Review Article

A FinTech Clustering Framework: Technology, Model, and Stakeholder Perspectives

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Nowadays, the global boom of FinTech can be seen everywhere. FinTech has created innovative disruptions to traditional, long-established financial institutions (e.g., banks and insurance companies) in financial services markets. Despite its popularity, there are many different definitions of FinTech. This issue occurs because many existing studies only focus on a particular aspect of FinTech without a comprehensive and in-depth analysis. This issue will hinder the further development and industrial application of FinTech. In view of this problem, we perform a narrative review involving over 100 relevant studies or reports, with a view to developing a FinTech clustering framework for providing a more comprehensive and holistic view of FinTech. Furthermore, we use an Indian FinTech firm to illustrate how to apply our clustering framework for analysis.

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Introduction

Financial Technologies (FinTechs), such as SWIFT and Bloomberg, have been around for decades, but only over the last few years have they revolutionized the way people interact with financial services[1][2][3]. Although it is almost certain that technological advancement has an impact on the financial industry, what makes the FinTech revolution so unique is: (a) the pace at which new technologies are tested and introduced into the financial industry is much faster than ever before, and (b) much of the change is happening from outside the financial industry, where young start-ups and large established technology companies are generally attempting to disrupt the incumbents by introducing new products and technologies[4][5].

From a review of the literature on FinTech[6][7][8], we have observed a problem. When people (particularly those working in the industry) talk about FinTech today, they generally have only a limited understanding of the concept[9]. There is still a lack of consensus on the definition of FinTech among researchers and practitioners[10]. A major reason for this incomplete and, perhaps, imprecise understanding of FinTech is that many existing studies focus only on a particular aspect of FinTech without a comprehensive and in-depth analysis. This problem is likely to hinder the further development and industrial application of FinTech. With a view to addressing this problem, we develop a

clustering framework for interconnected FinTech perspectives, through which a holistic overview of FinTech can be provided.

Study Approach

Consideration has been given to whether the study should be a systematic review or a narrative review. These two types of review mainly differ in their objectives and methods[11].

A *systematic review* formulates a well-defined research question, then uses qualitative and quantitative methods to analyze all the evidence for answering the research question. Thus, this review has a "narrow" focus on the research question. Also, a systematic review involves detailed and comprehensive literature searches with the use of a criterion-based selection of relevant evidence. Although systematic reviews are popular in the research community, Collins and Fauser[11] argue that its "narrow" focus and prescribed methods do not allow for "comprehensive" coverage.

On the other hand, a *narrative review* is a scholarly summary along with interpretation and critique. This review is generally comprehensive and covers a wide range of issues within a given topic. A narrative review often has only a topic of interest without predetermined research questions. Also, this review does not necessarily state or follow rules about the search for evidence (i.e., without a specified search strategy) and does not involve prescribed databases for a literature search.

This study adopted the approach of a narrative review for two reasons: (a) a historical review was indispensable for tracing the development of FinTech, but the narrative thread could be lost in the strict rules of a systematic review; and (b) a broad examination of various aspects of FinTech was not possible due to the restrictive focus of a systematic review.

Despite using a narrative review without the need for a rigorous and structured literature search and prescribed databases[12], our study still used an "informal" search strategy. A total of 25 FinTech-related "preliminary" articles were initially collected from two FinTech studies[13][14]. We then followed the relevant references (e.g., other journal and conference papers) mentioned in these "preliminary" articles to find more relevant ones. To supplement this snowballing approach, we searched for more relevant information online, using search words such as "FinTech," "financial technology," "financial technologies," "financial innovation," and "disruptive technologies."

Because the current study also aimed to investigate the development of FinTech in the financial services industry and the practitioners' views on FinTech, the study covered both the academic literature and information from various industry sources (e.g., practitioners' journals/magazines and industry/government reports). While academic literature enables rigorous knowledge synthesis of the various aspects of FinTech, information from industry sources provides an overview of the FinTech industry and its environment. All in all, the current study involved 76 and 27 FinTech-related references from academic and practitioner sources, respectively.

Different Definitions of FinTech

The continuous revolution of FinTech has resulted in multiple definitions of FinTech, with each definition emphasizing some (but not all) aspects of FinTech.

These definitions are grouped into three perspectives as follows:

Technology Perspective

It focuses on *FinTech-enabled technologies* (or simply *FinTech technologies*). This perspective acknowledges that a FinTech innovation can be assessed in terms of technology by considering this innovation as the practical application of technical processes or methods[15].

- *Technology* used to provide financial markets with a financial product or service, characterized by advanced technology relative to existing technology in that market[16].
- The use of *technology* to provide new and improved financial services[17].
- A broad category that encompasses many different *technologies* for changing the way consumers and businesses access their finances and compete with traditional financial services[18].

Model Perspective

It focuses on *FinTech models, ideas, innovations, applications*, and *businesses* (hereafter, they are collectively known as "FinTech models"). This perspective focuses on how FinTech companies take advantage of changing customer demands and expectations of financial services via their company's FinTech model innovations[19].

- Any innovative *ideas* that improve financial service processes by employing technology solutions for different business situations, and these *ideas* could also lead to new business *models* or even new *businesses*[20].
- The *application* of *technological innovations* to financial services and processes[21].
- The new business *model* for the global financial sector, offering clear and enormous potential for vast economies of scale and scope, massive cost savings and efficiency gains, significant risk reduction, and opening the door to banking for countless currently unbanked people[22].

Stakeholder Perspective

Examples of FinTech *stakeholders* are FinTech start-ups, traditional financial institutions, technology developers, Tech Titans, governments, and financial customers. This perspective acknowledges that FinTech stakeholders not only affect the survival and development of FinTech companies but also determine the activities and effectiveness of FinTech innovations in these companies[23].

- Technology-enabled new *entrants* that change how financial services are structured, provisioned, and consumed[24].
- *Organizations* combining innovative business models and technology to enable, enhance, and disrupt financial services[25].
- An *ecosystem* of heterogeneous, non-linear, dynamic, and complex networks of agents that interact with each other to provide a wide range of financial products and services to end customers[21][26][27][28].

To alleviate the confusion caused by the various FinTech definitions used by different researchers and practitioners, the next section systematically discusses

the important concepts of FinTech in terms of the three perspectives shown in Fig. 1.

A Clustering Framework for FinTech Perspectives

In view of all the FinTech definitions mentioned in the preceding section, we developed a FinTech clustering framework involving three interconnected perspectives as shown in Fig. 1. In this figure, we argue that technologies (the left block) serve as the underpinning enabler for the adoption and implementation of various FinTech models, ideas, innovations, applications, and businesses (the middle block). For example, Artificial Intelligence (AI) and Machine Learning (ML) are two main technologies that underpin the development of robo-advisors for supporting the wealth management model in FinTech. Then, FinTech models (the middle block) create new business opportunities for or impacts on different stakeholders (the right block). For example, the digital banking model in FinTech allows challenger banks to enter the financial services market by providing services to customers with banking fees lower than those of traditional, long-established banks.
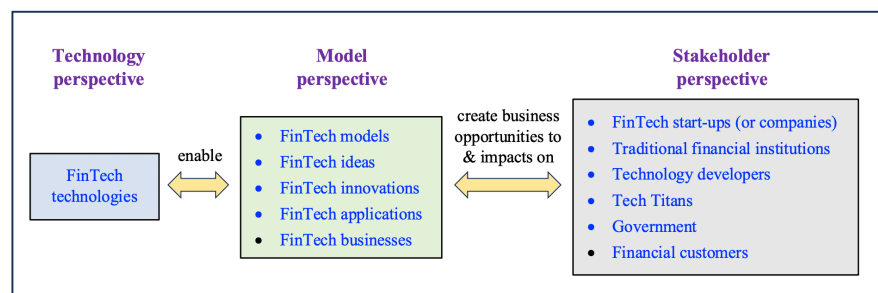

Figure 1. A clustering framework of FinTech perspectives.

Technology Perspective

Table 1 lists 21 major FinTech technologies, among which AI/ML, big data/data (or predictive) analytics, and blockchain/cryptocurrency are frequently mentioned. On the other hand, the FinTech technologies that are relatively less mentioned are the Application Programming Interface (API), Open-Source Software (OSS), quantum computing, the Quick Response (QR) code, the virtual card, voice technology, and the 5G network.

Table 1 is developed based on our narrative review of the relevant literature. Thus, the number of occurrences of a particular FinTech technology in the references listed in Table 1 may not necessarily reflect the degree of popularity of this technology in FinTech. Nevertheless, Table 1 still provides a useful overview of a variety of FinTech technologies.

Bholat[29] argues that the popularity of AI/ML in FinTech is caused by the variety, volume, and velocity of data created in the Internet era. Buchanan and Wright[30] argue that the tremendous growth in using AI/ML in FinTech is attributed to their wide range of applications in fraud detection and compliance monitoring, credit scoring, financial distress prediction, robo-advising, and algorithmic trading. AI is predicted to contribute up to US$15.7 trillion to the

global GDP by 2030, with the financial services industry becoming an area of substantial activity[31].

FinTech technologies	References
Application programming interface (API)	[32]
AI/ML	[33][34][35]
Augmented reality (AR)/virtual reality (VR)	[36]
Big data/data (or predictive) analytics	[33][35][37]
Biometrics	[38]
Blockchain/cryptocurrency	[39][40][41]
Cloud computing technology	[42][43]
Crowdfunding platform	[44][45]
Cybersecurity technologies	[46][47]
Internet of Things (IoT)/sensors	[48]
Near field communication (NFC)	[49][50]
No-code (or low-code) development platform	[51][52]
Open-source software (OSS)	[53]
Quantum computing	[41]
Quick response (QR) code	[54]
Robotic process automation (RPA)	[55][56]
Sentiment analysis	[57][58]
Smart contract	[59][60]
Virtual card	[61]
Voice technology	[62]
5G network	[63]

Table 1. Different FinTech technologies.

Khatri et al.[64] argue that big data is useful for developing FinTech innovations and inherently incentivizes, exposes, and resolves FinTech challenges. Haidar[65] argues that big data is a key enabler of FinTech because it facilitates financial companies' ability to innovate and improve their services and offerings to earn customer loyalty and surpass their competitors. For example, big data enables financial companies to perform the typically protracted and expensive credit-risk scoring and assessment tasks faster.

By their very nature, blockchain and cryptocurrency are closely related to payment transactions[66] and thus have immediate contributions to the financial services industry. The popularity of these technologies in FinTech is also caused by two main reasons. First, blockchain can significantly shorten the settlement period and accelerate the payment process[67]. Second, using blockchain and cryptocurrency (e.g., bitcoin) in financial services can effectively prevent adverse behavior and repercussions, such as double spending and forgery[68][69].

Nowadays, the 5G network is commonly considered the next generation of wireless data networks[70]. 5G is argued to be a gateway to the new era of the financial industry. The contribution of 5G to FinTech is mainly due to its high transmission speed (up to 10 gigabits per second, which is about 100 times faster than 4G). In general, 5G contributes to FinTech in several aspects, such as (a) real-time mobile banking user experience, (b) streamlined lending, (c) security and fraud detection, and (d) an enabler for AI, IoT, and VR[71].

Model Perspective

This subsection discusses some popular FinTech models, their concepts, value propositions, underlying technologies, and associated applications.

Payment Model: As payments are daily financial activities, those financial services companies adopting this model (known as PayTechs) will be able to attract customers quickly. The main value created by this model is streamlined payments experienced by customers in terms of speed, convenience, and multichannel accessibility. This model even makes payments embedded (and, hence, "invisible") within customer journeys by reducing the obstacles of making a payment transaction to a minimum. This explains why PayTechs currently account for about 25% of FinTechs and why they focus on the payment value chain, payment facilitation, and new payment propositions[72].

BNY Mellon[73] has identified several FinTech applications associated with this payment model: mobile wallet, P2P payment, foreign exchange and remittance, real-time payment, and *digital currency solution* (this solution offers banks a new way to handle, manage, and distribute their funds in the form of digital money, designed to beneficially replace fiat currencies through blockchain and process automation).

Various FinTech technologies are used to support this model, including, for example, blockchain/cryptocurrency, cloud computing, cybersecurity technologies, NFC, QR code, payment gateways (e.g., PayPal, SecurePay, and Alipay), virtual card, and mobile card reader. Another emerging technology that underpins the payment model is *biometric authentication*, where payments can be made using customers' fingerprint, facial and iris recognition, heartbeat analysis, and vein mapping.

Digital Banking Model: This model is almost identical to that of a traditional, long-established bank ("high street bank") with physical branches, except that it involves huge cost savings in manpower and real estate. In this model, *challenger banks* (e.g., N26) offer no-frills individual and business bank accounts through a well-defined digital infrastructure (i.e., challenger banks offer services via an app or through their websites). Customers of challenger banks not only benefit from higher interest rates on their savings and reduced banking fees, but they can also enjoy additional services (e.g., real-time spending notifications, and personalized advice and analytics) that are not available in high street banks.

Another motivating factor that makes customers move from a high street bank to a challenger bank is "personalization." Relatively speaking, challenger banks have higher agility and speed in innovation to meet customers' needs in terms of their lifestyle choices. Even if customers' needs constantly change, challenger banks will be able to offer more that is hyper-personalized and highly appealing (e.g., simple account opening and operation)[74].

GlobeNewswire[75] projected that the market size of the challenger bank industry will reach $471.0 billion by 2027. Examples of the technologies that underpin digital banking are open banking API, AI, ML, blockchain, advanced data analytics, and mobile apps[76].

Wealth Management Model: Traditionally, banks and wealth managers mainly offer expensive financial products with very high minimums. Thus, these products are mainly for high-net-worth individuals. Consequently, small investors are often excluded from these wealth management services. Nowadays, with the availability of wealth management applications (e.g., robo-advisors and digital brokerage), financial services are made available at a fraction of the cost of a human financial advisor[77].

Consider, for example, robo-advisors. Investors (especially the small ones) prefer robo-advisors to human financial advisors because these application tools are less vulnerable to potential conflicts of interest, have significantly lower and more transparent cost structures, and are much less prone to misguided incentive-based compensation schemes and conflicting kickback payments[78]. The total value of assets managed by robo-advisors is expected to reach a staggering $4.6 trillion by 2022[79]. The two main technologies underpinning robo-advisors are AI-based algorithms and ML.

Apparently, robo-advisors and human financial advisors are competitors of each other. This view, however, has been changing. Nowadays, traditional banks view robo-advisors as "healthy" for several reasons: (a) robo-advisors represent a challenge to traditional banks, so the latter are motivated to offer better customer experiences and journeys; and (b) combining the reach and tech-enabled capabilities of digital platforms with the relationship and client base of traditional wealth managers creates synergies that allow a wider group of clients to be served more efficiently in terms of product access and cost[80].

Crowdfunding Model: This model provides an effective mechanism to fund a project or venture by raising many small amounts of money from a huge number of people, typically through the Internet[44]. Crowdfunding is particularly advantageous to small businesses and start-ups by offering them an opportunity to succeed through demonstrating their innovative business models to the world.

Crowdfunding involves three parties: the project initiator who needs funding, the contributors who may be interested in supporting the project, and the moderating organization that facilitates the engagement and collaboration between the initiator and the contributors. There are three major crowdfunding models: rewards-based, donation-based, and equity-based[26]. These three models are technically supported by Internet-based crowdfunding platforms such as Kickstarter and Crowdfunder. Note that many FinTech *companies* have the same names as the *applications* or *platforms* they offer (e.g., Kickstarter). Despite this, readers should know what they are referring to from the context.

In general, crowdfunding is associated with several advantages and disadvantages[81]. On the positive side, crowdfunding offers three major benefits:

- Whereas traditional fundraising needs significant effort to persuade investors who are mainly interested in the return on investment, crowdfunding offers an opportunity to raise money for any project or idea that is innovative, is thought-provoking, and has the potential to generate significant profit in the future.
- Business control and management remain in the hands of the project initiator.
- The project initiator can reach a large audience by publishing particular posts, videos, ads, and information. Once the idea becomes visible, genuine feedback can be obtained from those who are interested in supporting this idea. This feedback then allows the project initiator to tweak the initial idea.

On the negative side, crowdfunding has the following major weaknesses:

- Crowdfunding may take a long time to perform research for identifying what audience to target and what features to offer to stand out from the crowd.
- Most FinTech start-ups are unable to raise sufficient funds for company growth.
- Crowdfunding takes a long time to raise funds. Often, most crowdfunding initiatives take weeks or even months to complete.

Cash Flow Underwriting / Lending: Cash flow underwriting provides a new, more accurate approach to evaluating borrowers' creditworthiness. This new approach analyzes real-time financial data, beyond the limitations of traditional credit reports. These credit reports often focus on *past* credit behavior. Cash flow underwriting, however, takes into consideration *real-time* data from a borrower's bank account, including income, spending patterns, and financial obligations[82]. Thus, cash flow underwriting facilitates more informed lending decisions. A major factor in the growth of cash flow underwriting is the introduction of open banking, which allows secure and consent-based financial data sharing between banks and third-party providers.

Cash flow lending is related to cash flow underwriting, but there is a major difference between the two. For cash flow lending, the lender who provides the loan assumes all financial risk. On the other hand, for cash flow underwriting, the underwriter determines the value of that risk for the lender.

The major underlying technologies used to support this model are APIs, AI/ML, big data and predictive analytics, and cybersecurity technologies. Cash flow underwriting/lending is commonly used in payday and cash advance loans, property management, mortgage and auto financing, and credit card applications[83].

P2P Lending Model: P2P lending is the model of lending money to individuals or businesses through online investment platforms (also called *intermediary P2P platforms*) that match lenders with borrowers, without an official financial institution (e.g., a bank) participating as an intermediary in the deal[84]. These intermediary P2P platforms offer identity verification, proprietary credit models, loan servicing, as well as legal and compliance services to their customers (i.e., borrowers and lenders). A major difference between a bank and an intermediary P2P company is that the latter does not involve itself in the lending. Thus, an intermediary P2P company does not need to meet the stringent capital requirements of a bank. Big data, data analytics, and ML are the main enabling

technologies for this model, which creates value for customers by using alternative credit scoring, online data sources, and data analytics to price risks, rapid lending processes, and lower operating costs[26]. There is a major difference between the P2P lending model and the crowdfunding model. The P2P lending model primarily focuses on debt consolidation and credit-card refinancing, but the crowdfunding model targets providing funding for projects.

Bavoso[85] reported that a larger share of loans has been originated through P2P platforms instead of traditional banking channels in the last decade. Policymakers generally prefer this trend because it contributes to better risk diversification by moving risks away from systemic financial institutions. However, this benefit comes with a cost. Because the nature and role of P2P platforms have remained loosely defined, it is difficult to identify relevant regulatory challenges emerging from P2P lending[85].

Capital Market Model: Capital markets (*CMs*) are financial markets that bring buyers and sellers together to trade stocks, bonds, and other financial assets. Prominent players in FinTech-driven CMs are investment banks, custodians, exchanges, clearinghouses, and CM-focused information service providers[86]. In this model, the major focus areas are automation, data analytics and intelligence, and customer satisfaction through safe and convenient access. FinTech-driven innovations have created tremendous impacts on many parts of the CM's value chain, such as investment, foreign exchange (forex) trading, and risk management.

Consider, for example, forex trading. Often, forex traders are trading on thin time margins using an "intraday" strategy because small hour-on-hour fluctuations in currency exchange rates can make a big difference. With the support of forex mobile apps (e.g., NetDania Stock and Forex Trader), forex traders can obtain the latest market news that may influence currency rate movements and perform more "responsive" real-time trading[87]. These mobile apps also generate quotes and charts and provide forex traders with access to their trading accounts at their fingertips at all times. Examples of the technologies underpinning these forex mobile apps are AI, ML, 4G/5G networks, and cybersecurity technologies.

Insurance Services Model: Insurance has now become ripe for disruption by Insurance Technology (InsurTech—an extension of FinTech beyond the banking sector) in much the same way as banking has by FinTech[88][89]. InsurTech companies aim to provide a more direct relationship between insurers and customers via a combination of mobile apps, wearables[1], and claims processing tools. InsurTech companies create value for their customers by providing: (a) enriched connectivity with AI solutions, (b) personalized product offerings, (c) an exceptional digital customer experience, and (d) streamlined processes[90]. Two popular InsurTech apps are Lemonade and Hippo, which are supported by various technologies such as AI, ML, blockchain, big data, data analytics, IoT, and mobile apps.

As InsurTech is part of FinTech in the same way insurance is part of finance, consumer trust plays an important role in the success of InsurTech. Zarifis and Cheng[91] performed an empirical study and found that consumers bring with them some pre-existing beliefs (or trust) in AI and related technologies (e.g., chatbots or virtual assistants) that underpin InsurTech. Therefore, consumer trust in InsurTech is not only based on their direct experience with InsurTech but is also influenced by their existing beliefs (or trust) in AI and related technologies.

Platform-Based Model: More recently, we have witnessed a further extension of FinTech (besides InsurTech)—BigTech[92][93]. JPMorgan[94] reported that BigTech had a combined market value of about $2.5 trillion in 2022. The appearance of BigTech, together with the digitization and platformization of finance, marks the era of so-called *FinTech 4.0* [95].

The stakeholders of BigTech are known as *Tech Titans*. Examples of these Tech Titans are Google, Apple, Facebook, Amazon, and Microsoft (GAFAM) in the U.S., and Baidu, Alibaba, and Tencent (BAT) in China. These Tech Titans initially started their FinTech activities in the payment area (corresponding to the payment model discussed earlier) for streamlining their core businesses (e.g., e-commerce). Later, they leveraged their platforms to expand into vast ecosystems covering other areas such as lending, investment, and insurance[96]. These Tech Titans have captured dominant market share, allowing them to capitalize on network effects and leverage their core offerings as multi-sided platforms for commerce and innovation[97]. Successful Tech Titans use the platform-based model to capitalize on "winner-takes-all" dynamics and strong reinforcing feedback loops, allowing them to become synonymous with entire industries[97].

The entry of Tech Titans into the financial market is driven by several reasons:

(a) diversifying their revenue streams, (b) accessing new sources of data, (c) complementing and reinforcing their core commercial activities, and (d) increasing their customer base and loyalty[98]. Some underlying technologies behind this platform-based model are APIs, AI, big data, and cloud computing.

The Emerging Trends of FinTech Models: The appearance of InsurTech and BigTech has indicated that FinTech is now extended from the banking sector to other sectors (e.g., insurance). Since there are many players in the FinTech space, there is fierce competition to acquire new customers and keep existing ones. Such competition has caused FinTech companies to move beyond addressing financial needs ("product-centric") by offering ancillary services such as accounting and coaching ("customer-centric").

Recently, we have also witnessed the occurrence of a particular niche of the FinTech industry, namely *decentralized finance* (*DeFi*). Basically, DeFi is an emerging technology that "reshapes" financial services based on secure distributed ledgers similar to those used by cryptocurrencies[99][100]. DeFi allows users to perform financial transactions or peer-to-peer digital exchanges (e.g., transfers, lending, savings, investing, and trading) without the presence of an intermediary entity (e.g., banks and brokerages), thereby eliminating the fees that an intermediary entity charges for using its services. Any individual holding money in a secure digital wallet with an internet connection can get access to DeFi applications. This allows DeFi applications to be accessible across conventional boundaries, markets, regions, and different layers of society.

Stakeholder Perspective

This perspective corresponds to the FinTech ecosystem, in which new and old stakeholders combine to offer unique capabilities that complement one another and contribute to innovation[21][26][27][28]. With the introduction of various complementary technologies, the complexity of FinTech ecosystems is rapidly increasing as new stakeholders emerge and new connections are established.

There are six major interacting stakeholders in the FinTech ecosystem as follows:

- *FinTech start-ups* offer technology-mediated services in payments, digital banking, wealth management, crowdfunding, P2P lending, capital markets, and insurance (corresponding to the FinTech models discussed in the preceding subsections "Payment Model" to "Insurance Services Model") to create value for financial customers. FinTech start-ups generally adopt a strategy of "unbundling" financial services, which serves as a major driver of growth in the FinTech sector.
- *Traditional financial institutions* (e.g., large commercial banks and insurance companies) are a major driving force in the FinTech ecosystem. After recognizing the disruptive power of FinTech, traditional financial institutions respond to protect their interests by reinventing their products, processes, and business models[101]. These institutions previously considered fast-growing FinTech start-ups as threats. Today, these institutions have shifted their focus and strategies from competing to collaborating with FinTech start-ups with various funding provisions[26].
- *Government* establishes a stable regulatory infrastructure for the financial services market. For example, the government can offer licensing of financial services, relaxation of capital requirements, and tax incentives to boost the growth and development of FinTech start-ups.
- *Financial customers* use and benefit from various FinTech services. These customers are also the source of revenue generation for FinTech companies. When compared with large organizations, individual customers and small-to-medium-sized firms are the predominant revenue sources for FinTech companies[26].
- *Technology developers* invent and provide different kinds of disruptive technologies (e.g., those listed in Table 1) to enable FinTech companies to launch their innovative services quickly and effectively. In return, the FinTech industry is generating revenue for these technology developers.
- *Tech Titans* increasingly underpin our social, political, and economic worlds by providing the digital infrastructure on which we rely to live our lives (similar to Big Oil and Big Banks in the past)[102]. According to a report by the World

Economic Forum, Tech Titans are more disruptive to banks than FinTech start-ups[103].

Case Study: FlexiLoans

This section illustrates how to use our FinTech clustering framework to systematically and holistically analyze an app (FlexiLoans) developed by a FinTech firm in India (called FlexiLoans.com).

In India, its MSME (Micro, Small, and Medium Enterprise) sector (which contributes to about 30% of the country's GDP) is largely underserved. For example, less than 10% of India's MSMEs have access to loans from "traditional" financial institutions because most MSMEs do not have the conventional credit histories required by these financial institutions. This creates a large capital gap. In view of this issue, FlexiLoans.com was founded in 2016 to bridge this gap, particularly in Tier-2 and Tier-3 cities where access to financial funding is limited[104][105].

FlexiLoans is a mobile app that provides quick business loans without collateral to India's MSMEs to support their working capital requirements. FlexiLoans offers unsecured business loans of various types (e.g., working capital loans,

vendor financing, merchant cash advance, and line of credit) starting at a very low interest rate of 1% per month. By leveraging alternative data sources, the app offers a fast process for getting business loans approved within 48 hours, with no hidden charges and a hassle-free, paperless process. The app involves a simple three-step process: (a) download the app, (b) upload photos of some key documents, and (c) connect to the applicant's bank account.

Technology Perspective

Several FinTech technologies underpin FlexiLoans. Examples of the technologies include the following:

- *API:* This technology enables FlexiLoans to integrate its lending platform with the Amazon Lending Marketplace in India. This integration allows (a) Amazon sellers to apply for and monitor their loans with FlexiLoans.com from their Amazon seller dashboard[106] and (b) FlexiLoans.com to keep its cost of acquisition low because the Amazon platform already has a huge amount of data about sellers (e.g., monthly sales and growth in sales).
- *Data-driven AI/ML technologies:* The in-house developed AI/ML technologies are able to read and process a large volume of images of uploaded documents in seconds. Besides image processing, these technologies can also solve complex problems such as credit scoring, creditworthiness analysis, and financial analysis.
- *Data analytics:* It empowers end-to-end risk assessments and facilitates real-time credit decisions. Coupled with the in-house developed AI/ML technologies, effective credit models and customer scorecards can be built that access diverse third-party data for comprehensive evaluation, reducing friction, enhancing processing speed, and improving the customer experience.
- *Cybersecurity technologies:* All applicants' data are transferred over a secure connection to avoid unauthorized data disclosure and tampering during transmission.

Model Perspective

FlexiLoans.com has co-created underwriting models with its co-lenders. Thus, the firm is adopting the "Cash Flow Underwriting/Lending" model. The firm also adopts the "Platform-Based" model. Through the firm's digital platform, merchants have access to a massive pool of capital from FlexiLoans.com as well as its co-lenders (including banks and other Non-Banking Financial Companies (NBFCs)). Today, FlexiLoans.com has over 150 ecosystem partners, including online retailers of fashion and beauty products, food-tech, pharm-tech, MSME SaaS (Software as a Service) platforms, point-of-sale firms, and other e-commerce giants[105].

Stakeholder Perspective

Various types of stakeholders are involved in the business of FlexiLoans.com as follows:

- *Traditional financial institutions:* FlexiLoans.com is supported by an advisory team of senior risk and credit professionals from leading banks and NBFCs. To support its operations, the firm has raised debt from financial institutions such as JM Financial and Vivriti Asset Management. Also, FlexiLoans.com is backed by an NBFC called Epimoney.

- *Government:* As an online lending FinTech platform in India, FlexiLoans.com is subject to the regulation and monitoring of India's government.
- *Financial customers:* As stated earlier, the major customers of FlexiLoans.com are MSMEs in India. As of today, the firm has disbursed over 75,000 loans, with a total amount of about 5,000 crores Indian Rupees.
- *Technology developers:* In the past few years, it was observed that over 80% of borrowers via FlexiLoans have been using a mobile device to apply for a loan. Thus, FlexiLoans.com has formed a partnership with True Software Scandinavia AB (a privately held company headquartered in Sweden that has developed the Truecaller app). Truecaller is a smartphone app that helps improve the user experience on all platforms, especially mobile. With Truecaller, the user experience of FlexiLoans is improved with one-click registration and handy identity verification[107].
- *Tech Titans:* FlexiLoans.com has partnered with major e-commerce and payments platforms such as Amazon, Flipkart, Paytm, and PhonePe, enabling seamless loan origination within these ecosystems.

The above discussion has demonstrated the effectiveness and practicality of our FinTech clustering framework for analyzing the various aspects associated with a FinTech firm (including its ecosystem).

Conclusion

To alleviate the confusion caused by many different FinTech definitions from various studies, we developed a FinTech clustering framework with three interconnected perspectives: technology, model, and stakeholder. The technology perspective focuses on various FinTech-enabled technologies. The model perspective focuses on FinTech models, ideas, innovations, applications, and businesses. The stakeholder perspective includes various FinTech stakeholders such as FinTech start-ups, traditional financial institutions, technology developers, Tech Titans, the government, and financial customers. These three perspectives are not isolated. FinTech technologies serve as the underpinning enabler for the adoption and implementation of various FinTech models, and in turn, these FinTech models create new business opportunities for or impacts on different stakeholders. We also illustrated how to use our clustering framework for analysis using an Indian FinTech firm.

Not only does our FinTech clustering framework provide a more comprehensive and holistic view of FinTech, but it also provides two practical implications for FinTech practitioners. First, it indicates that FinTech entrepreneurs and practitioners must have a thorough understanding of various contemporary FinTech technologies before they can recognize the business opportunities brought forward by these technologies[108]. These business opportunities then lead to the subsequent formation of the corresponding FinTech models, through which sustainability in business success can be achieved. Second, analyzing FinTech models cannot be performed in a vacuum. Rather, such analysis should be performed with respect to the relevant stakeholders, because it is these stakeholders who largely determine the success of a FinTech model[109].

Statements and Declarations

Data Availability

Data sharing is not applicable to this article as no new data were created or analyzed in this study. The study is based on publicly available literature and reports cited in the references.

Author Contributions

Conceptualization, P.L.P., S.W., and S.F.T.; Methodology, P.L.P.; Investigation, P.L.P.; Writing − Original Draft Preparation, P.L.P.; Writing − Review & Editing, P.L.P., S.W., and S.F.T.; Supervision, P.L.P.

Footnotes

[1] *Wearables* (or *wearable technology*) is a category of electronic devices that can be worn as accessories, embedded in clothing, implanted in the user's body, or even tattooed on the skin. These devices are hands-free gadgets, powered by microprocessors and enhanced with the ability to send and receive data via the Internet.

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Declarations