Research in International Business and Finance 69 (2024) 102225

Contents lists available at ScienceDirect

Research in International Business and Finance

journal homepage: www.elsevier.com/locate/ribaf

ESG and FinTech: Are they connected?

Graziana Galeone *, Simona Ranaldo, Antonio Fusco

Business Administration, Department of Economics, Management and Business Law, University of Bari Aldo Moro, Largo Abbazia Santa Scolastica, 53, Bari, 70124, BA, Italy

ARTICLE INFO

Keywords:
FinTech
Sustainability
ESG
Banking sector
UTAUT Model

ABSTRACT

Due to the growing focus of institutional investors on sustainability, investment decisions in the financial sector are increasingly focused on environmental, social and governance (ESG) aspects. In this scenario, together with technological progress, sustainable finance, unlike traditional finance, directs capital towards operations that generate positive impacts for the environment and society. FinTech, considered an accelerator of sustainable economic growth, is part of the technological innovations related to sustainable finance. Through the analysis of an exploratory case study of international importance, represented by the bank BNP Paribas, this article uses the unified theory of acceptance and use of technology (UTAUT) to investigate the factors that influence technological innovation in the banking sector. The results show that social influence, reinforced by ESG factors, is a variable that encourages technology adoption in the banking sector. Collaborations with FinTech companies support banks in achieving sustainability objectives more efficiently. This study makes an important contribution to the academic literature. It expands knowledge on the determinants of financial technology diffusion by analysing the effect of ESG factors not considered in previous literature. The study also presents practical implications for banks and policy makers. It is appropriate for banks to plan training activities for managers and employees on FinTech to promote understanding of these subjects and facilitate better institutionalization of sustainability practices.

1. Introduction

The increase of financial technology (FinTech) using smartphones, artificial intelligence (AI), Internet of Things (IoT), blockchains is assuming central importance in the banking sector, revolutionising the way financial institutions operate and offering them numerous benefits (Dwivedi et al., 2021; Lee and Shin, 2018). FinTech can make the financial system more transparent, more secure and less expensive, creating a stable financial landscape that is diversified and attractive, thanks to improvements in the quality of services offered (Kabulova and Stankeviciene, 2020; Moro-Visconti et al., 2020). Furthermore, the social, environmental and ecological benefits associated with the implementation of this technology are evident, encouraging the funding of energy and environmental projects, the use of renewable energy and the construction of environmental infrastructures (Deng et al., 2019).

FinTech is closely related to the concept of sustainable finance. Although the two areas have been addressed separately for a long time, in recent years, some common features have emerged that, when combined, show great potential, which is why they are both important pillars of the current European Union (EU) policy agenda (Nassiry, 2019). Thanks to its ability to channel financial resources towards sustainable investments, FinTech can contribute to the achievement of the Sustainable Development Goals (SDGs) of the 2030

* Corresponding author.
E-mail address: graziana.galeone@uniba.it (G. Galeone).

https://doi.org/10.1016/j.ribaf.2024.102225
Received 19 April 2023; Received in revised form 21 December 2023; Accepted 9 January 2024
Available online 17 January 2024

Agenda (Dwivedi et al., 2021). In this regard, to develop strategies that promote financial technology to advance SDGs, the United Nations (UN) has established the Task Force on Digital Financing, recognising FinTech as an important accelerator for achieving the above-mentioned objectives (UN Secretary General, 2018). From this perspective, FinTech supports the mobilisation of private savings—through institutional investors such as pension funds, insurance, investment companies and banks—towards eco-compatible initiatives by retrieving non-financial data and information useful to incorporate environmental, social and governance (ESG) issues in investment analysis and decision-making (Chen et al., 2022; Wang et al., 2020; Zhou et al., 2020).

Studies that deal with the relationship between FinTech and sustainability are limited, as it is an emerging theme that is still under exploration (Liu et al., 2022). More specifically, the paper contributes to the extension of the literature analyzing the relationship between ESG and FinTech, under a new profile of investigation. The prevalence of existing studies, in fact, has focused on analyzing the benefits of implementing FinTech in the banking sector, for example in terms of improved performance and risk reduction, but without analyzing the determinants that drive financial intermediaries to adopt such technology (Chen et al., 2019; Buchak et al., 2018).

This work, through the analysis of a BNP Paribas bank exploratory case study of international importance, aims to fill this gap by analysing the role of sustainability in the diffusion of FinTech technology in the banking sector.

Using the Unified Theory of Technology Acceptance and Use (UTAUT), this study analysed the factors influencing technology acceptance and implementation in the banking sector. These factors include the variable "social influence" against which we analyse the impact of ESG factors as a proxy for sustainability. The results show that social influence, one of the variables of the above theory—integrated with the ESG factors that represent the novel element of our study—is a factor that can substantially encourage the acceptance and implementation of technology in the banking sector, especially using external partnerships with FinTech companies. In detail, the case study analysis showed that sustainability is not affected by technology because the bank's choice to follow the principles of sustainability is linked exclusively to its propensity towards these issues. However, the choice to operate according to these principles has encouraged the use of forms of collaboration with FinTech, which is considered useful to achieve sustainability objectives efficiently.

In terms of theoretical implications, this work contributes to the ongoing debate about the relationship between FinTech and sustainability, thus expanding the literature on the subject. In terms of practical implications, the banking sector, with the support of FinTech, can play an important role in creating a more environmentally friendly and inclusive economy, choosing how to direct its funding and designing investment solutions and products that combine positive impact and financial performance.

The work is structured as follows. Section 2 presents a literature review, which is divided into three sub-sections. The first provides a comprehensive description of FinTech, highlighting its advantages and disadvantages. The second focuses on FinTech as a tool to promote sustainable development in the banking sector. The third outlines the research hypothesis. Section 3 presents the methodology of the research, with a detailed description of the reference framework used, as well as the presentation of the case study being explored. Section 4 illustrates the results, while Section 5 includes the discussion. Finally, Section 6 presents the conclusions with an explanation of the practical and theoretical implications, the limits of the research and future lines of research.

2. Literature review

2.1. FinTech in the banking sector: advantages, challenges and opportunities

In recent years the global financial system has been affected by two distinct but interconnected phenomena: technological innovation and sustainable finance (Kumar et al., 2022).

Technological innovation is becoming a fundamental asset in the financial landscape (Lee and Shin, 2018) and 'financial technology' known as 'FinTech' occupies a central role, offering banks innovative technological solutions to make financial services more efficient (Li and Xu, 2021). Traditional financial institutions invest in FinTech in various ways, establishing external partnerships or opting for the acquisition or development of internal FinTech, as they are aware of FinTech's benefits in terms of increased profitability (Lee and Shin, 2018; Zhao et al., 2022) as well as contribute to financial innovation and better risk control (Tang et al., 2024; Wang et al., 2021; Gambacorta et al., 2019). Other studies have shown that FinTech improves the investment efficiency of publicly traded companies (Panpan, Hu, 2022) while offering more liquidity for the public (Guo and Zhang, 2023; Dranev et al., 2019).

FinTech technology means more than just the use of 'digital' technologies and data, the interconnection of which leads to the development of new products or processes or the improvement of existing ones (Hasan et al., 2020; Cruz-García et al., 2021; Lee et al., 2021). FinTech involves a real change process that permeates the entire organisational structure of a company, from the way the work is carried out to the roles and customer experience (Gong and Ribiere, 2021; Bresciani et al., 2021). FinTech, in general, can be defined as 'the technologically enabled financial innovation that could lead to new business models, applications, processes or products with an associated material effect on markets and financial institutions and on the provision of financial services' (Navaretti et al., 2018).

The digital transformation of the banking system, however, can be a disruptive factor for the financial industry if it fails to make its banking activities consistent with new technologies (Putri et al., 2019). For this reason, it is necessary to combine existing resources and skills with new skills, including external ones (data scientists, developers or IT experts), so that they are effectively adapted to the evolving scenario in which financial institutions operate and, in particular, allow the digitisation and simplification of processes (Tao et al., 2022; Campanella et al., 2023). This underlines the importance of human capital in FinTech technology (Begenau et al., 2018; Haddad and Hornuf, 2019). The transition to innovative business models and processes is considered necessary to adapt to an increasingly data-rich economy and to highly technological young customers (Chirumalla, 2021; Murinde et al., 2022). It involves investing in all areas of banking and financial intermediation, including credit (crowd-funding and peer-to-peer lending), payment services (instant payment), virtual currencies (Bitcoin), consulting services (robo-adviser), technologies of decentralised validation of

transactions (blockchain or distributed ledger technology), biometric identification (fingerprint, retina or facial recognition) and supporting the provision of services (cloud computing and Big Data) (Bollaert et al., 2021).

The demand for high-tech financial services is set to increase as the population grows, which shows confidence in digital services for millennials or digital natives (Weichert, 2017). However, the simplification of the use of financial services, thanks to the use of mobile devices, will gradually facilitate use by older and less computer literate users (Chen, 2020). The pandemic emergency encouraged the acceleration of FinTech services, as it forced most users to purchase products and services using financial technology (Le, 2021).

The implementation of innovation in the banking sector is linked not only to customer demand for digital services but also to the growing competition between traditional banks and digital banks based on innovative transaction methods (Laidroo et al., 2021; Shin, 2021).

Through investments in FinTech, financial intermediaries can enter new markets and resist the strong competitive pressures of over-the-top operators (e.g., Amazon, Alibaba, Apple and Facebook), which gradually appear in the markets not as internet platforms to support consumers, but as financial intermediaries (Campanella et al., 2023).

Another reason for banks to use financial technology is the protection of consumer data (Stewart and Jürjens, 2017). Users have an interest in services that offer trust and privacy (Chang et al., 2016). Within FinTech, financial/monetary activities can be performed with security thanks to data validation technologies, such as blockchains (Moro-Visconti et al., 2020). Therefore, FinTech services with highly secure data security and privacy systems attract users' trust and retain it in the long term (Gomber et al., 2018). Frequently, the adoption of technology is the result of the imposition of regulatory and social contexts (Rogers, 1983). According to some studies, the reasons for the rapid evolution of FinTech are linked to the existence of favourable regulations in this regard (Moro-Visconti et al., 2020).

2.2. FinTech supports sustainable development in the banking sector

The EU plays a crucial role in developing policies and strategies to promote a low-carbon economy, based on sustainable production and consumption patterns, in the banking and financial sector (Hayne et al., 2020). These include the EBA Action Plan on Sustainable Finance and EU Regulation 2020/852 regarding the taxonomy of eco-compatible economic activities (EU Taxonomy). These define strict standards that limit the risk of 'greenwashing' among the financial sector stakeholders a phenomenon that explains the attempt of a company to make its products appear sustainable when they are not (Delmas and Burbano, 2011).

Greenwashing is particularly critical in the current scenario, in which investors not only consider financial aspects in their investment decisions, such as risk and return, but also ESG factors by directing capital towards companies that better reflect their ethical and social values (De Freitas Netto et al., 2020).

This scenario has led to the expansion of supply and demand for sustainable financing, leading to the emergence of new products and services that meet the emerging needs of consumers and investors (Badía et al., 2020). An example is 'green bonds', fixed income financial instruments used to finance projects that produce positive environmental and climate benefits. This has contributed, therefore, to the development of sustainable finance that, unlike the traditional one, directs capital towards operations that create value in the long term, focusing not only on economic profitability, but also on the generation of positive impacts for the environment and the societies in which they are inserted (Leitao et al., 2021).

From this perspective, it is necessary to identify new objectives and reorganise production and consumption processes so that they are no longer linear but circular, based on factors of production that include, in addition to financial capital, natural and social capital (Pizzi et al., 2021). In the last decade, all business organisations, including financial institutions, have been called to adopt a new approach based on the 'sustainability of development' and, therefore, on long-term strategies in which the three dimensions of sustainability (ESG) no longer represent ethical issues but priorities, given their important economic implications (Campanella et al., 2023).

In the field of technological innovations related to sustainable finance, the new strategies that banks can pursue include participation in open banking ecosystems and cooperation with FinTech companies (Omarini, 2018). For example, an emerging area is represented by 'green FinTech', whose main purpose is to mitigate the risks related to climate change, a particularly useful tool for emerging and developing countries oriented towards the achievement of the SDGs (Macchiavello and Siri, 2022). The new paradigm of open banking, shared with FinTech companies that provide complementary activities to banks, encourages the removal of traditional barriers and improves the assessment of financial risks related to environmental issues in a particular climate (Zheng et al., 2021). This is an important milestone, especially considering that, to achieve climate neutrality targets by 2030, investments in clean technologies will have to triple globally (Adhikari and Chalkasra, 2021). Mobilising this amount of resources requires full involvement of the financial system, which is currently hampered by the less information on climate-related risks, that there is on credit and market risks (Zheng et al., 2021). In this regard, FinTech, through the use of AI and machine learning tools, ranks as the best 'revolutionary' technology in financial services, as it facilitates the acquisition of data that is useful for determining the ESG ratings of customers and, at the same time, promotes the financing of projects that rely on renewable energy and, more generally, on the generation of social, environmental and ecological benefits (Deng et al., 2019; Zhou et al., 2020; Chen et al., 2022). In this sense, FinTech contributes to the achievement of SDGs through its ability to channel financial resources towards sustainable uses and by promoting financial inclusion, that is, access to a wide range of financial products and services that enable it to meet the needs of customers in a sustainable way (Chueca Vergara, Ferruz Agudo, 2021; Dwivedi et al., 2021).

2.3. UTAUT Model and research question development

According to the literature, the increasing attention of financial institutions to sustainability issues has encouraged banks to use forms of external cooperation with FinTech companies, as they represent an accelerator of sustainable economic growth (Zhang-Zhang et al., 2020). Collaboration with FinTech companies, to promote the creation of value not only financially but also socially and environmentally, requires important changes in the philosophy, values and structure of the organisation, as well as in products and processes (Lee, 2020). This is summarised in Fig. 1, which shows that sustainability, as reflected in the ESG factors, is a factor that stimulates the implementation of technological innovation. Fig. 2.

Several studies have investigated the factors influencing technology acceptance in the banking sector using popular theories such as the Technology Acceptance Model (TAM), the integrated Task-Technology-Fit model and the Unified Theory of Technology Acceptance and Use (UTAUT), and the Diffusion of Innovation Theory (IDT) (Cheah et al., 2011; Sulaiman et al., 2007). In this study, the authors investigated and sought to understand how sustainability promotes the diffusion and use of financial technologies in the banking sector by introducing among the UTAUT Model, and particularly under the variable "Social Influence" the impact influence ESG factors, which are considered a proxy for sustainability.

The theory was developed through the revision and consolidation of the constructs of eight models that previous research had used to explain behaviour in the use of information systems: the theory of reasoned action (Ajzen and Fishbein, 1980), the theory of planned behaviour (TPB) (Ajzen, 1985), the technology acceptance model (TAM) (Davis et al., 1989), the combination of TAM and TPB (C-TAM-TPB) (Taylor and Todd, 1995), the model of PC utilization (Triandis, 1979), innovation diffusion theory (Rogers, 1983), the motivational model (Deci and Ryan, 1985) and the social cognitive theory (Compeau et al., 1999). These models share a common approach, in that the initial reaction of individuals to the possible use of technologies is followed by the intention to use them and their actual use. The UTAUT Model, from the analysis of the unique characteristics of all the other theories cited, identifies four constructs: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. These constructs are accompanied by factors that moderate the relationships between the different variables and the intention of use, represented by gender, age, experience and voluntariness of use. Table 1.

The first three constructs have a direct influence on intention and use behaviour (behavioural intention), while the fourth is a direct determinant factor of user behaviour (use behaviour). The element of novelty, albeit marginal, in our work concerns the introduction of ESG factors as an additional variable that strengthens social influence, called ESG influence. Considering what emerged from the literature that states that the attention of financial institutions towards the issues of sustainability has favoured a process of technological transition, mainly due to the collaboration with FinTech companies (Zhang-Zhang et al., 2020), we consider ESG factors as an additional factor that can promote the spread and acceptance of technology.

Considering these considerations, the study aims to answer the following research question (RQ):

RQ: How does sustainability promote the dissemination and use of financial technologies in the banking sector?

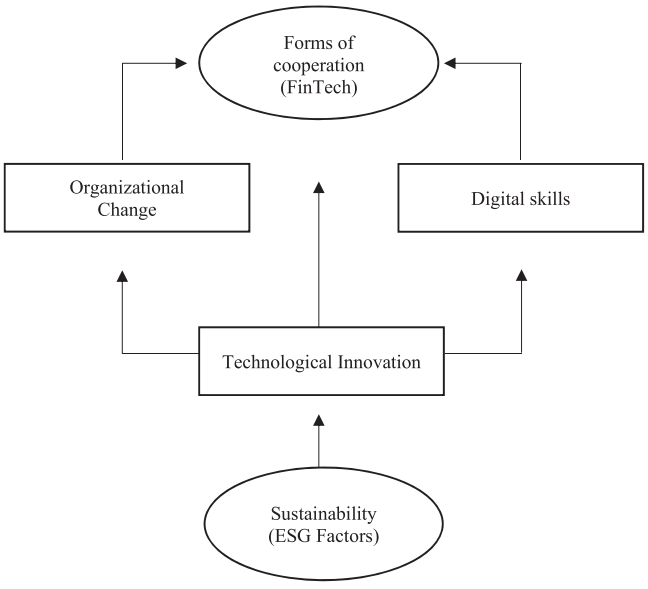

Fig. 1. Sustainability as a driving force for financial technology.
Source: Author's own elaboration.

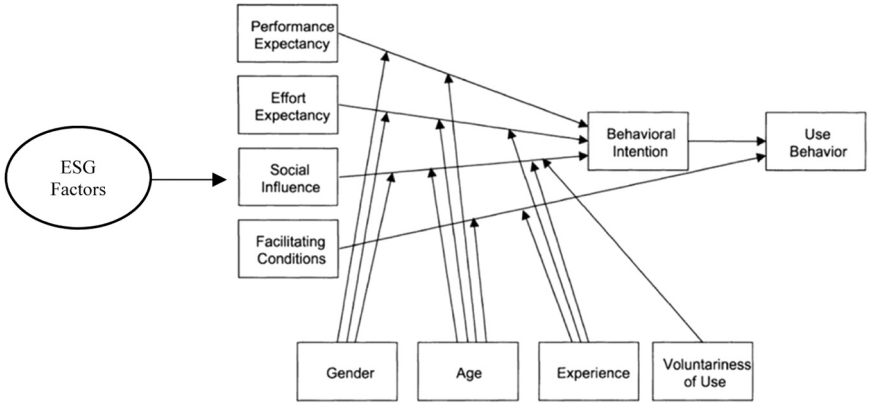

Fig. 2. The UTAUT Model (Venkatesh et al., 2003).

Table 1
UTAUT Model constructs.

	Constructs	Definition
1	Performance Expectancy	Degree by which an individual believes that the use of new technology allows benefits in terms of performance improvement.
2	Effort Expectancy	Degree of ease associated with the use of new technology.
3	Social Influence	The degree to which an individual perceives that other prominent individuals believe that new technology should be used. It is sometimes referred to as a social norm.
4	Facilitating Conditions	Degree by which an individual believes that there is an organisational and technical infrastructure to support the use of new technology.

3. Methodology

3.1. Case selection

To answer to the research question—that is, how sustainability promotes the dissemination and use of financial technologies in the banking sector—we used the case study methodology, which is useful for the discovery of new concepts rather than the affirmation of existing concepts' (Gioia et al., 2012).

This methodology allows an in-depth examination of the selected phenomenon, both considering the instantaneous situation and collecting information on its evolution over time. Therefore, it is a commonly adopted research approach when the processes of evolution and change are systematically observed (Lee, 1999; Eisenhardt, 1989). The case study methodology can also provide more detailed and in-depth explanations than quantitative approaches (Burns, 2000). Yin (2003) argued that this approach is preferable when research, like ours, asks questions about 'why' and 'how' to understand phenomena in a real context. Despite the widely recognised limitations of this method of analysis, especially in terms of reliability and validity, the case study is a very powerful methodology for understanding complex phenomena (Eisenhardt and Graebner, 2007).

The selected case study represents a 'revealing case' (Eisenhardt and Graebner, 2007), chosen not only for its unique circumstances (Yin, 2003) but also for its useful value and persuasive power to fully understand the phenomenon in question (Siggelkow, 2007), that is, the relationship between sustainability in the three dimensions of ESG and FinTech financial technologies.

In detail, the case chosen is that of the BNP Paribas banking group. The group, listed on the Paris Stock Exchange and present in 65 countries, is considered one of the world's leading players in the fields of corporate and investment banking, private banking and asset management.

The choice of the specific case study identified was based on three decision elements. The first is the relevance of the bank. BNP Paribas is one of the leading banking groups in Italy, a leader in Europe and has an international presence. The second element concerns the constant evolution of the group in terms of digital innovation, which is demonstrated by numerous partnerships with FinTech companies.

The third element is the attention that BNP Paribas pays to sustainability factors. The bank has launched its 2025 strategic plan with the aim of consolidating its European leadership and accelerating its transition to a sustainable economy. As highlighted in BNP Paribas' 2021 sustainability report, the strategic plan for 2025 is based on three major ambitions: growth, technology and sustainability (Fig. 3). This strategic orientation aims to make strong use of its financing capacity and its savings to achieve maximum environmental and social impacts.

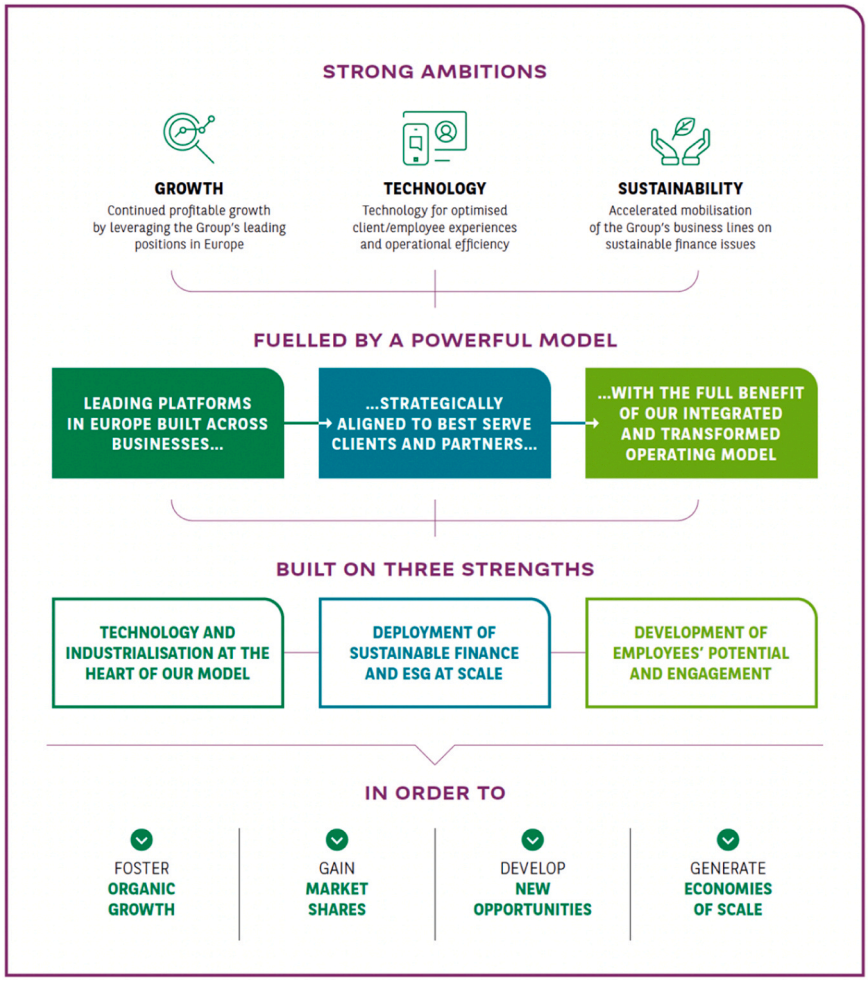

Fig. 3. BNP Paribas GTS 2025 strategic plan.
Source: Integrated Reporting 2021, p. 12.

Table 2
Semi-structured interview track (construct).

Performance Expectancy	Do you believe that FinTech-based solutions can improve your bank's performance, for example in terms of increasing efficiency, innovating products and ensuring greater customer inclusion? Do you think that the FinTech channel is able to improve the quality of the products offered in terms of sustainability? Has FinTech changed stakeholders' perception of your bank?
Effort Expectancy	Do you think that the implementation of FinTech initiatives is immediately applicable to banks and that its underlying logic is clear and easily understandable? Or does the implementation of such a service entail time and difficulty as well as a reorganisation of staff by increasing their digital skills? Do you think that FinTech improves customer interaction?
Social influence and ESG influence	What are the main initiatives and projects that have been or are being done to integrate SGDs into investment strategies and decisions? Is the decision to implement FinTech technologies within your bank a response to the current normative/regulatory scenario (EU taxonomy, Sustainable Finance Disclosure Regulation (SFDR), EU eco-label, Markets in Financial Instruments Directive (MIFID II), National Recovery and Resilience Plan (NRRP) Is this choice linked to the will to improve the image and reputation of the market, or is it the result of a greater need that takes into account both the advantages and expectations of stakeholders? How is the use of FinTech solutions facilitating the retrieval of ESG data useful to promote socially responsible investments in line with the new European regulation—Sustainable Finance Disclosure Regulation (SFDR)? ESG and technology enhancement issues are becoming increasingly pervasive in the area of bank governance. What are the main actions, in relation to ESG and technology, that have been taken into consideration to rethink the logic of business (evolution of organisational models, revision of processes in a digital perspective, development of new skills and new working logic)?
Facilitating Conditions	The adoption of FinTech technologies requires considerable investment. Did your bank already have the resources—human and financial—to be allocated to this form of innovation? Did FinTech support your bank in resolving past problems/critical issues?

3.2. Data collection

In the present work, the development and analysis of the case were based on interviews (primary data) with key corporate individuals with respect to the investigated phenomenon—the head of sustainability and the head of FinTech and strategic partnerships—the people responsible, within investment banking, for the relationships of BNP Paribas with all institutional entities in Italy (banks, insurance companies, asset management companies and FinTech).

The decision to interview people who had different assignments within the bank allowed us to analyse the investigated phenomenon from two different perspectives and provided a triangulation of the data. The relationship between financial technology and sustainability was analysed from the perspective of the individual responsible for implementing strategies to support the group in the transition to a new sustainable business model (head of sustainability) and those who manage the group's relationships with FinTech companies and who, therefore, highlight the advantages of these partnerships for the efficiency of the services offered by the bank in terms of sustainability.

The interviews, conducted remotely and lasting 45 min each, were semi-structured and aimed at enhancing the phenomenon related to the research objectives of this study.

The semi-structured interviews were elaborated on based on UTAUT Model, in order to understand if, among the constructs identified by the theoretical model, ESG factors influenced the use of FinTech (Table 2). In addition, questions were added to explore the model's moderating factors (Table 3).

In addition to the information from the interviews, other secondary data sources were also used, such as the company's integrated reports, sustainability reports, press reports (press releases), company brochures and industry reports on the company's website.

3.3. Data analysis

All data used in this study were of a qualitative nature. To ensure their credibility, validity and accuracy, they were aggregated and subsequently triangulated (Creswell, 2007; Denzin, 1984; Stake, 2000).

Triangulation of data collected from different sources (documents and interviews) was used (Denzin, 2017). This technique is equivalent to the reliability test of quantitative studies (Creswell, 2007). Triangulation of data was combined with triangulation of researchers. The analysis phase was based on the interaction between researchers and data to identify its real meaning (Strauss and Corbin, 1998). More precisely, all the data collected, primary and secondary, were carefully examined by each researcher and compared with each other to confirm their reliability. The three researchers read and analysed the documents individually. The interviews were carried out by two researchers, and the interview content was subsequently analysed individually by all three researchers. Fig. 4.

4. Results

The questions asked of the interviewees allowed each of the four constructs of the UTAUT Model to be investigated. As for *Performance Expectancy*, the analysis of the case showed that the integration of advanced information technology in the provision of financial products and services, ensured mainly by the spread of collaborations with FinTech companies, has changed the stakeholders' perception of the group's operations, making it more competitive and contributing to increasing its value in the market.

In this regard, the head of sustainability explained the following:

> 'The partnership with the world of FinTech companies, both domestic and foreign, has allowed the group to procure skills not available inside and reduce the time taken to implement projects (time to market)'

The head of FinTech and strategic partnerships also stated that most of the digitalisation and technological innovation projects have been developed by the group, collaborating with FinTech companies and, sometimes, entrusting them with the entire project implementation cycle, thus being able to provide equal and affordable financial services to all and thus promote inclusive finance.

As for *Effort Expectancy*, the difficulties that the use of FinTech could cause, in terms of time, difficulties and organisational structure, were investigated. In this regard, the head of sustainability explained the following:

> 'The choice to collaborate with new players such as start-ups and FinTech has not always made it necessary to integrate them into the banking system, being able to function as autonomous and separate entities. For the services in which FinTech was integrated into the group's organisational structure, it became necessary to improve their efficiency. In detail, low value-added tasks were easily replaced by technology.'

The head of FinTech and strategic partnerships confirmed the same evidence, explaining that employment is a particularly critical

Table 3
Semi-structured interview track (moderator factor).

Gender, age and experience	Do you think that age, gender, culture and professional training are factors that can influence the adoption of FinTech technologies?
Voluntariness of use	Do you think that your bank intends to use FinTech technology permanently and structurally, or for a limited period of time and with specific reference to the offer of predetermined products/services?

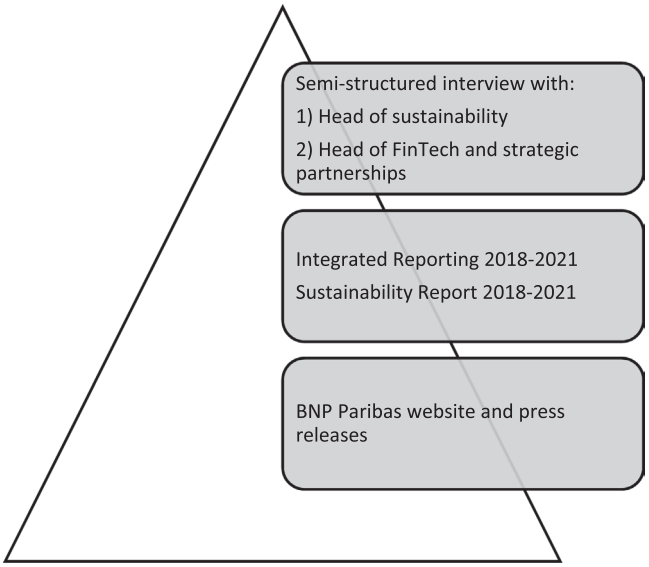

Fig. 4. Source triangulation.
Source: Author's own elaboration.

topic when it comes to technology. FinTech can perfectly replace human capital in the performance of certain tasks that can be carried out faster and without error. However, the banks also fulfil a social function so that employees whose jobs are replaced by FinTech must be relocated to other tasks. In the case of external collaboration with FinTech companies, it is also necessary to train employees to ensure the smooth operation of the technology.

Therefore, the head of FinTech and strategic partnerships added the following:

> 'The development of new technologies is a powerful engine of innovative solutions that, however, requires a rethinking of business models and the acquisition of specialised skills so that this potential can be exploited.'

Turning to the relationship between FinTech and sustainability, and therefore to the *Social Influence* construct and to ESG influence, the head of sustainability was asked about the main initiatives and projects adopted or being adopted to integrate SGDs into investment strategies and decisions. The interviewee explained that sustainability is one of the three pillars of BNP Paribas' strategic plan, testifying to the group's high degree of attention to these issues. The head of sustainability also added that:

> 'BNP Paribas is committed both to the definition of internal social cohesion objectives, such as the financial inclusion of women, young people, entrepreneurs and, in general, disadvantaged people, and to the development of external sustainable strategies that encompass all the themes of ESG, including biodiversity, in order to target funding and design investment solutions and products that reconcile environmental and social aspects with financial performance.'

Therefore, with specific reference to external activity, issues qualified as critical, including data privacy and security, climate change and energy transition, ethics and compliance, have also been extended to human rights and responsible investment and funding.

About the latter aspect, BNP Paribas first defines 'exclusion lists', which prevent 'irresponsible' investment and funding. Second, for the selection of 'eligible' customers, the bank analyses the respective ESG characteristics. Each customer is evaluated based on a list of questions, which, considering the sector of activity and the size of the company, allows for the extrapolation of information useful for the assessment of its maturity in terms of ESG performance. Companies must therefore set concrete, measurable and easily understandable targets and be transparent about their sustainability strategy to achieve rapid returns on investment, which in turn will result in more favourable interest rates.

Moreover, the head of sustainability specified that soon, the credit rating of the customer will suffer from the influence of the factors ESG since.

> 'The issues of sustainability and environmental risk also influence financial risk, making their integration necessary.'

The European Banking Association itself requires banks to calculate the carbon footprint of portfolios, to formulate the green asset ratio with assets aligned to the EU Taxonomy. This is a classification system established to clarify which investments are environmentally sustainable, in the context of the European Green Deal. Simultaneously, banks are required to develop a stress test of the portfolio against various ESG risks. This allows for the detection of the financial loss that an institution may incur, directly or indirectly, because of the adjustment process towards a low-carbon economy.

In this regard, interviewees were asked whether the choice to use FinTech was a response to the current normative/regulatory scenario (EU Taxonomy, SFDR, EU Eco-label, MIFID II, NRRP) or the will to improve the image and reputation of the market or the

need to meet the expectations of stakeholders.

According to the head of FinTech and strategic partnerships, there is regulatory confusion regarding the definition of sustainability. The most important risk for financial operators today is not credit risk but regulatory risk. This is due to a proliferation of bodies that legislate in a completely uncoordinated way, generating a sense of confusion about the elements of the classification of sustainable investments. Regardless of this regulatory confusion, both interviewees argued that BNP Paribas has decided to focus its operations by adopting ethical, ecological and social requirements with the aim of creating long-term value for all stakeholders. In this sense, by exploiting digital transformation, greater collaboration with new players, such as FinTech companies, guarantees the acceleration and improvement of the group's path towards sustainability.

The head of sustainability added that:

> 'FinTech are an essential tool for responding to otherwise difficult-to-implement regulations. For example, the collection of non-financial data and information, in addition to taking time, entails high costs. In this activity, FinTech companies greatly facilitate BNP Paribas, ensuring access to a large amount of information in a short time.'

In this sense, stakeholders appreciate the greater efficiency and effectiveness of the group, supported by FinTech companies in the process of integrating ESG criteria into all its operational processes, making BNP Paribas a global leader in sustainable finance.

ESG and technological enhancement are becoming increasingly pervasive in the group's governance. Interviewees were asked what main lines of action were considered regarding ESG and technology for a rethinking of business logic (evolution of organisational models, revision of processes in a digital perspective, development of new skills and new working logic). The head of FinTech and strategic partnerships explained that:

> 'The governance of BNP Paribas has had to equip itself, at several levels, with an ESG (ESG expert) representative involved in the decision-making processes when approving or structuring a specific type of business, new or existing. He is responsible for ensuring that the new initiative meets certain ESG criteria.'

Therefore, there is a need to reconfigure corporate governance systems towards sustainable practices and structure an ESG-based governance system aimed at maximising the involvement of its stakeholders.

With reference to *Facilitation Conditions*, the head of sustainability explained that, for BNP Paribas, FinTech companies, rather than supporting the group in resolving past critical issues, have added value to the services offered to individuals and industrial companies, proving to be more a lever of revenues than costs.

The head of FinTech and strategic partnerships, in this regard, also explained that FinTech has allowed the group to carry out activities that previously could not be carried out, stating that:

> 'In the past, for example, the granting of credit to small companies for some banks was a prohibitive thing, which, therefore, was left to the exclusive competence of cooperative credit banks. Their entrenched presence in the territory allowed them to acquire deep knowledge of the customer. Today, the use of FinTech allows us to overcome this critical point by supporting banks in the provision of loans to new customers.'

With reference to use behaviour, both interviewees argued that the promotion of sustainability and the orientation of capital towards sustainable investments are variables that support and encourage the use of financial technologies.

More specifically, the role of FinTech in BNP Paribas is, above all, to support the group in the collection of ESG data, making them usable, reliable and high-quality, in order to integrate ESG risks into customer risk profile assessments. From this perspective, it is clear how technology supports the financial sector in defining best practices, demonstrating above all the ability of FinTech to act as an accelerator of the path towards the sustainability of banks.

As for *Behavioural Intention*, the head of sustainability claimed that the bank would use FinTech permanently and structurally, as its benefits in terms of ESG performance evaluation are substantial. The head of FinTech and strategic partnerships also stated that FinTech is now a resource for the banking sector, facilitating the group in carrying out certain activities (such as customer selection and ESG information retrieval), which are carried out more quickly and efficiently.

With reference to the moderating factors of the model—*Gender, Age, Experience and Voluntariness of Use*—interviewees were asked if variables such as age, gender, culture and professional training are factors that can influence the adoption of financial technology. From an external perspective, the head of sustainability explained how the use of FinTech has encouraged the attraction and loyalty of young customers who are certainly more confident with technologies than older generations.

The head of FinTech and strategic partnerships, following an internal analysis perspective, explained how the adoption of FinTech in the banking sector is certainly influenced by age: the employees inside the bank who belong to a 'younger' generation certainly show a higher propensity towards this form of technology than older generations.

Finally, the risks associated with cyberattacks were also analysed, which could inhibit the stability of the financial system and fuel the distrust of the most fearful customers towards these services. In this regard, the head of sustainability explained that BNP Paribas, like every bank, has a huge amount of sensitive data, which is why investments aimed at preserving information security are imperative. As for FinTech companies, the interviewee stated that their acquisition has not in any way increased this type of risk, given the new technological and cyber-security risks. The group continues to regularly strengthen defence and security systems to protect customer data and transactions through the exploitation of technological innovation. In fact, while the massive exploitation of customer data opens up opportunities for the development of new financial products and services, the right balance must be identified between the supply of new digital services and respect for consumer rights.

As stated by the head of FinTech and strategic partnerships:

> 'Data security must be pursued not only in compliance with the privacy provisions, but also by ensuring that the technical solutions to oversee IT systems and communication channels between the different subjects meet the requirements imposed by European guidelines and the best international standards.'

Therefore, actions to create protected, secure, resilient infrastructures for the prevention and to combat cyberattacks respond to both regulatory imposition and to the interest of the group that is constantly subject to the risk of hacking.

5. Discussion

5.1. The effects of FinTech in banking sector

The case study analyzed shows that the digital revolution, disrupting traditional patterns used by intermediaries to offer financial services, is changing the market structure and forcing operators to substantially rethink models and strategies (Gong and Ribiere, 2021). In fact, deep changes in consumer habits are pushing for a reconfiguration of the bank-customer relationship model to meet customers' own needs for immediacy, simplicity and accessibility in their choices to purchase and use banking services. As a result, there is an increasing use of digital technologies for the provision of financial services, including FinTech; in particular, as also emerged during the interview, most intermediaries make payment services available to their customers through mobile applications and offer asset management services through digital channels (Le, 2021).

New technologies also influence how banks manage both internal processes and customer relationships. From the perspective of organizing internal resources, the use of technological tools and robotics to perform repetitive tasks (e.g., acquiring and verifying information related to a loan application) significantly reduces processing time for paperwork, allowing employees to focus on more complex operations that enhance human interaction and subjective input in decision making. In this sense, the adoption of more advanced technologies within the bank can facilitate compliance and operational risk control requirements (Wang et al., 2021).

As confirmed by interviewees, new digital information sources (such as websites and social networks) make available sets of huge, unstructured data stores (big data), which are processed through machine learning-based analysis techniques. The vast wealth of information produced by the footprint left on the web by consumers' digital behaviors lends itself to use for multiple purposes in banking: profiling customer habits for business purposes, improving cross-selling strategies, and assessing creditworthiness (Tao et al., 2022).

With specific reference to the measurement of credit risk, the literature points out that the use of digital data and new methodologies strengthens the ability of intermediaries to assess the riskiness of borrowers of funds, especially those for whom traditional sources provide limited or deficient information (Gambacorta et al., 2019; Tang et al., 2024).

The survey results conducted also show that the changes taking place will require the hiring of young talent among computer scientists and engineers and, at the same time, it will be necessary to invest in training to decline the skills of these professionals in the financial sector. Career and compensation paths will have to be revised, which, compared to the more productive sectors of the economy, may be more rigid (Haddad and Hornuf, 2019).

The coexistence of old and new distribution channels, of traditional and innovative products is an opportunity: there is the possibility of adapting offerings based on customer needs and reaching a wider audience of consumers, expanding market boundaries and financial inclusion. Even small intermediaries will have a chance to stay in the market, despite competition with BigTech, large banks, and technology providers, if they take advantage of the opportunity to differentiate their offerings based on customer segments (Liu et al., 2022). Customer service and rapid delivery of banking services increases the perceived value and innovativeness of the financial intermediary by directly influencing on customer experience and in particular customer retention intentions (Pandey et al., 2023).

5.2. Fintech and the transition to environmentally sustainable finance

The case study investigated shows that to achieve the UN's SDGs, the BNP Paribas Group is committed to developing strategies aimed at improving the environmental and social impact of its investment and financing choices. However, a reconfiguration of the governance system, charged with defining and implementing policies and strategies focused on sustainability, is necessary (Pizzi et al., 2021).

The financial sector is impacted by ESG factors on several fronts: (i) mobilizing capital and incorporating ESG factors into investment and credit/finance decisions by measuring their impact; (ii) monitoring commitment to ESG goals including through structuring voluntary and mandatory reporting and finding ways to progressively realign portfolios based on performance; and (iii) measuring impact and risk by quantifying and qualifying the impact of sustainable financing and assessing the impact of climate, environmental and transition risks on portfolios and the organization as a whole. Clearly, the entire FinTech ecosystem needs to come together and collaborate to achieve these goals (Deng et al., 2019). The implementation of financial technology has proved necessary for facilitating the transition to a sustainable economy more quickly and efficiently (Zhou et al., 2020; Chen et al., 2022). Many organisations, including FinTech companies, are mobilising to provide banks with the necessary tools to assess the ESG risks of their customers to encourage the destination of capital to environmentally friendly companies (Badía et al., 2020; De Freitas Netto et al., 2020). Banks, like other companies, can be vehicles of pollution because they are responsible for lending decisions concerning companies with high carbon emissions (fossil fuel, oil, and gas extraction) (Galletta et al., 2022). FinTech development can aid in lowering greenhouse gas emissions (Pandey et al., 2023). It is especially listed companies that have a strong motivation to disclose their digital information in annual reports to highlight their performance and attract the attention and support of investors (Fang et al.,

2023).

Against this background, this study seeks to understand how sustainability, measured by ESG factors, promotes the integration of FinTech into financial institutions using the UTAUT Model for this purpose. In detail, marginally revisiting the theory we have included in the model, with specific reference to the construct 'social influence', ESG factors can substantially influence the acceptance and use of financial technology in the banking sector.

Our results confirm this evidence. What has emerged is that the use of partnerships with FinTech companies, together with the use of new technologies (Big Data, natural language processing, IoT, satellite images, blockchain and robot-advisers), are tools for the development of sustainable finance practices and, therefore, support the banking sector in the selection process of investments useful to facilitate a transition to a low-carbon economy (Hayne et al., 2020).

With reference to the UTAUT Model (Venkatesh et al., 2003; Venkatesh and Davis, 2000), it can therefore be concluded that, within the social variable, after the adoption of the 2030 Agenda for Sustainable Development by the UN in September 2015 and the subsequent signing of the Paris Climate Agreement in December of that year, ESG factors are an important element in the dissemination and acceptance of technology. By external collaboration with FinTech companies, financial institutions can better analyse the exposure of stock and bond portfolios to different risk scenarios linked to climate transition.

FinTech play a leading role in environmental and social issues, from climate change to diversity, equity, and inclusion. To keep up with stakeholder expectations, an unstructured ESG strategy is not enough; it needs to be formalized. Financial technology is a highly relevant tool for capitalizing on the benefits of adopting an ESG strategy, as well as a driver of acceptance and diffusion of technology solutions. In this perspective, the adoption of technology, enhances the relationship between ESG and investment efficiency by improving information sharing capabilities. Engagement in ESG activities and disclosure of related information is necessary to reduce information asymmetries and agency conflicts. In particular, ESG practices and disclosure through technology reduce the likelihood of agency problems distorting the efficiency of investment projects while attracting sufficient capital through fewer information asymmetries. (Lin et al., 2023).

6. Conclusion

Sustainable finance represents a wide-ranging challenge within the traditional management systems of financial intermediaries, as the new 'green' instruments aim to profoundly transform conventional investment practices. To undertake a path compatible with the objectives of the 2015 Paris Agreement, financial institutions will have to gradually divest into projects that are not in line with greenhouse gas reduction scenarios, preferring environmentally and socially responsible companies and governments and, at the same time, develop financial instruments aimed at achieving both economic growth and social and environmental welfare. To promote the efficient use of resources, restore biodiversity and reduce pollution, one of the actions to be taken will be to invest in environmentally friendly technologies and support industry in technological innovation. Sustainability and innovation are essential pillars for the growth of the financial sector. The use of FinTech is an effective and rapid ally for the achievement of the objectives of sustainable development, as well as being a support for the transformation process of financial intermediaries in an ecological way.

Our results show that sustainability and attention to ESG issues encourage the use of FinTech technologies, which are instrumental in accelerating the path to sustainability. The BNP Paribas case shows that while FinTech technologies can help achieve sustainability goals faster and more efficiently, it is appropriate that the bank itself should show an orientation and a predisposition towards the integration of environmental and social aspects in its corporate strategy. In this sense, it is sustainability that influences the use of FinTech, not the other way around.

From the perspective of theoretical implications, this study expands the literature exploring the relationship between FinTech and sustainability in the banking sector, a topic that, given its topicality, is rarely investigated. Indeed, Fintech must increasingly move toward being an enabler of innovation in partnership with banks, corporations, and regulators to manage new sustainability issues arising from ongoing crises: geopolitical, climate, and energy.

Indeed, among the factors outlined in the UTAUT Model introduced by Venkatesh et al. (2003) and considered to influence the use of technology in the financial sector, ESG factors, in the current scenario, now represent a variable that reinforces the social influence on technology acceptance.

As for the practical implications, the results show important evidence that is useful to managers, researchers, practitioners and governments. In the current context, the financial sector plays a key role in combating climate change by encouraging the financing of sustainable investments. The BNP Paribas case shows that FinTech substantially supports banks in this process, assisting them in the collection of structured and unstructured ESG data from a variety of sources useful for assessing the degree of risk of customers in environmental and social terms.

The work also shows how the increased availability of ESG data is useful in supporting the bank in the detection and prevention of greenwashing practices and in directing those who require funding to adopt increasingly responsible behaviour.

From the point of view of the strictly managerial implications, the work highlights how, in addition to traditional risk profiles, intermediaries are called upon to control and manage other emerging types of risk more carefully, such as climate and environmental risks. From this perspective, technology plays an important role in mitigating or eliminating risk, while also ensuring financial inclusion and sustainability.

However, the results of this study must be interpreted mindful of the presence of some limitation which do not reduce the general quality of the work. This study was conducted over a single case study and analysing only the impact of ESG factors on the acceptance of the technology without considering other factors that could be relevant.

Future research line will be able to conduct econometric analyses to investigate the factors that encourage banks to use FinTech

companies to pursue sustainability objectives more efficiently, such as culture, governance variables and gender diversity in its broadest sense, as these aspects were examined only marginally in this study.

CRediT authorship contribution statement

Ranaldo Simona: Conceptualization, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Galeone Graziana:** Conceptualization, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Fusco Antonio:** Conceptualization, Writing – original draft.

Declaration of Competing Interest

none.

Data availability

No data was used for the research described in the article.

References

Adhikari, B., Chalkasra, L.S.S., 2021. Mobilizing private sector investment for climate action: enhancing ambition and scaling up implementation. J. Sustain. Financ. Invest. https://doi.org/10.1080/20430795.2021.1917929.

Ajzen, I., 1985, From Intentions to Actions: A Theory of Planned Behaviour. In J. Kuhl & J. Beckmann (Eds.).

Ajzen, I., & Fishbein, M. (1980). Understanding Attitudes and Predicting Social Behavior (1st ed.). Englewood Cliffs, New York.

Badía, G., Cortez, M.C., Ferruz, L., 2020. Socially responsible investing worldwide: do markets value corporate social responsibility? Corp. Soc. Responsib. Environ. Manag. 27, 2751–2764. https://doi.org/10.1002/csr.1999.

Begenau, J., Farboodi, M., Veldkamp, L., 2018. Big data in finance and the growth of large firms. J. Monet. Econ. 97, 71–87. https://doi.org/10.1016/j.jmoneco.2018.05.013.

Bollaert, H., de Silanes, F.L., Schwienbacher, A., 2021. FinTech and access to finance. J. Corp. Financ. 68, 101941 https://doi.org/10.1016/j.jcorpfin.2021.101941.

Bresciani, S., Huarng, K.H., Malhotra, A., Ferraris, A., 2021. Digital transformation as a springboard for product, process and business model innovation, 204–210 J. Bus. Res 128. https://doi.org/10.1016/j.jbusres.2021.02.003.

Buchak, G., Matvos, G., Piskorski, T., Seru, A., 2018. Fintech, regulatory arbitrage, and the rise of shadow banks. J. Financ. Econ. 130, 453–483.

Burns, R.B., 2000. Introduction to Research Methods. Sage Publications, London.

Campanella, F., Serino, L., Battisti, E., Giakoumelou, A., Karasamani, I., 2023. FinTech in the financial system: towards a capital-intensive and high competence human capital reality? J. Bus. Res 155, 113376. https://doi.org/10.1016/j.jbusres.2022.113376.

Chang, Y., Wong, S.F., Lee, H., Jeong, S.P., 2016. What motivates Chinese consumers to adopt FinTech services: A regulatory focus theory, in: Proceedings of the 18th Annual International Conference on Electronic Commerce: E-Commerce in Smart Connected World.

Cheah, C.M., Teo, A.C., Sim, J.J., Oon, K.H., Tan, B.I., 2011. Factors affecting Malaysian mobile banking adoption: an empirical analysis. Inter. J. Net. Mob. Techn. 2 (3), 149–160.

Chen, J., Siddik, A.B., Zheng, G.W., Masukujjaman, M., Bekhzod, S., 2022. The effect of green banking practices on banks' environmental performance and green financing: an empirical study. Energ 15, 1292. https://doi.org/10.3390/en15041292.

Chen, K.C., 2020. Implications of FinTech developments for traditional banks. Int. J. Econ. Financ. Issues 10, 227–235. https://doi.org/10.32479/ijefi.10076.

Chen, M.A., Wu, Q., Yang, B., 2019. How valuable is FinTech innovation? Rev. Financ. Stud. 32, 2062–2106.

Chirumalla, K., 2021. Building digitally-enabled process innovation in the process industries: a dynamic capabilities approach. Technovation 105, 102256. https://doi.org/10.1016/j.technovation.2021.102256.

Chueca Vergara, C., Ferruz Agudo, L., 2021. FinTech and sustainability: do they affect each other? Sustainability 13, 7012. https://doi.org/10.3390/su13137012.

Compeau, D., Higgins, C., Huff, S., 1999. Social cognitive theory and individual reactions to computing technology: a longitudinal study. MIS Q. 23 (2), 145–158 https://doi.org/0.2307/249749.

Creswell, J.W., 2007. Qualitative inquiry and research design: Choosing among five approaches (Second ed.). Sage, Thousand Oaks, CA.

Cruz-García, P., Fernandez de Guevara, J., Maudos, J., 2021. Bank competition and multimarket contact intensity. J. Int. Money Financ. 113, 102338 https://doi.org/10.1016/j.jimonfin.2020.102338.

Davis, F.D., Bagozzi, R.P., Warshaw, P.R., 1989. User acceptance of computer technology: a comparison of two theoretical models. Manag. Sci. 35 (8), 982–1003. https://doi.org/10.1287/mnsc.35.8.982.

De Freitas Netto, S.V., Sobral, M.F.F., Ribeiro, A.R.B., Soares, G.R.L., 2020. Concepts and forms of greenwashing: a systematic review. Environ. Sci. Eur. 32 (1), 12. https://doi.org/10.1186/s12302-020-0300-3.

Deci, E.L., Ryan, R.M., 1985, Intrinsic Motivation and Self-Determination in Human Behavior (1st ed.). Plenum Press.

Delmas, M.A., Burbano, V.C., 2011. The drivers of greenwashing. California. Manag. Rev. 54, 64–87. https://doi.org/10.1525/cmr.2011.54.1.

Deng, X., Huang, Z., Cheng, X., 2019. FinTech and sustainable development: evidence from china based on P2P data. Sustainability 11, 6434. https://doi.org/10.3390/su11226434.

Denzin, N. 1984. The research act. Prentice Hall, NJ: Englewood Cliffs.

Denzin N.K. (2017), The Research Act. A Theoretical Introduction to Sociological Methods, London (NY), Routledge.

Dwivedi, P., Alabdooli, J.I., Dwivedi, R., 2021. FinTech adoption for competitiveness and performance of the bank: a study of banking industry in UAE. Int. J. Glob. Bus. Compet. 16 https://doi.org/10.1007/s42943-021-00033-9.

Eisenhardt, K., 1989. Building theories from case research. Acad. Manag. Rev. 14 (4), 532–550. https://doi.org/10.2307/258557.

Eisenhardt, K., Graebner, M., 2007. Theory building from cases: opportunities and challenges. Acad. Manag. J. 50 (1), 25–32. https://doi.org/10.5465/amj.2007.24160888.

Fang, M., Nie, H., Shen, X., 2023. Can enterprise digitization improve ESG performance? Econ. Model. 118, 106101 https://doi.org/10.1016/j.econmod.2022.106101.

Galletta, S., Mazzù, S., Naciti, V., 2022. A bibliometric analysis of ESG performance in the banking industry: from the current status to future directions. Res. Int. Bus. Financ. 62, 101684 https://doi.org/10.1016/j.ribaf.2022.101684.

Gambacorta, L., Huang, Y., Qiu, H., Wang, J., 2019. How do machine learning and non-traditional data affect credit scoring? New evidence from a Chinese fintech firm. BIS Work. Pap. 834.

Gioia, D., Corley, K.G., Hamilton, A.L., 2012. Seeking qualitative rigor in inductive research: notes on the Gioia methodology. Organ. Res. Methods 16 (1), 15–31 https://doi.org/0.1177/1094428112452151.

Gomber, P., Kauffman, R.J., Parker, C., Weber, B.W., 2018. On the FinTech revolution:Interpreting the forces of innovation, disruption, and transformation in financial services. J. Manag. Inf. Syst. 35, 220–265. https://doi.org/10.1080/07421222.2018.1440766.
Gong, C., Ribiere, V., 2021. Developing a unified definition of digital transformation. Technovation 102, 102217. https://doi.org/10.1016/j.technovation.2020.102217.
Haddad, C., Hornuf, L., 2019. The emergence of the global FinTech market: Economic and techno-logical determinants. Small Bus. Econ. 53, 81–105 h ttps://doi.org/10.1007/s11187-018-9991-x.
Hasan, R., Hassan, M.K., Aliyu, S., 2020. FinTech and islamic finance: literature review and research agenda. Int. J. Islam. Econ. Financ. 3 https://doi.org/10.18196/ijief.2122.
Hayne, M., Ralite, S., Thomä, J. e, Koopman, D., 2020. Factoring transition risks into regulatory stress-tests: the case for a standardized framework for climate stress testing and measuring impact tolerance to abrupt late and sudden economic decarbonization. ACRN J. Financ. Risk Perspect. 8 (1), 206–222. https://doi.org/10.35944/jofrp.2019.8.1.013.
Kabulova, J., Stankeviciene, J., 2020. Valuation of FinTech innovation based on patent applications. Sustainability 12, 10158. https://doi.org/10.3390/su122310158.
Kumar, S., Sharma, D., Rao, S., Lim, W.M., Mangla, S.K., 2022. Past, present, and future of sustainable finance: insights from big data analytics through machine learning of scholarly research. Ann. Oper. Res. https://doi.org/0.1007/s10479–021-04410–8.
Laidroo, L., Koroleva, E., Kliber, A., Rupeika-Apoga, R., Grigaliuniene, Z., 2021. Business models of FinTechs. Difference in similarity? Electron. Commer. Res. Appl. 46, 101034 https://doi.org/10.1016/j.elerap.2021.101034.
Le, M.T., 2021. Examining factors that boost intention and loyalty to useFinTech post-COVID-19 lockdown as a new normal behavior. Heliyon 7, e07821 https://doi.org/0.1016/j.heliyon.2021.e07821.
Lee, C.C., Li, X., Yu, C.H., Zhao, J., 2021. Does FinTech innovation improve bank efficiency? Evidence from China's banking industry. Int. Rev. Econ. Financ. 75, 468–483. https://doi.org/10.1016/j.iref.2021.03.009.
Lee, I., 2020. Internet of Things (IoT) cybersecurity: Literature review and iot cyber risk management. Future Internet 12, 9. Available at:https://doi.org/10.3390/FI12090157. https://doi.org/10.3390/fi12090157.
Lee, I., Shin, Y.J., 2018. FinTech: Ecosystem, business models, investment decisions, and challenges. Bus. Horiz. 61, 35–46. https://doi.org/10.1016/j.bushor.2017.09.003.
Lee, T.W., 1999. Using Qualitative Methods to Organize Research. Sage Publications, Thousand Oaks, CA.
Leitao, J., Ferreira, J., Santibanez-Gonzalez, E., 2021. Green bonds, sustainable development and environmental policy in the european union carbon market. Bus. Strateg. Environ. 30, 2077–2090. https://doi.org/10.1002/bse.2733.
Li, B., Xu, X., 2021. Insights into financial technology (FinTech): a bibliometric and visual study. Financ. Innov., 69 https://doi.org/10.1186/s40854-021-00285-7.
Lin, Y., Lu, Z., Wang, Y., 2023. The impact of environmental, social, and governance (ESG) practices on investment efficiency in China: does digital transformation matter? Res. Int. Bus. Financ. 66, 102050 https://doi.org/10.1016/j.ribaf.2023.102050.
Liu, H., Yao, P., Latif, S., Sumaira, A., Nadeem, I., 2022. Impact of Green financing, FinTech, and financial inclusion on energy efficiency. Environ. Sci. Pollut. Res. 29, 18955–18966. https://doi.org/10.1007/s11356-021-16949-x.
Macchiavello, E., Siri, M., 2022. Sustainable finance and FinTech: can technology contribute to achieving environmental goals? A Prelim. Assess. 'Green FinTech' 'Sustainable Digit. Financ. Eur. Bank. Inst. Work. Pap. Ser. 2020 19, 128–174. https://doi.org/10.1515/ecfr-2022-0005.
Moro-Visconti, R., Cruz Rambaud, S., López Pascual, J., 2020. Sustainability in FinTechs: an explanation through business model scalability and market valuation. Sustainability 12, 10316. https://doi.org/10.3390/su122410316.
Murinde, V., Rizopoulos, E., Zachariadis, M., 2022. The impact of the FinTech revolution on the future of banking: opportunities and risks. Int. Rev. Financ. Anal. 81, 102103 https://doi.org/10.1016/j.irfa.2022.102103.
Nassiry, D., 2019. The role of FinTech in unlocking green finance. Handbook of Green Finance. Springer,, Singapore, pp. 315–336.
Navaretti, G.B., Calzolari, G., Mansilla-Fernandez, J.M., Pozzolo, A.F., 2018. FinTech and banking. Friends or foes? SSRN Electron. J. https://doi.org/10.2139/ssrn.3099337.
Omarini, A.E., 2018. Banks and FinTechs: how to develop a digital open banking approach for the bank's future. Int. Bus. Res 11, 23–36 https://doi.org/0.5539/ibr.v11n9p23.
Pandey, D.K., Hassan, M.K., Kumari, V., Zaied, Y.B., Rai, V.K., 2023. Mapping the landscape of FinTech in banking and finance: a bibliometric review. Res. Int. Bus. Financ, 102116. https://doi.org/10.1016/j.ribaf.2023.102116.
Panpan, L.V., Hu, X., 2022. Can FinTech improve corporate investment efficiency? Evidence from China. Res. Intern. Bus. Fin. 60, 101571 https://doi.org/10.1016/j.ribaf.2021.101571.
Pizzi, S., Corbo, L., Caputo, A., 2021. FinTech and SMEs sustainable business models: reflections and considerations for a circular economy. J. Clean. Prod., 125217 https://doi.org/10.1016/j.jclepro.2020.12521.
Putri, W.H., Nurwiyanta, N., Sungkono, S., Wahyuningsih, T., 2019. The emerging FinTech and financial slack on corporate financial performance. Invest. Manag. Financ. Innov. 16, 348–354.
Rogers, E.M., 1983. Diffusion of innovations, 3rd ed. The Free Press, New York.
Shin, J.W., 2021. Mediating effect of satisfaction in the relationship between customer experience and intention to reuse digital banks in Korea. Soc. Behav. Personal. Int. J. 49, 1–18. https://doi.org/10.2224/sbp.9753.
Siggelkow, N., 2007. Persuasion with case studies. Acad. Manag. J. 50 (1), 20–24.
Stake, R.E., 2000. Case studies. In: Denzin, N.K., Lincoln, Y.S. (Eds.), Handbook of qualitative research. CA, Sage, Thousand Oaks, pp. 435–454.
Stewart, H., Jürjens, J., 2017. Data security and consumer trust in FinTech innovation in Germany. Inf. Comput. Secur. 26, 109–128. https://doi.org/10.1108/ICS-06-2017-0039.
Strauss, A., Corbin, J., 1998. Basics of qualitative research: Techniques and procedures for developing grounded theory, Second ed..,. CA, Sage,, Thousand Oaks.
Sulaiman, A., Jaafar, N.I., Mohezar, S., 2007. An overview of mobile banking adoption among the urban community. Intern. J. Mob. Comm. 5, 157–168.
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. Technol. Forecast. Soc. Change 174. https://doi.org/10.1016/j.techfore.2021.121278.
Taylor, S., Todd, P.A., 1995. Assessing IT usage: the role of prior experience. Manag. Inf. Syst. Q. 19 (4), 561–570. https://doi.org/10.2307/249633.
Triandis, H.C., 1979. Values, attitudes, and interpersonal behavior. Neb. Symp. Motiv. 27, 195–259.
UN Secretary General, 2018. Task force on digital financing of sustainable devel-opment goals.
Venkatesh, V., Davis, F.D., 2000. A theoretical extension of the technology acceptance model: four longitudinal field studies. Manag. Sci. 46 (2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926.
Venkatesh, V., Morris, M., Davis, G., Davis, F.D., 2003. User acceptance of information technology: toward a unified view. MIS Q 27 (3), 425–478. https://doi.org/10.2307/30036540.
Wang, R., Mirza, N., Vasbieva, D.G., Abbas, Q., Xiong, D., 2020. The nexus of carbon emissions, financial development, renewable energy consumption, and technological innovation: what should be the priorities in light of COP 21 Agreements? J. Environ. Manag. 271, 111027 https://doi.org/10.1016/j.jenvman.2020.111027.
Weichert, M., 2017. The future of payments: how FinTech players are accelerating customer-driven innovation in financial services'. J. Paym. Strateg. Syst. 11, 23–33.
Yang, W., Sui, X., Qi, Z., 2021. Can fintech improve the efficiency of commercial banks? —An analysis based on big data. Res. Intern. Bus. Fin. 55, 101338 https://doi.org/10.1016/j.ribaf.2020.101338.
Yin, R.K., 2003. Case study Research: Design and Methods. Sage Publication, Thousand Oaks, CA.
Zhang-Zhang, Y., Rohlfer, S., Rajasekera, J., 2020. An eco-systematic view of cross-sector fintech: the case of alibaba and tencent. Sustainability 12, 8907. https://doi.org/10.3390/su12218907.

Zhao, J., Li, X., Yu, C.-H., Chen, S., Lee, C.-C., 2022. Riding the FinTech innovation wave: FinTech, patents and bank performance. J. Int. Money Financ. 122, 102552 https://doi.org/10.1016/j.jimonfin.2021.102552.

Zheng, G., Siddik, A.B., Masukujjaman, M., Fatema, N., 2021. Factors affecting the sustainability performance of financial institutions in Bangladesh: the role of green finance. Sustainability 13, 165. https://doi.org/10.3390/su131810165.

Zhou, X., Tang, X., Zhang, R., 2020. Impact of green finance on economic development and environmental quality: a study based on provincial panel data from China. Environ. Sci. Pollut. Res. 27 https://doi.org/10.1007/s11356-020-08383-2.