyse, manage and share knowledge. Among its partners are Microsoft Academic, CrossRef, and ORCID.

In the second stage, the eligibility criteria were specified. The initial search was done using the following keywords: fintech(s) and social impact, fintech(s) and social development, FinTechs and Sustainable Development Goals or SDGs, fintech(s) and social contribution, fintech(s) and social accomplishment, fintech(s) and sustainability.

Besides the keywords, the eligibility criteria included language (English), manuscript type, and open access. The initial keyword search was applied to Scopus, Web of Science, and Lens. Then, the duplicates in each database were deleted using a unique DOI number. Next, all items were merged into one database, and the process of deleting duplicates was repeated. Besides a DOI number and open access, exclusion criteria included articles with the same title and incomplete articles (the lack of title, DOI, or abstract). At the following stage, the database was filtered to search for studies related to sustainable development goals or SDGs. In this search, the abstract notes were analysed. The authors assessed the results independently to avoid biases. They decided if the paper was adequate, not adequate or required discussion. The final decision was made together. The content analysis was conducted using the accepted database.

The initial search results were downloaded and saved as a CSV file. Microsoft Excel was chosen for collecting CSV files and deleting duplication, in combination with Microsoft Access, which was used for data storage and meta-data analysis using pivot tables. All the papers filtered for analysis were combined in Adobe Reader Pro as one document. A Python code with the Fitz module was run to highlight the keywords within this aggregated document.

The data collection process (Stage 3) followed the assumptions agreed on at stages 1 and 2. The paper's third section describes the identified, removed, and screened records. This section also presents the data analysis (Stage 4), which includes the description of the search and selection (from the number of identified records to the number of studies included in the review using a flow diagram). The content analysis is presented in the fourth section. Coherently with the PRISMA methodology, this section includes a discussion followed by a conclusion.

Data collection and analysis

Following the systematic literature review strategy, the WoS, Scopus and Lens databases were analysed using keywords and inclusion criteria. The total number of manuscripts extracted using the fintech or fintechs and particular keywords published in English in open access was 5314, including 3831 records from Scopus, 218 from Web of Science and 1265 from Lens. Among them, 4636 were journal articles. All those records were uploaded as a .csv file. The detailed data for 2015-2023 are presented in Table 2. Before 2014, three papers were found using "fintech*" and "sustainability" as keywords, but they did not refer to sustainable development goals.

Table 2. The number of publications concerning FinTechs and particular keywords in selected databases

Database	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Search Criteria: fintech/s and social impact										
Scopus	0	0	0	2	3	20	31	51	42	149
Web of Science	0	0	0	0	0	1	1	1	0	3
Lens	0	0	1	1	3	4	9	8	12	38
Search Criteria: fintech/s and social development										
Scopus	1	0	1	2	6	8	33	61	48	160
Web of Science	0	0	0	0	1	1	2	1	0	5
Lens	0	0	2	1	7	7	4	6	8	35
Search Criteria: fintech/s and social development goals										
Scopus	0	0	0	0	0	0	1	0	1	2
Web of Science	0	0	0	0	0	0	0	0	0	0

Database	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Lens	0	0	0	0	0	0	0	0	0	0
Search Criteria: fintech/s and social development goals										
Scopus	0	0	0	2	15	29	91	220	163	520
Web of Science	0	0	0	0	0	2	3	6	6	17
Lens	0	0	1	0	5	11	20	30	30	97
Search Criteria: fintech/s and social contribution										
Scopus	0	0	0	0	0	1	1	2	0	4
Web of Science	0	0	0	0	0	0	0	0	0	0
Lens	0	0	0	0	0	0	0	0	0	0
Search Criteria: fintech/s and social accomplishment(s)										
Scopus	0	0	0	0	0	0	0	0	0	0
Web of Science	0	0	0	0	0	0	0	0	0	0
Lens	0	0	0	0	0	0	0	1	0	1
Search Criteria: fintech/s and sustainability										
Scopus	0	2	4	24	82	221	487	1106	862	2788
Web of Science	0	0	2	6	18	28	37	55	40	186
Lens	1	2	11	13	46	76	134	189	159	631
Sum:	2	4	22	51	186	409	854	1737	1371	4636

The number of publications has been significantly growing during the last five years. It increased from 186 in 2019 to 1737 in 2022 and 1371 in 2023 (as of August 2023). Most of them can be retrieved from the Scopus database (see Figures 1 and 2).

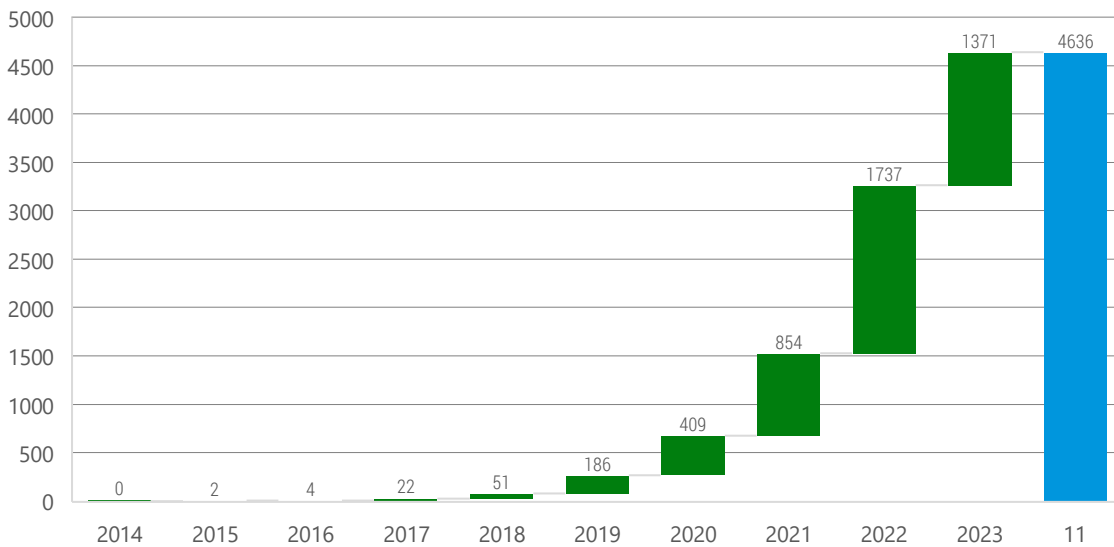


Figure 1. Cumulative increase of articles in all databases

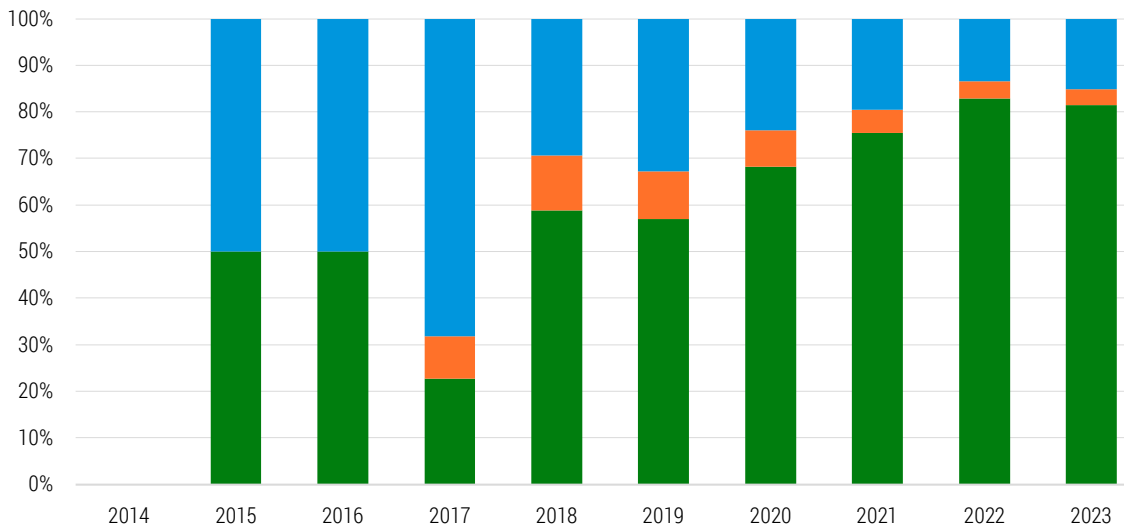


Figure 2. The structure of journal articles available in selected databases

The total number of positions left after removing duplicates using a unique DOI number, papers with no open access, the same title and authors' names, and blanks (the lack of the title, DOI, or abstract) was 3246.

One hundred forty-five papers were left to be assessed as adequate or inadequate by authors. They were uploaded as .pdf files and analysed. At this stage, numerous articles were excluded due to the following facts:

- providing general or indirect reference without studying or referring to sustainable development goals (SDGs) specifically, e.g. there was only one mention of FinTech on how to enhance SDGs in the introduction (reason 1),
- FinTech as a keyword was not included in the paper but in one of the authors' bios (notes) or only in the bibliography (reason 2),
- containing just one paragraph pointing to an article on Fintech and SDGs in an editorial article (reason 3),
- language – if the abstract included the keywords but the main paper was not in English, e.g., Indonesian (reason 4),
- paid server or broken server links to the article or paper are available but in a different language, e.g., Ukrainian sites (reason 5).

Finally, the content analysis covered 50 studies. Figure 3 summarises the studies' identification via databases.

Next, the key features of selected studies, such as subject, object, spatial (geographical) scope, key target of paper's contribution and type, were analysed following the systematic literature review strategy. The synthetic characteristics of the reviewed articles are presented in Table 3.

Table 3. The synthetic characteristics of papers included in the review

Research characteristics	2018	2019	2020	2021	2022	2023	Sum
Subject*							
Financing sustainable development	1				1		2
FinTechs and green technology		1		1			2
Digital financial inclusion		2	1	4	7	4	18
FinTechs' landscape and frameworks			1	2		2	5
FinTechs' financial situation (revenues, dividends, statements, disclosure)			1		1		2

Research characteristics	2018	2019	2020	2021	2022	2023	Sum
Financial technology application and development			1	2	4	3	10
FinTechs' market behaviour				1	1		2
Blockchain			1		2		3
Supply chain finance				1			1
Zakat, Sharia			1	1	2	1	5
Object*							
Sustainable development and growth	1	1	3	6	6	4	21
SDGs' achievement (in general)		1	3	3	6	3	16
Transforming agribusiness		1				1	2
Managing transformations in the financial system				1	1		2
Energy efficiency				1	1	1	3
Selected SDGs				1	4	1	6
Spatial (geographical) scope							
Selected emerging countries (as an example)		1	1				2
Selected developed countries (as an example)						1	1
Selected Asia countries		1		4	2	3	10
Selected Islamic countries			1	1			2
Selected European countries				1	1		2
Selected African countries				1		1	2
Selected American countries						1	1
E7 countries				1			1
Not specified	1	1	4	4	15	4	29
The key target of the papers' contribution							
Polymakers	1	3	5	4	7	5	25
Stakeholders			1	1	1		3
Business				2	3		5
Practitioners and researchers				2	1	1	4
General				3	6	4	13
Type							
Qualitative (Conceptual)			1	2	2	1	6
Qualitative	1	3	5	5	9	6	29
Quantitative				1	5		6
Mixed				4	2	3	9
Number of publications	1	3	6	12	18	10	50

* As defined in the search strategy, the subject refers to FinTechs and technologies they use, while the object relates to sustainable development goals and SDGs.

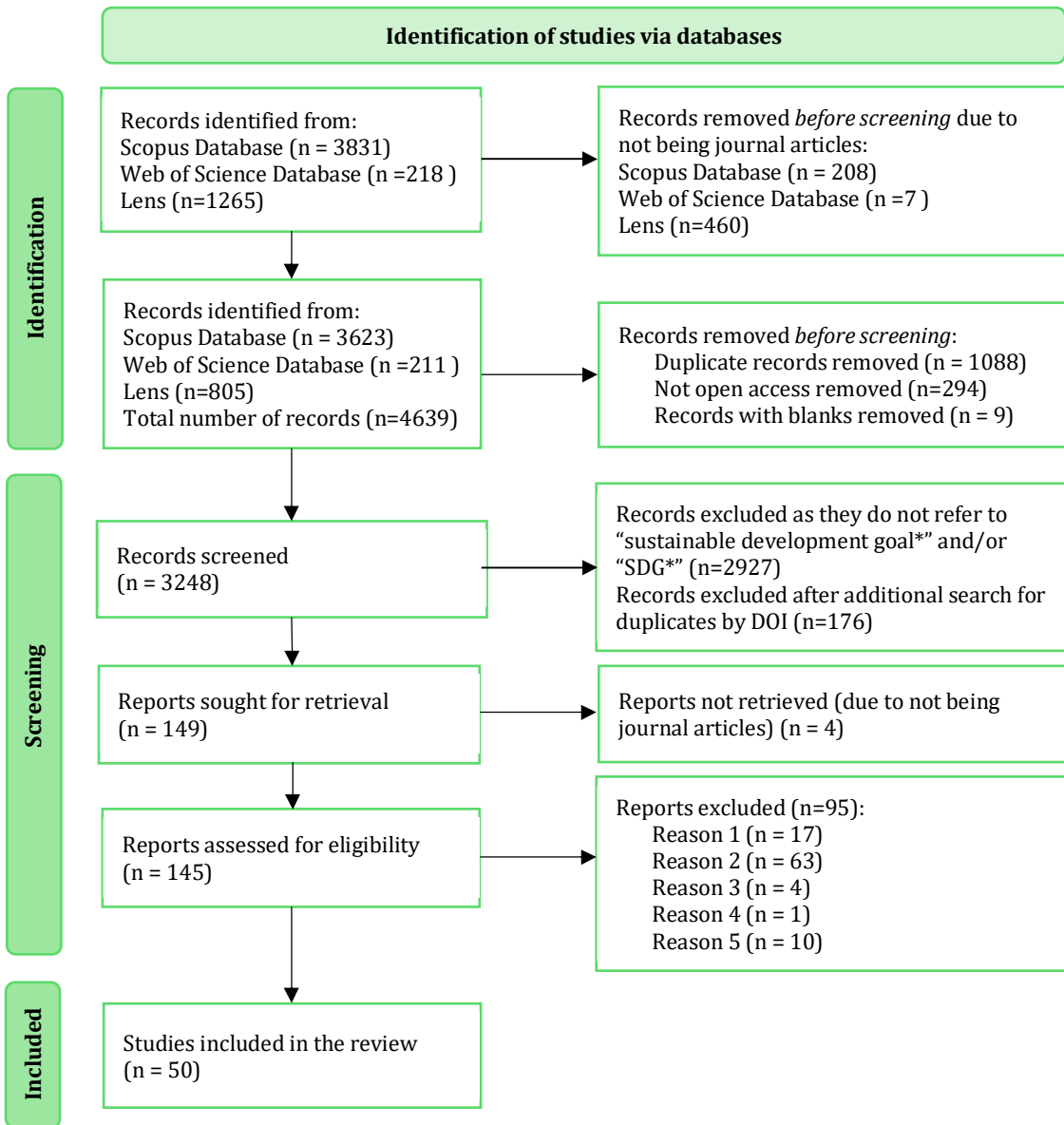


Figure 3. Identification of studies for content analysis

Results and discussion

The data analysis proved the increasing interest in the FinTech phenomenon and its social impact. Still, the share of papers focusing on social impact reflected in the achievement of SDG goals remains low. Among 3248 papers extracted from the databases, only 50 analysed different perspectives of this relationship. Considering the importance of SDGs' achievement for economies and societies, social impact seems not to be reflected satisfactorily in research on FinTechs' impact (Q1). However, it must also be stressed that during the last five years, the number of studies has been growing dynamically (Q2).

The selected articles refer to different subjects and regions. They address different targets and apply various methodologies (Q3).

The analysis of the papers' subjects, defined as FinTechs and financial technology, shows the dispersion of scientific interests. The first article included in the review was published in 2018 and refers to financing sustainable development. It critically analyses literature from across a spectrum of research topics to explore the inhibiting barriers and apparent disconnect between the purported

available (or required) finance and the actual finance invested in sustainable development. It concludes with the recommendation to undertake more coordinated efforts to encourage investments in long-term and sustainable landscape-scale initiatives (Clark et al., 2018). Most of the papers (36%) refer to digital technologies, which were mainly discussed in relation to digital financial inclusion (Thathsarani et al., 2021; Gigaur, 2022). As a research subject, this topic was primarily analysed from the perspective of financial inclusion's impact on different aspects of sustainable development (Ferrata, 2019; Le et al., 2019; Stamegna & Karakas, 2019; Arner et al., 2020; Gálvez-Sánchez et al., 2021; Glavina et al., 2021; Samsø Fibæk et al., 2021; Thathsarani et al., 2021; Alshater et al., 2022; Gigaur, 2022; Liu et al., 2022; Lopukhin et al., 2022; Mhlanga, 2022; Mufaidah, 2022; Pandey et al., 2022; Tay et al., 2022; Baker, 2023; Chu et al., 2023; Murshed et al., 2023; Rafiuddin et al., 2023; Syamsu et al., 2023). Another explored research field is surveying the relationship between FinTechs, financial technology and Islamic finance (Alfiani & Akbar, 2020; Glavina et al., 2021; Alshater et al., 2022; Mufaidah, 2022; Trimulato, 2022; Trimulato et al., 2022; Harahap et al., 2023; Ozili, 2023). Other topics range from the FinTech landscape and conceptual framework to specific accomplishments of FinTech projects. The environmental factors were examined by conducting a PEST analysis (Pauliukevičienė & Stankevičienė, 2021; Richard et al., 2021) in connection with the achievement of selected SDGs (Pauliukevičienė & Stankevičienė, 2021). Bittini et al. (2022) mapped Spanish FinTechs from the perspective of their activity, dividing them into FinTechs, InsurTechs and PropTechs and then analysing whether their business models are related to the existence of sustainability plans. Some studies focused on FinTech's role in the ecosystem (Hinson et al., 2019). Others examined FinTechs' website disclosures (Franco-Riquelme & Rubalcaba, 2021; Susilowati et al., 2022). Additionally, FinTechs were mentioned together with traditional market players analysing sustainable development plans and goals (Gupta & Soni, 2021; Kokoreva, 2022).

The research, which analyses particular countries, refers mainly to Asia. Among the Asian countries analysed in the sample papers were China (Stamegna & Karakas, 2019; Appiah-Otoo & Song, 2021), Indonesia and Malesia (Susilowati et al., 2022), India (Prakash & Sethi, 2020), and Bangladesh (Zheng et al., 2021). Financial inclusion in selected Asian countries was analysed by Le et al. (2019), Murshed et al. (2023) and Thathsarani et al. (2021). In Europe, Pauliukevičienė and Stankevičienė (2021) analysed fifteen countries from four different regions, while Bittini et al. (2022) focused on Spain. The study on financial inclusion in Africa presented some countries as examples (Baker, 2023). Others referred to some regions in general.

The main contribution of the papers is to address policymakers to make necessary changes to the financial system, e.g., infrastructure or regulations, to aid in achieving SDGs. Some of the articles target managers on how fintech can help their organisations. Most authors agree on FinTechs' enormous potential to support sustainable development and growth and achieve sustainable development goals. Thirty-six articles include such a general conclusion. Similarly to Clark et al. (2018), most of the papers analysed addressed the need to coordinate different fragmented activities, develop systemic solutions for FinTechs' development, create a regulatory framework, improve access to finance (Mahesh et al., 2023), and inclusive business (Hinson et al., 2019). Liu et al. (2022) recommend that policymakers develop viable energy systems with friendly policies to grant green finance. Razletovska (2020) tried to identify trends and promising areas of international coordination of FinTech development that may help achieve SDGs. Others focused on formulating a policy to increase compliance with the corporate governance code for FinTech companies (Susilowati et al., 2022) or creating decision-making (Gupta & Soni, 2021) or regulatory framework (Cao & Nguyen, 2023; Zhou et al., 2023).

More than half of the research was qualitative. Conceptual papers discussed the concept of financial inclusion (Gigaur, 2022; Baker, 2023), an overview of how the state can apply distributed ledger technology (DLT) and blockchain technology in public administration (Glavanits, 2020) or science (Dziatkovskii et al., 2022), and FinTechs' awareness regarding SDGs (Franco-Riquelme & Rubalcaba, 2021) and corporate governance disclosures (Susilowati, et al., 2022). The quantitative analysis concerned the inequality reduction in countries with strong and weak laws (Úbeda et al., 2022), financial inclusion (Stamegna & Karakas, 2019; Samsø Fibæk et al., 2021), and the relationship between digital finance and CO2 emissions (Qin et al., 2022).

Considering the research object related to the sustainable development goals (SDGs), it must be stressed that only a few papers directly refer to the relationship between FinTechs and sustainable

development reflected in particular SDGs' achievement (Q4). This relationship is rather generally discussed. The following SDGs refer to the relationship between FinTechs and their particular SDGs' achievement in the reviewed articles:

- SDG 1: No poverty (Le et al., 2019; Appiah-Otoo & Song, 2021; Glavina et al., 2021; Pauliukevičienė & Stankevičienė, 2021; Ali et al., 2022; Mufaidah, 2022; Tay et al., 2022; Trimulato et al., 2022; Rafiuddin et al., 2023),
- SDG 2: Zero hunger (Trimulato, 2022; Trimulato et al., 2022),
- SDG 3: Good health and well-being (Pauliukevičienė & Stankevičienė, 2021; Dziatkovskii et al., 2022; Jiang et al., 2022),
- SDG 4: Quality education/Digital skills (Pauliukevičienė & Stankevičienė, 2021; Dziatkovskii et al., 2022; Gigaur, 2022; Tay et al., 2022),
- SDG 7: Affordable and clean energy (Stamegna & Karakas, 2019; Ali et al., 2022; Jiang et al., 2022; Baker, 2023),
- SDG 8: Decent work and economic growth/Sustainable economic growth (Ali et al., 2022; Dziatkovskii et al., 2022; Trimulato et al., 2022),
- SDG 10: Reduced inequalities (Le et al., 2019; Glavina et al., 2021; Ali et al., 2022; Úbeda et al., 2022),
- SDG 11: Sustainable cities and communities (Pauliukevičienė & Stankevičienė, 2021; Dziatkovskii et al., 2022),
- SDG 12: Responsible consumption and production (Hinson et al., 2019; Dziatkovskii et al., 2022),
- SDG 16: Peace, justice and strong institutions (Gupta & Soni, 2021; Pauliukevičienė & Stankevičienė, 2021; Susilowati et al., 2022),
- SDG 17: Partnership for the goals (Alfiani & Akbar, 2020; Gálvez-Sánchez et al., 2021; Pauliukevičienė & Stankevičienė, 2021).

Alfiani and Akbar (2020) stress the importance of stakeholders' collaboration to achieve synergy in achieving SDG 17. This research was conducted from the perspective of Zakat's role in supporting sustainable development goals. The importance of strengthening the global partnership for sustainable development (SDG 17) was also pointed out in the context of financial inclusion (Gálvez-Sánchez et al., 2021). Analysing the blockchain potential, it was stated that the new era of finance is aligned with SDGs 3, 4, 8, 11 and 12 (Dziatkovskii et al. 2022). The authors emphasised the government's responsibility to strengthen institutional quality and mitigate income inequality through all available means (alternative to redistributive taxation) as an input to SDG 10 (Úbeda et al., 2022). Others focused on FinTechs' management and the information they disclosed (Susilowati et al., 2022). They conclude that FinTech companies must enhance their accountability by communicating corporate governance information on their websites. According to them, increased compliance with the corporate governance code will assist in achieving SDG 16. Baker (2023) analyses the discursive efforts for the realisation of SDG 7 through an evolving set of socio-technical and financial relationships. It seems that FinTechs can also contribute to the gender employment gap and position held by women in senior management (SDG 5), increasing industry innovations, especially by funding research and development (SDG 9). Besides poverty reduction, the above SDGs have not been analysed in more than four papers.

The systematic literature review has gained increasing scientific interest worldwide in surveying FinTechs and their contribution to achieving SDGs. This trend has been observed mostly in Asia and Islamic countries. There are only a few studies referring to other continents. Thus, there is a need to explore other areas and develop cross-country analysis. Such a conclusion aligns with other authors' recommendations (e.g. Appiah-Otoo & Song, 2021; Richard et al., 2021; Bittini et al., 2022).

Conclusions

There is no doubt that FinTechs have already changed financial systems worldwide. Their development has impacted societies and economies, forcing traditional market players to adapt their offerings, strategies, and business models. Today, the vast majority of authors notice their huge potential as sustainability enablers. This study contributes to improving the understanding of the FinTech phenomenon in three ways.

First, the results shed light on existing academic literature embracing both FinTech and SDGs issues, explored emerging trends in current research, and identified the main areas for further investigation. It maps the evolution of the literature on FinTech, pointing out the low share of studies focusing on FinTechs and their social impact reflected in SDGs (Q1). Only 1,5% of the screened records (50 out of 3248 papers) refer to this subject. It supports the claim that it is a relatively new research field requiring further exploration. Even if the last five years show an increase in scientific interest (Q2), the number and the scope of those studies still cannot constitute a realm of research that creates solid, relevant academic knowledge. It proves the necessity to conduct further conceptual research to propose the foundations for the commonly accepted research framework in this area.

Second, the analysis includes the research scope (Q3). It showed that articles devoted to mapping the literature on FinTechs are relatively scarce, and none of such reviews refer to the SDGs' achievement. Most reviewed studies refer to digital inclusion (18 out of 50 papers) and financial technology applications, including blockchain (13 papers). The remaining scientific research and interests can be considered quite scattered. They include Islamic finance (5 papers) and financing sustainable development (2 papers), FinTechs and green technology (2 papers), FinTechs' financial performance and disclosures (2 papers), and FinTechs' market behaviour (2 papers). The research, which analyses particular countries, refers mainly to Asia. Individual analysis of selected countries, although valuable, cannot be considered representative of a particular region even if they presented some cross-country comparisons; the research sample covered only selected countries. Therefore, analysing the relationship between FinTechs' market activities and SDGs' achievement requires further in-depth research on all continents. Similarly, the articles referred only to selected SDGs in general (Q4). Only a few cases mentioned particular targets. More than half of the research was qualitative.

Third, the study surveyed papers' contributions. They mainly addressed policymakers to make necessary changes to the financial system, e.g., infrastructure or regulations, to aid in achieving SDGs and stressed FinTechs' huge potential to support sustainable development and growth and achieve sustainable development goals. Only a few articles target managers on how fintech can help their organisations. The results show the general consensus that revealing FinTechs' potential and using it to support SDGs will change the business landscape. Thus, further exploring and surveying this potential will be an up-to-date and valuable research field.

Inevitably, this work has some limitations resulting from the research design and methodology, including the databases, inclusion and exclusion criteria as well as timeline selection, which may have narrowed the research sample. The exploratory nature of this research is also acknowledged, with subjectivity in the content analysis of the surveyed sample. Still, it sheds light on important and mostly non-addressed scientific fields. Future studies can be undertaken in this area by comparing and validating the results presented here, especially with expanded search criteria, databases and other analysis techniques, as well as developing the scope of the research conducted so far.

Acknowledgements

The paper presents the scientific results of a project conducted in the framework of an International Researchers' Sabbatical at Trier University of Applied Sciences. This was financed by the joint federal-state-Länder program FH-Personal.

The contribution of the authors

Conceptualisation, M.K., M.V. and H.R.S.; literature review, M.K. and H.R.S.; methodology, M.K.; formal analysis, M.K. and H.R.S.; writing, M.K., M.V. and H.R.S.; conclusions and discussion, M.K., M.V. and H.R.S.

The authors have read and agreed to the published version of the manuscript.

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ROLA FINTECHÓW W OSIĄGANIU CELÓW ZRÓWNOWAŻONEGO ROZWOJU – SYSTEMOWY PRZEGLĄD BADAŃ NAUKOWYCH

STRESZCZENIE: Artykuł ma na celu dokonanie przeglądu badań naukowych dotyczących FinTechów prowadzonych z perspektywy ich wpływu na zrównoważony rozwój krajów odzwierciedlony w celach SDG. W systemowym przeglądzie literatury (SLR) zastosowano metodologię PRISMA. Przeprowadzona analiza potwierdziła, że na świecie systematycznie rośnie zainteresowanie badaniem wkładu FinTechów w realizację celów zrównoważonego rozwoju. Tendencji tej nie zaobserwowano dotychczas w Europie. Tylko kilka artykułów odnosi się bezpośrednio do związku pomiędzy działaniami firm sektora FinTechs na rynku europejskim, a realizacją celów SDGs. Większość badań dotyczących tych zagadnień ma charakter jakościowy. Ich tematyka obejmuje zarówno ramy koncepcyjne badań, jak i omówienia konkretnych projektów realizowanych przez FinTechy i podejmowanych zazwyczaj przez rządy. Odnoszą się one głównie do ograniczania ubóstwa poprzez włączenie finansowe. Wyniki systemowego przeglądu badań naukowych rzuciły zawierającą rzetelną analizę literatury przedmiotu w badanym zakresie, omawiając trendy pojawiające się w bieżących badaniach oraz identyfikując główne obszary dalszych badań.

SŁOWA KLUCZOWE: FinTechy, technologia finansowa, cele zrównoważonego rozwoju, systemowy przegląd literatury (SLR), metodologia PRISMA