



MONIKA KLIMONTOWICZ

University of Economics in Katowice,
Poland

ORCID iD: 0000-0001-9215-1938

BANKS' INNOVABILITY: ANALYSING THE IMPACT OF INNOVATIVE CAPACITY ON ESG PERFORMANCE

ABSTRACT

Purpose: *The purpose of this paper is to explore the relationship between banks' innovative capacity and their sustainability performance, which is referred to in this research as ESG performance.*

Methodology: *The relationship between banks' innovative capacity and ESG performance was analysed using partial least squares path modelling (PLS-PM). The bank's innovative capacity is an independent latent variable in this research. The variables contributing to innovative capacity are those observed and measured using a questionnaire. The bank's ESG performance is a dependent variable measured by the ESG indexes available at Refinitiv Eikon and Sustainalytics databases.*

Findings: *The paper presents the results of exploratory research on banks' innovability, defined as the ability to use innovative capacity to gain a competitive advantage through sustainable practices carried out among banks operating in Poland. The analysed constructs – banks' innovative capacity and banks' ESG performance – were defined based on the in-depth literature review. Bank innovative capacity was defined as the ability to create, adapt, and implement innovations resulting from the bank's organisational culture, relationships with customers, and organisational characteristics and helping to achieve the bank's strategic goals. Banks' ESG performance is reflected in their environmental, social, and governance practices, measured by SDG indexes. The results showed a correlation between ESG performance and variables contributing to research constructs, such as bank size, market position, centralisation, formalisation, and managing customer knowledge.*

Implications for theory and practice: *The paper contributes to the global research focusing on the relationships between innovativeness and the implementation of ESG strategies. It develops theory and research in organisational innovation and ESG practices. The research findings have important practical implications, proving that banks can use their innovative capacity to improve ESG performance. Additionally, the results develop the methodology for applying ESG indices to measure the banks' ESG performance in reference to innovative capacity and innovativeness.*

Originality and value: *To the best of the Author's knowledge, this is the first attempt to use the model approach to empirically analyse the relationships between the two constructs—banks' innovative capacity and ESG performance.*

KEYWORDS: *Banks' innovability, bank's innovative capacity, ESG performance, ESG index, sustainability, PLS-PM*

INTRODUCTION

Dynamic environmental changes have led to the need to change banks' market behaviour and performance paradigms. The ability to innovate has become a significant factor in creating value. Due to their innovative capacity, banks can adapt flexibly to external factors. It is also necessary to design and adapt innovative products, services, technologies, and organisational solutions. Such capacity establishes the foundation for competitiveness and results in banks' performance. However, the capacity to innovate is no longer enough. Today, banks should feel the responsibility to address the significant challenges facing humanity. Thus, maintaining a satisfactory bank's market and financial performance should also consider the bank's environmental, social and governance (ESG) performance. The importance of ESG in banks' activities and processes is supported by European Union regulations. Their implementation caused an increase in scientific and practical interest in banks' sustainability practices. As a result, the links between innovations and sustainability strengthened, and a new term, innovability, has appeared. The review of research on the convergence of innovation and sustainability pointed out that it is *no longer possible to think about innovation without that action being sustainable*. As a result, innovability becomes a determinant of strategic competitive advantage (De la Vega Hernández & Barcellos de Paula, 2021). Consequently, in this paper, bank innovability is defined as the ability to use the innovative capacity to gain a competitive advantage through sustainable practices. Such practices are reflected in ESG behaviour. Research on the relationship between innovative capacity and sustainability reflected in ESG behaviour is a new field in banking. Studies conducted in Europe, Asia, and emerging markets provide some evidence that innovative banks are more likely to integrate ESG objectives into their business models and to improve their ESG disclosures and financial performance (Forcadell et al., 2019; Buallay, 2019; Di Simine et al., 2022; Galeone, Ranaldo & Fusco, 2024; Gonzalees-Ruiz et al., 2024; Salem, Shahimi & Alma'amin, 2024; Pyka, Karkowska & Nocoń, 2025). However, they rarely refer to banks' innovative capacity. Thus, answering whether banks' innovative capacity can impact banks' ESG performance

appears to be timely and crucial, reflecting a broader global research stream focused on sustainable transformation in the financial system.

Most research on innovative capacity refers to the industry sector. The majority of studies analysing entities operating in the banking market focused on innovations which result from innovative capacities, such as electronic distribution channels or product innovations (Akhisar et al. 2015; Mullan et al. 2017, Priya et al. 2018; Salampasis & Mention 2018) and their relationship with profitability (Magallón González, Galeana Figueroa & Prado-Roman, 2022) or performance (Uzkurt et al., 2013). Only a few analyse or refer to the bank's innovative capacity (Dobni, 2008; Klimontowicz, 2019). Innovative capacity is defined as the ability to create, adapt, and implement innovations to achieve the bank's strategic goals and performance. Concurrently, the majority of the studies on ESG have focused their attention on the relationship between different ESG factors and financial performance or risks (Hussain et al. 2018; Di Simone, Petracci & Piva, 2022; Nocoń, 2024; Pyka, Karkowska & Nocoń, 2025), sometimes finding positive (for example, Wagner 2010; Cavaco & Crifo 2014; Mishra 2015; Yu & Zhao 2015; Buallay, 2018; Okafor et al. 2021; Klimontowicz, Losa-Jończyk & Zacny, 2021; Alamsyah & Muljo, 2023) or negative relationships (Pyka, Karkowska & Nocoń, 2025). Most of those studies conclude that incorporating ESG issues into banks' operating and strategic activity enhances their financial performance and the capacity to manage disruptions within the financial system (Shakil et al., 2019; Galletta & Mazzù, 2023; Ling & Zhang, 2023). Bank ESG performance can be defined as the result of a bank's environmental, social and governance behaviour disclosed in the sustainability report. The bibliometric analysis regarding the convergence of innovation and sustainability, referred to as innovability, did not extract any studies referring to banking and finance (De la Vega Hernández & Barcellos de Paula, 2021; Salem, Shahimi & Alma'amin, 2024). To the author's knowledge, no research has explored bank innovative capacity as a determinant of ESG performance. This means that the presented study is original and responds to this gap. The purpose of this paper is to explore the relationship between banks' innovative capacity and their sustainability performance, which is referred to in this research as ESG performance.

The partial least squares path modelling (PLS-PM) was applied to explore this relationship. The analysis of scientific literature and research held so far on bank innovative capacity and innovativeness served as a basis for designing the tool (questionnaire) to measure the observed variables contributing to the dimensions of innovative capacity, which is an independent latent variable in this research. The data for this part of the research was based on empirical research conducted among managers and experts of commercial banks in the turn of 2018 and 2019. The ESG performance (a dependent variable) has been measured based on ESG indices from the Refinitiv Eikon database and Sustainalytics.

The paper presents the results of the exploratory research carried out among banks operating in Poland. It contributes to global research trends focused on the relationship between innovativeness and the implementation of ESG strategies. It develops the organisational innovativeness theory, contributing to resource-based and market-based theories of competitive advantage and studies on ESG behaviour and disclosures. The research findings have important practical implications as they may help banks use their innovative capacity to improve ESG performance. Additionally, the results develop the methodology for applying ESG indices to measure the banks' ESG performance in reference to innovative capacity and innovativeness.

The paper is structured as follows: the first section includes the literature review on banks' innovative capacity and ESG performance and defines research constructs. The second section describes the research design and provides research hypotheses, methodology, sample characteristics, and variable descriptions. The third section presents the results and a discussion. The paper concludes with a summary of the research findings and their implications.

1. BANKS' INNOVATIVE CAPACITY AND ESG PERFORMANCE – LITERATURE REVIEW

A. *BANKS' INNOVATIVE CAPACITY*

For decades, banks' competitiveness and performance development have been strictly connected with technological advancement and innovativeness. Today, innovativeness is perceived as one of the key competencies that

determine a company's competitive position in the market and its value increase. Innovativeness, as a term, incorporates many dimensions. It refers to companies (organisational innovativeness) or customers (customer innovativeness) and focuses on their features and traits (innovative capacity), which enable them to act innovatively. Innovative capacity reflects a potential and does not equal innovativeness, as this potential may or may not be used. When a bank decides to use it to implement innovations, the innovative capacity is converted into innovativeness.

Innovative capacity is a multi-contextual, broadly defined concept. It combines internal aspects of companies' activities and characteristics with the ability to identify (anticipate) environmental changes. The review of studies referring to banks' innovative capacity leads to the conclusion that innovative capacity results from structural features that characterise an organisation, such as centralisation, formalisation, specialisation, size, and slack resources (Subramanian & Nilakanta, 1996; Liu et al., 2018) contributing to the organisational culture, as well as the ability to manage customer knowledge (Terziovski, 2010; Taherparvar, Esmaeilpour & Dostar, 2013). Those factors align with resource-based theory (RBV), which focuses on internal companies' features that contribute to competitive advantage and performance.

The innovative organisational culture is one of the crucial organisational competencies enabling the creation of competitive advantage (Malisić et al., 2025; Nkgowe, Qu, & Odai, 2025), employee engagement and performance (Nwankwo, Kanyangale & Eze, 2022). Most research referring to this dimension of innovative capacity analyses centralisation, formalisation, specialisation, and strategic focus on innovation. Some of them stress the necessity to cooperate with other entities. Centralisation refers to the hierarchisation level and the employees' engagement in the decision-making process (Sciulli, 1998; Subramanian & Nilakanta, 1996; Liu et al., 2018) while formalisation refers to competencies and responsibility for the performance of specific tasks and includes the formal descriptions of duties, responsibilities, employees' management policies and procedures (Sciulli, 1998; Subramanian & Nilakanta, 1996; Liu et al., 2018). In turn, specialisation determines whether highly specialised employees are in the organisation's structures (Subramanian & Nilakanta, 1996). There is a predominant belief that decentralised and informal organisational structures

foster innovation. The flexibility and openness of these types of organisations are believed to enhance innovativeness by encouraging novel ideas. Conversely, the concentration of power in centralised organisations is considered to be an impediment to the adoption of innovations (Subramanian & Nilakanta, 1996; Liu et al., 2018). A high degree of specialisation among individuals has been evidenced as a facilitator of innovation. A greater variety of specialists engenders a more extensive knowledge base, thereby increasing the exchange of new ideas (Subramanian & Nilakanta, 1996; Liu et al., 2018). A strategic focus on innovation equals an organisational culture that engages employees in achieving objectives related to designing and implementing innovations and encourages them to develop creativity and improvisation (Liu et al., 2018; Klimontowicz, 2019). Good governance, characterised by board independence, diversity, and transparency, strengthens the positive relationship between ESG activities and financial performance (Salem, Shahimi & Alma'amin, 2024). Today, creating banks' competitiveness in the banking market is strictly connected with the ability to cooperate with other banks and selected competitors, such as financial technology providers (FinTechs). Including such a variable to access innovative organisational culture aligns with Chesbrough's concept that promotes the idea of collaboration with third parties (Chesbrough, 2003). Undoubtedly, such coopetition may be one of the most important determinants of a bank's innovativeness (Forcadell, Aracil & Ubeda, 2019; Klimontowicz, 2019; Malisić et al., 2025). Taking into account previous research findings suggesting that banks' innovativeness enhances corporate sustainability (Forcadell, Aracil & Ubeda, 2019) and underlying the influence of organisational culture on implementation of ESG-related practises (Claudio & Gallo, 2025; Vapa Tankosić, 2025), the first hypothesis was formulated as follows:

H1: *Banks' organisational culture positively influences banks' ESG performance.*

Knowledge and new technologies play an important and constantly growing role, supporting the continuous learning process among employees and collaborators from the market environment. The significance of customer knowledge as an external source of innovativeness is highlighted by academics and scientists due to the strong customer position in the marketplace, their increased activity, worldwide information, and experience sharing. Many studies have shown the relationship between customer knowledge

management, innovativeness and performance. Customer knowledge management (KNM) encompasses managing knowledge about customers, knowledge from customers, and knowledge for customers (Garcia-Murillo & Annabi, 2002; Gebert et al., 2003; Taherparvar, Esmaeilpour & Dostar, 2013). The knowledge about customers includes the history of cooperation with the bank and transactions, knowledge of purchasing habits, motivations, and other information that helps better understand their needs (Smith & McKeen, 2005). The knowledge from customers relates to product, competition, and market evaluation and helps in better understanding the bank's competitive environment (Garcia-Murillo & Annabi, 2002). It can be used as an inspiration to improve existing innovations and achieve a satisfactory position in the market, thanks to the appropriate modification of existing products or the introduction of new ones (Bielińska-Dusza & Hamerska, 2020). Nowadays, technology is broadly applied to collect and analyse customer knowledge (Tao et al., 2022; Galeone, Ranaldo & Fusco, 2024). On the other hand, knowledge for customers helps them to understand financial products and services. It addresses clients' knowledge needs. Providing knowledge to clients influences the perception of service quality (Gebert et al., 2003). This kind of knowledge also includes access to all information on product features, fees, charges, and other conditions that may cause some risks for customers in the future and is aimed at helping them make better financial decisions (Lopez-Nicolas & Molina-Castillo, 2008). The up-to-date study surveying banks in Thailand proved the direct influence of knowledge management on banks' performance (Chotivanich & Phorncharoen, 2023). In addition, some studies report the relationship between. Therefore, the second hypothesis was formulated as follows:

H2: Banks' customer knowledge management has an impact on banks' ESG performance.

Considering banks' role in the economy and the nature of their operations, which can support sustainable lending and investment decisions, it is necessary to define innovative capacity, including drivers of their activities (Krisciukaityte, Balezentis & Streimikiene, 2023). Many studies suggest that there is a need to explore more factors that may impact this relationship (Salem, Shahimi, & Alma'amin, 2024). That is why assessing the impact of their innovative capacity on performance requires including other competitive advantage

factors, such as the bank's size, the time it has operated in the banking market, its strategic market position, and the funds available for technology development, referred to as slack resources (Klimontowicz, 2019). A comprehensive understanding of the banking sector requires incorporating these factors into the evaluation of a bank's innovative capacity and performance, which aligns with market-based valuation (MBV). There is some evidence that size determines ESG practices, as large banks tend to invest more in ESG initiatives (Bhaskaran et al., 2023; Salem, Shahimi & Alma'amin, 2024; Njuguna, Mwangi, & Waweru, 2025), while the impact of other factors is ambiguous. Some authors found a link between the market value and returns (Azmi et al., 2022; Ersoy et al., 2022; El Khoury et al., 2023) or market performance (Buallay, 2020). The inconsistency of the studies' results (Salem, Shahimi & Alma'amin, 2024) led to the last hypothesis:

H3: *There is a relationship between banks' characteristics and banks' ESG performance.*

The analysis of the different factors that impact innovative capacity led to the conclusion that they can be divided into three dimensions: organisational culture focused on innovation, the banks' customer knowledge management and the bank's characteristics. Banks' sustainability and ESG performance

2. BANKS' SUSTAINABILITY AND ESG PERFORMANCE

Since the mid-2010s, sustainability has been an overarching goal of global and local organisations, together with governing bodies. Banks have long been concerned with sustainability in a mostly fragmented fashion (KPMG, 2021). However, as they remain the significant market players whose strategic and operating activities, including providing funds for enterprises and individuals, impact economies and societies, their contribution to sustainability is systematically growing (Carnevale & Drago, 2024). As a result, their role in supporting other entities in achieving ESG goals is not just significant but crucial.

Banks' role in this field has been recognised relatively recently. Integrating ESG activities into core business has become a critical driver in changing the paradigm of their banks' operating activity, which includes the shift from purely profit-driven business models and strategies (Hayretci & Aydemir, 2021) to sustainability. This shift not only impacts risk management and long-term

sustainability (Tashtamirov, 2023) but also creates new opportunities (Weber & Feltmate, 2016). Gonzalez-Ruiz, Ospina Patiño, and Marín-Rodríguez (2024) revealed two scientific trends. The research, which refers to the first trend, analyses the influence of corporate social responsibility, financial performance and ESG issues in banks. The surveys coherently conclude that banks take ESG issues more seriously in both their core business and loan offers. The studies related to the second trend explore the results of different aspects of ESG implementation in the banking industry in terms of its financial performance, management, and risk. Salem, Shahimi & Alma'amin (2024) performed a detailed review of studies conducted in the second trend.

As listed companies, banks follow the government requirements, guidelines and regulations to implement ESG practices. In 2020, the European Central Bank recommended integrating climate-related and environmental risks into banks' risk management frameworks. It was followed by the Task Force on Climate-related Financial Disclosures (TCFD) and strengthened after the European Green Deal adoption (Gonzalez-Ruiz, Ospina Patiño & Marín-Rodríguez, 2024). Today, banks are obligated to present to stakeholders what actions are being taken in this field, as well as how and when they will change their policies and offerings (Mehdiabadi et al., 2020). Such information is usually presented in nonfinancial reports, which are commonly thought to be the primary communication tool used in building relationships with different stakeholders (Tewari & Dave, 2012; Waslander, Bos & Wu, 2021; Klimontowicz et al., 2019).

Banks usually apply non-financial reporting standards in preparing sustainability reports, such as the Global Reporting Initiative guidelines (GRI) and ISO norms related to organisations' social responsibility (Klimontowicz et al., 2021). The GRI guidelines propose a framework for designing a reporting system and preparing a report based on specified rules referring to quantified and comparable measures. Similarly, some ISO norms support the preparation of non-financial reports. For example, CSR (ISO 26000) refers to the social responsibility of organisations, ISO 14000 for pro-environmental activities, ISO 14067 and the SA8000 standard to the carbon footprint. Among others are the OECD and industry guidelines.

The European Union's initiatives in this field resulted in implementing Directive 2014/95/EU describing the harmonisation approaches (EU, 2014;

Venturelli et al., 2020). Detailed rules and standards for collecting and processing information are not laid down in the Directive. As a result, some authors stated that its effects were insignificant (Waller & Lanis, 2009; Szabo & Sørensen, 2015; Ho, 2017; Matuszczak & Różańska, 2021). In 2019, the European Parliament and the European Council implemented the new EU regulation on environmental, social, and governance (ESG)-related disclosures in the financial services sector (the SFDR – Sustainable Finance Disclosure Regulation), which came into force in March 2021 (EU, 2019; Klimontowicz et al., 2021). The SFDR and the EU Taxonomy aimed to make financial market participants, including banks, consider the sustainability and ESG factors in their core processes, such as credit and investment decisions, and disclose information concerning that in their reports. Banks are also obliged to present information on their websites about how to incorporate ESG risks and their *principal adverse impacts* in investment decision-making, as well as the due diligence to understand those risks. The SFDR implementation caused the necessity to collect and manage data, incorporate ESG goals into market strategy, credit policy, and risk management and monitor their achievement. Additionally, ESG factors should be considered as benchmark clients' ESG performance (Klimontowicz et al., 2019). In 2023, the Corporate Sustainability Reporting Directive (CSRD) came into force, replacing the Non-Financial Reporting Directive (NFRD). It is thought to be a driver for broadening the spectrum of sustainability reporting and integrating ESG into banks' fundamental business strategies. The bank's environmental, social, and governance behaviours are reflected in its sustainability performance, also referred to as ESG performance. Consequently, bank ESG performance can be defined as the result of a bank's environmental, social and governance behaviour disclosed in the sustainability report.

The interest in surveying ESG practices in the banking sector has evolved during the last two decades. Initially, researchers took a broad perspective to analyse the banks' pioneering ESG practices, focusing primarily on ethics. The systemic literature review conducted by Galletta et al. (2022) showed that, till 2021, banks first focus on CSR until the reach of the ESG issues. In the early stage of banks' ESG awareness, there are relatively few publications due to the lack of regulatory pressure and market focus on profitability (Gonzalez-Ruiz, Ospina Patiño & Marín-Rodríguez, 2024). Most further research focusing on

banks' performance treats ESG behaviour as a bank's financial performance driver. They usually refer to Return on Assets (ROA) and Return on Equity (ROE). They show mixed findings (Gonzalez-Ruiz, Ospina Patiño & Marín-Rodríguez, 2024). El Khoury, Nasrallah and Alareeni (2023) state that while overall ESG scores may not directly impact the ROA, some dimensions can negatively affect market performance based on Tobin's Q ratio. Similarly, Buallay (2018) deduced that ESG issues positively and significantly affect the ROA. Some studies suggest a positive correlation between the overall ESG score and the ROE (Alamsyah & Muljo, 2023). However, other studies showed a limited connection between ESG scores and the bank performance measured by ROE and ROA (Mohamed Buallay et al., 2023). Most of those studies conclude that banks demonstrating substantial ESG issues enhance their financial performance and the capacity to withstand and mitigate the effects of financial disruptions within the financial system (Shakil et al., 2019; Galletta & Mazzù, 2023; Ling & Zhang, 2023). The disclosure of ESG practices and related indicators is commonly applied to the analyses. Those indicators have not been standardised yet and may vary between countries. As a result, sustainability indexes are commonly used because they cover all or selected areas of the sustainability factors and reflect the ESG practices disclosed in banks' reports (Krisciukaityte, Balezentis & Streimikiene, 2023).

2. RESEARCH DESIGN

A. *RESEARCH SCOPE, OBJECTIVES, HYPOTHESES AND DIMENSIONS*

In order to fill the research gap, the paper aims to explore the relationship between banks' innovative capacity and their sustainability performance, referred to as ESG performance. The scope of the research is as follows:

- Subject: Bank innovability, defined as the ability to use the innovative capacity (understood as the ability to create, adapt, and implement innovations resulting from the bank's organisational culture, relationships with customers, and organisational characteristics) to gain a competitive advantage through sustainable practices.

- Object: An analysis of the relationship between the bank's innovative capacity and the bank's ESG performance.
- Spatial (geographical) scope: Poland
- Timed: 2019-2023.

The paper aims to prepare the foundation for analysing correlations between multidimensional conceptual categories (constructs), bank innovative capacity and bank ESG performance by answering the following research questions:

Q1: What is the relationship between banks' organisational culture and banks' ESG performance?

Q2: What is the relationship between banks' customer knowledge management and banks' ESG performance?

Q3: What is the relationship between banks' characteristics and banks' ESG performance?

Based on the literature review, this research defined the bank's innovative capacity as the ability to create, adapt, and implement innovations resulting from the bank's organisational culture, relationship with customers, and organisational characteristics and helping to achieve the bank's strategic goals. The dimensions of a bank's innovative capacity include organisational culture, the ability to manage customer knowledge, and the bank's structural characteristics. The scope of variables contributing to those dimensions and the scale applied to assess them were prepared based on the research conducted in the service sector, including banking (Subramanian & Nilakanta, 1996; Wang & Ahmed, 2004; Dobni, 2008; Liu et al., 2018; Anning-Dorson, 2018). The bank's innovative capacity is an independent latent variable in this research. The variables contributing to innovative capacity are observed variables measured using a questionnaire Table 1).

The bank's ESG performance (BESG) was assessed using the ESG indexes available in the Refinitiv Eikon and Sustainalytics databases. The sustainability indexes are commonly used in the research referring to banks' ESG performance (Buallay, 2019; Buallay et al. 2020; Bhaskaran et al., 2023; Iannuzzi et al., 2023). The Refinitiv Eikon database is an extensive and comprehensive database of its kind, covering ten categories contributing to the ESG pillars. In order to objectify the assessment of each ESG issue's importance and ensure

its impartiality and credibility, the original LSEG ESG magnitude matrix is used at the level of each category. As a result, the values are automatically and constantly updated as companies' ESG disclosures evolve (Refinitive, 2022). Additionally, the Sustainalytics ESG scores were used. This rating refers to listed companies' ESG-driven risks and opportunities. The ESG Risk Ratings measure the degree to which a company's economic value is at risk driven by ESG factors or, more technically speaking, the magnitude of a company's unmanaged ESG risks (Sustainalytics, 2021). The bank's ESG performance is a dependent variable.

Table 1. *The dimensions (constructs) of bank innovative capacity*

Dimension		Variables		Source
Bank Organisational Culture	BOC	Decisions' centralisation	BOK_1	Subramanian & Nilakanta, 1996; Nobel & Birkinshaw, 1998; Dobni, 2008; Liu et al., 2018
		Formalisation of processes and decisions	BOK_2	
		Employees' specialisation	BOK_3	
		An organisational culture focused on innovations.	BOK_4	
		The ability to cooperate with banking competitors	BOK_5	
		The ability to cooperate with non-banking competitors, e.g. FinTechs	BOK_6	
Bank Customers' Knowledge Management	BCKM	Managing knowledge about customers	BCKM_1	Dobni, 2008; Taherparvar, et al., 2013; De Smet, Mention, & Torkkeli, 2013
		Gathering and managing knowledge from customers	BCKM_2	
		Delivering knowledge for customers	BCKM_3	
Bank Characteristics	BC	Size	BC_1	Subramanian & Nilakanta, 1996; Nobel & Birkinshaw, 1998; Liu et al., 2018
		The time of operating activity in the banking market	BC_2	
		Strategic market position	BC_3	
		IT and products development budget	BC_4	

Source: Own elaboration.

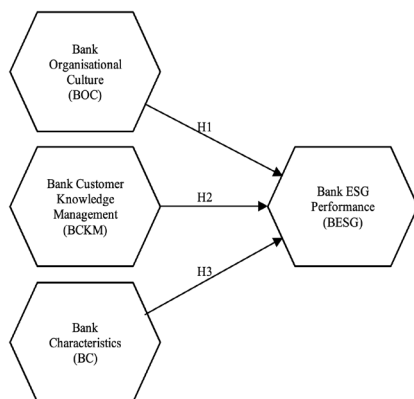
The main research hypothesis (H) states that there is a relationship between banks' innovative capacity and banks' ESG performance. The decomposition of this hypothesis resulted in assuming three specific hypotheses reflecting research questions (Figure 1):

H1:Banks' organisational culture (BOC) positively influences banks' ESG performance (BESG).

H2:Banks' customer knowledge management (BCKM) has an impact on banks' ESG performance (BESG).

H3:There is a relationship between banks' characteristics (BC) and bank's ESG performance (BESG).

Figure 1. *The theoretical model of the relationship between banks' innovative capacity dimensions and banks' ESG performance*



Source: Own elaboration.

B. RESEARCH METHODS

The research scope, purposes, and hypotheses influenced the applied research approach and methods. Similar to other research providing multi-dimensional analysis (for example, Klimontowicz et al., 2021), this research used different multidisciplinary research methods, such as inductive and deductive conclusions, comparative analysis, and selected statistical methods, enabling hypothesis falsification.

Based on organisational innovativeness theory and resource-based theory, it was assumed that banks possessing innovative capacity have specific features that distinguish them from other, noninnovative banks; having innovative capacity can be converted into innovativeness, which is beneficial and desirable from the perspective of building the bank's competitiveness and performance; introducing innovations is a response to changes taking place in the environment, especially in customers' behaviour and expectations. Based on the market-based theory, it was assumed that banks' competitiveness and performance might result from their market position and the history of their operating activity. The research design included five stages

The first stage aimed to analyse the existing research on bank innovative capacity, innovativeness, competitive performance, sustainability, and related

terms to determine the degree of research novelty and relevance to the banking sector. This stage resulted in the research assumption, including the research scope, objectives, hypotheses, dimensions and variables, as well as the project of the measurement tool. To prevent bias in the research, the sample included all commercial banks operating in the Polish banking market, which makes it representative; anonymity and confidentiality were ensured; the questionnaire included clear and concise instructions with an explanation of how the applied scales should be interpreted; the 7-point scales were balanced with an equal number of positive and negative options; the questionnaire was consulted with experts surveying innovativeness and competitiveness in the banking market and piloted in the second stage.

The empirical survey was conducted in the third stage. The quantitative data for assessing the bank's innovative capacity was gathered during empirical research conducted at the turn of 2018 and 2019. The survey was conducted among commercial banks operating in Poland, defined as entities established as joint-stock companies. Similarly to other research on organisational innovative capacity and innovativeness, taking into account the multi-dimensional character of the research issue, it was assumed that the sample should include individuals who can assess the banks' innovative capacity by their experience, knowledge, competencies and information (Choi & Eboch, 1998; Ngo et al., 2024). That is why the research sample consisted of management board members and managers responsible for strategic fields and key departments. First, all 61 commercial banks operating in the Polish banking market were invited to take part in the research. The questionnaires were sent by the Polish Banks Association (PBA) to achieve a satisfactory response rate. The digital version of the questionnaire was prepared using the SurveyMonkey software. To increase the response rate of the survey, questionnaires were also distributed during the meetings of the PBA committees and councils. A sampling procedure used in research in the banking market was applied (Salampagis & Mention 2018). Finally, 26% of banks constituting the general sample fulfilled the questionnaire. They represent 77% of the Polish banking sector, taking into account assets. Altogether, 71 managers responded to the questionnaire.

The data on banks' ESG indexes were retrieved from Refinitiv Eikon and Sustainalytics. The ESG score available at Refinitiv Eikon takes into account

data disclosure in verifiable financial and non-financial reports to measure the company's ESG performance. The detailed scores are aggregated into environmental, social, and corporate governance pillar scores by summing up the category weights. The weights for the environmental and social categories differ in specific industries. The pillar weights are presented as percentages and range between 0 and 100. The ESG views show the scores letter grades to show at a glance how companies are performing relative to their peers and where a company's ESG weaknesses and strengths lie (Refinitive, 2022).

The Sustainalytics indexes present another perspective. The ESG Risk Rating takes into account both a quantitative score reflecting areas of unmanaged ESG risk and risk categories. A lower quantitative score of unmanaged risk means a lower level of ESG risk. Quantitative results are the basis for classifying a company into one of the risk categories – negligible, low, medium, high, or severe. These categories reflect the degree of unmanaged ESG risk compared to all sub-industries covered. The ESG Risk Ratings take into account exposure, which demonstrates the extent to which a company is exposed to material ESG risks at the overall and the individual level, and management, which reflects how well a company is managing its exposure (Sustainalytics, 2021).

This stage was followed by data analysis and discussion (Stage 4). The partial least squares SEM (PLS-SEM, also called PLS path modelling) was used to explain the effects of bank organisational culture (BOC), bank customer knowledge management (BCKM), and bank characteristics (BC) on ESG performance (BESG). Several indicators were used to measure each construct. The statements representing those indicators were assessed using a 7-point scale, where one meant totally disagree and seven meant completely agree. ESG has only a single indicator. Following Hair et al. (2021) the specification and estimation of the PLS-SEM proceed in three steps. First, the measurement model was specified. It describes the relationships between the latent variables and their measures (i.e., their indicators). This step was followed by the structural model specification. This model explains the relationships between the latent variables. In the third step, the model was estimated, bootstrapped, and summarised. The PLS-SEM algorithm's iterative procedures serve to estimate all partial regression models. Primarily, the construct scores are estimated. Then, the final estimates of the indicator loadings, the structural model's path coefficients and the resulting R^2

values of the endogenous latent variables are calculated. PLS-SEM is the preferred approach in such exploratory research, as it offers greater flexibility and adaptability to less stringent data conditions. Careful consideration was given to the quality, in terms of both reliability and validity, of reflective measurement models estimated by PLS-SEM. This model's reliability assessment included evaluating measures on an indicator level (indicator reliability) and a construct level (internal consistency reliability). Validity assessment took into account each measure's convergent validity and used the average variance extracted (AVE). All calculations were conducted using the *SEMinR* library in R (Hair et al., 2021).

The last research stage included results interpretation, conclusion, and implications.

3. RESULTS AND DISCUSSION

The bank's innovative capacity was assessed using 13 variables that contribute to the bank's organisational culture (BOC), bank customer knowledge management (BCKM), and bank characteristics (BC). For ESG performance, which was measured by the score retrieved from the Refinitive Eikon database, the number of variables constituting the constructs in the measurement model was reduced so that the constructs show convergence and relevance. All indicator loadings of the reflectively measured constructs bank organisational culture (BOC), bank customer knowledge management (BCKM), and bank characteristics (BC) are well above the threshold value of 0.708 (Hair et al., 2021), which suggests sufficient levels of indicator reliability. Table 2 presents the internal consistency reliability values in a matrix format. The values show the reliability of all three constructs' measures and their internal consistency. It should be noted that *BESG_Ref*'s internal consistency reliability values cannot be interpreted as perfect reliability due to a single item measuring it, which makes its internal consistency reliability equal to 1.

Measurement and structural models are presented in Figure 2. The BC and BOC constructs are negatively related to ESG, and BCKM is positively related to ESG (a significance level of 0.1). The choice of $p < 0.1$ reduces the risk of a type II error, which corresponds to failing to reject a true alternative

hypothesis. This is particularly important in a situation where the sample size is small, and there is a risk that the conventional $p < 0.05$ threshold may be too conservative, leading to the failure to detect significant effects.

Table 2. *Constructs reliability and convergent validity – model using Refinitiv Eikon data*

	alpha Cronbach	rhoC	AVE	rhoA
BOC	0.662	0.815	0.689	0.616
BCKM	0.646	0.788	0.650	0.632
BC	0.599	0.799	0.666	0.554
BESG_REF	1.000	1.000	1.000	1.000

Source: Own elaboration.

The negative impact of the constructs results from the negative correlation between some indicators within BC and ESG and BOC and ESG statements (Tables 3-5). Those indicators that significantly correlate with ESG were included in the model.

Table 3. *The correlation matrix between bank organisational culture (BOC) indicators and ESG performance measured by Refinitiv scores*

	BOC_2	BOC_3	BOC_4	BOC_5	BOC_6	Refinitiv
BOC_1	0,391*	0,184	0,362*	0,031	0,343	-0,701***
BOC_2		0,174	0,183	-0,198	0,030	-0,477**
BOC_3			0,073	0,174	0,111	-0,064
BOC_4				-0,067	0,323	-0,353
BOC_5					0,291	0,351
BOC_6						-0,007

Significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.1$

Source: Own elaboration.

Table 4. *The correlation matrix between bank customer knowledge management (BCKM) indicators and ESG performance measured by Refinitiv scores*

	BCKM_2	BCKM_3	Refinitiv
BCKM_1	0,375*	0,136	0,340*
BCKM_2		0,301	-0,172
BCKM_3			-0,194

Significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.1$

Source: Own elaboration.

Variables in the measurement model were left such that the constructs show convergence and relevance (Table 6).

Table 6. *Constructs reliability and convergent validity – model using Sustainalytics data*

	alpha Cronbach	rhoC	AVE	rhoA
BOC	0.662	0.809	0.682	0.687
BCKM	0.646	0.795	0.666	0.767
BC	0.599	0.789	0.655	0.591
BESG_REF	1.000	1.000	1.000	1.000

Source: Own elaboration.

Statistically, the BCKM has a significantly negative impact on ESG performance measured by Sustainalytics scores, so the higher the BCKM rating, the lower the risk. Based on the f^2 effect size of the predictor constructs, BCKM has a large effect size of 0.635 on ESG performance. The impact of the remaining dimensions is statistically insignificant (BOC has a small effect on ESG (0.020), BC—medium effect (0.333). Tables 7-9 present the correlation matrix between indicators and ESG performance measured using these scores. The model's explanatory power, i.e., the R^2 value of ESG (0.559), can be considered moderate (Figure 3).

Table 7. *The correlation matrix between bank organisational culture (BOC) indicators and ESG performance measured by Sustainalytics scores*

	BOC_2	BOC_3	BOC_4	BOC_5	BOC_6	Sustainalytics
BOC_1	0,391*	0,184	0,362*	0,031	0,343	-0,701***
BOC_2		0,174	0,183	-0,198	0,030	-0,477**
BOC_3			0,073	0,174	0,111	-0,064
BOC_4				-0,067	0,323	-0,353
BOC_5					0,291	0,351
BOC_6						-0,007

Significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.1$

Source: Own elaboration.

Table 8. *The correlation matrix between bank customer knowledge management (BCKM)) indicators and ESG performance measured by Sustainalytics scores*

	BCKM_2	BCKM_3	Sustainalytics
BCKM_1	0,375*	0,136	0,340*
BCKM_2		0,301	-0,172
BCKM_3			-0,194

Significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.1$

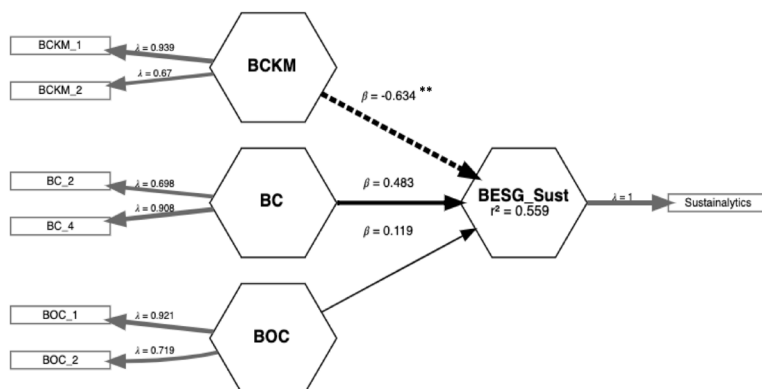
Source: Own elaboration.

Table 9. *The correlation matrix between bank organisational culture (BOC) indicators and ESG performance measured by Sustainalytics scores*

	BO_2	BC_3	BC_4	Sustainalytics
BC_1	0,626***	-0,168	-0,009	-0,162
BC_2		-0,046	0,333*	-0,489**
BC_3			0,115	0,055
BC_4				-0,431*

Significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.1$

Source: Own elaboration.

Figure 3. *ESG Performance explaining model (based on Sustainalytics)*

Source: Own elaboration.

The results confirm the relationship between banks' organisational culture and ESG performance when measured using non-financial disclosures used

by Refinitive (Q1). This is in line with the previous studies analysing the relationship between innovative organisational culture and market performance (Uzkurt, 2013). However, due to a different measuring philosophy, this relationship is not confirmed directly when the Sustainalytics index is applied. Similar results refer to bank characteristics (Q3). The first model does not show a statistically significant impact of bank customer knowledge management on ESG performance (Q2). Interestingly, such a relationship was confirmed in the second model.

In both models, only two variables contribute to bank organisational culture: decision centralisation and the formalisation of processes and decisions. This can explain why bank's organisational culture negatively influences a bank's ESG performance (H1). Those features are perceived as barriers to innovation, creativity, and flexibility—the higher the level of centralisation and formalisation, the lower the openness to new ideas and solutions. The result of previous research showed that the bank's innovative capacity is negatively affected by centralisation and formalisation (Subramanian & Nilakanta, 1996; Tidd, Bessant & Pavit, 2005, s. 71; Wang, 2008; Liu et al., 2018; Anning-Dorson, 2018; Klimontowicz, 2019, pp. 147-148).

Based on non-financial report disclosures taken into account by Refinitive Eikon, the result does not confirm that bank customer knowledge management has a direct impact on bank ESG performance (H2). In the case of this model, two variables contribute to this construct: managing knowledge about customers and delivering knowledge to customers. However, this relationship is confirmed when ESG risk is discussed (in the model using Sustainalytics scores), where managing knowledge about customers and gathering and managing knowledge from customers contribute to this construct. The indirect impact of innovative capacity and knowledge management on banks' performance was proved in further research (for example, by Chotivanich & Phorncharoen, 2023). The newest literature reviews stress the role of internal dynamics related to innovative organisational culture and the complex nature of its relationship with innovations. The results state that adapting practices that link organisational culture with outcomes is imperative in achieving innovations (Malisić et al., 2025).

Both models confirm the relationship between a bank's size and market position (which contribute to its characteristics) and its ESG performance (H3).

The results show that other variables contribute to the bank's innovative capacity when the model refers to competitive performance and others when it refers to ESG performance. In the case of competitive performance, among all variables describing the bank's innovative capacity, only the formalisation and centralisation of processes and decisions were eliminated due to the lack of significant dependencies or very weak dependencies (Klimontowicz, 2019).

Even if both models analysed in this paper are not comparable due to different methodologies applied for measuring ESG performance, the results are quite promising. Developing the survey by, for example, expanding the research sample may change the significance of the construct impact. Additionally, the R^2 level shows that it may be valuable to develop a list of latent variables contributing to model constructs. The main contribution of this exploratory research is pointing out the areas that negatively impact the ESG performance of banks operating in the Polish banking market.

CONCLUSION

The results of exploratory research on bank innovability, defined as the ability to use the innovative capacity to gain a competitive advantage through sustainable practices, present evidence of the relationship between banks' innovative capacity and ESG performance.

The research contributes to organisational innovation theory and research-based market-based theories by defining the two fundamental constructs, *bank innovative capacity* and *bank ESG performance*, and their operationalisation. A bank's innovative capacity is defined as the ability to create, adapt, and implement innovations resulting from the bank's organisational culture, relationships with customers, and organisational characteristics, while bank ESG performance as the result of a bank's environmental, social and governance behaviour disclosed in the sustainability report.

The results proved the correlation between bank ESG performance and some variables contributing to research constructs such as bank size, market position, centralisation, formalisation, and managing customer knowledge. In both models, only two variables contribute to bank organisational culture:

decision centralisation and the formalisation of processes and decisions, which negatively impact bank organisational culture on a bank's ESG. The findings regarding bank customer knowledge management are mixed. Based on non-financial report disclosures taken into account by Refinitive Eikon, the result does not confirm its direct impact on bank ESG performance. However, this relationship is confirmed in the model using Sustainalytics scores. Two variables contribute to this construct: managing knowledge about customers and delivering knowledge to customers. Both models confirm the relationship between a bank's size and market position (which contribute to its characteristics) and its ESG performance (H3).

The literature on ESG practices mostly analyses their influence on market and financial performance. Similarly, research on innovative capacity explores its influence on innovativeness and performance. This is the first attempt to match the most critical issues influencing banking markets in the contemporary economy – innovativeness and sustainability.

Although the results are interesting and promising, the study's exploratory character causes some limitations that must be discussed. Due to the exploratory character of this research, its framework and methodology should be further developed. The results show that other variables contribute to the constructs of bank innovative capacity when it is analysed in relation to financial performance and when ESG performance is surveyed. As a result, the list of those variables should be critically reviewed to merge innovativeness with sustainability. Additionally, the impact of the ESG index selection on the research results should be explored as different methodologies are applied. Some shortcomings result from using scales to measure innovative capacity. Even if it is a commonly applied practice, it still involves risks due to the subjectivity of individual assessments. Another implication for further research relates to banks' performance. Most research uses financial ratios, like ROA and ROE, to measure bank performance. It seems that today, such an attitude can not be satisfactory. As a result, a scientific discussion on defining and measuring bank performance is needed. One of the research questions which must be addressed here is whether ESG performance should be treated as a determinant of financial performance or as a dimension of a bank's overall performance, which includes financial, market, and sustainable performance.

Another one refers to the selection of financial indices. As a result, further research on larger samples exploring the complexity of interrelations between different variables is needed.

The research findings also have practical implications. They prove that banks can use their innovative capacity to improve ESG performance and point out the factors that positively and negatively influence ESG performance.

REFERENCES

- Akhisar, I., Tunay, K. B., & Tunay, N. (2015). The effects of innovations on bank performance: The case of electronic banking services. *Procedia – Social and Behavioral Sciences*, Vol. 195, s. 369-375.
- KPMG (2021). ESG risks in banks. KPMG International. Publication number: 137347-G. Available at: <https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2021/05/esg-risks-in-banks.pdf>
- Alamsyah, S. A. L., & Muljo, H. H. (2023). *The Effect of ESG Dimensions on Banking Performance: An Empirical Investigation in Asia Pacific*. In E3S Web of Conferences (Vol. 426, p. 02053). EDP Sciences. <https://doi.org/10.1051/e3sconf/202342602053>
- Anning-Dorson, T. (2018). Innovation and competitive advantage creation: The role of organisational leadership in service firms from emerging markets. *International Marketing Review*, 35(4), 580-600. <https://doi.org/10.1108/IMR-11-2015-0262>
- Azmi, W., Hassan, M. K., Houston, R., & Karim, M. S. (2021). ESG activities and banking performance: International evidence from emerging economies. *Journal of International Financial Markets, Institutions and Money*, 70, 101277. <https://doi.org/10.1016/j.intfin.2020.101277>
- Bhaskaran, R. K., Sujit, K. S., & Mongia, S. (2023). Linkage between performance and sustainability initiatives in banking sector – An empirical examination. *International Journal of Productivity and Performance Management*. 72 (1), 200-225. <https://doi.org/10.1108/IJPPM-07-2020-0385>
- Bielińska-Dusza, E. & Hamerska, M. (2020). Innovative activity of Polish enterprises – a strategic aspect. The similarity of NACE divisions. *Journal of Entrepreneurship, Management And Innovation*, 17 (2), 53-98. <https://doi.org/10.7341/20211723>
- Buallay, A. (2019). Is sustainability reporting (ESG) associated with performance? Evidence from the European banking sector. *Management of Environmental Quality: An International Journal*, 30(1), 98-115. <https://doi.org/10.1108/MEQ-12-2017-0149>
- Buallay, A., Fadel, S. M., Alajmi, J., & Saudagaran, S. (2020). Sustainability reporting and bank performance after financial crisis: Evidence from developed and developing countries. *Competitiveness Review: An International Business Journal*, 31(4), 747-770. <https://doi.org/10.1108/CR-04-2019-0040>
- Carnevale, C., & Drago, D. (2024). Do banks price ESG risks? A critical review of empirical research. *Research in International Business and Finance*, 102227. <https://doi.org/10.1016/j.ribaf.2024.102227>
- Cavaco, S. & Crifo, P. (2014). CSR and financial performance: Complementarity between Environmental, Social and Business Behaviours. *Applied Economics*, 46, 3323-3338. <https://doi.org/10.1080/00036846.2014.927572>
- Chesbrough, H. (2003). *Open Innovation: The New Imperative for Creating and Profiting From Technology*. Harvard Business School Publishing, Cambridge, MA.
- Choi, T. Y., & Eboch, K. (1998). The TQM paradox: relations among TQM practices, plant performance, and customer satisfaction. *Journal of Operations Management*, 17(1), 59-75. [https://doi.org/10.1016/S0272-6963\(98\)00031-X](https://doi.org/10.1016/S0272-6963(98)00031-X)

- Chotivanich, P., & Phorncharoen, I. (2023). The mediator role of knowledge management and innovative capability affecting firm performance among commercial banks in Thailand. *Asian Economic and Financial Review*, 13(2), 148. <https://doi.org/10.55493/5002.v13i2.4718>
- Claudio, L., & Gallo, S. (2025). An empirical analysis of how national culture influences banks' sustainability via ESG criteria. *Culture and Organization*, 31(5), 375-400. <https://doi.org/10.1080/14759551.2024.2443422>
- Danneels, E., & Kleinschmidt, E. J. (2001). Product innovativeness from the firm's perspective: Its dimensions and their relation with project selection and performance. *Journal of Product Innovation Management: An International Publication of the Product Development & Management Association*, 18(6), 357-373. <https://doi.org/10.1111/1540-5885.1860357>
- De Smet, D., Mention, A. L., & Torkkeli, M. (2013). Innovation-related knowledge from customers for new financial services: A conceptual framework. *Journal of Innovation Management*, 1(2), 67-85. https://doi.org/10.24840/2183-0606_001.002_0006
- De la Vega Hernández, I., & Barcellos de Paula, L. (2021). Scientific mapping on the convergence of innovation and sustainability (innovability): 1990–2018. *Kybernetes*, 50(10), 2917-2942. <https://doi.org/10.1108/K-05-2020-0328>
- Di Simone, L., Petracci, B., & Piva, M. (2022) Economic Sustainability, Innovation, and the ESG Factors: An Empirical Investigation. *Sustainability*, 14, 2270. <https://doi.org/10.3390/su14042270>
- Dobni, C.B. (2008), Measuring innovation culture in an organization: The development of generalized innovation culture construct using exploratory factor analysis, *European Journal of Innovation Management*, Vol. 11, No. 4, p. 539–559. <https://doi.org/10.1108/14601060810911156>
- El Khoury, R., Nasrallah, N., & Alareeni, B. (2023). ESG and financial performance of banks in the MENAT region: concavity–convexity patterns. *Journal of Sustainable Finance & Investment*, 13(1), 406-430. <https://doi.org/10.1080/20430795.2021.1929807>
- EU, (2014) Directive 2014/56/EU of the European Parliament and of the Council of April 16 2014 Amending Directive 2006/43/EC on Statutory Audits of Annual Accounts and Consolidated Accounts. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0056>
- EU, (2019). Disclosures in the Financial Services Sector. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32019R2088>
- El Khoury, R., Nasrallah, N., & Alareeni, B. (2023). ESG and financial performance of banks in the MENAT region: concavity–convexity patterns. *Journal of Sustainable Finance & Investment*, 13(1), 406-430. <https://doi.org/10.1080/20430795.2021.1929807>
- Ersoy, E., Swiecka, B., Grima, S., Özen, E., & Romanova, I. (2022). The impact of ESG scores on bank market value? Evidence from the US banking industry. *Sustainability*, 14(15), 9527. <https://doi.org/10.3390/su14159527>

- Forcadell, F. J., Aracil, E., & Úbeda, F. (2019). The influence of innovation on corporate sustainability in the international banking industry. *Sustainability*, 11(11), 3210. <https://doi.org/10.3390/su11113210>
- Galeone, G., Ranaldo, S., & Fusco, A. (2024). ESG and FinTech: Are they connected?. *Research in International Business and Finance*, 69, 102225. <https://doi.org/10.1016/j.ribaf.2024.102225>
- Galletta, S., & Mazzù, S. (2023). ESG controversies and bank risk-taking. *Business Strategy and the Environment*, 32(1), 274-288. <https://doi.org/10.1002/bse.3129>
- Galletta, S., Mazzù, S., & Naciti, V. (2022). A bibliometric analysis of ESG performance in the banking industry: From the current status to future directions. *Research in International Business and Finance*, 62, 101684. <https://doi.org/10.1016/j.ribaf.2022.101684>
- Garcia-Murillo M., & Annabi H. (2005). Customer knowledge management, *Journal of the Operational Research Society*, 53 (8), 875-884.
- Gebert, H., Gelb, M., Kolbe, L. & Brenner W. (2003). Knowledge-enabled customer relationship management integrating customer relationship management and knowledge management concepts, *Journal of Knowledge Management*, 7 (5), 107-123. <https://doi.org/10.1108/13673270310505421>
- Gonzalez-Ruiz, J. D., Ospina Patiño, C., & Marín-Rodríguez, N. J. (2024). The influence of environmental, social, and governance issues in the banking industry. *Administrative Sciences*, 14(7), 156. <https://doi.org/10.3390/admsci14070156>
- Hair, Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modelling (PLS-SEM) using R: A workbook*. Springer Nature. Available at: <https://link.springer.com/book/10.1007/978-3-030-80519-7>
- Hayretci, H. E., & Aydemir, F. B. (2021). *A multi-case study on legacy system migration in the banking industry*. In *International Conference on Advanced Information Systems Engineering* (pp. 536-550). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-79382-1_32
- Hilmi, M. F., Ramayah, T., Mustapha, Y., & Pawanchik, S. (2010). Product and process innovativeness: Evidence from Malaysian SMEs. *European Journal of Social Science*, 16(4), 556-565. Available at: https://www.academia.edu/524436/Product_and_Process_Innovativeness_Evidence_from_Malaysian_SMEs
- Ho, V. H. (2017). Comply or explain and the future of non-financial reporting. *Lewis & Clark L. Rev.*, 21, 317. Available at: <https://heinonline.org/HOL/LandingPage?handle=hein.journals/lewclr21&div=16&id=&page=>
- Hussain, N., Rigoni, U., & Cavezzali, E. (2018). Does it Pay to be Sustainable? Looking inside the Black Box of the Relationship between Sustainability Performance and Financial Performance. *Corporate Social Responsibility and Environmental Management*, 25 (6), 1198-1211. <https://doi.org/10.1002/csr.1631>
- Iannuzzi, A. P., Dell'Atti, S., D'Apolito, E., & Galletta, S. (2023). Nomination committee characteristics and exposure to environmental, social and governance

- (ESG) controversies: evidence from European global systemically important banks. *Corporate Governance: The International Journal of Business in Society*, 23(6), 1314-1338. <https://doi.org/10.1108/CG-03-2022-0119>
- Klimontowicz, M. (2019). *Innowacyjność banków komercyjnych w Polsce – ujęcie modelowe* (Innovativeness of commercial banks operating in Poland – the model approach). Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach., Katowice
- Klimontowicz, M., Losa-Jończyk, A., & Zacny B. (2021) Banks' Energy Behavior: Impacts of the Disparity in the Quality and Quantity of the Disclosures. *Energies* 2021, 14, 7325. <https://doi.org/10.3390/en14217325>
- KPMG, (2021). *ESG risks in banks. Effective strategies to use opportunities and mitigate risks*. KPMG International. Available at: <https://assets.kpmg.com/content/dam/kpmg/kw/pdf/insights/2021/05/ESG-risks-in-banks-kw.pdf>
- Krisciukaiyte, K., Balezentis, T., & Streimikiene, D. (2023). Linking financial performance and efficiency to sustainability in banking sector: a literature synthesis. *Journal of Business Economics and Management*, 24(3), 506–526. <https://doi.org/10.3846/jbem.2023.19462>
- Ling, A., Li, J., & Zhang, Y. (2023). Can firms with higher ESG ratings bear higher bank systemic tail risk spillover?—Evidence from Chinese A-share market. *Pacific-Basin Finance Journal*, 80, 102097. <https://doi.org/10.1016/j.pacfin.2023.102097>
- Liu, Y., Lv, D., Ying, Y., Arndt, F., & Wei, J. (2018), Improvisation for innovation: The contingent role of resource and structural factors in explaining innovation capability, *Technovation*, 74/75, 32-41. <https://doi.org/10.1016/j.technovation.2018.02.010>
- Lopez-Nicolas, C., & Molina-Castillo F.J. (2008), Customer knowledge management and e-commerce: The role of customer perceived risk, *International Journal of Information Management*, 28 (2), 102-113. <https://doi.org/10.1016/j.ijinfomgt.2007.09.001>
- Magallón González, H. B., Galeana Figueroa, E., & Prado-Roman, C. (2022). Banking innovations and their effect on profitability. *Mercados y negocios*, 23(47), 25-56. <https://doi.org/10.32870/myn.vi47.7680>
- Malisić, B., Tinaj, S., Popović, J., Lukovac, L., & Vlačić, B. (2025). Internal dynamics and innovation: A cross-disciplinary review and future research agenda. *Technology in Society*, 81, 102773. <https://doi.org/10.1016/j.techsoc.2024.102773>
- Matuszak, Ł., & Różańska, E. (2021). Towards 2014/95/EU directive compliance: the case of Poland. *Sustainability Accounting, Management and Policy Journal*, 12(5), 1052-1076. <https://doi.org/10.1108/SAMPJ-02-2020-0042>
- Mehdiabadi, A., Tabatabeinasab, M., Spulbar, C., Karbassi Yazdi, A., & Birau, R. (2020). Are we ready for the challenge of Banks 4.0? Designing a roadmap for banking systems in Industry 4.0. *International Journal of Financial Studies*, 8(2), 32. Available online at: <http://www.mdpi.com/journal/ijfs>
- Mishra, D. R. (2017). Post-innovation CSR performance and firm value. *Journal of Business Ethics*, 140, 285-306. <https://doi.org/10.1007/s10551-015-2676-3>
- Mohamed Buallay, A., Al Marri, M., Nasrallah, N., Hamdan, A., Barone, E., & Zureigat, Q. (2023). Sustainability reporting in banking and financial services sector: a regional

- analysis. *Journal of Sustainable Finance & Investment*, 13(1), 776-801. <https://doi.org/10.1080/20430795.2021.1978919>
- Mullan, J., Bradley, L., & Loane, S. (2017). Bank adoption of mobile banking: Stakeholder perspective, *International Journal of Bank Marketing*, Vol. 35, No. 7, s. 1154–1174. <https://doi.org/10.1108/IJBM-09-2015-0145>
- Ngo, N. D. K., Le, T. Q., Tansuchat, R., Nguyen-Mau, T., & Huynh, V. N. (2022). Evaluating innovation capability in banking under uncertainty. *IEEE Transactions on Engineering Management*, 71, 855-872. <https://doi.org/10.1109/TEM.2021.3135556>
- Nkgowe, S. T., Qu, L., & Odai, L. A. (2025). The interplay between digital organizational culture, ESG performance, and corporate reputation in shaping innovation capacity. *Business Process Management Journal*, 1-25. <https://doi.org/10.1108/BPMJ-01-2025-0040>
- Njuguna, I.M., Mwangi, L.W., & Waweru, F. (2025). The Moderating Effect of Size of the Bank on the Relationship Between Environmental, Social, and Governance (ESG) Practices and the Financial Performance of Listed Commercial Banks in Africa. *Journal of Finance and Accounting*. <https://doi.org/10.70619/vol5iss11pp36-53-706>
- Nwankwo, C. A., Kanyangale, M. I., & Eze, S. U. (2022). Organisational Structure as a Strategic Enabler of Commercial Bank Employees in Nigeria. *Academic Journal of Interdisciplinary Studies*, 11. <https://doi.org/10.36941/ajis-2022-0086>
- Nobel, R., & Birkinshaw, J. (1998). Innovation in multinational corporations: control and communication patterns in international R&D operations. *Strategic Management Journal*, 19(5), 479-496. [https://doi.org/10.1002/\(SICI\)1097-0266\(199805\)19:5%3C479::AID-SMJ954%3E3.0.CO;2-U](https://doi.org/10.1002/(SICI)1097-0266(199805)19:5%3C479::AID-SMJ954%3E3.0.CO;2-U)
- Nocoń, A. (2024). Climate risk in banks—the case of Polish banking sector. *Journal of Modern Science*, 56(2), 535-552. <https://doi.org/10.13166/jms/188730>
- Okafor, A., Adeleye, N. B., & Adusei, M. (2021). Corporate Social Responsibility and Financial Performance: Evidence from US Tech Firms. *Journal of Cleaner Production*, 292, 126078. <https://doi.org/10.1016/j.jclepro.2021.126078>
- Pichlak, M. (2012). Otwarte innowacje jako nowy paradygmat w zarządzaniu innowacjami. *Zeszyty Naukowe. Organizacja i Zarządzanie/Politechnika Śląska*, 281-292. Available at: <https://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-article-BSL9-0066-0028>
- Priya, R., Gandhi, A. V., & Shaikh, A. (2018). Mobile banking adoption in an emerging economy: An empirical analysis of young Indian consumers. *Benchmarking: An International Journal*, 25(2), 743-762. <https://doi.org/10.1108/BIJ-01-2016-0009>
- Pyka, I., Karkowska, R., & Nocoń, A. (2025). ESG activities and their influence on commercial banks' profitability and financial stability. *Journal of Entrepreneurship, Management and Innovation*, 21(4), 54-75. <https://doi.org/10.7341/20252143>
- Refinitiv (2022). *Environmental, Social and Governance Scores from Refinitiv*. Available at: https://www.lseg.com/content/dam/data-analytics/en_us/documents/methodology/lseg-esg-scores-methodology.pdf

- Salampasis, D. G., & Mention, A.-L. (2018). Open innovation in financial institutions: Individual and organisational considerations, *International Journal of Transitions and Innovation Systems*, Vol. 6, No. 1, s. 62-87. <https://doi.org/10.1504/IJTIS.2018.090781>
- Salem, M. R., Shahimi, S., & Alma'amun, S. (2024). Does mediation matter in explaining the relationship between ESG and bank financial performance? A scoping review. *Journal of risk and financial management*, 17(8), 350. <https://doi.org/10.3390/jrfm17080350>
- Sciulli, L. M. (1998). How organizational structure influences success in various types of innovations, *Journal of Retail Banking Services*, 20 (1), 13-20. <https://link.gale.com/apps/doc/A20507536/AONE?u=anon~126d9d6&sid=googleScholar&xid=1f2db1d7>
- Shakil, M. H., Mahmood, N., Tashnia, M., & Munim, Z. H. (2019). Do environmental, social and governance performance affect the financial performance of banks? A cross-country study of emerging market banks. *Management of Environmental Quality: An International Journal*, 30(6), 1331-1344. <https://doi.org/10.1108/MEQ-08-2018-0155>
- Smith, H., A., & McKeen, J. D. (2005). Developments in practice XVII – customer knowledge management: adding value for our customers, *Communications of the Association for Information Systems*, 16 (1), 744-755. <https://doi.org/10.17705/1CAIS.01636>
- Subramanian, A., & Nilakanta, S. (1996). Organizational innovativeness: Exploring the relationship between organizational determinants of innovation, types of innovations, and measures of organizational performance, *Omega*, 24 (6), 631–647. [https://doi.org/10.1016/S0305-0483\(96\)00031-X](https://doi.org/10.1016/S0305-0483(96)00031-X)
- Sustainalytics, (2021). ESG Risk Ratings – Methodology Abstract. Available at: https://connect.sustainalytics.com/hubfs/INV/Methodology/Sustainalytics_ESG%20Ratings_Methodology%20Abstract.pdf
- Szabó, D. G., & Sørensen, K. E. (2015). New EU directive on the disclosure of non-financial information (CSR). *European Company and Financial Law Review*, 12(3), 307-340. <https://doi.org/10.1515/ecfr-2015-0307>
- Taherparvar, N., Esmaeilpour, R. & Dostar, M. (2013). Customer knowledge management, innovation capability and business performance: A case study of the banking industry, *Journal of Knowledge Management*, Vol. 18, Iss. 3, p. 591–610. <https://doi.org/10.1108/JKM-11-2013-0446>
- Tao, R., Su, C.W., Naqvi, B., Rizvi, S.K.A., 2022. Can FinTech development pave the way for a transition towards low-carbon economy: a global perspective. *Technological Forecasting Social Change* 174. <https://doi.org/10.1016/j.techfore.2021.121278>
- Tashtamirov, M. (2023). The place of sustainable development in ESG risks formation in banking sector. In E3S Web of Conferences. 371, 03051. EDP Sciences. <https://doi.org/10.1051/e3sconf/202337103051>
- Terziovski, M. (2010). Innovation practice and its performance implications in small and medium enterprises (SME) in the manufacturing sector: A resource-based view, *Strategic Management Journal*, 31, 892–902. <https://doi.org/10.1002/smj.841>

- Tewari, R., & Dave, D. (2012). Corporate social responsibility: Communication through sustainability reports by Indian and multinational companies. *Global Business Review*, 13(3), 393-405. <https://doi.org/10.1177/097215091201300303>
- Tidd, J., Bessant, J. & Pavitt, K. (2005) *Managing Innovation: Integrating technological, market and organizational change*, Third edition, Wiley.
- Vapa Tankosić, J., Lekić, N., Čavlin, M., Burnać, V., Mirkov, M., Prodanović, R., Bejatović, G., Prdić, N., & Mirjanić, B. (2025). Employee Perceptions of ESG Policy Implementation in Urban and Rural Financial Institutions. *Agriculture*. <http://doi.org/10.3390/agriculture15151684>
- Venturelli, A., Pizzi, S., Caputo, F., & Principale, S. (2020). The revision of nonfinancial reporting directive: A critical lens on the comparability principle. *Business Strategy and the Environment*, 29(8), 3584-3597. <https://doi.org/10.1002/bse.2598>
- Uzkurt C., Kumar R., Kimzan H.S. & Eminoğlu G. (2013), Role of innovation in the relationship between organizational culture and firm performance: A study of the banking sector in Turkey, *European Journal of Innovation Management*, 16 (1), 92-117. <https://doi.org/10.1108/14601061311292878>
- Wagner, M. (2010). The role of corporate sustainability performance for economic performance: A firm-level analysis of moderation effects. *Ecological economics*, 69(7), 1553-1560. <https://doi.org/10.1016/j.ecolecon.2010.02.017>
- Waller, D. S., & Lanis, R. (2009). Corporate social responsibility (CSR) disclosure of advertising agencies: an exploratory analysis of six holding companies' annual reports. *Journal of Advertising*, 38(1), 109-122. <https://doi.org/10.2753/JOA0091-3367380107>
- Wang, C. L., & Ahmed, P. K. (2004). The development and validation of the organisational innovativeness construct using confirmatory factor analysis. *European Journal of Innovation Management*, 7(4), 303-313. <https://doi.org/10.1108/14601060410565056>
- Waslander, J., Bos, J., & Wu, Y. (2021). Banking Beyond Climate Commitments: Transforming Client Engagement and Products & Services for a Net-Zero Emissions Future. *Working Paper 2021*, Washington, DC: World Resources Institute. DOI:10.46830/wriwp.19.00155 <https://doi.org/10.46830/wriwp.19.00155>
- Weber, O., & Feltnate, B. (2016). *Sustainable banking: Managing the social and environmental impact of financial institutions*. University of Toronto Press.
- Yousaf, S., Anser, M. K., Tariq, M., Sahibzada Jawad, S. U. R., Naushad, S., & Yousaf, Z. (2020). Does technology orientation predict firm performance through firm innovativeness? *World Journal of Entrepreneurship, Management and Sustainable Development*, 17(1), 140-151. <https://doi.org/10.1108/WJEMSD-11-2019-0091>
- Yu, M., & Zhao, R. (2015). Sustainability and firm valuation: an international investigation. *International Journal of Accounting and Information Management*, 23(3), 289-307. <https://doi.org/10.1108/IJAIM-07-2014-0050>