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Fintech and Sustainability Driving Innovation for a Greener Future

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ABSTRACT

Background: Numerous technological and managerial innovations have emerged in response to modern environmental concerns. In the era of digital transformation and sustainable finance, fintech has evolved as an alternative to traditional financial institutions. By leveraging advanced technologies, Fintech offers innovative solutions that align financial services with sustainability goals.

Purpose: This paper aims to explore the relationship between Fintech and sustainability by analyzing various areas of collaboration between Fintech and sustainable finance. The study also examines how emerging fintech innovations—such as artificial intelligence, blockchain technology, big data and analytics, IoT (Internet of Things), and digital payments—enhance sustainability.

Methods: A theoretical and descriptive approach is used in this study, relying on a comprehensive review of relevant literature, case studies, and research papers. The analysis highlights key innovations in financial technology that have the potential to support sustainability initiatives.

Results: The findings indicate that fintech and sustainable finance share numerous synergies. Fintech plays a significant role in promoting green finance, enhancing transparency, and increasing financial inclusion. Technological innovations have demonstrated their potential to mobilize financial resources more effectively for sustainable development and climate change mitigation.

Conclusion: Achieving sustainable development goals (SDGs) and addressing climate change challenges require accelerated financial innovation. Fintech has emerged as a critical enabler in this regard. However, fostering Fintech-driven sustainability solutions demands a deeper understanding of innovation processes, the factors influencing them, and the interplay between individual actors, organizational dynamics, and the external social environment. Encouraging and facilitating fintech innovations will be essential in making the financial sector more sustainable.

1. Introduction

The term "fintech" was coined to describe the convergence of the financial sector with the information technology industry to better assist businesses, entrepreneurs, and investors in managing their money. A lot of people attribute the rise of financial inclusion to developments in information and communication technology, particularly fintech. The field of financial management is becoming increasingly complex as new challenges arise often. This is due to the increased digitization of business processes and the increasing concerns of consumers for environmental friendliness and social responsibility in the products and services they buy and use. Corporate social responsibility (CSR) and environmental, social, and governance (ESG) considerations are two prominent examples. The United Nations 2030 Agenda for Sustainable Development Goals (SDGs) also has a significant impact on the global effort to curb the effects of global warming. Customers are expecting ecological or environmentally friendly products for a more sustainable lifestyle as they become more aware of global warming and its detrimental influence on the world. There is growing demand on businesses from customers, investors, and government agencies to disclose more data about the environmental effects of their operations. Specifically, "66% of worldwide customers" (and 73% of millennials) "are willing to pay more for ecologically friendly items," as reported by Nielsen Media Research. Thus, when consumers view a company as socially responsible, they may be more likely to purchase its goods and services and even pay a premium for them. So, businesses work hard to separate themselves apart from rivals by developing unique selling points, such as "green marketing" campaigns and cutting-edge technologies. To win over customers, several businesses promote their eco-friendliness. If the claims made in

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commercials and product descriptions are true, green marketing campaigns "benefit customers by informing them of which products feature those green properties (Chueca Vergara & Ferruz Agudo, 2021). Green investment is one way that this kind of modernization can be financed, but new green technologies also open new avenues of financial support. However, "greenwashing" is used by businesses as an unfair marketing tool due to the existing competition for attracting environmentally conscious investors and consumers. The term "greenwashing" refers to a collection of dishonest actions taken to make a company's ecological practices, or the environmental benefits of a product, seem more genuine than they are. Exaggerating the ecological features of a product by omitting or obscuring critical information or presenting data in a misleading way are all examples of greenwashing.

CO2-neutral certification and other similar schemes help a highly polluting corporation provide the impression that its products are environmentally friendly by placing a "green" label on them. Although not always significant, such marks can help distinguish legitimate businesses from those that aren't offering adequate security or independent verification in accordance with industry standards and best practices. Corporate social responsibility (CSR) activities are harmed when companies engage in greenwashing because it dilutes the message that the corporation is trying to be ecologically and socially conscious. Simultaneously, they may undermine trust among consumers. Greenwashing threatens to water down the entire CSR movement, lowering the pressure on corporations to act in a socially and economically responsible way. This contrasts with reporting on CSR activities, which is a reasonable and often economically sound thing to do (Rizwan & Mustafa, 2022).

1.1. Fintech Innovation and Sustainable Development

Investors and customers alike are showing their support for businesses that make efforts to improve their environmental, social, and governance practices. In 2020, sustainable assets saw a 34% gain in popularity among investors and a 61% increase among millennial investors, according to statistics from Refinitiv. The proportion of today's buyers interested in items made to these standards is about the same as the percentage of today's buyers in general.

Organizations like the International Monetary Fund and Nasdaq are reflecting the shift in focus to the capital markets. Sustainable business models have the potential to provide $12 trillion in annual economic opportunity and almost 400 million jobs by 2030, with the majority of these jobs being created in poor nations. (BBVA, 2022)

To check if sustainability-related goals are being met, however, it is important to take stock of the progress made. If you have a solid technological foundation and uniform, standardized, and consistent indicators and measurement methodologies, you'll have a more accurate and useful assessment. A solution to this extremely difficult problem may be found with the aid of fintech.

According to KPMG's Pulse of Fintech H1'21' research, this has sparked an unprecedented technical explosion inside the industry, with nearly 200 data suppliers and innumerable fintech companies operating throughout the globe.

Fintech innovations, including artificial intelligence (AI), advanced data analytics, tokens, and distributed ledger technologies (DLT), have the potential to make the financial sector more resilient in the long run. A few examples of how it's being used to make the economy more stable are provided below:

- Use artificial intelligence to analyze massive amounts of unstructured data to gauge real-time public sentiment on sustainability. It captures the most pressing problems, the characters driving the debate, and the interconnections between them to shed light on what, how, when, and where people's discussions of sustainability are.
- Use artificial intelligence to determine whether a company's actions contribute to achieving each Sustainable Development Goal.
- Create blockchain platforms to track progress toward the SDGs. As an illustration, consider G17Eco, a venture of the fintech Worldwide Generation backed by the UK government and the City of London.
- Evaluate the ecological footprint of business assets using big data (for example, their carbon emissions or the traceability of their supply chain).
- Use 'robo-advisors' to direct the money of small investors into environmentally responsible ventures.

Both public and private multinational corporations are using cutting-edge technological tools to aid in the worldwide shift toward a greener economic model.

1.2. How Fintechs are Taking a Stand on Financial and Environmental Sustainability

The financial technology sector is crucial to the global economy and has become a synonym for innovation. Its global reach, however, makes it a key factor in the push for better monetary and ecological sustainability.

The Glasgow 2021 COP26 Climate Change Conference reaffirmed the importance of corporate social responsibility and provided a stark illustration of the dangers for the earth if we fail to act with purpose.

Therefore, the FinTech sector is in a prime position to leverage its global prominence to positively impact the most pressing problems we confront. It has the potential to serve as a "green" model for other sectors, paving the path toward a future in which all sectors of the economy produce less carbon dioxide (Tully, 2022).

Below are the factors where Fintech businesses can take a stand on sustainability:

- **Foster an environmentally friendly supply chain:** The inherent use of big data, AI, and real-time information in fintech makes it an ideal paradigm for the implementation of green and sustainable logistics methods. A 'green' supply chain cannot function without open communication and cooperation among its players; doing so helps cut down on waste while also improving efficiency and saving money.
- **Create environmentally friendly methods:** Cutting-edge solutions continue to be developed by the industry; these solutions improve the efficiency of financial processes and payment systems and have the potential to alter the behavior of businesses. When companies use cutting-edge financial technologies, they boost their brand's image and earn the respect of their peers and the public at large. Putting money into "green" solutions is a definite way to ensure the long-term viability of your organization and pave the way for more moral practices and decisions.
- **New and improved methods of banking and making payments:** In the recent few decades, there has been a dramatic shift in the banking and payments sectors. New financial technology has provided a totally contemporary alternative to the 'conventional' high street banking services still available to businesses and individuals. The financial technology industry has created cutting-edge, efficient, and environmentally friendly banking and payment systems that enable firms to lessen their impact on the planet. One such technology is blockchain, which serves as a foundation for other innovations, including innovative fiscal and monetary systems.
- **Emphasize environmental responsibility as your unique selling point:** Fintech businesses may set themselves apart and stand out in a competitive market by embracing best practices and advocating for financial and environmental sustainability. Using sustainability as a competitive advantage within the broader "Green Fintech" category of cutting-edge technology and methods of operation reinforces the intention to combat climate change while fostering a sense of meaning and well-being among employees.

2. Literature Review

2.1. Importance of Big Data on Fintech and Sustainability

Banks and other financial institutions can use the vast amounts of structured and unstructured data at their disposal to better understand and forecast their customer preferences. Information is produced at an unprecedented rate in the financial industry. The term "structured data" refers to internal records kept by a business that may be analyzed to provide useful information for making decisions. There is great analytical potential in the growing mountains of unstructured data being generated by a wide range of sources. To differentiate themselves from conventional banks, upcoming fintech firms are increasingly utilizing big data for predictive analytics and risk assessments. Real-time data allows challenger banks and disruptive fintech to quickly adapt to the market. With the ability to process large amounts of data, FinTechs can improve their decisions and give customers more individualized service. Rather than relying on educated guesses or overly cautious risk assessments, FinTechs might use big data to gain a deeper understanding of their customers. (Anand, 2021)

Understanding the results of the effects of the business world and the natural world on each other is crucial for putting successful corporate sustainability into reality, which is something that businesses have finally realized. Interactions between the natural and corporate worlds are complex, but they shed light on where big data analytics could be useful. Prior to the last decade, businesses had a hard time understanding the entire scope of their operations' effects on the environment. In the era of big data, they have access to several datasets that aggregate a wide range of information that may be utilized to boost performance efficiency and achieve sustainability goals (Acharjya & Ahmed, 2016).

The allure of making a profit is the engine that keeps the business world moving. To make matters worse, it doesn't necessarily go hand in hand with environmental improvement. Companies in the modern day confront several complex challenges, but big data may hold the key to finding answers. Companies are now working to incorporate sustainability considerations into their overall company strategy and goals. They may maximize revenues while minimizing their impact on the environment by using big data analytics to investigate all their available possibilities. It is especially important for the large corporations that cause most of the environmental damage to take responsibility for their own actions and thereby foster sustainability (Al-Lozi, 2022).

When it comes to preserving the planet, the applications of big data are practically limitless. The application of big data within a company typically begins with internal processes. Using smart sensors, we can maximize system performance and ensure that all components are available precisely when and where they are needed (Victor & Maria, 2020).

2.2. Artificial Intelligence and its Impact on Sustainable Development

The use of artificial intelligence (AI) has already revolutionized banking and is set to do the same for the financial sector. AI is used in businesses to develop efficiency and discover trends that can improve decision-making because of its ability to quickly analyze huge amounts of data to draw key insights and information. While many people's daily interactions with businesses may not be influenced by AI in any way, its use is anticipated to rise as people become increasingly dependent on digital technology and processes. This has the potential to improve anti-fraud efforts, enhance customer service, and open the door to new payment-related efficiencies and conveniences for the financial services sector. (Solis, 2021).

Artificial intelligence is one technological advancement that has the potential to greatly aid in the promotion of sustainability. Artificial intelligence (AI) is expected to be a game-changer and mega-trend that will affect many industries and commercial practices, and as such, it has recently drawn interest from both the academic and business communities. Artificial intelligence (AI) is a broad phrase that refers to the integration of computational resources and the facilitation or imitation of human-like functions, including decision-making, event prediction, pattern recognition, and logical reasoning to address complicated circumstances. The UN conducted the Artificial Intelligence Summit in Geneva in 2017 to solve great challenges, and the organization has since acknowledged AI's potential to aid in solving complex, dynamic, and linked issues related to sustainability. Research has since begun down the path of using AI for sustainability, with a focus on developments in a wide range of fields, such as natural language processing (NLP) for studying public opinion on biodiversity using social media, deep learning (DL) for keeping tabs on forest conditions using satellite photos, machine learning (ML) for aiding cancer diagnostics using large amounts of sensor data, and AI-driven businesses for responsible waste management (Schoormann *et al.*, 2021).

Machine learning (ML) has become the de facto standard for implementing AI-based systems, as it enables the system to autonomously learn from data and solve problems on its own. Artificial intelligence (AI) subfield ML helps with cognitive tasks including decision-making, object detection, and NLP (Natural Language Processing). Different forms of ML, such as regression models, decision trees, etc., can be used for different purposes. Common classifications for ML algorithms include a set of inputs and a set of desired outputs; supervised learning algorithms seek out the best possible mapping between the two sets of data. A training dataset, such as one that has been pre-defined and organized by humans, is required for this. Unsupervised learning is a type of machine learning that does not require labeled or otherwise specified inputs to discover useful structural information inside datasets, such as clusters and representations. Algorithms in reinforcement learning try to figure out the optimal way to reach a target by themselves, given a description of the current state of a system, the set of actions that are permitted, and the constraints imposed by the surrounding environment. Deep learning (DL), a subfield of machine learning, is helpful when there is a need to process massive data sets consisting of things like photos, videos, audio, and text. The ability to rely on both supervised and unsupervised learning means that DL may automate previously labor-intensive tasks, such as identifying characteristics in raw data. There's usually a higher data bar for DL to clear before it can be used, compared to standard ML. Deep neural networks and recurrent neural networks are two examples of the algorithms used in DL, both of which are designed to mimic the way human brains work. Computer vision (CV), which is concerned with the acquisition, processing, analysis, and understanding of digital images to generate symbolic or numerical information, and NLP (Natural Language Processing), which is concerned with the automatic parsing of natural language chunks to, for example, implement speech recognition, are both enabled and supported by the advanced ML capabilities provided by DL (Kar *et al.*, 2022).

2.3. Blockchain and Sustainability

The blockchain, first theorized by Satoshi Nakamoto and released to the world in 2008, has been variously characterized. The most widely accepted definition is that it is a digital ledger (i.e., a ledger of all payment transactions) that is open, shared, decentralized, and distributed, where all transactions and related data are recorded and added in chronological order with the goal of producing permanent and unchangeable records. As a system based on a distributed ledger—that is, a system in which all the nodes of a network have the same copy of a database that can be read and modified independently by the individual nodes of the network—blockchain is also considered to be one of the distributed ledger technology (DLT). The term "blockchain" is used to describe methods in which the ledger is organized

into blocks (or "nodes") that include multiple transactions and are connected cryptographically. For each of these nodes, the system needs a consensus function to check the transitions, which is how the chain remains immutable. With this setup, the network can function as a server housing immutable data, from which members can see any discrepancies. Non-localization (decentralization), security, verifiability, and smart execution are four distinguishing features of blockchain technology that set it apart from previous information system efforts. Blockchains are digital ledgers that are distributed across a network of computers, either public or private. Each completed transaction becomes part of a growing "block" that cannot be altered once it has been added to the chain. Once the node has been confirmed and uploaded to the blockchain, a chain of trust is built by making several copies in a decentralized fashion (Du *et al.*, 2022).

Increasing digitization is the germinal environment for the new sustainable business models that are rapidly proliferating in today's society. To achieve this shift, businesses are embracing technologies from the fourth industrial revolution, or industry 4.0. These include the Internet of Things (IoT), AI, big data analysis, cloud computing, and 3D printing. The Internet of Things (IoT), 3D printing, the banking industry (central bank digital currency), the supply chain, and other enabling technologies have all benefited from the widespread adoption of blockchain technology. Given the circumstances outlined above, blockchain technology can help develop and coordinate unique sustainable business models by encouraging elements of sharing, optimizing, virtualizing, and, most importantly, exchanging. This is a major factor in our progress towards our sustainability objectives. Blockchain can be used here as a coordination tool, facilitating the linking and synchronization of several decentralized and frequently updated datasets. Moreover, the blockchain's decentralized nature and tamper-resistance, along with its smart contract and tokenization capabilities, can aid in the sustainability outcomes. A new business model that emphasizes waste reduction, a more transparent and secure product offering, and greater corporate social responsibility can help businesses reach their sustainability goals. By providing a distributed, complicated system that can update servers concurrently and irreversibly, blockchain technology can make a significant contribution in this area. For blockchain to be successfully adopted, it is essential that network participants adjust their business strategies to incorporate the new technology's requirements. The use of blockchain technology has the potential to be a useful tool for improving the efficiency and effectiveness of achieving sustainability goals (Mercuri *et al.*, 2021).

2.4. Digital Payments and Sustainability

Digital transformation in companies has been accelerated using COVID-19. Digital payments, once a luxury, have become a regular requirement in many countries as the need for social distance has developed. In response to the COVID-19 issue and its disastrous repercussions on businesses and lives, governments around the world have established or extended digital money transactions. Those who have been unable to use digital payment systems and other financial services due to factors such as a lack of infrastructure, inability to afford mobile devices and government-issued identification, or illiteracy can do so with government support.

Companies that facilitate financial transactions can utilize AI and ML to automate manual tasks and improve customer experience. This would boost productivity and reduce human error. A company's invoice payment process, for instance, may look simple on the outside, but it necessitates a great deal of labor on the inside. AI, on the other hand, can automate procedures like document identification and decision support to make real-time payments conceivable (Bhavsar & Samanta, 2021).

It is crucial for companies operating in developing economies to be able to adapt quickly to changing market conditions, and having access to real-time data and analytics helps payments organizations and their merchants accomplish this. One area where this is important is in the prevention and identification of fraud. There are additional potential entry points for fraud attributable to the digital payment paradigm and the enormous volume of cross-border payments that are processed every hour. Annual fraud costs the online retail sector roughly $19.5 billion (Jamel, 2022). To better aid their merchant clients, banks that have access to real-time analytics may monitor customer behavior in real-time and investigate any suspicious conduct before money is wasted. The employment of big data and real-time analytics can be leveraged to boost the STP (Straight Through Processing) flow (Nadikattu, 2020).

The core principle of sustainable development is to consider both immediate and long-term concerns about the economy, society, and the environment. Increasing people's access to financial services is seen as a means toward more equitable economic growth and long-term prosperity. Financial inclusion through digital payments is highlighted as an emerging trend and current state in the 2017 Global Findex Database. Studies conducted all over the world have found that digitizing payment processes might further improve efficiency by accelerating payment times and decreasing disbursement costs. Additionally, this caused a rise in institutional savings. Additionally, the financial infrastructure, which includes a suitable payment structure

and a physical network to transport payments, is crucial to the successful implementation of digitalization. Customers using digital payment methods must feel safe, confident, and at ease when depositing and withdrawing funds. The benefits of digital financial services can only be realized if governments enact the necessary rules and consumer protection safeguards.

In this paper, we use India as an illustration of a country whose government is actively working to promote digital payments and transform the country into a cashless society by employing a wide range of strategies and initiatives aimed at facilitating the acquisition, provision, and distribution of digital currency. The percentage of non-cash retail payments made via digital channels increased by 97.0 percentage points in 2019–20, according to data published by the Reserve Bank of India (RBI). By 2022, it is expected that the total value of all transactions made using digital payment methods in India will have reached $700 billion. The digital market is further segmented by region and payment system type. Digital payment systems come in a variety of forms, including mobile wallets, online banking, mobile banking, point of sale, and others. Despite the fact that digital payments can be broken down into urban and rural sectors, the former is currently the larger of the two. The monthly trend of India's payment system infrastructure is shown in Figure 1. There was a 38.2 percentage rise in the use of POS terminals, a 3.08 percentage rise in ATMs, and a 74.6 percentage rise in the use of Bharat QR codes (Bhavsar & Samanta, 2022).

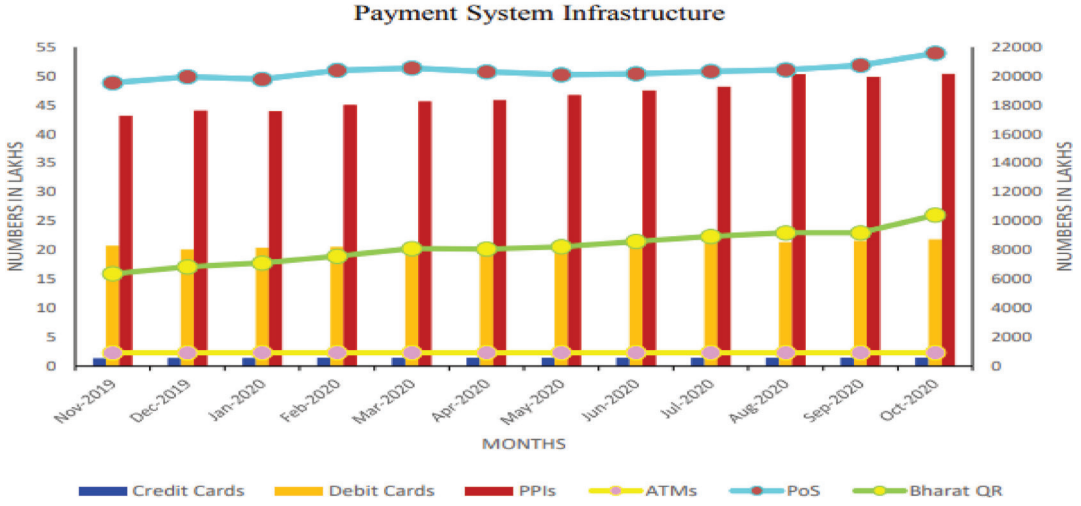

Figure 1: India's Digital Payment System Infrastructure
Source: RBI Report

2.5. Internet of Things and Sustainability

The term "Internet of Things," or IoT, is used to refer to the ever-expanding collection of internet-enabled physical things. Everything from internet-enabled cars and factories to high-tech gadgetry at home falls under this category. The Internet of Things (IoT) is propelling the future of banking services and the fintech industry by allowing banks to provide services that were previously unavailable. For instance, financial institutions can now issue "smart" credit cards that can be used to make purchases without the card itself or a SIM. The Internet of Things (IoT) is the widespread movement toward greater connectivity between various electronic components and infrastructure. Everything from thermostats and security systems to fitness trackers and internet-connected autos falls into this category. The Internet of Things (IoT) is fueling a service delivery revolution in the financial technology (fintech) and banking sectors. The Internet of Things is also helping to curb fraudulent activity. Financial institutions are increasingly turning to Internet of Things (IoT)-enabled devices to learn more about their consumers. By using this information, fraud can be stopped before it ever starts. The financial technology sector is always developing innovative approaches to servicing its clientele. IoT, or the Internet of Things, is a cutting-edge innovation that is finding increasing application in the banking and finance industry. In the banking industry, for instance, IoT-enabled ATMs are being used to automate processes like cash replenishment and routine maintenance. Point-of-sale terminals with Internet of Things connectivity are being used by retailers to monitor stock and avoid stock-outs. And insurance firms are employing IoT gadgets to track safe drivers and reward them with lower premiums. (Stefanini Group, 2022).

For the past three decades, society's welfare has been prioritized over environmental preservation and protection. As a result of the worldwide environmental problem, new ideas are gaining traction, including sustainability and sustainable development. The world can be preserved for future generations while also enhancing the quality of life through sustainable development. Living within ecological boundaries and serving the needs of everyone are the two fundamental goals of sustainability, which emphasizes 'triple bottom line' approaches, sometimes known as social, environmental, and economic responsibility. Since the 1960s, businesses have been influenced by the concept of sustainable development, which prioritizes ecological stability to ensure a high standard of living for future generations without sacrificing current ones. Studies have been conducted in recent years on sustainability as well as consumer behavior and attitudes towards sustainable development. Sustainable practices are now embedded in the operations of many businesses. Applications built on the Internet of Things (IoT) can have positive effects on the planet (Suciu *et al.*, 2021). The Internet of Things aids in combating global warming, resource depletion, and extinction. Some of the most pressing issues in human, economic, and environmental health could be alleviated by this. Recent research has focused on the positive impact of the Internet of Things (IoT) on sustainability. The growth of the IoT and its many uses in various sectors has been very beneficial. The Internet of Things has the potential to positively impact any environmental issue, including but not limited to lowering the frequency and severity of water-related disasters and economic losses; increasing energy efficiency; fostering better and more widespread connectivity; and improving the quality of decisions made regarding water management. The Internet of Things (IoT), the Internet of Business (IoB), the Internet of Energy (IoE), and the Internet of Manufacturing (IoM) are all examples of high-technology techniques used to implement strategies and solutions essential to sustainable development. The fast development of the Internet of Things has caused a need for a new concept of sustainability. In the fields of ecological engineering, earth systems engineering, industrial ecology, environmental sustainability, and green engineering, the Internet of Things can facilitate long-term growth and improvement. Achieving the goals of the Paris Agreement and the UN Sustainable Development Goals will be aided by IoT (SDGs). The Internet of Things and other linked gadgets were seen as the primary catalysts for development. A new concept, "globality," is being incorporated into the business lexicon because of recent developments. The usage of digital technology, from the proliferation of robotics and AI to the rise of e-health and digitally delivered public services, is influencing every facet of economic and social life in the European Union (Rosca *et al.*, 2021).

3. Conclusion

The concept of sustainability has entered the mainstream. There is a great chance for businesses that use it to create innovative products, exceed their customer's expectations, and contribute to the improvement of society. Creating a low-carbon economy and meeting the UN's Sustainable Development Goals (SDGs) may seem unconnected to climate change at first glance, but a closer look reveals the critical role that FinTech plays in accomplishing these objectives. Climate fintech is a new industry being pioneered by a new breed of fintech companies, and the established players are getting on board. Companies are taking action to address the climate crisis in a variety of ways, including the introduction of new products that facilitate sustainable investing and aid consumers in making conscious purchase decisions and the launch of new projects that plant trees and remove carbon. People are growing less loyal to certain brands and more interested in purchasing goods from companies that prioritize social responsibility. The rapid rise in European supervisory expectations and the accompanying increase in legislation is another contributing element. EU banking institutions will be forced to include ESG analytics into their risk management systems by June 2022. The purpose of this initiative is to direct funding into environmental, social, and governance initiatives while eliminating greenwashing. Since their operations are based mostly on digital procedures, fintech organizations often have a smaller environmental impact than their more traditional counterparts. Banks and other financial organizations may greatly lessen their impact on the environment by embracing digital transformation. Getting rid of paper waste is step one, and then branches can be cut down. In addition to being more environmentally friendly, less money would be spent on each step of the process, which would boost profits. Fintech firms may contribute much to the fight against climate change through the decarbonization of their operations and the development of novel products, but they cannot do so alone. Governments and regulators also play a part, and they are committed to making changes in the interest of securing the future.

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The authors declare that there is no conflict of interest related to this research.

Declarations

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