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ABSTRACT

Achieving financial inclusion in shorter timeframes is a grand societal challenge that can be addressed by digital technology. Nonetheless, how an innovative digital technology gets generalized is understudied in the literature. We present the generalization of a cloud-based core banking system to drive financial inclusion in the Philippines. We draw our material from the case of cloud-based core banking system adoption in the Philippines. Our results show that market formation is essential to the generalization, and this can be accomplished through a mix of laissez-faire and dirigisme mechanisms. Pure laissez-faire mechanisms alone, with minimal intervention from the central bank, may drive the generalization of digital innovations. Nonetheless, for the generalization of cloud digital technology to happen *at an accelerated pace*, the central bank must intervene more proactively, especially in establishing an industry-wide digital financial ecosystem. Furthermore, for the generalization of cloud digital technology to truly contribute to the societal mission of financial inclusion, the central bank ought to take the lead as a meta-governor directing the various elements of the digital finance ecosystem. Our study provides a nuanced understanding of the interplay between laissez-faire and dirigisme in the genesis of markets for digital innovations in pursuit of financial inclusion.

1. Introduction

1.1. The grand societal challenge of financial inclusion

Financial inclusion (FI) is defined as a state in which everyone (but especially the vulnerable) has *effective access* to a wide range of financial services – whether for saving, payments, investing, or insurance.[1] The term *effective access* refers not only to the availability of services but also to their usage, uptake, and quality. While financial inclusion goes beyond mere ownership of a transaction account, owning an account is considered a core indicator of financial inclusion as it facilitates basic financial transactions.

In the Philippines, the objective set by the central bank is to expand the financially included to 70% of Filipino adults by 2023 (from a baseline of 29% in 2019). Given the magnitude of the goal (70% from 29%) and the speed that this should be accomplished (the timeframe is only four years), it is critical to use innovative approaches that will enable financial institutions to expand their geographic reach and broaden their customer base, especially from among the most vulnerable.

1.2. Scaling financial inclusion through a cloud-based core banking system (CBS)

Financial exclusion is a multi-faceted problem. There are several reasons why 71% of the Filipino adult population (or 51.2 million) remain unbanked. In the 2019 Financial Inclusion Survey, the following reasons are identified based on the responses by the

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[1] See the National Strategy for Financial Inclusion 2022–2028. https://www.bsp.gov.ph/Pages/InclusiveFinance/NSFI-2022-2028.pdf.

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unbanked. Lack of enough money is the top reason for not opening any account (as reported by 45% of the unbanked), followed by the perceived lack of need for an account (27%) and the lack of documentary requirements (26%). In rural areas, where many of the unbanked are, the difficulty in physically accessing bank services and brick-and-mortar branches compounds the problem of financial exclusion even more.

Banks have difficulty broadening their outreach to the unbanked partly due to their legacy core banking system (CBS). Core banking is defined as "the mission-critical systems that facilitate virtually every transaction for a bank" [1]. It encompasses core financial services like payments, loans, mortgages, and accounts. These services have been traditionally supported by on-premise servers and closed legacy systems. With in-house legacy infrastructures, banks are severely limited in their capacity to provide services to those excluded.

To expand financial inclusion in rural localities, one of the reform areas is the enhancement of the capacities of financial service providers through digital transformation. A key technology that can drive the expansion of geographic access coverage by banks is the cloud. With cloud-enabled core banking, rural banks can easily open new access points to reach individuals who did not have access to financial services before. Simply put, with the cloud, financial institutions may be able to scale financial inclusion quickly and affordably.

1.3. Market creation and the generalization of innovations

We define *generalization* as the processes that upscale, normalize and embed the outcomes of innovation. These routes are diverse and are typically combinations of market and non-market dynamics. As a starting point, we take the perspective that the generalization of transformative innovations includes market routes. Markets are "concrete exchange structures between producers and consumers" [2]; p. 529). For a market to be created, producers and consumers must come to a certain shared understanding of what is being exchanged and why.

Scaling financial inclusion can be facilitated with the broader use of a cloud-based CBS. Nonetheless, promoting the adoption of the technology to as many banks as possible is not without any difficulty. We contend that the generalization of innovation depends to a large extent on the existence of the market demand for it. This is the demand side in the success of generalization.

The creation of new markets is an important engine for the generalization of innovations. As early as 2007, Hekkert et al. [3] recognized "market formation" for new technologies as a critical activity or function of innovation systems. In the space of financial inclusion, market creation and marketization are acknowledged as critical (e.g., Ref. [4]). But new markets do not emerge naturally; rather, they often arise from the collective mobilization of the necessary economic, cultural, and socio-political resources [2]. To be sure, numerous studies have examined how demand is induced or how markets are created for new technologies (e.g., Ref. [5]). Nonetheless, much attention is given to laissez-faire mechanisms and less to interventions by the State in market genesis (more below). Only limited studies illuminate the meta-governance role of regulatory bodies and State instruments in market creation to achieve grand mission-oriented societal objectives. In this study, we ask: *In the context of the generalization of digital innovations to scale financial inclusion, how does the central bank as a regulator and meta-governor enable the emergence of new markets?*

1.4. The case study

We draw our material from the case of the cloud-based core banking system adoption of banks in the Philippines. It is considered a promising digital transformation strategy that banks may pursue to accelerate financial inclusion. In the Philippines, financial inclusion has been an imperative sought since the early 2000s by the central bank of the Philippines, known locally as the *Bangko Sentral ng Pilipinas* (BSP).

In June 2017, the Asian Development Bank (ADB) and Cantilan Bank piloted the migration of the latter's core banking system to a cloud-based software-as-a-service developed by Oradian, Inc. With support from the BSP, the pilot was placed in a regulatory sandbox environment. A regulatory sandbox is a "controlled, time-bound, live testing environment" which enjoys certain regulatory waivers from the BSP. In 2019, after the two-year pilot study, Cantilan Bank became the first financial institution in the Philippines regulated by the BSP to adopt the cloud technology. As a result of the successful pilot, the BSP updated its regulations, allowing in 2021 at least 40 banks to move from on-site legacy systems to the cloud. In 2022, the BSP further expanded the possibility of cloud adoption and authorized six financial institutions (GOTyme, Maya Bank, Overseas Filipino Bank, Tonik, UnionDigital Bank, and UNOBank) to operate as digital banks. Digital banks are a new category of banks in that they are entirely online without any physical branches; they are to be distinguished from traditional banks that simply migrate some of their operations to the cloud.

Table 1 shows some of the key actors involved in the promotion of cloud-based CBS adoption by the banks. Two stages are distinguished: the pilot and the proliferation stages. The pilot stage is the period from 2017 until 2018 when Cantilan became the pioneering bank to have moved its CBS to the cloud. The proliferation stage is the period of expansion when more banks adopt the cloud technology, with the support of solution providers (such as Nucleus, Oradian, Nextbank, and Brankas) and international development agencies, including the Agence Française de Développement (AFD).

The digital transformation of banks is an arduous process, consisting mainly of three phases: upgrading of the core banking system (Phase 1), rollout of mobile banking (Phase 2), and linkages with partners (Phase 3) (see Fig. 1 for the roadmap). Phase 1 means a transition of the core-banking system from an on-site legacy system to the cloud. Phase 2 refers to the acquisition of mobile banking solutions, which enable customers or clients to manage their accounts or perform financial transactions (e.g., transfer, loan, etc.) on their phone or desktop computer. Phase 3 is all about the expansion of services (e.g., e-wallets, remittances, bills payment) through partnerships, based on Application Programming Interface (API), with other financial institutions and Fintech providers (e-Wallet providers, bills payments aggregators, and remittance operators).

Of course, it is not necessary to pursue these phases in sequence. A bank can acquire mobile banking without upgrading its core banking system. In the digital transformation roadmap, the transition to a cloud-based core banking system is an essential step, and this is the focus of the case study.

With the full migration to the cloud, banks may achieve increased operational efficiencies, improved customer convenience, and greater financial inclusion (Fig. 2).

The pursuit of the digital transformation of banks, especially rural financial institutions and other last-mile providers, is just one of the many initiatives to promote financial inclusion. So many other initiatives mutually reinforce each other, such as financial education, consumer protection, risk protection, and social safety nets. In all these, the central bank assumes a critical role.

1.5. Significance of the study

This study is positioned broadly within the literature on market

Table 1
Actors in the stages of cloud adoption. For the complete list of acronyms, refer to the Appendix.

	Pilot stage (2017–2018)	Proliferation stage (2019–2022)
Cloud adopter bank	Cantilan Bank	>40 traditional banks going on cloud migration Digital banks (GOTyme, Maya Bank, Overseas Filipino Bank, Tonik, UnionDigital Bank, UNOBank)
Solutions provider	Oradian	Nucleus, Oradian, Nextbank, Brankas
Government regulator	BSP	BSP
International development agency	ADB	ADB, AFD

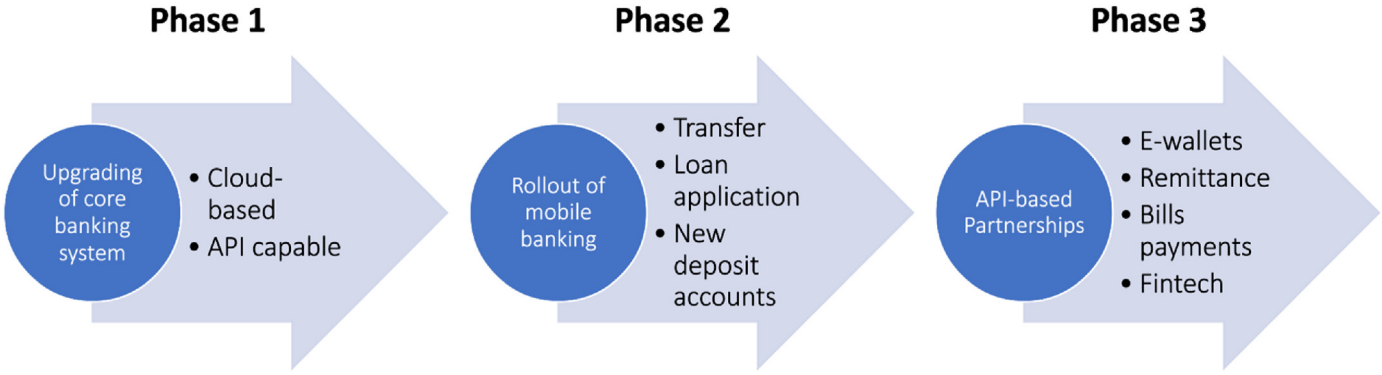

Fig. 1. Phases of digital transformation of banks (Adapted from Cruz, 2021[21]).

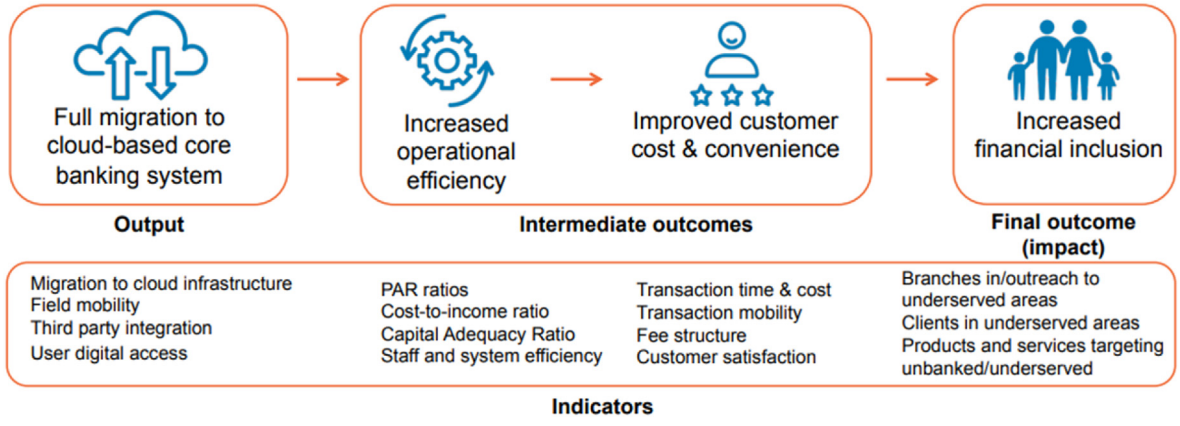

Fig. 2. Expected outcomes and impact of a full migration to the cloud-based core banking system (Figure taken from [6]).

formation for the upscaling or diffusion of innovation for transformative change. How technological innovations get scaled up or diffused through market mechanisms is a subject of much interest among scholars. Boon et al. [7] stated that the key question is "how these innovations, already existing in niche markets, can become diffused and embedded in broader markets."

The innovation and transition literature have published numerous studies on this topic, with some journals even dedicating special issues. For example, Boon et al. [8] edited a special issue on "Markets in sustainability transitions" in the journal *Environmental Innovation and Societal Transitions*. Another journal, *Technological Forecasting and Social Change*, has likewise featured recent studies on market formation, upscaling and technological innovation (e.g., Refs. [9–11]). Interestingly, the theme of market formation is not yet prominent in the journal *Global Transitions*, as shown by the fact that only very few articles (e.g. Ref. [12]), have been retrieved via search using keywords such as *market*, *diffusion*, and *innovation*. The current case study from the Philippines seeks to contribute to important scholarly conversations around this topic.

Innovation studies have always considered markets as essential and critical to the adoption, uptake, and spread of novel technologies. Nonetheless, the conceptualization of how markets emerge has been dominated by a diffusion perspective, which several scholars have criticized as inadequate [7,8], especially when looking at the nascent field of ecosystem emergence around digital technologies (e.g., Refs. [9,11]). The present study aims to contribute to the conceptualization of market emergence through laissez-faire and dirigisme mechanisms (more below).

2. Literature review

2.1. Entrepreneurial action and state intervention for market creation toward generalization

How new markets emerge and come to be has been the subject of investigation in the literature, especially marketing, economics, and entrepreneurship (e.g., Ref. [13]). There are two sides to new market creation: the supply-side and the demand-side [14,15].

Supply-side refers to the launch or roll-out of new products and services, while the demand-side refers to the inchoate or articulated customer needs. Both sides must be discovered, stimulated, or created for market genesis.

2.1.1. Entrepreneurial action: laissez-faire

In general, new markets emerge as a result of the action by the entrepreneur or firm through exploration and exploitation. Entrepreneurs bring to the market various products and services that may appeal to consumers whose preferences tend to be inchoate; later, as the market evolves and as customer demand is articulated, some of these goods/services are selected. This can take the form of a rational/heuristic search and selection. Demand exists *out there*, which an entrepreneur needs to discover or recognize through extensive search and selection processes, then afterward exploit. This is the view of entrepreneurs as discoverers of existing opportunities that they then exploit [16]. An alternative view is that entrepreneurs *create*, rather than *discover*, opportunities. In rare cases, they even transform existing realities to generate new markets: entrepreneurs, for example, forge a new network of stakeholders to generate demand for new products/services through effectual logic [13]. *In either perspective, the implication is that the entrepreneur is the central actor of market genesis, and State regulators must take a minimal interventionist role in entrepreneurial exploitation and the subsequent flourishing of new markets*. In doing so, the State simply facilitates the emergence of markets by removing barriers, constraints, and restrictions. We call this the *laissez-faire* process of market creation.

2.1.2. Active state intervention: dirigisme

In contrast to the laissez-faire route to market creation, which privileges a central role to entrepreneurial action unhindered by obstructionist state regulations, *dirigisme* affords a stronger and more prominent role to the apparatuses of the State in market creation, especially when pursued within the political and social objectives of the State (e.g., Ref. [17]). State intervention is necessary because of the excesses and failures of pure entrepreneurial or private firm action to market creation that do not meet societal goals (e.g., global financial crises) [18].

State involvement is typically associated with hands-on control (e.g., in Communist countries). In recent years, however, an alternative perspective to state intervention has emerged in recognition of the role of the State as a meta-governor in market economies, coordinating and directing multiple/diverse actors and networks to accelerate radical transitions at shorter periods [19,20]. This arises in the pursuit of a broad societal goal or mission (e.g., Ref. [5]). The rapid uptake of innovations for sustainable and transformative transition requires massive steering, coordination, and alignment, which the State is in the best position to accomplish (e.g., Ref. [21]).

2.2. Emergence of markets for innovations in regulated sectors

We now turn to how new markets for breakthrough innovations emerge in *highly regulated* sectors (e.g., mobility, energy, and finance). A regulated sector is one over which government agencies exert oversight, supervision, and control. Hence, markets in regulated sectors are unique avenues to observe the interplay of laissez-faire and dirigisme stance by the State.

Consider, for instance, the case of breakthrough innovation in the mobility sector, such as ride-hailing [22]. When Uber was founded in 2009, the years that followed saw a rapid uptake. However, because of a lack of policies regulating new mobility services, public transport authorities implemented a crackdown on them. Here regulation failed to catch up with the latest innovation and technologies. Eventually, regulations were put in place, legitimizing these innovative mobility services. This shows that the market could only emerge once existing regulations are updated to accommodate the innovations, legitimizing them in the process. Here the role of the State (i.e., public transport authority) in the emergence of the market is limited to mere regulatory authorization. It is the private firms that assume a more critical role.

In the energy sector, consider next the case of the market for renewable energy. Set against the societal mission of decarbonization (in the Philippines, the target is 35% RE mix by 2030), we see a more prominent role of State instruments in creating new markets [23]. Here the State does not simply limit itself to regulatory authorization but actively creates an enabling environment (e.g., renewable portfolio standards, green energy auction, feed-in-tariff, net-metering) for the market to emerge more rapidly [24].

Finally, in the finance sector, the regulatory supervision of the government is seen in the proliferation of regulatory sandboxes by central banks to mitigate the risks associated with fintech innovations going wayward (e.g., Refs. [25–27]).

2.3. Social innovations for expanded financial inclusion

Of particular interest in this study is the generalization of innovations that respond to grand societal challenges. In the literature, such innovations are commonly called “social innovation” since they aim to solve or ease social issues by creating dual value, both social and economic. Social innovation can be a new material, a technological artifact, or a social practice that aims at social value creation [28]. Most studies on social innovation are found in the literature on social entrepreneurship [29]. An example of social innovation – a social practice – in the finance sector is microfinance, defined as the “provision of financial services to the financially excluded, usually the poor” [30]. Another example – a technological innovation – is M-Pesa, a mobile phone-based money transfer innovation [31]. Both microfinance and M-Pesa aim to address the grand social challenge of financial exclusion and deep poverty. Partly the reason for the successful diffusion of these social innovations, such as microfinance, is the market of lenders and borrowers that supports it (e.g., Ref. [32]).

In the finance sector, a number of studies on the use and diffusion of digital technologies for financial inclusion have been done (e.g., Ref. [33]). Typically, these studies are on mobile money or digital payment innovations (e.g., Ref. [34]). For example, the diffusion of technological innovations, such as mobile money innovations for financial inclusion, has been studied by Lashitew et al. [35]. They found the “key role of the lead firm in guiding the innovation process, and the importance of a supportive regulatory environment that sought to advance financial inclusion.” Kingiri and Fu [34] also studied the diffusion and adoption of M-Pesa money mobile transfer service in Kenya using the technological innovation system framework. Generally, what we find in this sector is the critical role played by private firms (e.g., Fintech firms) in the growth and mass adoption of these digital innovations, with the State merely ensuring a conducive regulatory environment. It seems that it is the private firms, with the regulatory support of the State, that primarily drive financial inclusion. Recent studies in the literature on financial inclusion, ecosystem emergence, and digital financial services do not foreground much the meta-governance role of the State (e.g., Refs. [9,36]).

So far, the focus of the analysis in the existing studies has been the critical role of the private firms enabled by a supportive regulation on the generalization of social innovation (laissez-faire).

[2] See Digital Transformation Program for Rural Banks. https://rbap.org/wp-content/uploads/2021/06/2.-Digital-Transformation-for-Rural-Banks-v1.0.pdf.

Table 2
Profile of organizations and respondents interviewed.

Organization interviewed	Key Role	Respondent position	Phase 1: Helicopter interview (January –March 2022)	Phase 2: Detailed interviews (April –May 2022)	Phase 3: Validation interview (June 2022)
Cantilan Bank (CANBNK)	The first rural bank that successfully piloted the cloud transition	Vice President (n = 1)	One virtual interview	One virtual interview	By email only
Rural Bank of Luzon (RBL)	A rural bank that moved its core banking system to the cloud	Vice President and Technical Lead (n = 2)	Two virtual interviews	One virtual interview; Follow-through email interviews	One virtual interview
Maya Bank (MB)	One of the first six banks granted a digital banking license	Technical Lead (n = 1)	None	One in-person interview	One virtual interview
Bangko Sentral ng Pilipinas (BSP)	The central bank which exercises oversight and regulation over banks in the Philippines	A member of the team from the Technology Risk and Innovation Supervision Department (TRISD) (n = 1)	One virtual interview Multiple written interviews (over Facebook messenger/ email)	Multiple virtual interviews	Two virtual interviews
		Members of the team from the Financial Inclusion (FI) unit (n = 5)	None	One virtual interview	One virtual interview
Oradian Inc. (OI)	The provider of the cloud-based core banking system of Cantilan Bank	Chief Executive Officer (n = 1)	One virtual interview	By email only	None
Brankas Open Banking Company (BOBC)	A company that provides open banking solutions to financial institutions in Southeast Asia	Manager (n = 1)	One virtual interview	By email only	None
Asian Development Bank (ADB)	An international development finance institution that provided a grant to Cantilan Bank to pursue the cloud transition pilot	Specialist (n = 1)	One virtual interview	By email only	None

What is missing in the extant literature is an understanding of the role of the State. Is the role of the State merely regulatory? Can we achieve financial inclusion at an accelerated pace if the State simply regulates? Or should the State take a more proactive role – including leading as a meta-governor? We aim to show that to achieve the generalization of social innovations in the era of grand challenges, the State must, beyond regulation, assume a more proactive role as a frontrunner and meta-governor, building an entire inclusive financial digital ecosystem.

3. Materials and methods

To understand the critical role the central bank plays in the formation of a market for the generalization of digital innovation in pursuit of financial inclusion, we collected interview data from several respondents, which were complemented by documentary/ textual data. In Section 1, we presented the key stakeholder organizations (see Table 1). In choosing the organizations to interview, we relied on a combination of purposive and convenience sampling. Purposive sampling was used to ensure that all types of organizations involved in cloud-based core banking system adoption are included (i.e., cloud adopter bank, solutions provider, government regulator, and international development agency). Convenience sampling was then used to select a particular organization from each type. Table 2 presents the list of organizations interviewed across three study phases (more about the three phases below).[3]

Broadly, we followed the method of theory-building from cases as laid out by Eisdenhardt [37] and Eisdenhardt and Graebner [38], which consists of the following steps: definition of the research question, data collection and analysis, hypotheses development, comparison with extant literature, and closure.

In what follows, we describe the steps we have taken in refining our general research question (phase 1; Section 3.1); development of data collection instrument/protocol, data analysis and hypotheses development (phase 2; Section 3.2). In the second phase, we present our hypotheses as a set of propositions of an emerging theory (see, for example, [39]. Finally, while some studies propose testing the propositions through deductive research (e.g. Refs. [38,39]), our study performs the validation by presenting the results to some stakeholders (phase 3; Section 3.3).

3.1. First phase

Our data collection and analysis in the first phase were guided by our stated research question: *How does the central bank enable the emergence of a new market for cloud-based core banking systems through regulation and governance in pursuit of the mission of financial inclusion?* We started with desk research and helicopter interviews from December 2021 to March 2022. The aim of the first phase was to construct a broad outline of the narrative and ultimately to formulate research questions that further refine and specify our general question.

We gathered publicly available digital media about the digital transformation of banks in the Philippines and the role played by the BSP in building the digital finance ecosystem and expanding financial inclusion. Our desk research was complemented by helicopter interviews with individuals from key organizations who had a broad overview of the events and storylines related to the transition of banks to a cloud-based core banking system. Our interview respondents came from two rural banks (Cantilan Bank and the Rural Bank of Luzon[4]), BSP, Oradian, Brankas, and Asian

[3] Some of the respondents had limited availability for the interviews during the entire duration of the study. As a result, we, the researchers, only had to rely on their responses by email when we reached out to them during the second phase of the study.

[4] Pseudonym; not real name of the bank.

Development Bank (see Table 2).

At the end of the first phase, we were able to formulate more specific research questions to guide the data collection and analysis in the subsequent phases. From the general question stated earlier, we developed three specific questions:

- RQ1: How does the BSP enable the adoption of digital innovation by the banks? What regulatory authorizations are granted by the central bank?
- RQ2: How does the BSP govern and coordinate various actors to create an entire ecosystem of digital finance to support the adoption of the cloud-based core banking system?
- RQ3: How does the BSP ensure that the innovation and the market impact and expand financial inclusion?

3.2. Second phase

After constructing the general outline of the narrative and refining the general research question, we conducted another phase of more intensive document collection and semi-structured interviews with key actors.

For RQ1, we zoomed into three banks – two rural banks which transitioned their core banking systems to the cloud (CANBNK and RBL) and a digital bank (Maya Bank, or MB). These three banks were selected since they represented three different cases of regulatory authorizations by the BSP. Semi-structured interviews with the Vice-President and Technical Lead of these three banks were conducted over several sessions from April to May 2022. Additional interviews with Oradian, Brankas, and ADB were also conducted, albeit only by email. Apart from these interviews, we collected documents and articles publicly available on the web to enrich the narrative.

For RQ2, we examined in depth the initiatives of the BSP related to the promotion of digital finance. We first conducted virtual interviews with a representative from BSP's Technology Risk and Innovation Supervision Department (TRISD) to gather insider information about these initiatives and gain a deeper understanding of the contexts. We then gathered and read various BSP circulars on IT Outsourcing and Risk Management, Open Finance Framework, and Digital Payments Transformation Roadmap. Additional documents, such as media reports, were also collected to complement these textual sources.

For RQ3, we looked more closely into the initiatives of the BSP on financial inclusion. We first conducted desk research on the 2015 National Strategy for Financial Inclusion (NSFI) and its updated version, namely the 2022–2028 NSFI, both issued by the BSP. We also conducted semi-structured interviews with representatives from BSP's Financial Inclusion Unit.

We then performed an inductive thematic analysis of all the data collected. The objective of the analysis was the formulation of three propositions that answered the three specific research questions (RQ1, RQ2, and RQ3). The whole process was iterative: emerging findings, themes, and propositions were always checked back and forth with the literature/theories and the data collected.

3.3. Third phase

The final phase involved the presentation of these three propositions for verification by our stakeholders. The validation step, conducted in June 2022, was essential to ensure that the interpretation by the researchers made sense to the stakeholders. In the results and summary/conclusion sections, we present our results of the three mechanisms by which the central bank combines laissez-faire and dirigisme to enable market formation and the generalization of digital innovation in pursuit of financial inclusion.

4. Results

4.1. Laissez-faire: market creation through entrepreneurial action enabled by regulatory authorization

In this section, we describe how BSP's regulatory authorization, defined as a type of legitimation by reference to an authority (e.g. Ref. [40]), makes possible the emergence of markets for digital innovations mainly through pure market or economic forces after the central bank vests the action of banks with legitimacy. This perspective asserts that intervention from the central bank should be minimal, e.g., approvals and licensing. We consider the case of cloud adoption by the three banks.

4.1.1. Approvals to transition to the cloud

Fig. 3 shows the timeline of significant events in the journey of CANBNK toward digital transformation, beginning with the adoption of a cloud-based core banking system in 2019.

Although a generic cloud-based core banking system has been around, it was not used by banks in the Philippines before 2019. In the circular issued by BSP on IT risk management in2013,[5] the regulation is explicit about the use of public cloud (e.g., Amazon Web Service) solely for non-core banking operations and business processes (e.g., email accounts). However, for core operations (e.g., loans), the existing regulations of the BSP did not allow using a public cloud.

As early as 2015, when CANBNK crafted its IT modernization plan, they were certain they could not survive or grow if they relied on on-premise legacy systems for their core banking. Moreover, if CANBNK wanted to reach more effectively to the unbanked, the current setup could not support this. There seemed to be only one appropriate solution: the cloud.

In 2017, with a $150,000 technical assistance grant from the ADB and conditional approval from BSP, CANBNK and Oradian (a Croatian cloud-based core banking service provider) began the pilot migration to cloud-based core banking. Since existing regulations prohibit the use of a public cloud, the BSP placed the pilot on a test-and-learn "regulatory sandbox." This approach was necessary since the BSP itself also had to test and learn how to navigate this new territory. The pilot took two years to complete.

In January 2019, the legacy system was discontinued, and CANBNK became the first Filipino bank to have received the final BSP approval to deploy its core banking system entirely to the cloud. In 2021, CANBNK launched its mobile banking app. Moreover, it also rolled out its omnichannel hub, a cloud-based API layer, which could enable third-party connectivity.

The regulatory authorization of CANBNK benefitted the banking sector as a whole and paved the way for the cloud migration of other banks. According to the report by ADB [6], "By early 2020, more than 25 other BSP-regulated financial institutions, mostly rural banks, had received no objection from the BSP and switched to cloud-based core banking solutions. By mid-2021, this had increased to 46." One of these banks that subsequently migrated to the cloud for its core banking is the Rural Bank of Luzon (RBL).

The digital transformation of the RBL began in 2019 when, after evaluating the offerings of several vendors, it decided to procure the services of a provider based abroad. One of the first steps involved securing the approval of BSP, and to do so, the rural bank had to send various documents to the regulatory body. In mid-

[5] Circular No. 808. Guidelines on Information Technology Risk Management for all Banks and Other BSP Supervised Institutions.

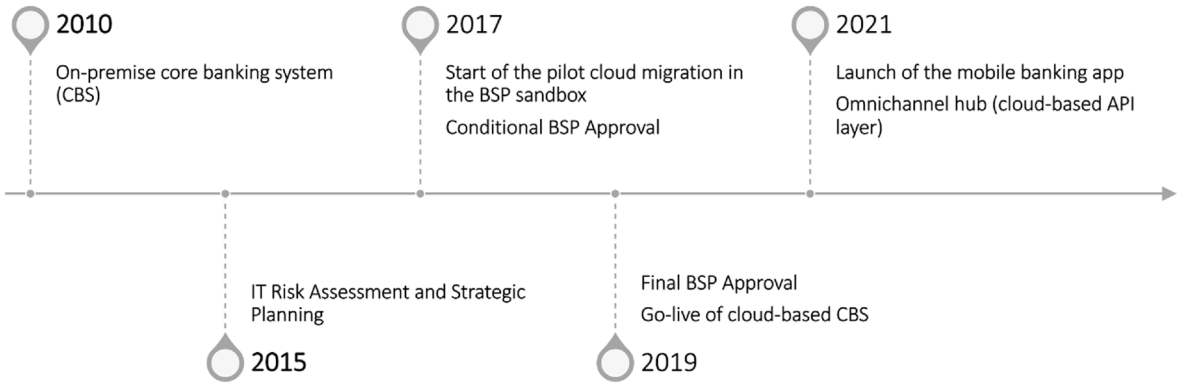

Fig. 3. Timeline of CANBNK's digital transformation.

2020, RBL received a conditional approval from BSP. Thereafter, various documents were submitted to comply with the deficiencies. A month later, the contract with the vendor was signed. In early 2021, the final approval to implement the cloud-based core banking system was granted by BSP. The transition was done in stages (i.e., user acceptance testing, regression testing, training, and validation). Parallel testing was performed for all branches for two days. In Q4 2021, the core banking system finally went live on the cloud.

Unlike CANBNK, RBL was no longer placed in a regulatory sandbox, since BSP, through the pilot with CANBNK, already knew how to assess the risks involved in cloud migration. Prior to granting its approval, BSP simply had to perform an audit (through a checklist).

After the transition to the cloud, some enhancements were pursued by RBL, such as third-party integration. The integration was done via the APIs exposed by the vendor. Third-party providers (less than 5) were onboarded or integrated via APIs by the vendor. One such partner is a fintech company that helps rural banks implement mobile payments and e-commerce. In fact, in collaboration with this fintech, RBL launched in 2022 its mobile banking application to reach out to more customers.

4.1.2. Digital bank licensing

The preceding describes the transition of the core banking system of banks with physical branches from on-premise legacy systems to the cloud. Digital banks are essentially different in the sense that they begin as digital/cloud natives (hence, no transition is needed), and that they have no physical branches.

In 2020, the BSP issued the Guidelines on the Establishment of Digital Banks,[6] which paved the way for the recognition and definition of a digital bank as a banking category of its own. A digital bank is defined as a bank that offers financial products and services that are processed end-to-end through a digital platform and/or electronic channels with no physical branch or branch-lite unit offering financial products and services. To date, the digital bank license has been awarded to six entities before the BSP issued a moratorium on new digital bank licenses. One of these is Maya Bank (MB).

From the foregoing, we put forward the following proposition:

Proposition 1. *The generalization of cloud-based core banking system, a digital innovation, is primarily driven by private banks, with the central bank merely removing regulatory roadblocks through cloud migration approvals and licensing.*

4.2. Dirigisme: market creation through building a digital finance ecosystem

Financial inclusion implies offering a wide range of financial products and services (e.g., savings, credit, payments, insurance, remittances, investments) for different market segments, particularly those traditionally unserved and underserved. The effective delivery of these products/services, especially to the previously unbanked, requires *the establishment of a digital finance ecosystem* (e.g., Refs. [9,36]). Fig. 4 shows an example of how the ecosystem may look like for rural banks.

In such an ecosystem, the technical deployment of API endpoints for third-party connectivity and the implementation of an API-based digital platform (e.g., API marketplace) are crucial. In the financial sector, APIs are potentially the means by which financial institutions may collaborate with upstart companies (e.g. fintech companies) and other financial institutions to offer innovative products (Kleinbaum, 2019). An API marketplace allows providers to publish APIs and developers to discover and consume useful APIs for the development of innovative products or services. APIs are a set of specifications for applications to communicate with each other.

As previously pointed out, *a bank can more effectively participate in this ecosystem with a cloud-based core banking system. Hence, such an ecosystem creates, to some extent, a market or demand for cloud-based solutions.*

Building an ecosystem like this has been accomplished by large banks, such as Union Bank of the Philippines, with the launch of its API Marketplace.[7] Another example of such an ecosystem at the ASEAN pan-regional level is API Exchange (APIX), a sandbox for banks and fintech companies run by the ASEAN Financial Innovation Network.[8] Many vendors also offer the implementation of API marketplaces or API developer portals as part of their service offerings.

Although API providers can develop local (e.g., Union Bank marketplace) and regional sandboxes (e.g., APIX), with APIs that are *openly* and *publicly* exposed, the technical specifications of these APIs may vary from one sandbox/marketplace to another. What is needed is a digital finance ecosystem whose technical specifications are not only *open* (i.e., publicly published) but also *standardized* (i.e., same design across all APIs) and *adopted* by the majority – if not all – of the stakeholders.

In the Philippines, an open API marketplace with a central API

[6] https://www.bsp.gov.ph/Regulations/Issuances/2020/c1105.pdf.

[7] https://developer.unionbankph.com/.

[8] https://apixplatform.com/.

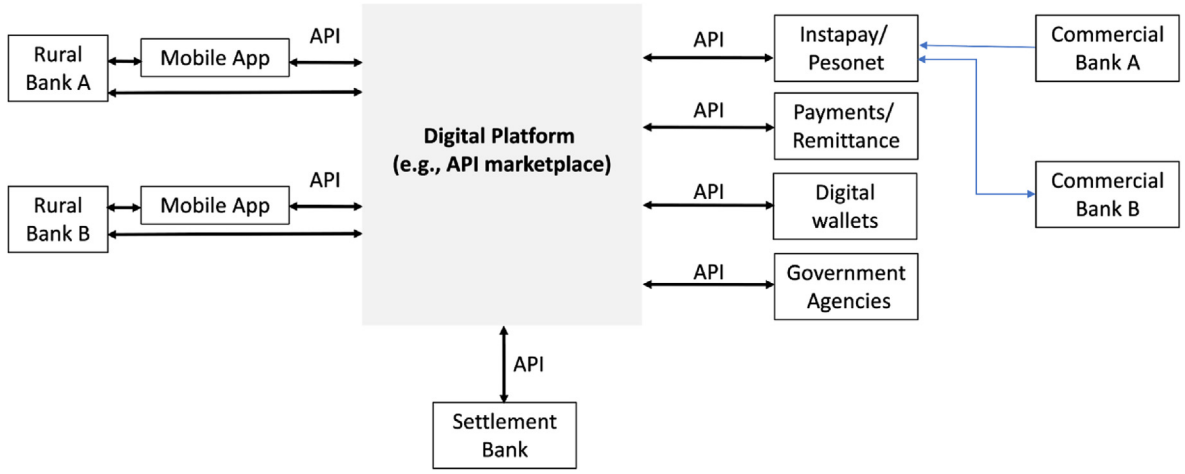

Fig. 4. Open API marketplace digital platform (Adapted from Cruz, 2021).

sandbox, adopting open finance standards and publication of open APIs, is currently being pursued by the whole financial industry, with representations from the banks (universal/commercial, thrift, rural, digital), electronic money issuers, operators of payment systems, and fintech firms. Although the initiative is primarily industry-led, *setting these technical specifications as the standards for the whole financial sector and requiring their wider use or adoption by the financial institutions can only be accomplished with the regulatory powers of a central bank*.

Apart from standardizing API design, Table 3 lists other pain points and challenges in building an open digital financial ecosystem and the possible critical interventions by the central bank. These include the proliferation of marketplaces (which can be addressed with a central API marketplace for the whole industry), the possible disinclination by some banks to participate in the open finance ecosystem (which can be dealt with by mandating banks supervised by the central bank to adopt open finance), and the low volume of transactions made through digital channels (which can be improved by catalyzing the use of electronic payments).

From the foregoing, we put forward the following proposition:

Proposition 2. *The generalization of cloud-based core banking system needs to be supported by a digital finance ecosystem, which can only be established with strong support from the central bank. The central bank can act as a governor and supervisor coordinating, driving, and steering the different components of the ecosystem and setting regulations requiring compliance.*

4.3. Orienting the market towards the mission of financial inclusion

The first two propositions consider how regulatory approvals and the digital financial ecosystem may create a market for the generalization of the cloud-based core banking system. At this point, we discuss how this market may be oriented by the central bank and other state agencies *to expand financial inclusion at an accelerated pace*.

The central bank has recognized the potential of digital innovations to drive down costs, increase operational efficiencies and enhance customer convenience. The challenge is leveraging these to promote inclusive finance and expand financial inclusion. In 2015, the BSP adopted the NSFI, which explicitly states the "use of technology and other innovations to reach the financially excluded." Furthermore, in its updated NSFI 2022–2028, the BSP reiterates: "Digital technologies can facilitate significant cost-efficiencies and innovation that enable the viable delivery of financial services to the low-income mass market and small enterprises." This means that digital innovations can give banks the opportunity to extend financial inclusion on an epic scale.

To track the progress toward financial inclusion, BSP monitors several metrics. One of these is the number of basic deposit accounts gathered through the supply-side survey. A basic deposit account is "a bank deposit product with features designed for the unbanked population (e.g., opening amount of PHP 100 or less, no maintaining balance, no dormancy charges, simplified KYC)". In 2021, there were 7.4 million basic deposit accounts (BDA); the target is to increase this to 20 million by 2028. Although the BSP can somehow monitor the extent to which individual banks contribute to financial inclusion through the number of BDA per bank, *it is beyond the regulatory powers of the central to set individual BDA targets for banks*. "There are no BDA quotas. Since the BSP cannot compel, the most it can do is to use moral suasion" (Respondent, MB).

Another metric that BSP monitors is the percentage of adults with transaction accounts. The goal is to raise it from 29% in 2019 to 70% in 2023 and 90% in 2028. Central to the strategy is the support for the digital transformation of rural financial institutions and other last-mile providers, including micro-finance institutions (MFI). Both rural financial institutions and MFIs are considered important agents that can drive financial inclusion because of their proximity to the unbanked and underserved as the last-mile financial providers.

However, this potential by rural banks and MFIs to expand financial inclusion remains untapped because of their limited capacity to expand their geographical outreach to the unbanked and underserved and to connect with the bigger banks.

One major impediment identified is the lack of efficient technology infrastructure. "Legacy systems by banks hinder their ability to innovate and reach out to more customers" (Respondent, CANBNK). By pursuing digital transformation (i.e., cloud technology), rural banks and MFIs can further expand their geographic reach and diversify their digital product and service offerings through collaborations with Fintech companies and bigger banks.

For instance, as a result of cloud transition, CANBNK was able to reach out to more individuals in rural areas, increasing financial inclusion. "Cantilan Bank can open new branches quickly and affordably to reach individuals who did not have access to financial services before" (Respondent, CANBNK). This was achieved because loan officers could open accounts even in remote areas with just internet connectivity. Between 2017 and 2020, CANBNK grew from

Table 3
Pain points and challenges in building a digital financial ecosystem.

Components of the digital finance ecosystem	Possible pain points (if primarily only laissez-faire)	BSP intervention
Technical specifications of APIs/API design	API specifications may vary from one marketplace to another since there is autonomy within the enterprise which owns the marketplace Need for consensus and industry-wide standards	Setting the standards for the technical specifications of APIs in consultation with the industry
Marketplace	Proliferation of marketplaces all over; no central marketplace	Central API sandbox or marketplace; Industry sandbox
Participating financial institutions	Business interests and prevailing business models may discourage banks from joining the ecosystem Financial institutions may not want to join the ecosystem because they see no value yet in open finance; they may even lose their advantage over other competitor banks if they join open finance (especially if they will be required to share data with other banks)	Mandating the wider adoption of open finance standards and publication of open/public APIs
Digital payment streams	Low demand for digital services/payment since most payments are still made by cash	Catalyze the use of electronic payments across various channels (person to person/business or government) By converting 50% of payments to digital, more may be encouraged to open bank accounts

approximately 95,000 to 130,000 clients, mostly from rural areas. Furthermore, CANBNK expanded its reach internationally through partnerships with universal banks, allowing cross-border and domestic transactions (e.g., a sender based abroad can send remittances to a beneficiary in a rural town in the Philippines).

Nonetheless, rural banks and other small financial institutions struggle to pursue digital transformation due to a lack of financial capacity. “Abandoning legacy systems, migrating to the cloud, and deployment of APIs are too expensive for small financial institutions, especially rural banks” (Respondent, RBL). The BSP is pursuing programs and initiatives to help rural banks in digital transformation through the Rural Bank Strengthening Program (RBSP).[9] Another state agency, a government-owned bank, is lending to rural banks which want to digitize through the Digitalization of Countryside Financial Institutions (DIGI-CFI) Lending Program[10]. The Asian Development Bank and the French agency AFD have also assisted rural banks and micro-finance institutions through the Inclusive Finance Development Program (IFDP).

Another critical intervention being pursued by the central bank, in coordination with other government offices, is the implementation and adoption of the Philippine Identification System (PhilSys) or the national ID. One of the reasons many low-income and marginalized Filipinos cannot open a bank account is the absence of government-issued IDs. With the national ID, more previously unbanked Filipinos are expected to open transaction accounts, particularly basic deposit accounts.

The foregoing suggests that in addressing the challenge of financial inclusion, there is a need to involve and coordinate several State agencies in a *whole-of-government, or even a whole-of-nation, approach*. Ultimately, “the challenge of financial inclusivity is too enormous for any single player to accomplish alone. This is why collaboration, synergy, cooperation, and partnerships will be key towards a sustainable digital economy for the Philippines.”[11] This brings us to our third proposition:

Proposition 3. *Financial inclusion is a national development agenda that needs a whole-of-nation approach, a deliberate and coordinated effort from the government, private sector, and civil society. It requires the implementation of several priority initiatives, among which are the digital transformation of last-mile financial institutions and the wider adoption of national ID. In this whole-of-nation mission, the central bank, as the main regulatory body, is poised to be the meta-governor, the frontrunner, and the driver of change toward financial inclusion.*

4.4. Limitations of the study

In foregrounding the role of market creation through regulation and oversight of the central bank as a route for the generalization of innovation, we do not ignore the roles played by other actors. In fact, we do recognize in this case study the importance of vendors and solution providers, financial institutions, industry associations, and pioneer banks in the generalization of cloud-based core banking system. Furthermore, we acknowledge other mechanisms at work in the generalization. Hekkert et al. [3] enumerate all the functions or activities necessary for the growth or expansion of a technological innovation system, and market formation is just one of these. However, we chose to focus on the mechanism of market creation by regulations and oversight by the regulatory body because we aim for a nuanced understanding of the role of markets and the State in the generalization. We contend that although diffusion through pure market forces alone is certainly inadequate as a route for the scaling of innovation to tackle grand societal challenges such as financial inclusion, the market is still an important route since we cannot neglect the demand side in the success of generalization. The challenge for policy-makers is thus how to create markets through a combination of market and non-market mechanisms to promote the scaling and generalization of innovation that can address grand challenges.

5. Summary and conclusion

It has long been acknowledged in the literature that critical to the generalization of digital innovations is the formation of markets. The mechanisms enabling market genesis have been explored and investigated in the literature. In this study, we study the creation of new markets in regulated sectors in order to provide a nuanced understanding of the interplay between laissez-faire and dirigisme. Fig. 5 summarizes our results.

We have demonstrated that pure laissez-faire mechanisms alone, with minimal intervention from a regulatory body such as the central bank, may indeed drive the generalization of digital innovations. “Even without BSP intervention, banks will still eventually digitalize, i.e., adopt the cloud technology. For me, it is just a matter of time. Migrating to the cloud can greatly improve operational efficiencies, driving down costs” (Respondent, MB). Simply put, there are plenty of business reasons for cloud adoption, and the central bank's role should be limited only to the removal of

[9] https://www.bsp.gov.ph/Regulations/Issuances/2022/M-2022-024.pdf.
[10] https://www.landbank.com/news/landbank-launches-p1-b-facility-for-rural-banks-to-go-digital.
[11] https://apixplatform.com/news/27.

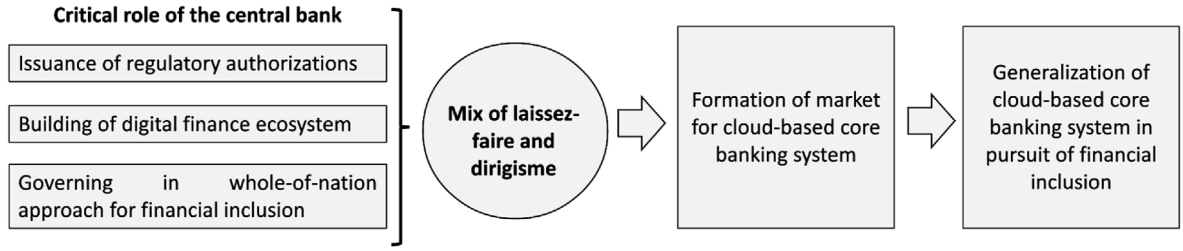

Fig. 5. Emerging theory on the role of the central bank in the formation of market for the generalization of cloud-based core banking system.

barriers and the legitimization of innovation (c.f [41]).

Nonetheless, for the generalization of cloud digital technology to happen *at an accelerated pace*, the State, through the central bank, must intervene more proactively, especially in establishing an industry-wide digital financial ecosystem. Building such an ecosystem at the industry level requires a meta-governor, coordinating the initiatives of various actors and steering them along the same direction. This governor is the central bank, locally known as the BSP. In the Philippines, the BSP has been fulfilling this role by providing guidance, direction, and supervision through the issuance of circulars and roadmaps on IT Outsourcing, Open Finance, Digital Transformation and enforcement of regulations.

Furthermore, for the generalization of cloud digital technology to truly contribute to the societal mission of financial inclusion, the central bank ought to take a more leading role. "What the BSP can contribute is to hasten the digital transformation of the financial sector as a whole, especially the rural banks, and to ensure that such a digital transformation impacts financial inclusion. Without the BSP intervention, I do not think FI will be achieved. We cannot leave the private sector on its own and hope that the financially excluded may be included. Or achieve this goal at a shorter period" (Respondent, BSP).

An obvious implication of our study is that simply letting private banks pursue cloud migrations through regulatory authorizations may drive the financial sector's digitalization but may not be sufficient for generalization to occur at an accelerated pace for financial inclusion. This is consistent with the findings of Kanungo and Gupta [41], which reveal that the digitalization of banks hardly advanced financial inclusion in India. To ensure that digital transformation impacts the societal objective of financial inclusion, a whole-of-nation approach is necessary, which the central bank, as regulator and meta-governor, is in the best position to accomplish.

CRediT authorship contribution statement

Varsolo Sunio: Conceptualization, Investigation, Methodology, Formal analysis, Validation, Writing – original draft, Writing – review & editing, Supervision, Project administration. **Jaime Mendejar:** Conceptualization, Investigation, Validation, Funding acquisition, Writing - original draft. **Justin Reginald Nery:** Conceptualization, Investigation, Validation, Funding acquisition, Writing - review & editing. **Jose Paolo Carlos:** Conceptualization, Investigation, Validation.

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Appendix. List of acronyms

Asian Development Bank ADB
Agence Française de Développement AFD
Application programming interface API
API Exchange APIX
Basic Deposit Account BDA
Brankas Open Banking Company BOBC
Bangko Sentral ng Pilipinas BSP
Cantilan Bank CANBNK
Core banking system CBS
Digitalization of Countryside Financial Institutions DIGI-CFI
Digital Payments Transformation Roadmap DPTR
Inclusive Finance Development Program IFDP
IT Outsourcing and Risk Management ITORM
Maya Bank MB
Micro-finance institutions MFI
National Strategy for Financial Inclusion NSFI
Open Finance Framework OFF
Oradian Inc. OI
Rural Bank of Luzon RBL
Rural Bank Strengthening Program RBSP
Technology Risk and Innovation Supervision Department TRISD

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