RESEARCH PAPER

Modeling key enablers influencing FinTechs offering SME credit services: A multi-stakeholder perspective

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Abstract
The study models inter-relationship among key enablers that influence the growth of FinTechs that offer credit services to small and medium enterprises (SMEs). It focuses on emerging market of India, which is the world's third-largest FinTech centre. It employs Grey DEMATEL method to measure the cause-effect relationship based on the assessment given by FinTech practitioners, experts, policymakers, and investors. The results show that credit demand by SME borrowers, availability of alternate data sources, and Covid-19 are the critical enablers that exercise strong impact on FinTech system. Collaboration between FinTechs and traditional financial institutions, end-to-end financial solutions, and scalability of business operations are recognized as critical dependents that are hugely affected by others. The study recommends policymakers to foster collaborative environment, strengthen digital data landscape, and improve financial literacy to develop FinTech sector. It recommends practitioners to focus on data security and to offer end-to-end financial solutions to its SME borrowers.

Keywords FinTech · Small and medium enterprises · Digital lending · Enablers · Grey DEMATEL · Multi-stakeholder perspectives

JEL classification G23 · O31 · C44

Introduction

"It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is most adaptable to change" – Prof. Leon Megginson

The Covid-19 outbreak has imposed an unprecedented impact on the global economy. The crisis, caused by the contagious virus, enforced social distancing norms worldwide, which led to the closing of cities, imposition of quarantine, and closing of national borders. These steps to contain the virus adversely impacted global economic activity. No industry has been left unscathed by the current crisis. But the business which is finding it most difficult to withstand and survive the current crisis is the small and medium enterprises (SME).

Crisis, economic or financial, has always adversely affected the availability of financing options for small enterprises. Chen et al. (2017) have shown that bank lending to small business firms in the USA declined from 2008 to 2014, owing to the recession caused by the 2008 global financial crisis (GFC). Contraction in credit lending led to increased interest rates and decline in business operations. Becker and Ivashina (2014) show that banks reduce their lending activity during crisis, forcing borrowers to shift from bank borrowings to bond markets. However, Didier et al. (2021) point out that this option is not available in the current crisis, as the Covid-19 pandemic has adversely affected both the banks and bond market. World Bank (2020) has called for "leveraging FinTech to broaden the reach of finance into the SME sector." The Financial Stability Board (2017) defines FinTech as "technologically enabled financial innovation that could result in new business models, applications, processes, or products with an associated material effect on financial markets and institutions, and the provision of financial services." Put simply, FinTech companies leverage technology to offer better

financial services to their customers. FinTechs decentralize financial services (Fenwick et al., 2018), lower the unit cost of financial intermediation (Thakor, 2020), increase competition in the credit market, and make small business lending a revenue-generating proposition (Lee and Shin, 2018). According to the survey report of Finch Capital (2020), SME lending is a sunrise sector in the FinTech space, as they have the "best-adapting mechanism to swiftly and efficiently deliver capital to key segments of the economy."

Many studies have examined important factors that influence the growth of FinTechs operating in SME lending space. For instance, Fenwick et al. (2018) argue that FinTechs specializing in SME lending services can grow only in a friendly regulatory environment. Claessens et al. (2018) identify the country's level of economic development as a critical factor that positively impacts FinTech business credit. Koenitzer et al. (2016) discuss the importance of the availability of rich and diverse data (from credit bureaus, company financial statements, mobile providers, social media, utility bills, etc.) for FinTechs to conduct precise risk assessment and offer customized financial solutions to SME borrowers. Lu (2018) highlights that FinTechs can better meet SME's financing needs as they use big data and artificial intelligence to assess the risk profile of SME borrowers. Fu and Mishra (2020) empirically demonstrate the positive and significant impact of Covid-19 on FinTech adoption rate. According to Lee & Shin (2018), customer management is a big challenge for FinTechs as they face intense market competition. Hence, word-of-mouth recommendations are critical for the growth and sustenance of Fintech firms. Review of literature reveals that past studies have performed a descriptive analysis of the FinTech ecosystem wherein they just identify the enablers that influence the FinTech sector. The constant evolution of the FinTech sector calls for a study that not only identifies but also presents the enablers in order of importance. Such a pecking order of enablers is expected to help FinTech practitioners and investors focus only on critical factors that are strategic to their FinTech firms' success. Furthermore, past studies have not explored the interrelationship among the enablers. The analysis of interrelationship between enablers will provide an in-depth understanding of the dynamics of the FinTech sector to FinTech regulators, practitioners, and investors. Such valuable insights are expected to help FinTech regulators frame sustainable policies and help practitioners and investors develop growth-oriented strategies. Hence, the study is motivated to identify the key enablers that influence FinTechs offering SME lending services and to present them in order of their prominence. The study also aims to model and explain the interrelationship between the enablers. The study focuses on detailed analysis of the FinTech landscape

by using multi-stakeholder and multi-criteria decision-making (MCDM) approach. The study explores the following questions:

1. What are the key enablers that influence the growth of FinTechs specializing in the SME lending industry?
2. How do the FinTech stakeholders (practitioners, experts, investors, and policymakers) evaluate the prominence and inter-relationship among the identified enablers?
3. What strategies and policies should be recommended to promote FinTechs specializing in SME lending services?

The study is motivated to explore the above questions in the emerging market of India. India presents an interesting market for investigation as it is not only one of the fastest growing emerging markets of the world (International Monetary Fund, 2021) but also the world's third largest FinTech center (BLinC Insights, 2022) with record fundraising of USD 9 billion in year 2021 (Iyer, 2021). PwC (2017) shows that Indian FinTech projects offer return on investments of 29%, which exceeds the global average of 20%.

The study contributes to the evolving sector of electronic markets and FinTechs in several ways. First, the study adds to the scant empirical work on FinTechs specializing in SME credit services. While the past studies have performed generic analysis on the FinTech sector, the current study concentrates on a specific market segment of SME credit services. Second, unlike past studies that focus on FinTechs in developed markets like the USA and UK (e.g., Jagtiani and Lemieux, 2018; Buchak et al., 2018; Lu, 2018), the proposed study investigates FinTechs in the emerging market of India. It is expected that study's findings will benefit other emerging economies that face similar challenges in the development of FinTech sector in their economy. Third, to the best of the author's knowledge, the present study is the first study that uses multi-stakeholder and multi-criteria decision making approach (grey decision-making trial and evaluation laboratory, i.e., Grey DEMATEL) to model the interrelationship between enablers that impact the growth of FinTechs specialzing in SME lending services. Finally, the study highlights the divergence in different stakeholders' perspectives on the interrelationship between the determinants. Such an analysis is expected to reduce information asymmetry and promote better understanding among the FinTech stakeholders.

The rest of the paper is as follows. "Literature review, research gaps, and research objectives" section presents a detailed literature review followed by research gaps and research objectives. "Research framework" section explains the research framework. "Results and analysis" section presents results and analysis. "Implications of the study and concluding observations" section discusses managerial and policy implications of the study and concludes the paper.

Literature review, research gaps, and research objectives

This section provides support from literature to frame decisions related to enablers influencing FinTechs specializing in SME lending space. This section is divided into five subsections. The "FinTech Landscape" subsection provides an overview of the FinTech ecosystem. The "FinTechs specializing in SME lending services" subsection presents scholarly work on FinTechs specializing in SME lending services. The "Enablers influencing the growth of FinTechs" subsection presents literature review on enablers that influence the growth of FinTechs. "Solution methodology perspective" subsection discusses the literature on multi-stakeholder MCDM approach and the suitability of Grey DEMATEL method. "Research gaps and research objectives" subsection highlights the research gaps and frames research objectives.

FinTech landscape

Feyen et al. (2021) define FinTechs as "digital technologies that have the potential to transform the provision of financial services spurring the development of new—or modify existing—business models, applications, processes, and products". Gimpel et al. (2018) describe FinTechs as organizations that use technologies like Internet, mobile computing, and data analytics to innovate financial services. According to Lee and Shin (2018), FinTechs enjoy low operating cost, and hence are able to offer customized financial solutions to their consumers. Lu (2018) asserts that FinTechs offer cost-effective financial solutions as they are lean organizations with low asset base and low operating costs. Lee and Teo (2015) argue that FinTechs with low profit margins, low asset base, innovative products, and scalable operations are more likely to thrive and succeed. Grant and Deer (2019) and Koenitzer et al. (2016) underscore the importance of a strong underwriting model to ensure low default rates. Haddad and Hornuf (2019) show that venture capital, secured Internet servers, mobile subscriptions, and availability of skilled talents are essential for the growth of FinTechs. Oh and Rosenkranz (2020) highlight the importance of physical and information technology infrastructure in promoting the FinTech sector. According to Claessens et al. (2018), a relaxed regulatory environment fosters the growth of FinTechs as it reduces compliance costs and transaction costs for FinTech firms. The results of Jünger and Mietzner (2020) reveal that young consumers are likelier to adopt FinTech solutions than old users. According to Koenitzer et al. (2016) and Yes Bank (2018), availability of investor capital and financial education plays an instrumental role in the growth of FinTech sector in an economy.

FinTechs specializing in SME lending services

Literature review on FinTechs specializing in SME lending reveals that academic interest in this topic is recent, and the scholarly work is nascent. According to Barkley and Schweitzer (2021), FinTechs are better able to tap the under-served market segment of young, small, and less profitable SMEs, compared to traditional lenders. Sheng (2021) illustrates that banks that take advantage of FinTechs' technological advancements can increase their credit supply to SME borrowers. Abbasi et al. (2021), Fenwick et al. (2018), and Lu (2018) show that FinTechs have improved access to finance for SMEs. Koenitzer et al. (2016) highlight that FinTechs offer SMEs efficient and effective financial solutions. Im and Yoon (2021) highlight that FinTechs effectively utilize big data to provide credit services to SMEs. Huang (2022) shows that FinTechs reduce information asymmetry between financial institutions and SMEs, improving investment efficiency. Xiang et al. (2021) demonstrate that financially constrained firms are more likely to seek FinTech credit services. Maier (2016) shows that SME borrowers are increasingly switching from banks to FinTechs as FinTechs offer the convenience of financing and process transparency. Coffie et al. (2021) reveal that CEO, business, and FinTech service's characteristics play an essential role in diffusion of FinTech solutions among SMEs. According to Rosavina et al. (2019), loan flexibility is one of the key factors that SME borrowers consider before approaching FinTech platforms for loans.

Enablers influencing the growth of FinTechs

The following enablers are identified through a comprehensive literature review. The list of enablers is validated by experts in industry and academia. Appendix 1 presents the profile of the experts and an overview of the discussions. The list of enablers is finalized based on existing literature and inputs from the experts.

Credit demand by SME borrowers

SMEs find it difficult to raise credit from formal financial institutions due to their small size, complex operations, and inability to offer good collateral. Literature shows that the demand for alternate financing solutions like digital finance and micro-credit is higher in countries with lower access to finance from formal financial institutions (Frost, 2020; Vanroose and D'Espallier, 2013).

Awareness of FinTech solutions among SME borrowers

Technology savvy customers create an enabling environment for FinTechs to proliferate (Leong et al., 2017). As

SMEs are generally not very technology savvy, they require handholding to adopt and adapt to digital funding solutions. Hence, FinTechs must evangelize their financial solutions among the target SME borrowers. Word-of-mouth recommendations play a critical role in the success and survival of FinTech firms (Lee and Shin, 2018).

Strong internet and smartphone penetration

According to International Finance Corporation (2018), higher accessibility to Internet and smartphones leads to higher volume of customers adopting digital lending platforms. In India, the number of smartphones per 100 people has increased from 5.4 to 26.2 from 2014 to 2018. Similarly, the total number of Internet users has soared from 239 million to 560 million, and the number of cashless transactions per person has increased from 2.2 to 18 within the short period of 2014 to 2018 (McKinsey, 2019).

Availability and accessibility to alternate data sources

The availability of diverse data sources and good quality data enables better risk assessment, facilitating customized solutions to customers (Claessens et al., 2018), and lower interest rates for small enterprises (Koenitzer et al., 2016). The availability of diverse digital data enables FinTechs to have a strong underwriting model.

Reliable physical infrastructure like electricity, broadband

Yermack (2018) argues that FinTechs cannot flourish without good physical infrastructure like optical fiber cable and broadband penetration. It is challenging for people to adopt digital financial solutions without strong physical infrastructures like reliable electricity and broadband Internet connection (Demirguc-Kunt et al., 2018).

Availability of skilled human capital

Jagtiani and Lemieux (2018) emphasize on the availability of "highly specialized individuals" to sustain FinTech ecosystem. Boston Consulting Group (2018) reports scarcity of "digital talent" and exhorts FinTechs to adopt innovative measures to attract skilled employees. The study also highlights the importance of balancing young employees' technical skills with experienced employees' business judgment skills. Since FinTechs are lean organizations, they need to attract and retain the best talents (Yes Bank, 2018).

Availability of investment and growth capital

FinTech sector is heavily dependent on investment from venture capitalists and private equities as they are high-risk and high-return projects (Claessens et al., 2018). Haddad and Hornuf (2019) and Deloitte (2017) highlight the importance of adequate and timely funding from venture capital and private equities for the survival and success of FinTech firms.

Rigorous underwriting model

FinTechs leverage technology and diverse data point to underwrite SME borrowers (Gauhman, 2020). Leong et al. (2017) demonstrate that a FinTech firm must have a robust risk assessment process and analytical capabilities to serve and succeed in a market segment with limited financial data for credit profiling. The success of the risk assessment model leads to the benefit of gaining users' trust (Thakor, 2020) and meeting regulatory scrutiny (Deloitte, 2017).

Scalability of business operations and technology

Every FinTech firm aims to create and maintain a large customer base which they monetise through channels like advertising, subscription fee, or consumer data analytics (Lee and Teo, 2015). Hence, it is important that FinTechs can scale up their business operations and technology without incurring additional costs and compromising on the technology's efficiency.

Effective collection management

A lending firm is as good as its collections. Collection management becomes a big challenge in a slow judicial system. FinTechs must employ "foot on the field" to ensure timely collections. Collection management is an expensive process in which trust plays an important role. With a remote workforce managing the collections, the FinTechs must trust their collection agents and ensure that they work ethically.

End-to-end solutions to SME borrowers

Deloitte (2017) highlights the importance of understanding SME borrowers' pain-points and offering them sustainable business solutions. FinTechs should act as end-to-end solution providers, i.e., they not only provide credit to SMEs, but also offer good financial advice and provide information regarding earnings opportunities. This would enable the SMEs to succeed in their venture, generate good returns for the FinTechs, and create a long-term win-win relationship.

Convenience and process transparency

Maier (2016) shows that SME borrowers prefer FinTechs over traditional bank finance, as it offers convenience (i.e., speed, flexibility, and availability) and process transparency (i.e., process clarity and predictability). Koenitzer et al.

(2016) report that borrowers are willing to pay a premium for the convenience offered by FinTech firms. According to Jünger and Mietzner (2020), borrowers value transparency provided by FinTech firms as it reduces information asymmetry and enables them to assess the services and their price correctly.

Data security

Jünger and Mietzner (2020) and Calisir and Gumussoy (2008) have highlighted customer security concerns for digital financial transactions. Lee and Shin (2018) argue that consumers are open to only trustworthy FinTechs who ensure data security. Das (2019) emphasizes data confidentiality and customer protection as the key challenges faced by FinTechs in India.

Conducive regulatory environment

Lee and Shin (2018) argue that, unlike traditional financial institutions like banks, FinTechs enjoy relaxed regulatory environment which enables them to offer customized and accessible financial services to consumers. According to Claessens et al. (2018), light regulatory environment reduces compliance costs and transaction costs for the FinTech sector. Jagtiani and Lemieux (2018) advise FinTech firms to closely monitor regulatory changes as they can impact their business models.

Collaboration between traditional financial institutions (FIs) and FinTechs

Capgemini (2018) highlights the importance of partnerships between FinTech firms and traditional financial institutions (like banks) for the growth of the FinTech sector in an economy. Financial institutions like banks are collaborating with FinTechs with the expectation of gaining new market segments (The Economist Intelligence Unit, 2015) and financial innovation (Lee and Shin, 2018). FinTechs are also keen on such collaboration as it allows them access to financial resources (Drasch et al., 2018), a huge consumer base, and management and deployment capabilities of financial institutions (PwC, 2017).

Covid-19 as the catalyst for digital ecosystem

The Covid-19 pandemic has enthused the development of digital environment in India. The pandemic encouraged regulatory initiatives like digital signature, e-KYC, video-based customer identification process, and contactless payment that propelled the growth of digital finance in India (PwC, 2020). The pandemic also forced traditional financial institutions to invest in digital infrastructure to continue to offer seamless financial services to their customers (CRISIL Coalition Greenwich, 2020). Goldman Sachs (2020) believes that the pandemic has propelled the growth of FinTechs that offer assistance to banks as they have "embedded base of users who are contributing recurring revenues." The pandemic has also changed consumer behavior; they are now more open to technological solutions. The pandemic adversely affected traditional banks' financing abilities, which has compelled SMEs to turn to FinTech firms to meet their capital requirements (Lara, 2020a).

Table 1 presents the list of enablers that influence FinTechs operating in SME lending space.

Solution methodology perspective

The study aims to analyze the interrelationship among enablers that influences the growth of FinTechs specializing in SME lending services. Multi-criteria decision making (MCDM) approach is utilized to achieve this objective as (i) many of the identified enablers (refer "Enablers influencing the growth of FinTechs" section) are intangible and hence difficult to quantify, and (ii) the enablers are not easily related with each other (Bai and Sarkis, 2013). The study uses multi-stakeholder MCDM approach. The stakeholder theory proposed by Freeman (1984) emphasizes on organization's relationship with its key stakeholders as they can influence the achievement of organizational goals. Many studies have used multiple stakeholders' perspectives to create an effective decision-making process. For instance, Bhuyan et al. (2022) use the perspectives of industry practitioners, policy planners, and academic researchers to develop a decision-making framework to evaluate lithium-ion battery industry. Mao et al. (2020) use aspects from environmental legal, economic, regulatory, and public participation institutions to assess barriers to the implementation of environmental protection institutions. Dou and Sarkis (2013) use inputs from local government, professional associations, and electronic components manufacturers to develop a decision-making model to evaluate the barriers to implementing of China's RoHS regulations. Other studies that have used multiple stakeholders' perspectives to create a suitable decision-making framework include Kumar and Anbanandam (2020), Ma et al. (2019), Bouzon et al. (2018), and Govindan and Chaudhari, 2016.

The study employs widely used MCDM tool, the Grey DEMATEL method, as a solution approach. The Grey DEMATEL method is chosen for three key reasons. First, the Grey DEMATEL method provides quantitatively oriented cognitive map, which helps to model interrelationships among factors (Bai and Sarkis, 2013). Secondly, the Grey DEMATEL not only presents the structure of causal relationship but also provides the degree of influence between the factors (Cui et al., 2019). Finally, the Grey DEMATEL

Table 1 Enablers influencing FinTechs specializing in SME lending services

Enablers	Denotation	Explanation	References
Credit demand by SME borrowers	E1: Demand	SMEs are unable to raise credit from formal financial institutions due to their small size, complex operations, and inability to offer good collateral. This gives opportunity to FinTechs to offer digital financial solutions to SME borrowers.	Frost (2020); Vanroose and D'Espallier (2013)
Awareness of FinTech solutions among SME borrowers	E2: Awareness	FinTechs must evangelize their financial solutions as most of the SMEs are not technology savvy and need handholding to adopt digital financial solutions. Furthermore, word-of-mouth recommendations play a critical role in the success of FinTechs.	Leong et al. (2017); Lee and Shin (2018)
Strong Internet and smartphone penetration	E3: Internet and smatphn	Higher accessibility to Internet and smartphones encourages online monetary transactions, which in turn leads to higher volume of customers adopting digital lending platforms.	International Finance Corporation (2018)
Availability and accessibility to alternate data sources	E4: Alternate data	The availability of diverse data sources and good quality data enables better risk assessment, facilitating customized financial solutions for small enterprises.	Claessens et al. (2018); Koenitzer et al. (2016)
Reliable physical infrastructure like electricity, broadband	E5: Infrastructure	Without strong physical infrastructure like reliable electricity and broadband Internet connection, it will be challenging for people to adopt digital financial solutions.	Yermack (2018); Demirguc-Kunt et al. (2018)
Availability of skilled human capital	E6: Talent	Since FinTechs are mostly lean organizations, they need to attract and retain the best of "digital talents" and employees with sound business acumen.	Jagtiani and Lemieux (2018); Yes Bank (2018)
Availability of investment and growth capital	E7: Capital	For FinTechs to survive, grow, and succeed, they must receive adequate and timely funding from venture capitalists and private equity firms.	Claessens et al. (2018); Haddad and Hornuf (2019)
Rigorous underwriting model	E8: Underwriting	FinTech firms must have a robust risk assessment process and analytical capabilities to serve and succeed in a market segment with limited financial data for credit profiling	Leong et al. (2017)
Scalability of business operations and technology	E9: Scalability	FinTechs aim to create and maintain a large customer base that they can monetise through advertising, subscription fee, or consumer data analytics. Hence, it is important that FinTechs scale up their business operations and technology without incurring additional cost and compromising on technology efficiency.	Expert interviews
Effective collection management	E10: Collection	A lending firm is as good as its collections. To ensure timely collections, Fintechs should augment feet on the street and intensify their calls/reminders.	Expert interviews
End-to-end solutions to SME borrowers	E11: End-to-end	FinTechs should act as end-to-end solution providers wherein they provide credit to SMEs and a holistic environment where earning opportunities and financial advice are easily accessible to SMEs.	Expert interviews
Convenience and process transparency	E12: Conv. transp	SME borrowers prefer FinTech solutions as it offers convenience (i.e., speed, flexibility, and availability of loans) and process transparency (i.e., process clarity and predictability).	Maier (2016); Jünger and Mietzner (2020)
Data security	E13: Data security	SME borrowers prefer trustworthy FinTech firms that ensure security of their personal data.	Lu et al. (2011); Calisir and Gumussoy (2008)

Table 1 (continued)

Enablers	Denotation	Explanation	References
Conducive regulatory environment	E14: Reg. Envt.	A conducive regulatory environment that offers schemes and encourages innovation, facilitates the growth of Fintech sector.	Lee and Shin (2018); Claessens et al. (2018)
Collaboration between traditional FIs and FinTechs	E15: Collaboration	Traditional financial institutions like banks collaborate with FinTechs to benefit from their financial innovation. FinTechs collaborate with traditional financial institutions to gain access to their huge consumer base, and leverage their management and deployment capabilities.	Capgemini (2018)
Covid-19 as a catalyst for digital ecosystem	E16: Covid-19	The Covid-19 pandemic has propelled the growth of FinTechs as it has encouraged consumers to be open to technology solutions. The pandemic has also adversely affected financing options from traditional banks which has compelled SMEs to turn to FinTechs to meet their unmet capital requirements.	PwC (2020); Lara (2020a, b)

method is best suited in analyzing the Interrelationships in a small sample size (Rajesh and Ravi, 2015).

Research gaps and research objectives

The literature review reveals that the scholarly work on FinTechs meeting financing requirements of small enterprises is nascent and can be explored further. The literature lacks studies that highlight the key factors in their degree of importance in the FinTech ecosystem. Literature is also deficient in studies that model inter-relationship between key factors that influence FinTechs specializing in SME lending services. Such modeling will provide a robust decision-making framework for FinTech players. In the absence of a robust decision-making framework, the literature also lacks studies that offer relevant managerial strategies and policy recommendations for the overall growth and development of the FinTech industry. The following research objectives are formulated to address the identified research gaps:

> RO1: To identify the key enablers that influence the growth of FinTechs operating in SME lending industry.
> RO2: To categorize the selected enablers based on their importance or prominence in multi-stakeholder and combined perspective.
> RO3: To measure the cause-and-effect relationships among the selected enablers.
> RO4: To examine the difference in assessments of the different FinTech stakeholders regarding the causal relationship among the selected determinants.
> RO5: To recommend managerial strategies and policy implications for improving the FinTech ecosystem.

Research framework

Research framework

Figure 1 presents the research framework employed to achieve the outlined objectives. A comprehensive literature review is conducted to achieve the first objective of identifying key enablers that influence FinTechs operating in SME lending services. The list of enablers is validated and finalized by experts from industry and academia.

A questionnaire is prepared based on the finalized list of enablers. The questionnaire attempts to capture FinTech stakeholders' perception of the direction and the degree of influence that each identified enabler has over the other. The respondent has to choose from the following six options to define each enabler's relationship with the other, viz., very high influence, high influence, medium influence, low influence, very low influence, and none. Appendix 2 presents the questionnaire sent to the respondents. The link for accessing the questionnaire is generated. It is sent to (a) FinTech practitioners who

are working with a FinTech firm specializing in SME lending services, (b) FinTech subject matter experts who teach and/or research on FinTechs, (c) FinTech policymakers who are associated with the central bank of India, and (d) FinTech investors who have invested in FinTechs specializing in SME lending services. The questionnaire link was emailed to 83 prospective participants through business social network LinkedIn. The reminder emails were sent after a couple of weeks. Only 18 respondents participated in the study, resulting in the overall response rate of 21%. Table 2 presents the brief profile of the respondents who participated in the study.

To achieve the second and third research objectives, Grey DEMATEL method is employed on the responses received from 18 participants. Grey DEMATEL method is employed because it offers the following advantages:

i.   it allows for variations in the strength of relationships between factors (Bai and Sarkis, 2013),

ii. it prioritizes the factors based on the type of relationship and its impact on other factors (Bai and Sarkis, 2013),

iii. it is an effective multi-criteria decision-making method that visualizes the structure of causal relationship between factors (Kumar and Anbanandam, 2020),

iv. it works efficiently for small sample of decision-makers (Rajesh and Ravi, 2015), and

v.   it avoids vagueness in human judgment, and offers flexibility to deal with an imprecise environment (Govindan and Chaudhari, 2016; Bai and Sarkis, 2013).

The steps involved in Grey DEMATEL method is explained below:

- *Step 1: Compute initial relation matrices*

Let "n" be the number of key factors identified and "l" be the number of respondents. Each respondent "k" assesses the influence of factor "i" over factor "j" using six-point normal scale ranging from 0 as *no influence* and 5 as *very high influence*. The associate grey values are displayed in Table 3. Hence, we will have "l" number of initial relation matrices.

- *Step 2*: *Compute grey relation matrices*

The next step involves converting the six-point integer scale to associated grey scales that have upper and lower range values, i.e.:

$$\otimes y_{ij}^k = \left(\underline{\otimes} y_{ij}^k, \overline{\otimes} y_{ij}^k \right) \tag{1}$$

where $1 \le k \le l;\ 1 \le i \le n;\ 1 \le j \le n;\ \otimes y_{ij}^k$ are grey pairwise relationship between the determinants in *nxn* matrix, $\underline{\otimes} y_{ij}^k$ is

the lower limit of the grey value for the k respondent, and $\overline{\otimes} y_{ij}^k$ is the upper limit of grey value of k respondent in terms of relationship between factor i and factor j. All principal diagonal elements of the matrix are set to zero.

- *Step 3: Compute average grey relation matrix*

The average grey relation matrix $\otimes \widetilde{y}_{ij}$ is obtained from "l" grey relation matrices as below:

$$\otimes \widetilde{y}_{ij} = \left(\frac{\sum \underline{\otimes} y_{ij}}{l}, \frac{\sum \overline{\otimes} y_{ij}}{l} \right) \tag{2}$$

- *Step 4: Compute crisp relation matrix*

The following three steps are followed to convert grey values into crisp values:

(a) Normalization of grey values

$$\underline{\otimes} \dot{y}_{ij} = \frac{\underline{\otimes} \widetilde{y}_{ij} - {}_j^{\min} \underline{\otimes}\, \widetilde{y}_{ij}}{\Delta_{min}^{max}} \tag{3}$$

$$\overline{\otimes} \dot{y}_{ij} = \frac{\overline{\otimes} \widetilde{y}_{ij} - {}^{min_j} \overline{\otimes}\, \widetilde{y}_{ij}}{\Delta_{min}^{max}} \tag{4}$$

$$\Delta_{min}^{max} = {}^{max_j} \overline{\otimes}\, \widetilde{y}_{ij} - {}^{min_j} \underline{\otimes}\, \widetilde{y}_{ij} \tag{5}$$

where $\underline{\otimes} \dot{y}_{ij}$ = normalized lower limit of the grey number $\otimes \widetilde{y}_{ij}$
$\overline{\otimes} \dot{y}_{ij}$ = normalized upper limit of the grey number $\widetilde{y}_{ij}$

(b) Total normalized crisp value

$$z_{ij} = \frac{\left(\underline{\otimes} \dot{y}_{ij} \left(1 - \underline{\otimes} \dot{y}_{ij} \right) \right) + \left(\overline{\otimes}\, \dot{y}_{ij} * \overline{\otimes}\, \dot{y}_{ij} \right)}{\left(1 - \underline{\otimes} \dot{y}_{ij} + \overline{\otimes}\, \dot{y}_{ij} \right)} \tag{6}$$

(c) Final crisp values

$$z_{ij}^* = \left(\min \underline{\otimes} \widetilde{y}_{ij} + \left(z_{ij} \text{ x } \Delta_{min}^{max} \right) \right) \tag{7}$$

and $Z = [z_{ij}^*]$ \qquad (8)

- *Step 5: Compute normalized direct crisp relationship matrix*

The normalization factor Q is computed by Eq. 9:

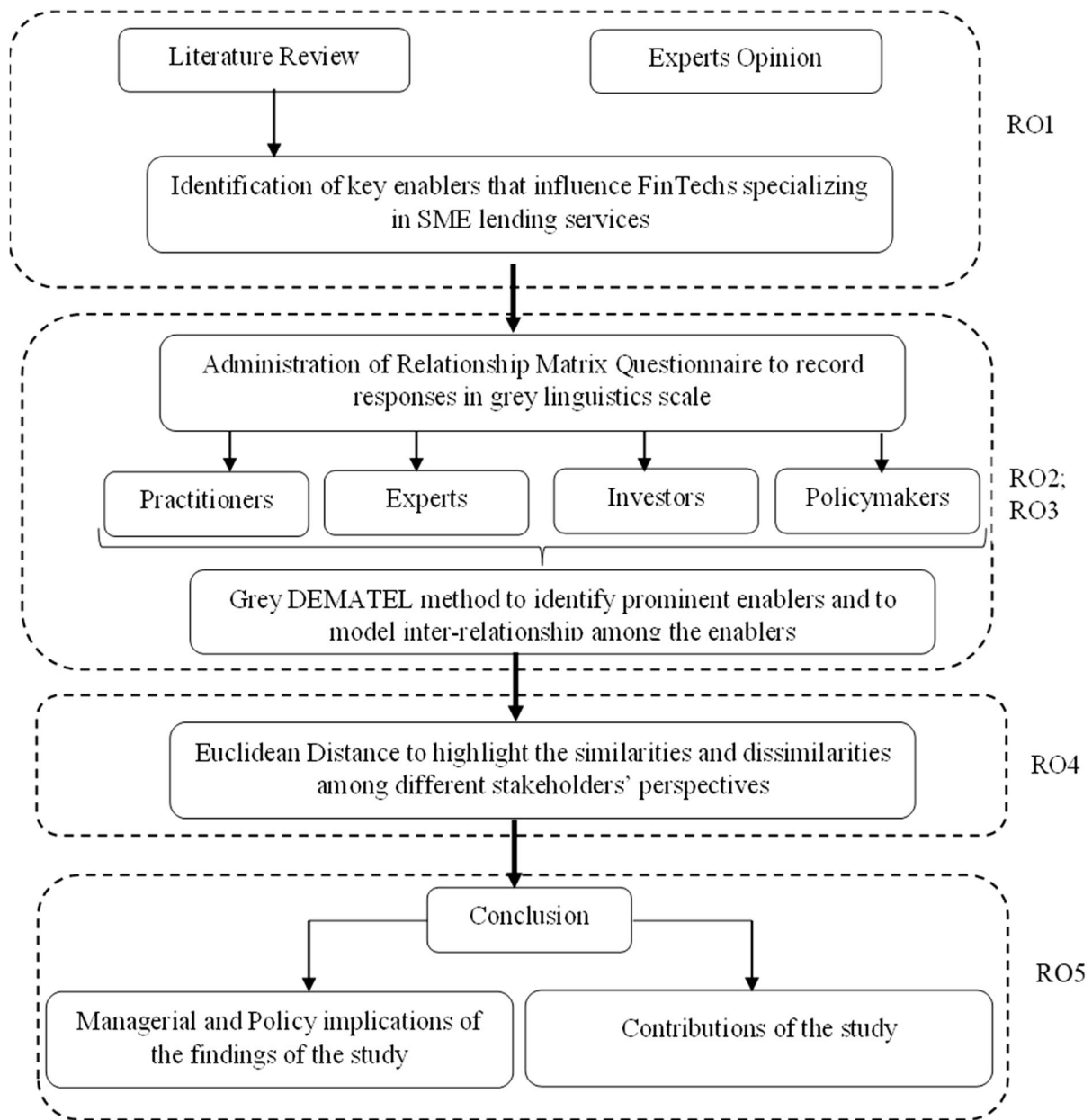$$Q = \frac{1}{\max_{1 \le i \le n} \sum_{j=1}^{n} z *_{ij}} \tag{9}$$

Fig. 1 Research framework for identification of enablers and its analysis

The normalized direct crisp relation matrix P is calculated as follows:

$$P = Z \times Q \tag{10}$$

Each element in matrix P will be between 0 and 1.

• *Step 6: Compute total relation matrix*

The total relation matrix T is obtained as follows:

$$T = P \times (I - P)^{-1} \tag{11}$$

where I is the identity matrix.

• *Step 7: Identify prominent factors; obtain causal relationship; plot cause-and-effect diagram*

(a) Compute row and column sums of total relation matrix

For each row i and column j of matrix T, compute

$$R_i = \left[\sum_{j=1}^{n} P_{ij} \right]_{n \times 1} \forall i \tag{12}$$

$$C_j = \left[\sum_{i=1}^{n} P_{ij} \right]_{1 \times n} \forall j \tag{13}$$

Table 2 Profile of the survey respondents

Respondent no.	Domain	Work experience (years)	Designation
P1	Industry	4*	Senior product manager at FinTech offering SME credit
P2	Industry	4*	Founder of FinTech offering SME credit
P3	Industry	3*	Associate director at FinTech offering SME credit
P4	Industry	6*	National sales manager at FinTech offering SME credit
P5	Industry	5*	Marketing manager at FinTech offering SME credit
P6	Industry	6*	Head of strategy and new initiatives at FinTech offering SME credit
P7	Industry	5*	Director of product management at FinTech specializing in banking-as-a-service platform and SME lending
A1	Subject matter expert	20	Program director of FinTech course in a leading B School
A2	Subject matter expert	15	Assistant professor of a leading B-school who teaches FinTech
A3	Subject matter expert	21	Associate dean of a leading B-school who teaches FinTech
A4	Subject matter expert	15	CEO of research organization that researches and publishes reports on FinTechs
A5	Subject matter expert	12	Associate professor in a leading B-school who teaches and researches in FinTechs
A6	Subject matter expert	21	Assistant professor in a leading B-school who teaches and researches in FinTechs
PM1	Policymaker	20	Ex-FinTech officer with one of the state governments of India
PM2	Policymaker	21	Works with the Central Bank of India
PM3	Policymaker	16	Works with the Central Bank of India
I1	Investor	10	Investor who specializes in FinTech investment
I2	Investor	13	Investor who specializes in FinTech investment.

*The overall work experience of P1, P2, P3, P4, P5, P6, and P7 are 9 years, 21 years, 11 years , 20 years, 18 years, 13 years, and 6 years respectively. Table 2 presents only the number of years that the industry professional has worked with FinTech firm. For the rest of the respondents, total work experience are presented in the table

(b) Compute prominent factor

The overall prominent factor is obtained by the following:

$$D_i = [R_i + C_j] \ \forall i = j \tag{14}$$

when $i = j$, the sum $R_i + C_j$ shows the total effects given and received by the enabler i. In other words, D_i represents the overall importance or prominence of the enabler i in the entire system. The greater the value of D_i, higher will be the overall importance of the factor in terms of relationship with other factors.

(iii) Compute causal relationship

The net effect factor is obtained by the following:

$$E_i = [R_i - C_j] \forall i = j \tag{15}$$

If the value of Ei is positive, then factor i is the driving factor, i.e., the net cause for other factors. If the value of Ei is negative, then factor i is the driven factor, i.e., net effect of other factors. The values of D_i and Ei are plotted on a two-dimensional graph called as prominent causal relationship graph.

- *Step 8: Set the threshold value to identify significant causal relationship*

The total relation matrix shows the influence of one factor over the other. To reduce the complexity and to avoid negligible effects, a threshold value θ needs to be set. The threshold value θ is computed as sum of mean and one standard deviation of the elements of matrix T. If $D_{ij} \geq \theta$, then it implies that factor i has significant influence on factor j.

Euclidean distance is computed to achieve the fourth objective of measuring the differences in the FinTech stakeholders' decision-making process. The first step involves normalization of all stakeholders' cause and effect values as follows.

$$\widetilde{D}_j = \frac{(\text{Max}_i D_i - D_j)}{(\text{Max}_i D_i - \text{Min}_i D_i)} \tag{16}$$

Table 3 Linguistic scale and corresponding grey values

Linguistic terms	Normal scale	Grey scale
Very high influence	5	(0.9, 1.0)
High influence	4	(0.6, 0.9)
Medium influence	3	(0.4, 0.7)
Low influence	2	(0.2, 0.5)
Very low influence	1	(0.1, 0.3)
No influence	0	(0.0, 0.1)

$$\widetilde{E}_j = \frac{(\text{Max}_i E_i - E_j)}{\left(\text{Max}_i E_i - \text{Min}_i E_i\right)} \qquad (17)$$

where D_i represents the net importance of the enabler i, and E_i is the net effect of the enabler i.

Euclidean distance is computed to calculate the difference in perspectives of the FinTech stakeholders A and B. Euclidean distance (δ_i^{AB}) over enabler i is computed as below:

$$\delta_i^{AB} = \sqrt{(\widetilde{D}_i^A - \widetilde{D}_i^B)^2 + (\widetilde{E}_i^A - \widetilde{E}_i^B)^2} \qquad \forall i = 1, 2, 3 \dots n \quad (18)$$

A graphical representation of Euclidean distance between different stakeholders is done for easy analysis and interpretation. Based on the results of Grey DEMATEL method and Euclidean distance, the study proposes suitable managerial strategies and policy recommendations.

Application of the Grey DEMATEL method

The application of Grey DEMATEL method to analyze and model the enablers influencing FinTechs in SME lending space is explained below:

Step 1: The total of 18 experts gave pairwise influence of one enabler over the other on linguistic grey scales. Table 3 details the linguistic scales. Overall, eighteen 16×16 grey relation matrices were made. After that, the average grey relations matrix was formulated by using Eq. 2. The average grey relations matrix was made for each of the stakeholder groups (i.e., FinTech practitioners, Fintech subject matter experts, FinTech investors, and Fintech policymakers) and for the complete set of 18 respondents (i.e., overall stakeholders).

Step 2: The crisp relationship matrix is computed using the procedures explained in Eqs. 2 to 8. Crisp relationship matrix is computed for each of the stakeholder groups as well as for total respondents.

Step 3: In this step, normalized direct crisp relationship matrix is computed by using Eqs. 9 and 10.

Step 4: Total relation matrix (matrix T) is computed by using Eq. 11. Tables 5, 6, 7, 8 present total relation matrix for the FinTech stakeholders and total respondents.

Step 5: In this step, prominent enablers, driving enablers, and driven enablers are identified. The row and column of matrix T are represented as R_i and C_j respectively. The rows and columns are summed by applying Eqs. 12 and 13 respectively. Now by using Eq. 14, D_i values are obtained by computing ($R_i + C_j$) for values $i=j$. The enablers with greater D_i values are considered prominent. Next, E_i values are obtained by computing ($R_i - C_j$) for values $i=j$, as explained in Eq. 15. If the E_i value is positive, the enabler is considered a driving enabler. If E_i value is negative, then the enabler is considered as driven enabler. Table 4 presents the D_i and E_i values for each of the FinTech stakeholder (panel A to panel D) and total respondents (panel E).

Step 6: In this step, significant causal relationship is established. For this purpose, threshold value θ is computed by taking the sum of mean and one standard deviation of the elements of matrix T. The enablers with value greater than θ are represented in bold and italic form in Tables 5, 6, 7 and 8. Such enablers are considered to have a significant influence on other factors of FinTech ecosystem. For example, in Table 5, enabler 1 has higher value than θ against enabler 8, enabler 9, enabler 10, enabler 11, enabler 12, and enabler 15. This implies that enabler 1 exercises significant influence on these six identified enablers.

Step 7: In this step, the driving enablers are classified into critical enablers and mild enablers, while driven enablers are categorized into critical dependents and independent enablers. For this purpose, two-dimensional graph, called as prominent causal relationship graph, is created using D_i and E_i values. D_i values are plotted on horizontal axis while E_i values are plotted on vertical axis. The enablers above x-axis are the driving enablers. Enablers below x-axis are the driven enablers. The graph is divided into four zones for better visualization of enabler's influence. Zone 1 includes "critical enablers" that exercise significant influence on other enablers of the FinTech ecosystem. Zone 2 includes "mild enablers" that have feeble impact on other factors. Zone 3 includes "independent enablers" which mostly remain unaffected by other factors. Zone 4 includes "critical dependents" that are greatly impacted by other factors of the system. Figures 2, 3, 4, 5 and 6 present zonal analysis for each of the FinTech stakeholder and total respondents.

Step 8: To understand the differences in FinTech stakeholders' perspectives on causal relationship, Euclidean distance is computed by applying computational procedure of Eqs. 16 and 17. Figure 7 presents the Euclidean distance of the stakeholders' perspective.

Results and analysis

As discussed in "Research framework" section, the study starts with a comprehensive literature review to identify the key enablers that influence FinTechs in SME lending services. The identified enablers are reviewed and validated by industry and academic experts. Appendix 1 provides the profile of the experts and an overview of the discussions.

The final list of enablers is decided after incorporating inputs from the experts. Table 1 presents the final list of enablers used in the study.

Categorization of the selected enablers based on their importance—Prominent enablers

Next, the study proceeds to identify the "prominent enablers" of the FinTech ecosystem. For this purpose, the Grey DEMATEL method is employed. The D_i values (as explained in Eq. 14, and Step 5 of "Application of the Grey DEMATEL method" section) is used to categorize the list of 16 enablers according to their level of importance or prominence. Table 4 presents D_i values of each enabler from individual stakeholder's perspective as well as combined perspective. The enablers with high D_i values are considered as *prominent enablers* as they reflect a combination of both cause-and-effect factors (Bai & Sarkis, 2013). The prominent enablers share a strong correlation with other determinants, and a change in them will impact the entire FinTech system. Panel E of Table 4 represents collective perspective of all stakeholders. Collaboration between traditional FIs and FinTechs (E15) has received the highest D_i values. The result implies that all stakeholders collectively view Collaboration between traditional FIs and FinTechs (E15) as the most "prominent enabler" among FinTechs specializing in SME lending services system. According to EY (2019), SME borrowers are attracted toward FinTechs that offer integrated financial services along with traditional financial institutions. Through collaboration, FinTechs have access to the customer base and financial resources of traditional FIs, while FIs can benefit from the innovative financial products and services of FinTechs (Forbes, 2021). End-to-end solutions to SME borrowers (E11) and scalability of business operations and technology (E9) have also emerged as prominent enablers of FinTech system (refer panel E of Table 4). Interestingly, despite their importance, the academic community has not well investigated these two factors. It is not surprising that Covid-19 as the catalyst for digital ecosystem (E16) has also emerged as one of the prominent enablers. Fu and Mishra (2020) document that Covid-19 outbreak led to increase in FinTech adoption among consumers. The study also shows that the end of the first wave of lockdown did not result in decline in FinTech adoption rate.

A close examination of D_i values across all panels of Table 4 reveals convergence in individual stakeholder perspectives and combined perspective for most prominent enablers. The only exception is FinTech investor, who considers the availability of investment and growth capital (E7) as the most prominent enabler of the FinTech ecosystem. The exception is not surprising, given the nature of the stakeholder.

Table 4 includes R_i, C_j, D_i, and E_i values of each of the enabler as described in Eqs. 12, 13, 14, and 15 respectively. Enabler with high D_i value is considered as a "prominent enabler." Enabler with positive E_i value is considered as "driving enabler." Enabler with negative E_i value is considered as "driven enabler"

Cause and effect relationship among the selected enablers—Driving enablers (critical enablers and mild enablers) and driven enablers (independent enablers and critical dependents)

The Grey DEMATEL results highlighting the causal relationship between enablers are presented in this section. Table 4 presents E_i values (as explained in Eq. 15, and step 5 of "Application of the Grey DEMATEL method" section) of each enabler from individual stakeholder's perspective as well as combined perspective. The enablers with positive E_i values are the driving enablers that influence other factors of the FinTech system. The enablers with negative E_i values are driven enablers that are impacted by other factors of the FinTech system. Furthermore, Tables 5, 6, 7, 8, and 9 present total relationship matrices for the respective FinTech stakeholders. These tables highlight the values greater than threshold value θ as bold, italics, and underlined. These highlighted values represent the influential impact of enabler i over enabler j (as explained in step 6 of "Application of the Grey DEMATEL method" section).

Figures 2, 3, 4, 5, and 6 show the prominent causal relationship graphs for each of the respective FinTech stakeholders (as explained in step 7 of "Application of the Grey DEMATEL method" section). The driving enablers are located above the *x*-axis, and the driven enablers are located below the *x*-axis. Each figure is divided into four zones to highlight the degree of influence of the enablers. Zone 1 includes driving enablers with a high degree of prominence (i.e., high D_i values). Factors in zone 1 are labeled as "Critical Enablers" as they strongly influence other factors and hence are critical to the success of the FinTechs providing SME credit services. The decision-makers should focus on these factors to ensure a sustainable FinTech sector. Zone 2 includes driving enablers that measure true causal relations. However, their low D_i values indicate that they have a very minor influence on the entire FinTech ecosystem. Hence driving enablers in zone 2 are termed as "Mild Enablers". Zone 3 includes driven enablers with low D_i values indicating their low level of significance in the FinTech ecosystem. The factors in zone 3 are called "Independent Enablers" as they are least impacted by others and have low levels of prominence in the system. The driven enablers present in zone 4 are significant as they are strongly connected with the entire system. These enablers are strongly intertwined receivers and hence are termed as "*Critical Dependents*." The decision-makers must focus on these

Table 4 Degree of prominence (D_i) and net cause (E_i) values of enablers

Enabler		A: FinTech Practitioners				B: FinTech Experts				C: FinTech Policymakers				D: FinTech Investors				E: Total FinTech Stakeholders			
		R_i	C_j	$D_i = R_i+C_j$	$E_i = R_i-C_j$	R_i	C_j	$D_i = R_i+C_j$	$E_i = R_i-C_j$	R_i	C_j	$D_i = R_i+C_j$	$E_i = R_i-C_j$	R_i	C_j	$D_i = R_i+C_j$	$E_i = R_i-C_j$	R_i	C_j	$D_i = R_i+C_j$	$E_i = R_i-C_j$
E1:	Demand	4.43	3.90	8.33	0.53	7.56	7.46	15.03	0.10	4.91	5.11	10.02	-0.20	2.40	2.16	4.56	0.25	6.47	6.13	12.59	0.34
E2:	Awareness	4.02	3.91	7.93	0.11	7.29	7.30	14.59	-0.01	4.72	5.55	10.27	-0.83	1.75	2.50	4.24	-0.75	5.94	6.24	12.17	-0.30
E3:	Internet & Smtphn	4.18	2.67	6.85	1.52	7.75	6.18	13.93	1.57	5.41	3.78	9.18	1.63	3.21	1.07	4.29	2.14	6.67	4.43	11.09	2.24
E4:	Alternate Data	4.09	4.02	8.10	0.07	6.93	6.91	13.84	0.02	5.51	5.56	11.06	-0.05	2.38	2.41	4.79	-0.03	6.22	6.15	12.37	0.07
E5:	Infrastructure	3.39	2.39	5.78	1.00	7.03	5.40	12.43	1.63	5.21	3.57	8.78	1.64	2.29	0.84	3.13	1.45	5.71	3.94	9.65	1.77
E6:	Talent	3.57	2.32	5.89	1.24	7.53	6.27	13.80	1.26	4.80	3.59	8.39	1.21	2.85	1.75	4.60	1.09	6.01	4.37	10.38	1.64
E7:	Capital	3.92	4.09	8.00	-0.17	7.54	7.82	15.36	-0.27	5.41	5.37	10.77	0.04	2.82	3.42	6.24	-0.61	6.36	6.69	13.05	-0.33
E8:	Underwriting	3.21	4.19	7.39	-0.98	5.88	6.66	12.55	-0.78	5.18	5.51	10.69	-0.33	1.62	3.56	5.18	-1.93	5.13	6.49	11.61	-1.36
E9:	Scalability	3.81	4.50	8.31	-0.69	6.77	8.12	14.88	-1.35	5.70	6.33	12.04	-0.63	2.42	3.41	5.83	-1.00	6.06	7.21	13.27	-1.15
E10:	Collection	3.20	4.49	7.70	-1.29	6.04	7.00	13.04	-0.96	4.81	5.58	10.39	-0.77	1.75	2.92	4.67	-1.17	5.11	6.63	11.74	-1.52
E11:	End-to-End	3.92	4.95	8.87	-1.03	6.54	8.51	15.05	-1.97	5.57	6.15	11.72	-0.59	2.08	3.45	5.53	-1.37	5.95	7.57	13.52	-1.62
E12:	Conv. & Transp.	3.82	4.69	8.52	-0.87	6.43	7.60	14.02	-1.17	5.51	6.11	11.61	-0.60	2.46	3.31	5.78	-0.85	5.95	7.14	13.09	-1.19
E13:	Data Security	3.24	4.06	7.30	-0.83	6.45	6.86	13.32	-0.41	5.27	5.68	10.94	-0.41	2.07	1.88	3.95	0.18	5.43	6.10	11.53	-0.67
E14:	Reg. Envt.	4.23	3.10	7.33	1.13	8.01	5.83	13.84	2.18	6.26	5.03	11.29	1.23	3.36	1.94	5.30	1.42	7.01	5.11	12.12	1.90
E15:	Collaboration	4.30	4.87	9.17	-0.57	7.64	7.95	15.59	-0.31	5.81	6.49	12.29	-0.68	2.43	3.27	5.70	-0.84	6.63	7.40	14.02	-0.77
E16:	Covid-19	4.85	4.02	8.87	0.83	8.02	7.56	15.58	0.47	4.94	5.59	10.53	-0.65	3.25	1.22	4.47	2.03	7.06	6.12	13.18	0.95

Table 5 Total relationship matrix: FinTech practitioners' perspective

	Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16
E1:	Demand	0.22	0.29	0.19	0.29	0.17	0.17	0.29	**0.31**	**0.32**	**0.32**	**0.35**	**0.33**	0.28	0.24	**0.36**	0.29
E2:	Awareness	0.26	0.2	0.18	0.27	0.17	0.14	0.26	0.25	0.29	0.29	**0.33**	**0.31**	0.26	0.21	**0.31**	0.27
E3:	Internet and Smtphn	0.26	0.28	0.14	0.28	0.17	0.14	0.26	0.28	**0.31**	**0.31**	**0.34**	**0.33**	0.28	0.21	**0.32**	0.28
E4:	Alternate data	0.25	0.25	0.17	0.21	0.16	0.15	0.27	0.3	0.3	**0.31**	**0.33**	**0.31**	0.27	0.2	**0.33**	0.28
E5:	Infrastructure	0.2	0.22	0.19	0.23	0.11	0.13	0.22	0.22	0.26	0.24	0.28	0.25	0.23	0.16	0.24	0.23
E6:	Talent	0.22	0.21	0.15	0.22	0.13	0.11	0.25	0.26	0.27	0.27	0.29	0.27	0.24	0.17	0.27	0.23
E7:	Capital	0.25	0.24	0.16	0.25	0.15	0.18	0.21	0.26	0.3	0.29	**0.32**	0.29	0.26	0.19	**0.31**	0.26
E8:	Underwriting	0.19	0.19	0.13	0.21	0.12	0.12	0.22	0.17	0.24	0.26	0.25	0.23	0.21	0.17	0.28	0.21
E9:	Scalability	0.24	0.25	0.17	0.25	0.15	0.14	0.26	0.25	0.22	0.27	**0.31**	0.3	0.25	0.19	**0.3**	0.25
E10:	Collection	0.19	0.19	0.13	0.22	0.13	0.13	0.22	0.24	0.23	0.19	0.27	0.25	0.2	0.14	0.27	0.21
E11:	End-to-end	0.25	0.26	0.17	0.26	0.16	0.14	0.26	0.26	0.28	0.29	0.25	**0.3**	0.25	0.2	**0.32**	0.25
E12:	Conv. and transp.	0.26	0.25	0.17	0.25	0.14	0.14	0.26	0.24	0.27	0.28	**0.31**	0.23	0.27	0.19	**0.31**	0.26
E13:	Data security	0.22	0.2	0.14	0.22	0.13	0.12	0.22	0.21	0.22	0.22	0.26	0.26	0.17	0.17	0.27	0.21
E14:	Reg. envt.	0.28	0.26	0.18	0.27	0.16	0.15	0.28	0.29	**0.32**	0.3	**0.34**	**0.33**	0.28	0.17	**0.34**	0.27
E15:	Collaboration	0.28	0.29	0.17	0.28	0.16	0.16	0.29	**0.31**	**0.31**	**0.32**	**0.35**	**0.32**	0.29	0.23	0.27	0.27
E16:	Covid-19	**0.31**	**0.32**	0.22	**0.31**	0.2	0.19	**0.33**	**0.33**	**0.35**	**0.34**	**0.39**	**0.37**	**0.31**	0.26	**0.37**	0.25

Mean = 0.2428, standard deviation = 0.0603, threshold value = 0.3031. The values greater than threshold are represented as bold, italics, and underlined values

factors because of their high degree of prominence and higher chances of getting influenced by other factors.

FinTech practitioners' perspective

Tables 4 (panel A) and 5 and Fig. 2 highlight practitioners' views on the enablers that influence the growth of FinTechs specializing in SME lending services. They identify eight enablers as driving enablers which are sorted on the basis of prominence (D_i values) as follows: E16 >E1> E4> E2> E14> E3> E6> E5. They identify Covid-19 as catalyst for digital ecosystem (E16), credit demand by SME borrowers (E1), availability and accessibility to alternate data sources (E4), and awareness of FinTech solutions among

Table 6 Total relationship matrix: FinTech experts' perspective

	Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16
E1:	Demand	0.44	0.49	0.42	0.46	0.37	0.42	**0.53**	0.44	**0.54**	0.47	**0.57**	**0.51**	0.46	0.41	**0.53**	0.50
E2:	Awareness	0.49	0.41	0.41	0.44	0.36	0.41	0.51	0.42	**0.53**	0.45	**0.55**	0.49	0.43	0.38	**0.51**	0.49
E3:	Internet and smtphn	0.50	0.50	0.37	0.49	0.39	0.43	**0.52**	0.46	**0.56**	0.49	**0.58**	**0.52**	0.48	0.39	**0.54**	**0.51**
E4:	Alternate data	0.44	0.46	0.38	0.37	0.32	0.37	0.48	0.43	0.49	0.44	**0.53**	0.46	0.42	0.37	0.49	0.46
E5:	Infrastructure	0.45	0.46	0.42	0.45	0.30	0.39	0.50	0.40	0.51	0.43	**0.52**	0.47	0.44	0.35	0.48	0.48
E6:	Talent	0.49	0.48	0.40	0.46	0.35	0.37	**0.53**	0.46	**0.55**	0.47	**0.57**	0.51	0.46	0.38	**0.54**	0.50
E7:	Capital	**0.52**	0.48	0.41	0.46	0.38	0.43	0.46	0.44	**0.55**	0.47	**0.56**	0.50	0.46	0.39	**0.52**	0.50
E8:	Underwriting	0.39	0.38	0.32	0.35	0.27	0.33	0.42	0.31	0.43	0.37	0.45	0.40	0.34	0.31	0.42	0.40
E9:	Scalability	0.46	0.44	0.37	0.41	0.33	0.39	0.48	0.39	0.43	0.42	0.51	0.45	0.42	0.34	0.48	0.47
E10:	Collection	0.41	0.38	0.32	0.37	0.29	0.34	0.41	0.36	0.44	0.33	0.47	0.42	0.35	0.30	0.44	0.40
E11:	End-to-end	0.45	0.42	0.36	0.39	0.31	0.36	0.46	0.39	0.47	0.40	0.43	0.44	0.40	0.34	0.48	0.44
E12:	Conv. and transp.	0.43	0.43	0.35	0.40	0.30	0.35	0.43	0.38	0.46	0.41	0.48	0.38	0.41	0.33	0.46	0.43
E13:	Data security	0.42	0.40	0.35	0.40	0.31	0.36	0.44	0.37	0.47	0.39	0.49	0.46	0.35	0.34	0.47	0.45
E14:	Reg. envt.	**0.53**	**0.52**	0.43	0.50	0.38	0.44	**0.56**	0.48	**0.57**	0.50	**0.60**	**0.54**	0.50	0.36	**0.57**	**0.53**
E15:	Collaboration	0.50	0.51	0.41	0.47	0.35	0.43	**0.54**	0.46	**0.55**	0.48	**0.58**	0.51	0.46	0.40	0.47	0.51
E16:	Covid-19	**0.54**	**0.53**	0.45	0.50	0.39	0.45	**0.55**	0.47	**0.57**	0.49	**0.60**	**0.54**	0.49	0.43	**0.55**	0.47

Mean = 0.4430, standard deviation = 0.0684, threshold value = 0.5115. The values greater than threshold are represented as bold, italics, and underlined values

Table 7 Total relationship matrix: FinTech investors' perspective

	Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16
E1:	Demand	0.10	0.16	0.06	0.15	0.04	0.09	**0.23**	**0.22**	0.19	0.17	**0.22**	0.20	0.10	0.14	0.22	0.10
E2:	Awareness	0.09	0.08	0.04	0.11	0.03	0.07	0.15	0.17	0.16	0.12	0.19	0.15	0.09	0.09	0.15	0.06
E3:	Internet and smtphn	0.17	**0.22**	0.06	**0.23**	0.06	0.17	**0.28**	**0.29**	**0.24**	**0.24**	**0.27**	**0.26**	0.18	0.17	**0.25**	0.10
E4:	Alternate data	0.12	0.14	0.05	0.10	0.03	0.09	0.22	**0.24**	0.22	0.19	**0.24**	**0.22**	0.12	0.10	0.21	0.08
E5:	Infrastructure	0.12	0.11	0.07	0.12	0.04	0.15	0.20	0.20	**0.23**	0.19	0.20	0.20	0.12	0.11	0.14	0.08
E6:	Talent	0.17	0.16	0.10	0.17	0.07	0.09	**0.26**	**0.24**	**0.26**	0.21	**0.25**	**0.25**	0.16	0.13	0.21	0.09
E7:	Capital	0.15	0.20	0.12	0.18	0.05	0.15	0.18	**0.26**	**0.25**	**0.23**	**0.25**	0.21	0.11	0.15	**0.24**	0.08
E8:	Underwriting	0.08	0.09	0.04	0.10	0.02	0.06	0.16	0.11	0.16	0.16	0.17	0.17	0.06	0.07	0.15	0.03
E9:	Scalability	0.15	0.17	0.07	0.17	0.05	0.11	**0.23**	0.21	0.15	0.19	**0.23**	0.20	0.10	0.10	0.22	0.05
E10:	Collection	0.08	0.09	0.03	0.09	0.07	0.07	0.17	0.19	0.18	0.10	0.16	0.14	0.07	0.11	0.16	0.04
E11:	End-to-end	0.14	0.16	0.04	0.12	0.03	0.08	0.20	0.19	0.19	0.14	0.13	0.20	0.09	0.10	0.20	0.05
E12:	Conv. and transp.	0.15	0.18	0.05	0.16	0.05	0.10	**0.22**	**0.23**	0.22	0.20	0.22	0.15	0.12	0.10	0.22	0.08
E13:	Data security	0.09	0.10	0.05	0.14	0.04	0.09	0.17	0.20	0.18	0.15	0.19	0.19	0.07	0.13	0.20	0.07
E14:	Reg. envt.	0.20	0.21	0.09	**0.22**	0.11	0.15	**0.29**	**0.28**	**0.29**	**0.24**	**0.26**	**0.28**	0.20	0.12	**0.28**	0.14
E15:	Collaboration	0.13	0.17	0.05	0.13	0.04	0.10	0.21	**0.23**	0.22	0.19	**0.22**	0.22	0.15	0.13	0.15	0.08
E16:	Covid-19	0.20	**0.23**	0.13	0.20	0.11	0.16	**0.26**	0.2	**0.28**	0.22	**0.25**	**0.27**	0.13	0.17	**0.26**	0.07

Mean = 0.1528, standard deviation = 0.0677, threshold value = 0.2205. The values greater than threshold are represented as bold, italics, and underlined values

SME borrowers (E2) as the "critical enablers" (zone 1 of Fig. 2). Industry reports have highlighted the importance of these factors in FinTech ecosystem. For instance, Deloitte (2020a) reports that Covid-19 has brought new growth opportunities for FinTech sector. Alliance for Financial Inclusion (2021) discloses that FinTech innovations have benefitted many SMEs in fulfilling their unmet credit demand. The report also states that FinTechs effectively utilize alternate data sets, like utility bills and payments to e-commerce platforms, to underwrite and lend to SME borrowers.

FinTech practitioners view remaining eight enablers as driven enablers which are sorted in the order of prominence as follows: E15 > E11 > E12 >E9 >E7 >E10 >E8 >E13. They consider collaboration between traditional FIs and FinTechs (E15), end-to-end solutions to SME borrowers (E11), convenience and process transparency (E12), scalability of business operations (E9), and availability of

Table 8 Total relationship matrix: FinTech policymakers' perspective

|	Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16
E1	Demand	0.25	0.32	0.21	0.33	0.21	0.20	0.31	0.33	0.37	0.32	0.37	0.36	0.33	0.31	0.38	0.31
E2	Awareness	0.30	0.26	0.21	0.30	0.20	0.20	0.30	0.30	0.36	0.30	0.35	0.34	0.32	0.30	0.37	0.32
E3	Internet and smtphn	0.32	0.37	0.20	0.37	0.24	0.23	0.33	0.35	**0.41**	0.36	0.39	0.39	0.36	0.31	**0.42**	0.37
E4	Alternate data	0.34	0.36	0.24	0.31	0.22	0.24	0.34	0.37	**0.41**	0.37	**0.40**	**0.40**	0.37	0.33	**0.43**	0.37
E5	Infrastructure	0.32	0.36	0.26	0.36	0.19	0.22	0.33	0.33	0.39	0.34	0.38	0.37	0.36	0.29	0.39	0.33
E6	Talent	0.28	0.31	0.21	0.31	0.18	0.17	0.32	0.32	0.37	0.33	0.35	0.35	0.33	0.28	0.37	0.32
E7	Capital	0.32	0.35	0.23	0.35	0.25	0.26	0.29	0.35	**0.41**	0.36	**0.40**	0.38	0.36	0.32	**0.41**	0.36
E8	Underwriting	0.32	0.32	0.23	0.34	0.21	0.21	0.33	0.29	0.39	0.35	0.38	0.38	0.35	0.32	**0.40**	0.35
E9	Scalability	0.34	0.38	0.26	0.37	0.25	0.24	0.37	0.36	0.36	0.38	**0.42**	**0.42**	0.39	0.33	**0.44**	0.38
E10	Collection	0.31	0.30	0.21	0.32	0.21	0.19	0.32	0.34	0.36	0.27	0.33	0.35	0.31	0.28	0.38	0.33
E11	End-to-end	0.35	0.37	0.26	0.37	0.24	0.22	0.34	0.37	**0.42**	0.38	0.34	**0.41**	0.38	0.33	**0.43**	0.37
E12	Conv. and transp.	0.33	0.37	0.26	0.36	0.23	0.23	0.35	0.37	**0.41**	0.35	**0.41**	0.34	0.38	0.34	**0.42**	0.36
E13	Data security	0.31	0.35	0.22	0.36	0.23	0.22	0.34	0.34	**0.40**	0.33	**0.40**	0.39	0.30	0.33	**0.41**	0.35
E14	Reg. envt.	0.38	**0.41**	0.29	**0.41**	0.26	0.29	**0.41**	**0.41**	**0.47**	**0.42**	**0.45**	**0.45**	**0.43**	0.32	**0.48**	**0.4**
E15	Collaboration	0.35	0.38	0.26	0.39	0.25	0.26	0.38	0.39	**0.44**	0.39	**0.42**	**0.41**	0.39	0.34	0.38	0.39
E16	Covid-19	0.29	0.32	0.22	0.33	0.22	0.21	0.31	0.31	0.37	0.34	0.36	0.36	0.33	0.30	0.38	0.28
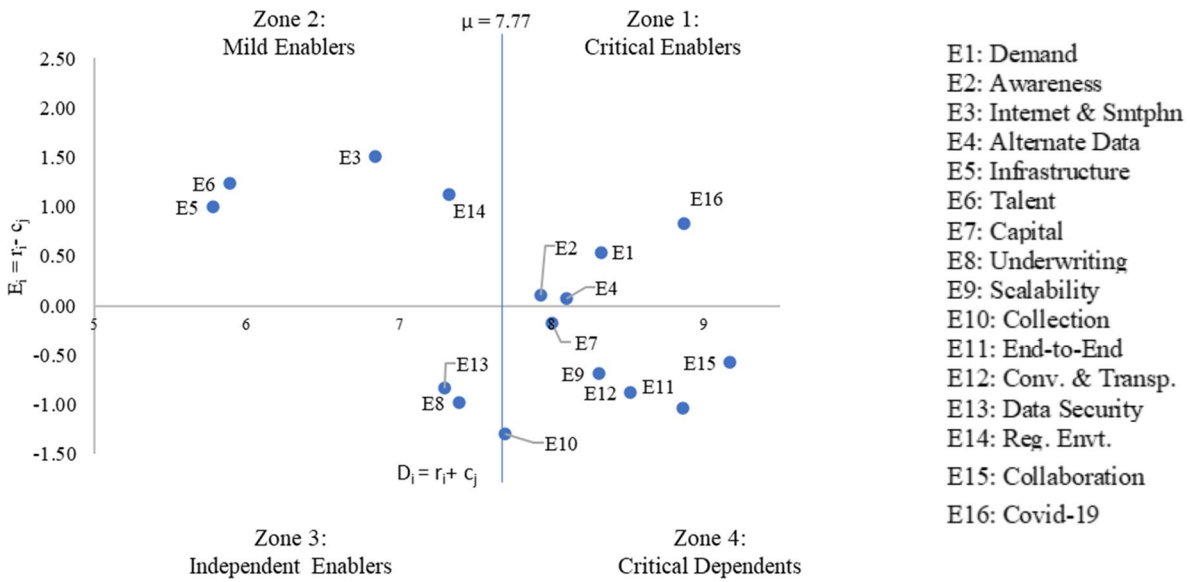
Fig. 2 Prominent causal relationship graph: By FinTech practioner

investment and growth capital (E7) as "critical dependents" that are greatly influenced by other factors of the Fin-Tech ecosystem (zone 4 of Fig. 2). A close examination of Table 5 reveals that, according to FinTech practitioners, the identified "critical enablers", i.e., Covid-19 (E16), credit demand (E1), alternate data sources (E4), and awareness of FinTech solutions (E2), have a deep impact on "critical dependents" that reflect customer service factors (like end-to-end solutions (E11), convenience and process transparency (E12)), and collaboration (E15) in the FinTech ecosystem. According to Global Partnership for Financial Inclusion (2017), growth in mobile phones, social media footprints, electronic payments, and big data has led to massive growth in availability of alternate data sets. Fin-Techs mine these digital footprints to assess the risk profile of the borrowers and offer customized and flexible financial solutions to SME borrowers. The report concludes that availability of alternate data sources has enabled FinTechs to reduce the financing gap of SME borrowers. Deloitte (2020b) argues that Covid-19 has fostered a new phase of
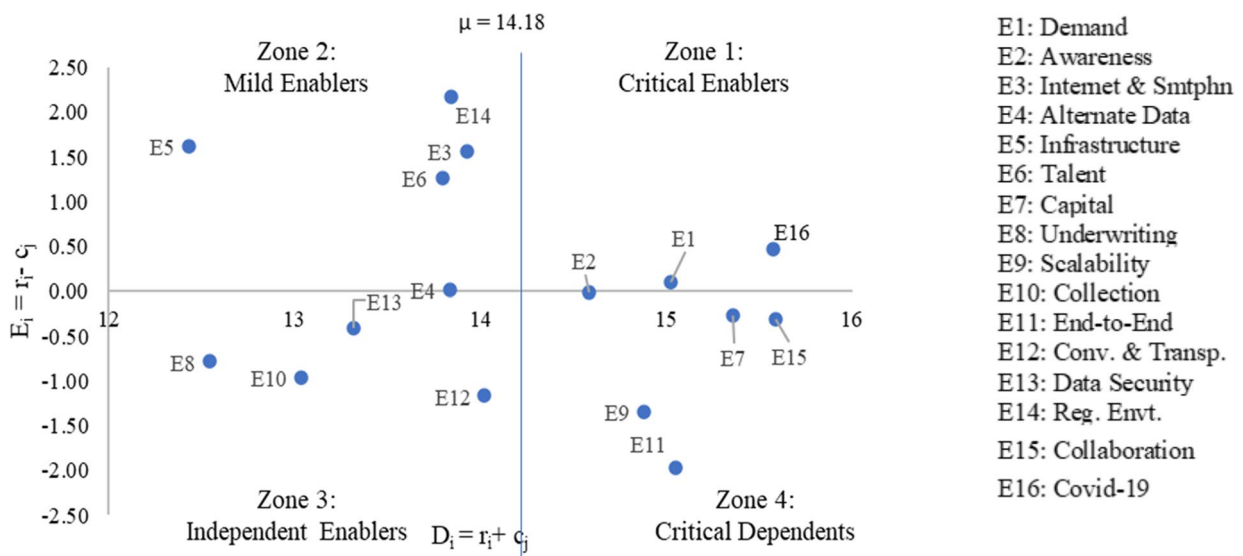
Fig. 3 Prominent causal relationship graph: By FinTech expert
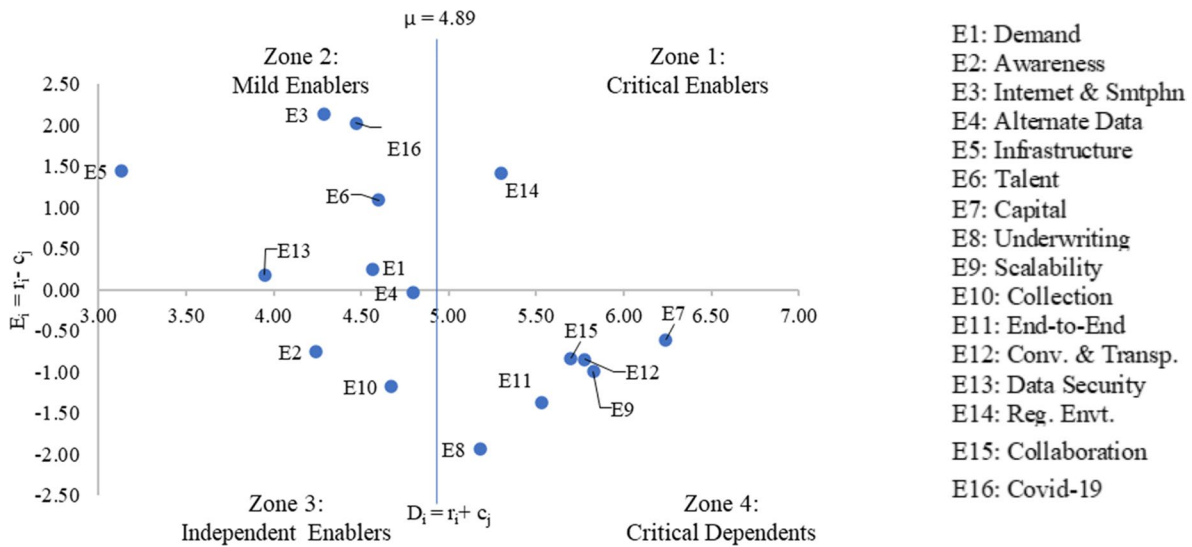
Fig. 4 Prominent causal relationship graph: By FinTech investor

collaboration between traditional FIs and FinTechs. The report suggests that traditional FIs seek to partner with FinTechs to access new products, gain new customers, and attain better operational efficiencies. FinTechs look for collaboration as they would like to expand their client coverage and gain industry and regulatory knowledge. The FinTech practitioners view collection management (E10), underwriting (E8), and data security (E13) as independent enablers that behave autonomously in the FinTech ecosystem.

FinTech subject matter experts' perspective

Tables 4 (panel B) and 6 and Fig. 3 highlight subject matter experts' views on the identified enablers. Interestingly, FinTech subject matter experts and FinTech practitioners share similar perspectives on driving and driven enablers, and the causal relationship. The experts view seven enablers as driving enablers in the following order of prominence: E16 >E1 >E3 >E14 >E4 >E6 >E5. The experts consider Covid-19 as catalyst for digital ecosystem (E16) and credit demand by SME borrowers (E1) as the "critical enablers" in the FinTech ecosystem (zone 1 of Fig. 3). Akpan et al. (2022) show that
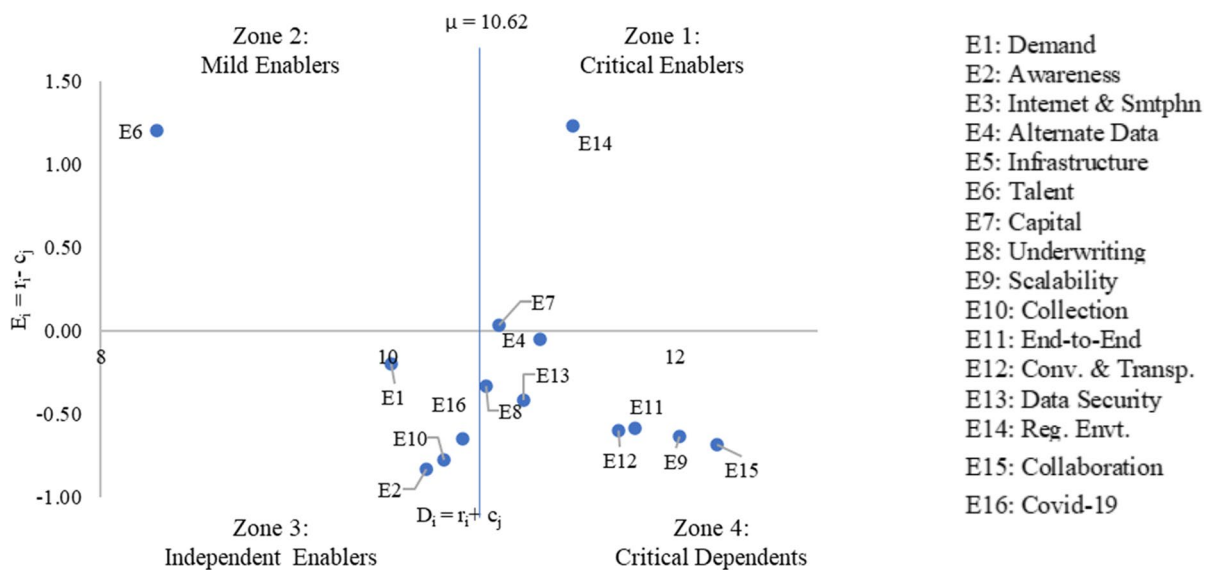
Fig. 5 Prominent causal relationship graph: by FinTech policymaker

Table 9 Total relationship matrix: FinTech stakeholders' combined perspective

	Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16
E1:	Demand	0.35	0.42	0.29	0.41	0.26	0.29	0.45	0.44	**0.48**	0.44	**0.51**	**0.47**	0.40	0.36	**0.50**	0.41
E2:	Awareness	0.38	0.33	0.28	0.38	0.25	0.27	0.41	0.38	0.44	0.40	**0.47**	0.44	0.37	0.32	0.45	0.38
E3:	Internet and smtphn	0.41	0.44	0.26	0.43	0.28	0.30	0.44	0.44	**0.49**	0.46	**0.52**	**0.49**	0.42	0.35	**0.50**	0.42
E4:	Alternate data	0.39	0.40	0.28	0.34	0.25	0.27	0.43	0.43	**0.46**	0.43	**0.49**	0.46	0.39	0.33	**0.48**	0.40
E5:	Infrastructure	0.35	0.37	0.29	0.37	0.20	0.26	0.39	0.37	0.43	0.39	0.44	0.42	0.36	0.29	0.41	0.36
E6:	Talent	0.37	0.38	0.27	0.38	0.23	0.23	0.43	0.41	0.46	0.42	**0.47**	0.45	0.38	0.31	0.45	0.38
E7:	Capital	0.41	0.41	0.29	0.40	0.27	0.31	0.38	0.42	**0.48**	0.44	**0.49**	0.46	0.39	0.33	**0.48**	0.40
E8:	Underwriting	0.32	0.32	0.23	0.32	0.20	0.23	0.36	0.30	0.39	0.37	0.40	0.38	0.32	0.27	0.40	0.32
E9:	Scalability	0.39	0.40	0.28	0.38	0.25	0.28	0.43	0.39	0.39	0.41	**0.48**	0.45	0.38	0.31	**0.47**	0.38
E10:	Collection	0.32	0.32	0.23	0.33	0.21	0.23	0.36	0.36	0.38	0.30	0.40	0.38	0.31	0.26	0.40	0.32
E11:	End-to-end	0.39	0.39	0.27	0.38	0.24	0.26	0.41	0.40	0.44	0.41	0.40	0.44	0.37	0.31	**0.46**	0.37
E12:	Conv. and transp.	0.38	0.39	0.27	0.38	0.24	0.26	0.41	0.39	0.44	0.41	**0.46**	0.38	0.39	0.31	0.46	0.38
E13:	Data security	0.34	0.34	0.24	0.35	0.22	0.24	0.37	0.36	0.40	0.35	0.43	0.41	0.29	0.30	0.43	0.35
E14:	Reg. envt.	0.45	0.45	0.32	0.45	0.28	0.31	**0.49**	0.47	**0.52**	0.48	**0.54**	**0.52**	0.45	0.32	**0.54**	0.44
E15:	Collaboration	0.42	0.44	0.29	0.42	0.26	0.30	**0.46**	0.45	**0.49**	0.46	**0.52**	**0.49**	0.42	0.36	0.44	0.41
E16:	Covid-19	0.45	**0.47**	0.34	0.45	0.30	0.32	**0.49**	0.47	**0.52**	0.47	**0.54**	**0.52**	0.43	0.39	**0.53**	0.38

Mean = 0.3816, standard deviation = 0.0775, threshold value = 0.4591. The values greater than threshold are represented as bold, italics, and underlined values

during Covid-19 pandemic, SMEs aggressively adopted FinTech solutions and other advanced technologies to sustain their competitive advantage. Haddad and Hornuf (2019) empirically demonstrate that FinTechs grow in economies where it is difficult to access loans from banks. The rest of the driving enablers are viewed as "mild enablers" that have a feeble influence on the FinTech community (zone 2 of Fig. 3).

FinTech experts consider the remaining nine enablers as driven enablers that are arranged in the order of prominence as follows: E15 >E7 >E11 >E9 >E2 >E12 >E13 >E10 >E8. The experts believe that collaboration between traditional FIs and FinTechs (E15), availability of investment and growth capital (E7), end-to-end solutions to SME borrowers (E11), scalability of business operations (E9), and
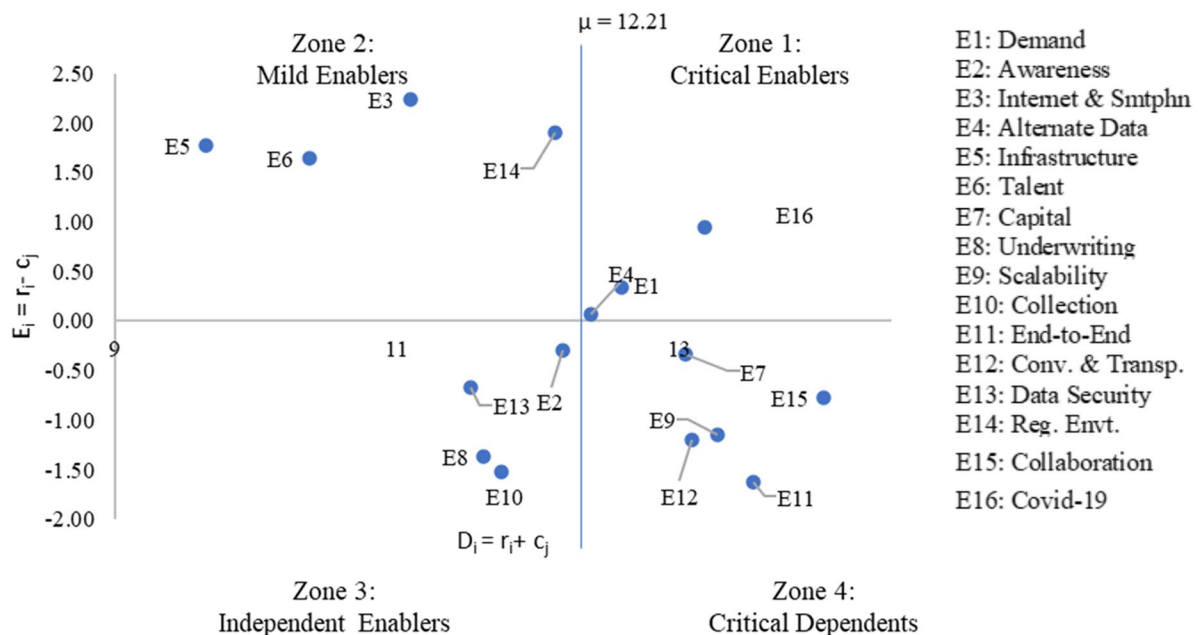
Fig. 6 Prominent causal relationship graph: overall FinTech stakeholders

awareness of FinTech solutions among SME borrowers (E2) are the "critical dependents" that are highly contingent on other determinants (zone 4 of Fig. 3). The rest of the driven enablers are considered "*independent enablers*" as they are almost detached from the FinTech ecosystem (zone 3 of Fig. 3).

Table 6 shows that the two critical enablers, i.e., Covid-19 (E16) and credit demand (E1) have a substantial effect customer service factors (like end-to-end solutions (E11), convenience and process transparency (E12)) and collaboration (E15) in the FinTech ecosystem. As shown in "FinTech Practitioners' Perspective" section, FinTech practitioners share the same perspective on this causal relationship. However, according to FinTech experts, the two critical enablers, i.e., Covid-19 (E16) and credit demand (E1) also significantly influence availability of investment and growth capital (E7) and scalability of business operations and technology (E9). The availability of capital to FinTechs during pandemic dried up (Financial Stability Board, 2022) as investors became cautious and were looking to conserve their current portfolio of investments (Deloitte, 2020a). However, FinTech funding increased from 2021 as FinTech sector rebounded (Financial Stability Board, 2022) and promised high growth trajectory on account of greater digital adoption by consumers. According to MicroSave Consulting (2021), FinTechs are using the funds raised to scale up their operations via strategic alliances.

FinTech investors' perspective

Tables 4 (panel D) and 7 and Figure 4 present FinTech investors' perspective on the interrelationship between enablers that impact FinTechs operating in SME lending space. The investors identify the following seven factors as driving enablers which are arranged in the order of prominence as follows: E14 >E6 >E1 >E16 >E3 > E13 >E5. Interestingly they treat only one factor, i.e., conducive regulatory environment (E14) as a critical enabler that deeply impacts the FinTech landscape (zone 1 of Fig. 4). As observed in Table 7, investors believe that regulatory environment (E14) has a huge impact on almost all factors of FinTech ecosystem. The advent of FinTechs has posed new risks like consumers' inability to comprehend the nature and risks of FinTech products, data security, and increased dependence on third party providers (KPMG, 2019). Regulators' responses to these new risks keep on evolving as their main aim is to maintain financial stability in the economy. Jagtiani and Lemieux (2018) advise FinTech firms to closely monitor regulatory changes as they can impact the business models. Hence, it is no surprise that FinTech investors consider regulatory environment (E14) as a critical enabler that influences FinTechs. The remaining six driving enablers are "*mild enablers*" (zone 2 of Fig. 4)

FinTech investors view the remaining nine enablers as driven enablers, which are sorted in the order of their prominence as follows: E7 > E9 >E12 >E15 >E11 >E8 >E4 >E10 >E2. Availability of investment and growth capital (E7), scalability of business operations (E9), convenience and process transparency (E12), collaboration between traditional FIs and FinTechs (E15), end-to-end solutions to SME borrowers (E11), and rigourous underwriting model (E8) are viewed as critical dependents. It is interesting to observe that FinTech investors view all internal and operational activities like scalability (E9), convenience and process transparency (E12), end-to-end solutions (E11), and underwriting model (E8) as "critical dependents" (zone 4 of Fig. 4).

FinTech policymakers perspective

Tables 4 (panel C) and 8 and Fig. 5 display FinTech policymakers' perspective on the interrelationship between enablers that impact FinTechs operating in SME lending space. They identify five driving enablers, which are arranged in the order of prominence as follows: E14 > E7 >E3 >E5 >E6. It is not surprising that they treat only conducive regulatory environment (E14) and availability of investment and growth capital (E7) as the "critical enablers" (zone 1 of Fig. 5). According to Table 8, these two critical enablers have a deep impact on the internal functions of FinTech firms as represented by underwriting (E8), scalability (E9), collection management (E10), and end-to-end solutions (E11). KPMG (2019) highlights that regulators around the world are drawing up policies to ensure that the FinTech's risk management model (which includes underwriting), operations (which includes scalability and financial solutions), and internal controls (which includes collection management) are appropriate and effective.

The remaining eleven enablers are classified as driven enablers, out of which seven as treated as "critical dependents" (zone 4 of Fig. 5). The order of driven enablers according to prominence values is E15 >E9 >E11 >E12 >E4 >E13 >E8 >E16 >E10 >E2 >E1. They consider collaboration between traditional FIs and FinTechs (E15), scalability of business operations (E9), end-to-end solutions to SME borrowers (E11), convenience and process transparency (E12), availability and accessibility of alternate data sources (E4), data security (E13), and rigourous underwriting model (E8) as critical dependents. Like FinTech investors, the FinTech policymakers also view all internal and operational activities like scalability (E9), convenience and process transparency (E12), end-to-end solutions (E11), and underwriting model (E8) as "critical dependents." However, they also consider issues related to data like availability and

accessibility of alternate data (E4) and data security (E13) as critical dependents. Financial Stability Board (2022) highlights regulators' concerns regarding data protection issues, and increased dependence on third party providers for alternate data, as they have implications on operational vulnerability of FinTech firms.

Overall stakeholders' perspective

Tables 4 (panel E) and 9 and Fig. 6 highlight the combined perspectives of total FinTech stakeholders. The stakeholders together view seven enablers as driving enablers which are sorted in the order of prominence as follows: E16 > E1 > E4 > E14 >E3 >E6 >E5. All stakeholders view Covid-19 as catalyst for digital ecosystem (E16), credit demand by SME borrowers (E1), and availability of alternate data sources (E4) as "critical enablers" (zone 1 of Fig. 6) which exercise great influence on scalability of business operations (E9), end-to-end solutions to SME borrowers (E11), and collaboration between traditional FIs and FinTechs (E15) (refer Table 9).

It is not surprising that all stakeholders consider Covid-19 as catalyst for digital ecosystem (E16) as a "critical enabler" for the development of FinTechs operating in SME credit services. Akpan et al. (2022) document increased adoption of technological solutions among SMEs due to Covid-19. Lara (2020a, b) shows that during Covid-19 pandemic SME borrowers have increasingly turned to FinTech platforms to meet their financing requirements. The results also identify

credit demand by SME borrowers (E1) as one of the critical enablers for the growth of FinTechs specializing in SME lending services. This finding supports the analysis of Frost (2020), Haddad and Hornuf (2019), and Vanroose and D'Espallier (2013), who document inaccessibility to formal sources of financing as a key factor for the growth of FinTechs in an economy. Availability of alternate data sources (E4) is also identified as a critical enabler. Jagtian and Lemieux (2019) demonstrate that alternate data enable FinTech lenders to grade borrowers correctly and better predict the default rate.

All stakeholders view remaining nine factors as driven enablers which are ordered in the order prominence as follows: E15 >E11> E9 >E12 >E7 > E2 >E10 >E8 >E13. The enablers collaboration between traditional FIs and FinTechs (E15), end-to-end solutions to SME borrowers (E11), scalability of business operations (E9), convenience and process transparency (E12), and availability of investment and growth capital (E7) are "critical dependents" (zone 4 of Fig. 6). A remarkable outcome of the zonal analysis (Fig. 6) is that all the prominent enablers, i.e., collaboration (E15), end-to-end solutions (E11), and scalability (E9) (refer "Categorization of the selected enablers based on their importance—prominent enablers" section) are also "critical dependents," which are strongly integrated with other factors in the FinTech ecosystem. A close examination of Table 9 reveals that these three critical dependents are greatly influenced by credit demand (E1), smartphone and Internet penetration (E3), regulatory environment (E14), and Covid-19 (E16).
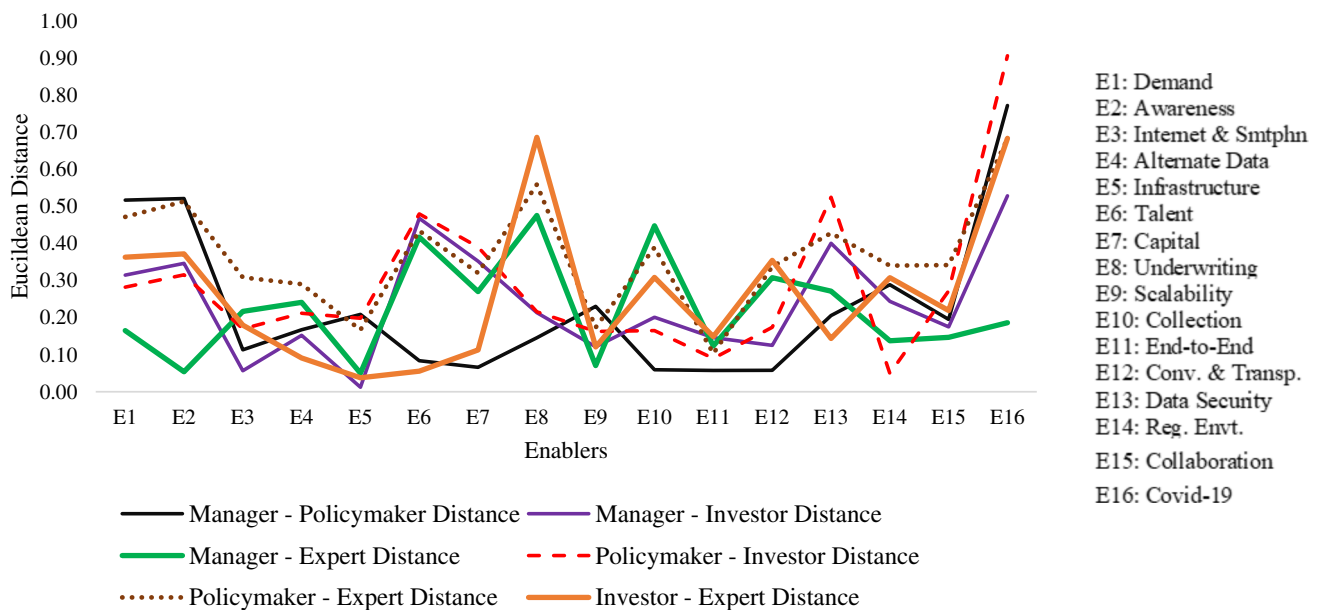

E1: Demand
E2: Awareness
E3: Internet & Smtphn
E4: Alternate Data
E5: Infrastructure
E6: Talent
E7: Capital
E8: Underwriting
E9: Scalability
E10: Collection
E11: End-to-End
E12: Conv. & Transp.
E13: Data Security
E14: Reg. Envt.
E15: Collaboration
E16: Covid-19

Fig. 7 Euclidean distance between FinTech stakeholders

Difference in stakeholders' perception regarding causal relationship

Euclidean distance (represented in Fig. 7) is computed to evaluate the difference in stakeholders' perception of the causal relationship. As observed in Fig. 7, most of the values of Euclidean distance are less than 0.50, indicating the convergence in viewpoints of FinTech stakeholders. FinTech practitioners and FinTech subject matter experts have similar perspectives toward all enablers. However, the distance between FinTech practitioners and policymakers on credit demand by SME borrowers (E1) and awareness of FinTech solutions among SME borrowers (E2) is higher than 0.50, indicating their differing opinion. The practitioners consider these enablers as critical enablers that have deep impact on other factors of the FinTech community. While policymakers view these enablers as independent enablers that behave autonomously in the FinTech community. FinTech policymakers consider data security (E13) as a critical dependent which is influenced by other factors, while investors consider E13 as a mild enabler that exercises a feeble impact on other factors. FinTech experts hold a distinct view on the rigorous underwriting model (E8) compared to policymakers and investors. The experts believe that E8 is an independent factor while policymakers and investors hold that E8 is a critical dependent. Similarly, FinTech policymakers have a very different opinion regarding Covid-19 as catalyst for digital ecosystem (E16). They view E16 as an independent factor, while rest of the stakeholders view E16 as a driving factor that exercises influence in the FinTech system.

Implications of the study and concluding observations

The recent past has seen growing importance of FinTechs in meeting financing requirements of the under-served market segment of SME borrowers. The rise of FinTechs in SME credit services calls for an in-depth investigation of the key enablers that influence FinTechs. The study employs a muti-stakeholder and multi-criteria decision-making approach of Grey DEMATEL as it helps to achieve good results in the presence of scantily available public information. The results show that credit demand by SME borrowers, availability of alternate data sources, and Covid-19 are the critical enablers that exercise a strong impact on FinTech system. Collaboration with traditional FIs, end-to-end financial solutions, and scalability of business operations are recognized as critical dependents that are hugely affected by others.

The study proposes the following policy recommendations based on the key findings of the study.

1. Promote collaboration between FinTechs and traditional financial institutions (FIs):

The results identify collaboration between traditional FIs and FinTechs (E15) as the most "prominent enabler" in the FinTech system. Through collaboration, FinTechs can access customer base and financial resources of traditional FIs, while FIs can benefit from the innovative financial products and services offered by FinTechs. Hence, the study recommends that the policymakers promote collaborative environment to unlock synergies to tap underserved markets of SME borrowers. According to Table 9, Covid-19 and conducive regulatory framework has promoted the collaborative environment in FinTech sector. The collaboration can be further strengthened by improving Internet and smartphone penetration, offering alternate data sources, providing more investment capital, and by enabling FinTech firms to scale up their operations.

2. Strengthen digital data landscape

Availability and accessibility to alternate data sources (E4) has emerged as a critical success factor for the growth of FinTechs specializing in SME lending services. Availability of diverse and good quality data enables better risk assessment, facilitating customized solutions for customers. Hence, policymakers are recommended to create an enabling digital landscape that allows FinTechs to access alternate and consent-based digital data of the SME borrowers. Such accessibility will improve their underwriting models and help them develop innovative and affordable financial solutions.

3. Improve awareness of digital financial solutions

EY (2021) reports poor awareness of digital financial solutions as a key hindrance to FinTech sector's growth. The Euclidean distance results show that practitioners consider awareness of FinTech solutions (E2) as a critical enabler, while policymakers consider it as an independent enabler that has negligible impact on the FinTech system. The result encourages regulators to promote financial literacy and awareness of digital solutions to strengthen the FinTech sector.

The study proposes the following managerial recommendations based on the key findings of the study:

1. Offer end-to-end financial solutions to SME borrowers

The study identifies end-to-end solutions to SME borrowers (E11) as the second important "prominent enabler" of the FinTech ecosystem. In the post Covid-19 era, SME borrowers expect to receive end-to-end credit solutions wherein they receive credit services and financial advice to succeed in their venture, generate good returns for the FinTechs, and create a long-term win-win relationship.

2. Emphasis on data security

Policymakers and investors have diverging opinions on data security (E13). While policymakers recognize data security as critical dependent that is heavily influenced by other factors, the investors consider it as mild enabler with negligible influence on FinTech landscape. It is advised for FinTech investors to align their expectations with the regulator's perspectives. Investors must ensure that their FinTechs maintain data security and utilize digital data to empower the small borrowers.

The study has a few limitations which can act as future research opportunities. The study focuses only on strategic factors. These factors can be decomposed, and a granular analysis can be performed to deal with tactical and operational issues. Future studies can be performed in developed economies, and a comparison can be drawn to further understand the FinTech system. Future studies can also include other stakeholders like technology developers, bankers, and customers to further enhance the findings of the study.

Appendix

Appendix 1 Validation of identified enablers by experts

Discussions were held with experts from industry and academia to validate the identified enablers. The brief profile of the experts is presented below:

Expert	Profile	Years of experience*
Industry expert 1	Consultant and trainer in small and medium enterprises and entrepreneurship	7
Industry expert 2	Founder and CEO of FinTech that offer credit services specializing in business and consumer loans	5
Industry expert 3	Project director of digital finance	9
Academic expert 4	Professor in management institute who researches and specializes in FinTechs	3
Academic expert 5	Professor in management institute who researches and specializes in FinTechs	11

*The table highlights the work experience of the experts in SME financing and/or FinTech domain. The overall work experience of the expert 1 and expert 2 is higher than as mentioned

The experts gave feedback on the relevance of the identified enablers. On their recommendation, the enabler "Economic factors like low interest rates" was removed as they suggested that FinTechs typically charge higher interest rates than banks as they offer speed, flexibility, and convenience to the SME borrowers. The experts also gave inputs if any important enabler was missing. For instance, the enablers "scalability of business operations" (E9), "effective collection management" (E10), and "end-to-end solutions to SME borrowers" (E11) were recommended by the experts and was later included in the list of enablers

Appendix 2 Questionnaires sent to the respondents

	E1 Credit demand by SME borrowers	E2 Awareness of FinTech solutions among SME borrowers	E3 Strong internet & smartphone penetration	E4 Availability and accessibility to alternate data sources	E5 Reliable physical infrastructure like electricity, broadband	E6 Availability of skilled human capital	E7: Availability of investment and growth capital	E8: Rigorous underwriting model	E9: Scalability of business operations and technology	E10 Effective collection management	E11 End-to-End Solutions to SME borrowers	E12 Convenience & Process Transparency	E13 Data Security	E14 Conducive regulatory environment	E15 Collaboration between FIs, fintechs
	Ena-bler →El → Ena-bler E1	E1 → Ena-bler →Ena-bler E2	E2 → Ena-bler →Ena-bler E3	E3 → Ena-bler →Ena-bler E4	E4 → Ena-bler →Ena-bler E5	E5 → Ena-bler →Ena-bler E6	E6 → Ena-bler →Ena-bler E7	E7 → Ena-bler →Ena-bler E8	E8 → Ena-bler →Ena-bler E9	E9 → Ena-bler →Ena-bler E10	E10 → Ena-bler →Ena-bler E11	E11 →Ena-bler →Ena-bler E12	E12 → Ena-bler →Ena-bler E13	E13 →Ena-bler →Ena-bler E14	E14 → Ena-bler →Ena-bler E14 →Ena-bler bler

E1: Credit demand by SME borrowers

E2: Awareness of FinTech solutions among SME borrowers

E3: Strong internet & smartphone penetration

E4: Availability and accessibility to alternate data sources

E5: Reliable physical infrastructure like electricity, broadband

E6: Availability of skilled human capital

E7: Availability of investment and growth capital

E8: Rigorous underwriting model

E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15
Credit demand by SME borrowers	Awareness of FinTech solutions among SME borrowers	Strong internet & smartphone penetration	Availability and accessibility to alternate data sources	Reliable physical infrastructure like electricity, broadband	Availability of skilled human capital	Availability of investment and growth capital	Rigorous underwriting model	Scalability of business operations and technology	Effective collection management	End-to-End Solutions to SME borrowers	Convenience & Process Transparency	Data Security	Conducive regulatory environment	Collaboration between FIs, fintechs
Ena-bler →E1	E1 → Ena-bler E2	E2 → Ena-bler E3	E3 → Ena-bler E4	E4 → Ena-bler E5	E5 → Ena-bler E6	E6 → Ena-bler E7	E7 → Ena-bler E8	E8 → Ena-bler E9	E9 → Ena-bler E10	E10 →Ena-bler E11	E11 →Ena-bler E12	E12 → Ena-bler E13	E13 →Ena-bler E14	E14 → Ena-bler E15

E9: Scalability of business operations and technology

E10: Effective Collection Management

E11: End-to-End Solutions to SME borrowers

E12: Convenience & Process Transparency

E13: Data Security

E14: Conducive regulatory environment

E15: Collaboration between FIs, fintechs

E16: Covid-19 as a catalyst for digital ecosystem

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