The Emergence of FinTech Ecosystem: A Case Study of 'bKash' in Bangladesh

Md Saikat Hosen[1], Md. Habibur Rahman[2]*

[1]College of Management, Capital Normal University, Haidian District, Beijing, CHINA
[2]Faculty of Business, ASA University Bangladesh, Dhaka 1207, BANGLADESH

E-mail for correspondence: hrahman550@gmail.com

ABSTRACT

The cutting-edge economy has a lot of new wheels that turn the fortune of contemporary times. Monetary innovation is no question one of those. The new credit-only economy depends on these computerized monetary administrations. As of late, financial organizations, particularly banks, have become more subject to these howdy tech administrations. For the review, the information has been gathered by poll overview utilizing the positioned technique for examination utilizing SPSS, in which IT-related individuals have been studied. The study explains the characteristics and features of FinTech ecosystems emerging in Bangladesh. The "bKash" in Bangladesh is particularly appropriate for our research as it seeks to become a world-class Fintech hub for innovation by capitalizing on the opportunities brought by global technological trends. The study uses the CAS process model for analyzing biological systems, difficulties, and possibilities of fintech, especially bKash in Bangladesh. The results show that bKash has a promising future can significantly uplift Bangladesh's economy.

Key words: FinTech, Ecosystem, Bangladesh, bKash

INTRODUCTION

'FinTech' is 'digital innovations and technology-enabled business model innovations in the financial sector.' Financial Stability Board 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." In recent years, FinTech has gained increasing attention worldwide and become more prominent in establishing an incremental, radical, or disruptive innovation development within the financial services industry. The 4th industrial revolution saw a financial institution implementing new business models, challenging the channeling of the exponential growth of technologies congregating towards the latest financial institution industry. FinTech technology has changed the traditional finance system over the past decade, whether due to consumer patterns shifting too much more toward non-traditional FinTech service providers or even as a result of the FinTech organizations working in conjunction with FinTech startups gaining a competitive advantage on those who have not yet. Investors and

business organizations collaborating with FinTech companies have increased their engagement in FinTech technology (Baddam, 2017). These payments, banking, insurance, and property and wealth management industries have also received excellent attention regarding ease of use, quicker delivery, improved customer service, and 24/7 availability. FinTech and also the Internet of Things (IoT) have each achieved widespread recognition as symbols for new technology. FinTech has been spawning a slew of new goods and services, such as FinTech accounting and others, aiming to make current FinTech procedures better and more accessible (Dekkati, 2021). Furthermore, due to the apparent wide range of businesses and sectors that have been tied to or have touched, even those who aren't involved in the industry were observing developments in just this growing field, it might be stated that there is presently no industry unconnected to the Internet (Albarrak & Alokley, 2021).

The study explores the FinTech phenomenon from a complex adaptive system (CAS) perspective and contributes to a process model of FE emergence. In addition to being empirically grounded in data obtained from an FE in Bangladesh, our study generates insights into the stages of

ecosystem emergence to reveal how a global self-sustaining ecosystem emerges. Accordingly, this study aims to address the research question: This study is one of the earliest attempts to contribute to information systems (IS) research by providing a conceptual framework to explore the FE emergence process by applying the critical tenets of CAS theory. CAS theory facilitates researchers to gain insight into the diverse non-linear interactions among myriad stakeholder groups, resulting in a macroscopic structure. A process model of FE emergence is presented by mapping the attributes of CAS to FE emergence concepts. The proposed process model facilitates a systematic and consistent approach to exploring the Complexity of FE emergence.

FinTech: Current Scenario in Bangladesh

Bangladesh has one of the quickest Gross domestic product development rates on the planet, establishing itself as one of the eleven developing business sectors. The nation is also gradually moving towards upper-center pay status, changing into the contemporary industry from its common conventional modern area (Baddam, 2020). In any case, different regions of Bangladesh need to improve in innovation, one of which is the monetary area. Despite having a gigantic population, Bangladesh is ailing tremendously in the economic area. Above 35 million individuals play out their monetary prerequisites through casual channels without financial balances. Subsequently, with the right innovation, FinTech can play a significant part in defeating this boundary. The essential focal point of FinTech is to decrease the process duration of exchanges, reduce administration costs, and improve help quality.

Consequently, FinTech can bring monetary incorporation and speed up the advancement of economic areas in emerging nations like Bangladesh. FinTech -empowered installment strategies can change the framework by carrying the casual economy into the formal economy and upgrading straightforwardness and expense assortment. FinTech can likewise bring down working expenses for installment banks and relieve current extortion risk for the national bank. FinTech can likewise mechanize the confirmation cycle of the credit endorsement technique, which still needs to be added in Bangladesh. Decreasing the time it takes to finish a credit endorsement/dismissal would further develop consumer loyalty and diminish the danger to the business. FinTech can likewise be utilized to give Robo Guide to all different level partners to give warning services, which could further develop administration quality. Client care can now be supplanted with Chatbots to bring down working expenses and further develop the speed of administrations. Bangladesh has space in this large number of regions to execute FinTech. Besides, the nation enjoys an enormous youthful populace base, and portable membership inclusion is very high. Joining the two variables, FinTech can bring macroeconomic development by going about as an impetus, but a legitimate administrative body will be urgent for the development (Chakraborti, 2020).

Bangladesh has a desperate requirement for FinTech administrations as it has been found they need legitimate information to open financial balances, or there is a considerable divergence of per capita pay between rustic what's more metropolitan individuals to try and open ledgers. The economic foundation and administrations need to be more robust as it isn't rewarding for conventional physical banks to open their branches there. Subsequently, to bypass this multitude of issues, government arrangements and FinTech mindfulness can carry monetary incorporation to country regions (Rahman, 2020).

Research questions

This research will focus on the questions that help us attain the study's objectives. The FinTech ecosystem comprises different agents that connect to provide financial and technological services and products to the end customers. This leads us to explore some research questions that are as follows:

- What are the biological system, difficulties, and possibilities for the FinTech ecosystem in Bangladesh?
- What is the future of bKash in Bangladesh?

Objectives

The following are the main objectives to be achieved in this study:

- The research aims to enlighten the essential elements and agents to develop a well-established FinTech ecosystem.
- It also aims to highlight the difficulties and possible opportunities the FinTech industry holds for Bangladesh.

METHODOLOGY

Although quantitative methods like agent-based modeling have been the dominant approach to studying CAS in other disciplines, qualitative methods are suitable for studying FEs as CASs (Holland, 2002) for several reasons. First, FE is a multifaceted and intrinsically complicated phenomenon, and the richness of qualitative data can facilitate researchers to unpack the temporally unfolding characteristics of FEs and investigate the phenomenon by teasing out the shared interpretation of the relevant stakeholders (Dekkati, 2022). Second, qualitative data are particularly effective in illustrating complex and abstract ideas and making conceptual frameworks comprehensible (Mahadasa, 2017). We adopted the case research method because most theories, including the CAS model of FE emergence, require "some form of realist ontology, as constructs in theoretical statements can refer to entities in the real world". The strengths of case study design lie in exploring "how" research questions, processes that are deeply intertwined

with their contexts, and under-studied phenomena (Kaluvakuri & Vadiyala, 2016)—all conditions that are relevant to our study. The case data provided the empirical grounding for developing the CAS model of FE emergence. Based on our research objectives, two conditions formed the basis of case selection. First, the FE we study must be in the very early stages of emergence to allow us to capture the initial conditions, activities, entities, events, agents, and their interactions and to explore the phenomenon at multiple levels. Second, the FE we select must have a wide array of entities across diverse sectors to explore the phenomenon more holistically. The "bKash" in Bangladesh is particularly appropriate for our study as it seeks to become a world-class FinTech hub for innovation by capitalizing on the opportunities brought by global technological trends, such as blockchain, financial analytics, and cybersecurity.

Data Collection

To answer the research question, the bKash ecosystem was chosen as the unit of analysis. Data collection occurred in two main phases—a preparatory phase and a fieldwork phase. The focus of the preparatory phase was to collect and analyze data from diverse secondary sources to gain an understanding of the emerging FinTech phenomenon, while the emphasis of the fieldwork phase was to collect data specific to our research question and explore in depth the various stages of FE emergence. Interviews were the primary means of data collection during the fieldwork phase. A total of 18 informants were identified via chain referral sampling. The informants

were referred to us incrementally by the "gatekeeper" (Dekkati et al., 2022), who granted us case access based on the interview questions we formulated emergently across the various iterations of data collection and analysis. These informants comprised government officials, start-up owners, academia, representatives, and an incubator within the FE.

Each interview was conducted with the help of a semi-structured interview guide. Questions were open-ended, focusing on guiding the conversation rather than maintaining a closed structure. The guides were drafted based on the relevant themes in the FE and CAS pieces of literature (Vadiyala et al., 2016). Each interview guide consisted of a critical set of questions pertinent to the emergence of ecosystems, challenges, and outcomes that resulted from the initiatives taken by government officials. Each interview, which took an average of about 90 minutes, was digitally recorded and subsequently transcribed for data analysis. There were a total of 218 pages of interview transcripts. Each researcher from the team reviewed the data independently, and regular meetings were held throughout the development of the study to ensure a congruous interpretation of the data (Lal et al., 2022).

The examination manages the general possibilities and difficulties of FinTech in Bangladesh. Thus, to legitimize the review, the testing has been finished thinking about the knowledge of this innovation.
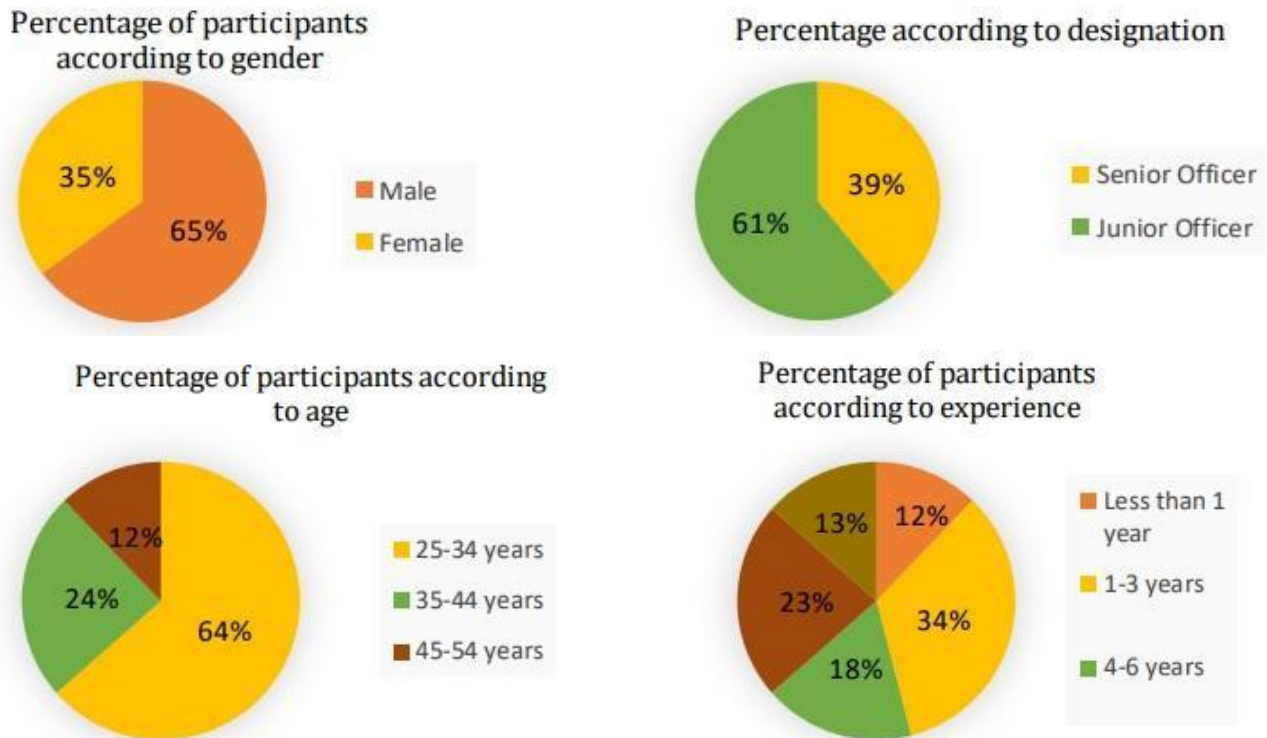

Figure 1. Demographic information of the respondents

Among the 70 respondents, 65% are male, and 39% have a place in senior positions in their regarded associations. 64% have a place between the ages of 25 and 34. It is positive that 34% of the respondents have 1-3 years of involvement with their fields, while 49% know about FinTech by purchasing administrations.

LITERATURE REVIEW

The word FinTech is a blend of the expressions "Monetary" and "Innovation" and is expected to mean the utilization of innovation to convey a monetary arrangement (Puschmann, 2017). As per Zapkau et al. (2015), FinTech provides a monetary arrangement fostering innovation-based items and administration. Viewed as the leading development in the financial area, FinTechs guarantee to reshape the business by reducing expenses and developing the nature of administration conveyance (Lee and Shin, 2018). FinTech action plans are created to be reasonable and savvy and stand apart from conventional monetary specialist co-ops (Ashraf, 2019). As contended by Rouf et al. (2019), FinTechs are looking for imaginative arrangements and have new plans of action that are conceivable utilizing computerized innovations. FinTech definitions incorporate monetary cycles, like speculation, installment, protection, and administrative issues. FinTech began with the withdrawal for Monetary Innovation, which was first presented in 2006, and from that point forward, it has rapidly massed ubiquity. It may be summed up as advancements that objective individual specialty units of banks and plan to isolate the clients from them through the production of administrations and arrangements through innovation (Kolesova & Girzheva, 2018). One significant part of FinTech to work immaculately is the production of the stage. Stages work with simple investment between at least two reliant gatherings through the plan of admittance to channels, IT-based usefulness, and capacity to direct business processes, which expansions in esteem as support increments and thus information age increments. The web is one such stage that has permitted organizations like Facebook, Google, Amazon, LinkedIn, Air B & B, etc., to become such ruling powers that they are not disregarded. Along these lines, making FinTech stages over this channel is indispensable for its prosperity (Dhar and Stein, 2016). FinTech is viewed as a combination of money and innovation that is changing the job of data innovation by uniting social registering, the web of things, distributed computing, and colossal information and empowering monetary organizations to computerize their interaction through these innovations (Hasan, 2021). They are changing the purchasers' behavior by creating a more self-administration-centered culture. They are changing the biological system of customary monetary areas by producing new plans of action, stages, and channels. These are adjusting guidelines. For instance, London, Singapore, or Hong Kong utilizes a FinTech "sandbox" to

explore new administrations and items (Puschmann, 2017). FinTech can be named comprising of the accompanying qualities (Ravenswood, 2011):

- Utilizing innovation and development at the most significant level to acquire the upper hand through expanding the quality and security of administrations, expanding computerization, and giving better administration.
- They typically run on a nimble plan of action, thus their notoriety in new businesses.
- They target modern promoting channels like the web and portable.
- They centre on a client-driven approach through the formation of making client lives more straightforward with monetary administrations by bringing down cost and time inclusion.

Because of the vast region that FinTech covers in its characterization of precisely what FinTech is and what areas it covers, at present, other than the monetary portion, it is likewise sorted under the accompanying developments.

For the last ten years, the rise of FinTech innovation has disturbed the conventional monetary area either because of shopper patterns moving to more modern monetary help suppliers or because monetary foundations cooperating with FinTech new businesses have acquired strategic advantage over those that poor person (Ellis & Herbert, 2010). This has prompted an expansion in speculation in FinTech innovation by financial backers or monetary foundations collaborating with FinTech's new businesses.

BANGLADESH'S FINTECH ECOSYSTEM

It is vital to differentiate between the global and local FinTech ecosystems, although they intersect in many areas. Bangladesh has one of the quickest Gross domestic product development rates on the planet, which has solidified it as one of the eleven developing business sectors. The nation is gradually moving towards upper-center pay status and changing into the modern industry from its commonplace customary modern area (Azim, 2019). Nonetheless, different areas of Bangladesh are deficient in innovation, one of which is the monetary area. Despite having an enormous populace, Bangladesh has an immense ailing in the monetary area. Above 35 million individuals play out their monetary necessities through casual channels and with no ledgers. With the right innovation, FinTech can play a critical part in defeating this hindrance. The essential focal point of FinTech is to lessen the process duration of exchanges, decrease administration costs, and improve the quality of help. Consequently, FinTech can bring monetary consideration and speed up advancing monetary areas in emerging nations like Bangladesh. FinTech -empowered installment strategies can change the framework by carrying the casual economy into the proper economy and upgrading

straightforwardness and expense assortment. FinTech can likewise bring down working expenses for installment banks and relieve current extortion risk for the national bank. FinTech can likewise computerize the credit endorsement strategy's check cycle, which is still missing essentially in Bangladesh. Decreasing the time it takes to finish a credit endorsement/dismissal would further develop consumer loyalty and diminish the danger to a business. FinTech can likewise be utilized to give Robo Counsel to all different level partners to offer warning types of assistance, which could further develop administration quality. Client care can now be supplanted with Chatbots to bring down working expenses and further develop administration speed. Bangladesh has space in this large number of regions to execute FinTech. Besides, the nation enjoys the benefit of having a huge youthful populace base, and versatile membership inclusion is very high. Consolidating the two elements, FinTech can bring macroeconomic development by going about as an impetus, but a legitimate administrative body will be significant for the development (Chakraborti, 2020). Rubaiyat has additionally upheld the discoveries expressing the meaning of the capability of FinTech in Bangladesh because of the immature monetary design and the developing cell phone entrance recurrence and the startup area being currently at earliest stages in Bangladesh blasts positive for the FinTech improvement exceptionally with different gas pedals, hatcheries, and supported occasions by both the state and confidential enterprises occurring presently. Versatile cash administration is thus obviously the main FinTech with organizations, for example, Bkash and iPay, driving the portion of the overall industry followed by comparative administrations from banks like Rocket, mCash, and Ukash. Be that as it may, other than this, other monetary administrations, for example, account opening, advances, and protection, have still not been computerized in a large portion of the monetary organizations. In this manner, autonomous organizations might get an interruption in the monetary market by presenting these innovations (Lao et al., 2008). Be that as it may, notwithstanding FinTech's capability to remodel the monetary area, there is a critical requirement for legitimate guidelines and rules. Bangladesh is the ninth most elevated beneficiary of settlement on the planet. Still, because of strategies taken by the public authority and the National Bank of Bangladesh, cross-line cash moves are a lumbering and extended technique. However, there have been dazzling accomplishments all over the planet to make this framework faster through FinTech. FinTech can likewise be utilized at the root level to make money in business sectors for individuals working in country regions, for example, ranchers and anglers, as they can't get fair costs generally and, in this way, increment their way of life. FinTech can likewise further develop SMEs the nation over by eliminating the need for a bank to perform monetary administrations. FinTech likewise permits the

open door for executing green systems. In light of every one of these, the public authority of Bangladesh has proactively established the point from 2019-2024 to make the primary Public Monetary Consideration System (NFIS) a component of the public authority's Vision 2021 (Islam, 2019). Studies have found that online business is blasting in Bangladesh, and one of the principal justifications for that is FinTech and the web, which has made both the likelihood to direct business without actual presence, get installments through versatile cash move, and send the item through dispatch applications who can likewise be paid through FinTech. As a rewarding methodology for automated revenue, an ever-increasing number of business people are presently taking on Online business in Bangladesh, and FinTech can play a huge part in the development of this area, too (Bahrami & Evans, 1995). In light of that, admittance to data was likewise made in an organization with UNDP to support the advanced development of Bangladesh, and monetary consideration through FinTech is additionally important for their agenda (Nuyens, 2019). As of now, the FinTech organizations which are performing great in Bangladesh are (Ahmed and Rahman, 2020).

- bKash
- CloudWell
- Rocket
- Nagar
- DBBL
- Suresh
- SmartKompare

Banks have begun to embrace new advancements, and many are recruiting more youthful, more mechanically clever representatives to ensure they can take on the progressions or plan to prepare projects to adapt to FinTech changes (Boamah et al., 2021). In addition, considering the populace's size, there is a vast opportunity for FinTech's new businesses. Uncommonly, the provincial areas of Bangladesh have a desperate requirement for FinTech administrations as it has been found they don't have the legitimate information to open financial balances, or there is the enormous dissimilarity of per capita pay among rustic and metropolitan individuals to try and open ledgers. The economic framework and administrations are likewise lacking as it isn't rewarding for conventional physical banks to open their branches there. Consequently, to bypass this multitude of issues, government approaches, and FinTech mindfulness can carry monetary consideration to rustic regions (Rahman, 2020).

The current start-up ecosystem in Bangladesh is valued at $1.45 billion and has the potential to reach a $10 billion valuation. Financial inclusion in the country increased from 16% in 2011 to 37% in 2018. Despite remarkable progress, Bangladesh remains one of the economies with the largest unbanked population. All FinTechs put together process $4 billion in monthly transactions. The

Remittances segment is catching up owing to money transfers by expatriates. Lending and Personal Finance are the other segments that are registering growth.

Role of Banks/DFIs in promoting FinTech

Bank's role in the FinTech space has fluctuated, and many rely on how the bank wishes to move toward these open doors. It isn't unreasonable to say that FinTech wouldn't be where it is today without the association of banks. The more evolved commercial center loaning field demonstrates that banks are essential to development. Banks need to foster a procedure and way to adjust and incorporate advancement and innovation into the foundation, reliable with its gamble profile, and afterward, structure connections to safeguard the bank that guarantees consistency with relevant regulations and guidelines. Following are the jobs that Banks can play in advancing FinTech:

- Investing in FinTech
- Acquiring FinTech
- Developing their competency through innovation
- Creating awareness about financial literacy
- Improving Risk Management System
- Improving IT infrastructure
- Developing partnership

One more significant stage in advancing FinTech is spreading mindfulness among its clients and tending to their interests in asset protection and online security. While states of non-industrial nations have begun to invite the ascent of FinTech, laid-out monetary establishments working in the district view it as both an open door and a danger. Banks have various benefits over FinTech new companies as given under:

- trust with customers;
- access to years of data
- familiarity with the regulatory environment

Nonetheless, they need to be timelier in embracing change and conveying what they need and need to clients, making a hole that FinTech new companies have bit by bit begun to load up with their creative, computerized, and client-situated arrangements. Banks in the district need to embrace FinTech and start creating plans to underwrite and assimilate progressions in innovation as opposed to attempting to contend with rising firms in the FinTech space.

In the USA, Bank of America, JP Morgan, and Citibank have put resources into FinTech organizations while others have obtained FinTechs. In many regions of the planet, like the USA, moneylenders need to have a banking permit and to move cash around, a cash transmitter permit is required. This implies that a startup loan specialist should collaborate with a foundation having a financial sanction. This is the reason the joint effort of FinTechs and banks is inescapable. Nonetheless, to thoroughly understand the problematic capability of monetary innovation, banks, and FinTech new businesses need to accomplice up and share their experience

and aptitude. Laid-out monetary foundations can glean tons of helpful knowledge from new companies, take on some of their techniques, and even collaborate with them. FinTech new companies can likewise assist keeps money by further developing their customer experience, diminishing working costs, and finding new open doors for development. Banks can help new companies with their image validity and customers' trust, ability to handle monetary risk and administrative requests and give them a crowd of people for their applications. They can likewise fabricate drives, for example, gas pedal and hatchery programs, which will permit the advantages of the two players to be upgraded in an aggregate climate and give new companies what they need request to offer to keep money with what they need. Banks can gain or put resources into FinTech organizations, buying discrete applications or even whole organizations or stages to increase and develop the establishment's inventive items and administrations.

Types of FinTech

Balance Tech is an etymological mix of two words: money and innovation. It portrays an arising monetary administration area in the 21st 100 years. Initially, the term was utilized for innovation applied to the back-finish of laid-out buyer and exchange monetary foundations. Since the finish of the first ten years of the hundred years, the term has extended to include any mechanical development for the financial area, including advancements for monetary proficiency and training, retail banking, speculation, and even digital currencies like piece coin.

The term monetary innovation can apply to any development regarding how individuals execute business, from cash innovation to twofold section accounting. Since the origin of the web and the versatile web upheaval, monetary innovation has developed colossally, and FinTech, which initially alluded to PC innovation applied to the administrative center of banks or exchanging firms, presently depicts a wide assortment of innovative intercessions into individual and business finance FinTech's are ordered as:

- **Conventional FinTechs:** team up with occupant monetary specialist organizations as their innovation suppliers through conventional evaluating models.
- **Developing FinTechs:** another classification of FinTechs that band together with a bank through new commitment models or dislodge monetary foundations.

FinTech organizations influence innovation to make new and better monetary administrations for the two buyers and organizations. It incorporates organizations of different types that may work in private monetary administration, protection, installment, resource the executives, etc. These new businesses contend straightforwardly with customary banking and financial organizations and, in many regards, have shocked them. FinTech organizations work in many nations and, furthermore, are gradually working on bits of

the economic administration's industry, giving items and administrations when solely accessible through monetary organizations. These items and administrations are inside the classes of loaning, individual accounting, retail and institutional speculations, value funding, shopper banking, and others. In the present computerized age and with massive segment shifts in the populace, individuals are looking for simple access, comfort, proficiency, and speed. Individuals need to manage exchanges through versatile innovation stages and applications, and such exercises incorporate dealing with their monetary lives, whether following their general spending, applying for credit, or upgrading their speculation procedures. Many individuals like to be involved in online applications or locales for funds. By and large, somewhere in the range of 1 and 3 applications are utilized by individuals to deal with their monetary lives. FinTech organizations furnish the two people and organizations with more versatile apparatuses. These advanced instruments disturb conventional action plans with creative thoughts and programming arrangements. Although 2016 could have been a better year for new FinTech businesses, a few are ready to move forward this year, and many have previously experienced massive development since their beginning.

THEORETICAL FRAMEWORK

Complex Adaptive Systems (CAS)

Frames of reference from other disciplines, such as social and natural sciences, provide a suitable theoretical foundation for understanding business and other complex networked phenomena (Muthukannan et al., 2020). Using recent advances gained through investigating networks and complex network dynamics in physics and biology, an ecosystem perspective of inter-network structure is a valuable lens for understanding economic organization. A key attribute of such an ecosystem is its ability to adapt, emerge, and evolve to internal and external changes. Thus, complex systems exhibit emergent behavior and are composed of dynamic entities called agents that adapt and evolve (Rouse, 2007). Research on CAS has emerged in the last few decades to understand the behavior of myriad, interconnected processes and agents from a system-wide perspective. This interdisciplinary branch of scholarship, called complexity science (Mueller et al., 2014), suggests that CASs are systems in which macro-level behaviors both stem from and influence micro-level interactions of the elements of the system. A CAS is inherently multi-level, facilitating the exploration of collective macro-level behavior. Although CAS gained attention in the field of evolutionary biology, many of its core principles have been applied in multiple disciplines to understand the non-linear and dynamic behaviors of complex systems, such as organizational learning (Mahadasa, 2016), self-organization and evolution (Casti, 1994) and supply chain networks (Mahadasa & Surarapu, 2016). Agents' adaptability to the environment results from both micro- and macro-level interactions in the

FE (Mandapuram et al., 2019). The agents' actions help create macro-level system rules and, simultaneously, are influenced by the rules. The macro system adaptability emerges from the interactions that happen at the micro level (Holland, 2002). For instance, start-up firms may realize that their FE needs more skilled tech talent for software code development, which may restrict their ability to create emerging technology firms. As the firms collaborate with other agents, they will have an opportunity to communicate the gap, which may attract the attention of regulatory or government bodies to address the problem. For example, the government may implement programs by partnering with educational institutions to develop tech skills within the system. Suppose the initiatives by the government are successful. In that case, it signifies a change in the system behavior, increasing the range of possible behaviors in the FE and making adaptation possible. There is no universal perspective and theory of CAS (Vadiyala & Baddam, 2017). Nonetheless, scholars imply that a CAS comprises agents that interact, continuously adapt, and organize themselves within an environment. Holland (2002) suggests a definition of a CAS as a single coherent system that emerges over time from the interactions of its agents and adapts itself within the space in which the elements or agents reside. The discussion is therefore framed around these key attributes while drawing on insights from critical characteristics of CAS. Outcomes for a specific group of agents depend on other agents. For instance, a solution developed by a start-up could be capitalized on by other start-ups, resulting in increased coherence among the agents, thereby increasing the likelihood of their survival (Mahadasa et al., 2020). By competing and collaborating, the agents followed simple rules that governed their interaction, called behavioral rules, resulting in a similar structure (Vadiyala, 2017). The individual micro-interactions among the agents get coalesced into an aggregate group by increasing the degree of association between the components of a CAS, called the degree of coherence; specific outside forces termed control parameters push the CAS and its agents into different behaviors and influence coherence (Rahman & Dekkati, 2022). The internal forces that influence agent and system behaviors are the order parameters (Goldstein et al., 2019), resulting in the participants of the ecosystem interacting with one another and increasing the coherence among agents. Introducing your figure before showing it out.

FinTech Ecosystem as CAS

This can be suitably conceptualized as CASs for the following reasons. First, this emergence is not controlled by a central authority, an organization, or a global controller (Surarapu et al., 2018). For instance, the government can play a critical role in promoting FEs. However, the order that emerges in an FE is mainly from multiple agents' coherent, coordinated actions and not from a centralized authority. Although some agents, such as investors, maybe more powerful and influential, there is no particular entity that controls the agents' behaviors and activities, and it implies

that the macro-level systems are emergent and arise from self-organization rather than from top-down control. In other words, an FE is a macro-level system that emerges from the micro-level interactions of its agents, which collectively leads to the formation of an aggregate CAS. Attempts to control and direct the development of an FE can prove detrimental to its healthy functioning and cohesiveness. An FE comprises government, industry, start-ups, customers, tech vendors, universities and research institutions, investors and incubators, accelerators, and innovation labs. The agents of an FE are heterogeneous in their attributes, interactions with other agents outside the FE, and interactions with the environment. Despite the heterogeneity among the isolated agents in the ecosystem, they exhibit similarities in behaviors, intentions, and activities, allowing them to be assigned to a specific category. In a CAS, agents are not role-exclusive and can play multiple roles. For instance, an investor may also be an entrepreneur (Holland, 2002). A suitable theoretical foundation must address the ecosystem dynamics' cross-level nature and the collective outcome from each level. The complex multi-level interactions need to be decomposed and analyzed by considering the interactions and the interdependencies. These interactions capture the FE regarding organizational entities and technological resources. In this study, we use the critical tenets of CAS to deepen our understanding of ecosystem emergence. The CAS theory has drawn widespread attention from researchers in the IS field. In the CAS context, aggregate structures arise not from a global or central controller but from the interactions among interdependent agents that are goal-seeking based on local knowledge and feedback loops. Hence, CAS theory provides a suitable framework that facilitates the generation of new concepts and promotes formal modeling as it allows us to see the contribution of individual agents and their interactions with the environment Journal Pre-proof in the emergence of an FE.

Case study of "bKash" in Bangladesh

BKash is a mobile financial service and payment system for consumers. It features a solution for money transfers, mobile recharges, utility bill payments, etc. Users can dial a number to initiate the transaction, fill in the bKash account and amount, and the money will be sent to the receiver's mobile. The beneficiary can cash out at the participating agent or partnered locations and ATMs. It was founded in 2011 and was funded with 11 million dollars. Bill & Melinda Gates Foundation and Gray Ghost Ventures were the investors of bKash. bKash started in 2011 as a joint venture between BRAC Bank Limited, Bangladesh, and Money in Motion LLC, United States of America. In April 2013, International Finance Corporation (IFC) became an equity partner; in March 2014 and in April 2018, Ant Financial, the operators of Alipay, became an equity partner and announced a strategic partnership to promote financial inclusion for the unbanked and underbanked communities in Bangladesh. Later, in November 2021, bKash announced an investment from SoftBank Vision Fund 2 to promote financial inclusion by building a digital financial ecosystem in Bangladesh.

Fortune magazine ranked bKash among the top 50 companies in their Change the World list 2017. According to Fortune, 22% of adults in Bangladesh use bKash, with around 4.5 million daily transactions. bKash has been declared the Best Digital Bank (2018). World HRD Congress declared it one of Asia's best employees in 2017.

The Business Model: bKash is a mobile money system in Bangladesh operating under the jurisdiction of Bangladesh Central Bank as a subsidiary of BRAC Bank, a local bank. The service aims to serve users at the bottom of the economic pyramid (BOP), ensuring a broader range of financial services across Bangladesh's population. The service uses a USSD interface, accessible via an essential handset, and offers no cashing-in fee and low cashing-out and person-to-person transfer fees. These elements provide a system by which BOP users can send money in a way that is fast, secure, and affordable. Launched in July 2011, the service now has 2.2 million registered customers.

Taking full advantage of the permit given by the national bank alongside his skill acquired from the Kenyan M-Pesa model, Qadir sent off bKash, a reason-constructed substance to provide MFS to the unbanked. The underlying test was which innovation stage to depend on — the way to concoct a primary point of interaction that could be gotten to by the least expensive (around US$15) handset. The path of least resistance is to foster an application for cell phones. In any case, the assistance would be restricted to well-off clients, nullifying the point of arriving at poor and unbanked people.

bKash was quick to avoid exchanges because of Short Message Administration (SMS) since this would make the cycle costly and dangerous. Clients would have sums deducted from their virtual records with each SM trade. Besides, SMS kept a log, all things considered, which could prompt protection penetrates, for example, an individual distinguishing proof number (PIN) getting taken. At last, every handset had an alternate arrangement of rules for sending messages, making things more intricate. Qadir instead settled on an innovation called Unstructured Valuable Help Information (USSD). This framework offered a way for people to send and get cash utilizing their phones without the inconveniences of SMS-based frameworks. Likewise, it was upheld by all handsets, regardless of how essential. The way that USSD could be utilized irrespective of the versatile handset or operator15 provided Bangladesh with a quicker reception of portable cash than different nations.

What's more, with a USSD framework, security was higher. The framework offered a chance to execute a two-factor validation framework. Since the versatile number for every individual was remarkable, there was dependably a method for delegating responsibility concerning which record was being utilized. Likewise, giving a PIN to each record holder

distinguished both the beneficiary and the shipper. In this way, there was more prominent security regarding installment or cash moves since the mystery PIN would forestall, for instance, a criminal from making an installment or moving cash in the event of telephone burglary. bKash found Fundamo, a South African monetary programming organization that had sent an exceptionally versatile monetary stage above 20 nations. Fundamo was anxious to work with bKash and ready to give bKash a stage that consolidated worldwide security principles with severe flexibility to oblige any administrator or sort of handset. Another test was the way to get clients to utilize bKash.

First, individuals didn't see a requirement and needed the foggiest idea of trusting the help. bKash's central innovation official, Azmal Huda, remarked, "As Steve Occupations said, clients don't have the foggiest idea what they need. Breaking that ice is vital." He further noticed that individuals might initially have difficulty believing that cash could be moved through the air; they must be persuaded that it genuinely worked. To arrive at the large numbers of unbanked individuals the nation over, bKash required an effort program. At first, fully backed by the Bill and Melinda Entryways Establishment, bKash directed a specialist enrollment program with BRAC, which had microfinance borrowers nationwide. Shahid Ullah, a veteran staff individual from the BRAC Microfinance Program, made sense of the enrolling system, which brought about the initial 5,000 "valiant people" as specialists: "bKash selected little and medium endeavor borrowers as they were business visionaries and had extraordinary promoting abilities.

ANALYSIS AND FINDINGS

Data Analysis

Grounded theory techniques are particularly suited for analyzing our data because they provide the means to identify and develop concepts and their inter-relationships that form the building blocks of theory from qualitative data. More specifically, we adopted the techniques from the Straussian tradition of the grounded theory method because of our epistemological assumption that it is more feasible to "create (rather than to discover)" theory using an initial theoretical lens as the starting point of our inquiry. In addition, this approach has the benefit of enabling "theoretical sensitivity", which helped us to recognize the relevance of raw data to our theorizing efforts and better focus on the abstraction (as opposed to the description) of our empirical materials. From the concepts derived from our literature review on FinTech and CAS theory, we first constructed an initial theoretical lens consisting of several theoretical dimensions and themes. With each instance of data collection, such as conducting an interview or acquiring a new secondary document, the data collected were then coded based on the structure presented by our theoretical lens using the techniques of open, axial, and selective coding.

Table 1: Dimensions and themes of our initial theoretical lens

Dimensions and themes of our initial	theoretical lens
Dimensions	Themes
Agents	FinTech firms, incumbent financial institutions, investors, borrowers, government authority
Interactions	Emergence, adaptation, self-organization, non-linearity, adaptive tensions, emergent structuration
Environment	Dissipative structures, behavioral rules, degree of coherence, control parameters, order parameters

Open coding was first used to apply conceptual labels to the relevant excerpts of our interviews to form first-order concepts. The first-order concepts were then grouped into second-order themes via axial coding. In particular, if the first-order concept fitted an existing second-order theme within our coding structure, the concept was assigned to the theme directly. Conversely, if the fit was not exact or the idea related to a theme that did not yet exist, an existing or new second-order theme was modified or created accordingly before coding was restarted based on the changes made. Finally, selective coding was used further to abstract the second-order themes into several aggregate dimensions. This was done to establish the relationships between the second-order themes with new dimensions incorporated into our coding structure or modified existing dimensions, where needed. Next, we applied a visual mapping strategy to present the concepts, themes, and dimensions derived from coding and capture our theoretical ideas in a diagrammatic form. We also used a narrative strategy to construct a coherent "story" that represented our case study account. Both the visual maps and narrative created were verified with many key informants and iteratively refined to ensure the validity of our interpretation and theoretical ideas. In addition, we ensured that each of our findings was validated by at least two distinct data sources in line with the principle of triangulation. The measures adopted to ensure the rigor of our research method, using the criteria of credibility, transferability, confirmability, and dependability as proposed by Boamah et al. (2021), Data analysis unfolded concurrently with data collection such that the insights gained from one iteration of analysis guided the collection of further data, until the state of theoretical saturation was reached. This state refers to the point where our emergent process model could account fully for any additional data collected, and there were no further findings that would augment or require modifications to our process model. One hundred twenty polls were conducted among individuals who are connected with FinTech. Among them, 70 individuals associated with the IT world or FinTech have been studied for the exploration. The reaction rate is 58.33% since this industry is in its rising period, so finding an expert is troublesome. The example has been designated from

Dhaka city, as it were. An organized poll has been set to gather information in which the respondents express their

perspectives through the Likert scale involving various marks in various inquiries.

Table 2: Scale involving various marks

Not at all relevant	Not relevant	Somewhat relevant	Relevant	Very relevant
1	2	3	4	5

The questionnaires of two overview reports of New Zealand and Europe have been followed as a model [PWC.co.NZ/fintech2017 and European FinTech review report of CFA foundation (2016)]. Positioning strategies

are likewise utilized for survey inquiries to get the respondents' inclinations and input. The survey has been adjusted to fit the Bangladesh market with the assistance of the two alluded sources referenced previously.
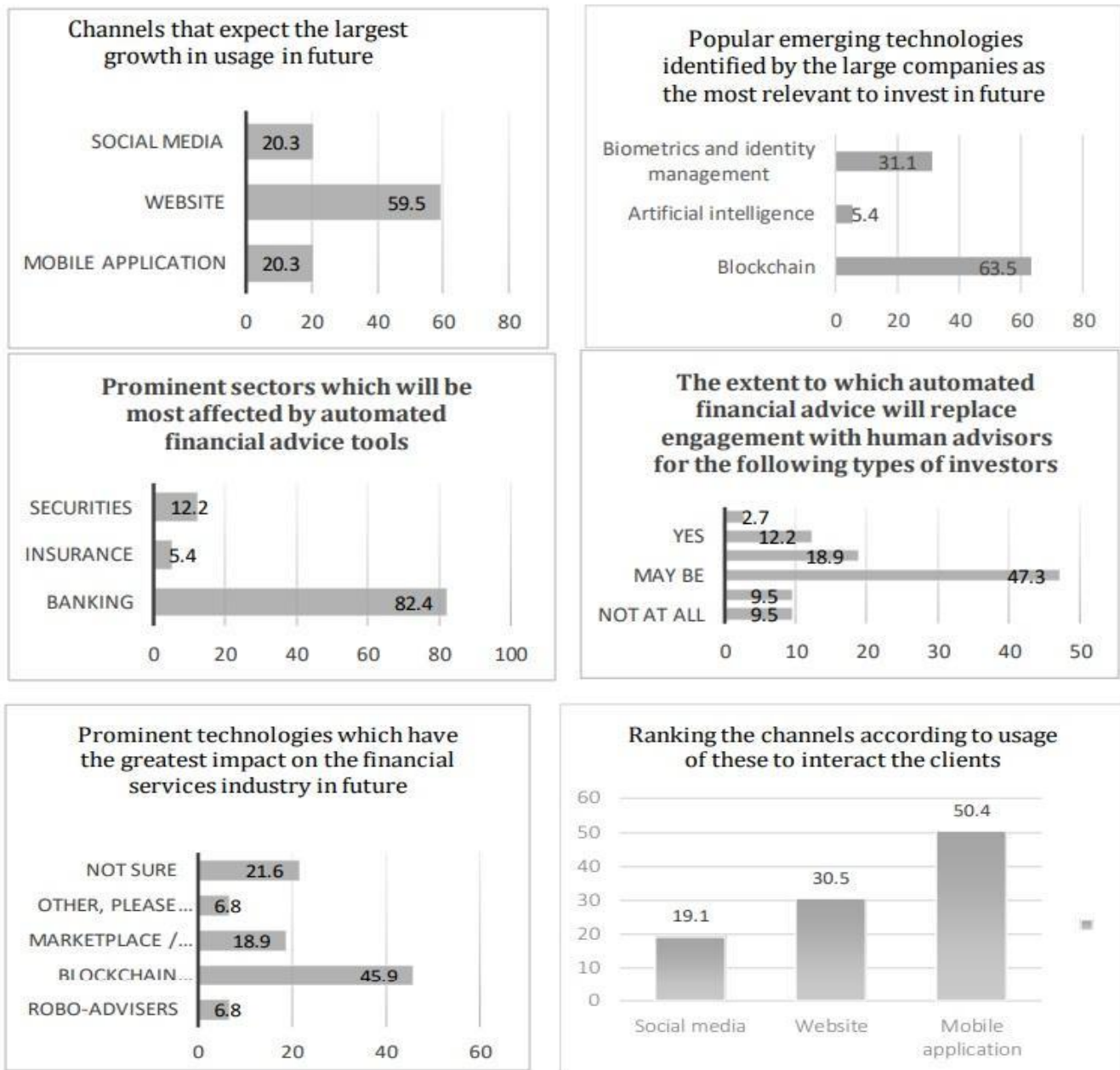

Figure 2: Ranking and other feedback from the respondents

In the inquiry where it was posed about Channels that expect the most significant development in utilization in the future, the result demonstrated that sites will be the best source with a level of practically 60%. In comparison, web-based entertainment and portable applications took 20% each. This clue that sites ought to be provided with a higher need to use FinTech. Although, as per the overview, development in sites is the most noteworthy, as far as use for collaboration with clients, versatile applications are driving with 50.4%. In comparison, site and online entertainment take 30.5% and 19.15, respectively. In this manner, sites have the most elevated potential to develop utilization compared with others.

At the point when it was gotten some information about well-known emerging innovations was to be the most applicable to contribute later on, the reactions of the representatives of the enormous organizations upheld the idea of Blockchain (63.5%) and Biometrics and the character of the executives (31.1%). They needed to be more specific about the artificial brainpower with just 5.4%. In addition, when it got some information about noticeable advancements that will significantly affect the future monetary administration's industry, there also competitors featured blockchain innovation, with practically 46% following my commercial center/shared loaning, which was close to half of it with only 18.9%. Hence, blockchain should be presented in the market as it shows high possibilities. Moreover, contrasted with protections and protection, the financial area will be impacted the most (82.4%) by the mechanized monetary guidance instruments, so banks should not postpone to present FinTech. The authorities were very uncertain about the reality when it was found out if the computerized monetary exhortation would supplant commitment with human counsel as 18.9% addressed, perhaps. In comparison, a gigantic 47.3% expressed maybe this.
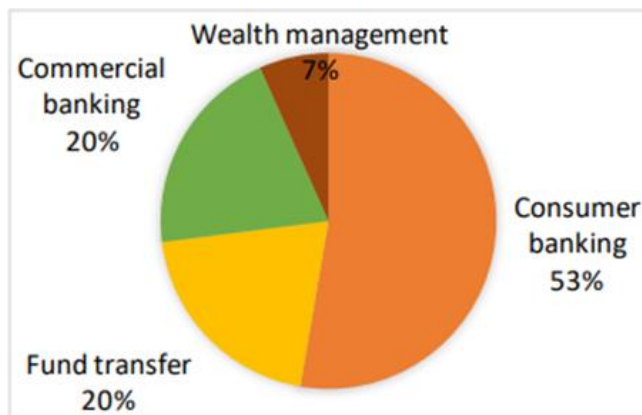

Figure 3: Prime areas of the financial sector are likely to be the most disrupted by FinTech in the future

The overview result indicates that purchaser banking will be immensely upset (53%). In comparison, store move and business banking will be similarly upset (20% each), and the abundance of the board will be most upset by FinTech (7%). As monetary delegates, banks gather and cycle data about their clients, counting their borrowers, complex and delicate data, and public and private data. This capability has given banks a primary yet exceptional job in the monetary area and the more extensive economy. The fixed (also sunk) expenses of putting resources into long-term relationships with borrowers are the scenery for hypotheses and experimental proof that restricting rivalry in banking could expand efforts to hazy borrowers. Packaging monetary administrations gives banks an expense and a data assortment advantage. Going past complex data, delicate data, characterized as private nonverifiable data, is the premise of long-haul connections. The presence of such delicate data can likewise assist saves money by keeping up with loaning, and borrowers keep admittance to subsidizing during downturns and emergencies.

FinTech and bigtech organizations depend on effectively accessible information they can acquire from their clients' computerized impressions or scratching the Internet. Big tech organizations might go above and beyond - they have information promptly accessible on likely clients from their nonfinancial exchanges; man-made brainpower likewise permits them to change over delicate data gathered through virtual entertainment or different means into complex data. At long last, the organization's advantage enables them to get additional information, work on their models, and increment their effort further.

Findings

Our analysis indicates that the emergence of an FE in Bangladesh was initiated as part of the broader strategic vision of the government to stimulate economic growth, promote business infrastructure, fast-track digitalization, attract global investors to the state, and provide an impetus for the FinTech community. This research proposes a process model of how an FE emerges in a rapidly changing technological landscape. Emergence, the "process by which patterns or global-level structures arise from interactive local level processes" (Boamah et al., 2021), is central to complexity science.

Where interconnection among the agents of the ecosystem is facilitated to build symbiotic synergies and promote operational efficiency, as depicted in our process model, ecosystem emergence was triggered by the government's strategic vision in response to the global emerging technological trends and the national IT agenda. The following subsections present the empirical case evidence used to construct our process model and describe more fully how the model was developed.

Stage 1

The first step towards understanding the emergence of an FE is to identify the system's key agents, the forces influencing the agents, and the levels at which these forces

operate (Holland, 2002). Evidence from our case study suggests that the global emerging technological trends and the national IT agenda stimulated the formation of a loosely connected ecosystem where potential agents began to come together but had yet to form connections. The key agents were the government, educational institutions, and the Bangladesh Electronic & IT Agency. The agents were interested in coming together at this stage but had yet to connect. This resulted in the formation of context-dependent structures, where the ecosystem structure formed in response to the environment in which it is built, termed the "contextual structures." The government provided a purpose-built facility at subsidized rates to foster growth and promote business infrastructure in the state. The government partnered with academia to support the FinTech community and nurture a skilled workforce.

The broader strategic vision of the state government triggered the FinTech ecosystem initiative to put the state on a trajectory of growth and development. It entailed extensive brainstorming sessions, stakeholder consultations, and ratification of the vision document from influencers and community representatives of the state assembly. FinTech was chosen as it opens up opportunities to cater to the unmet needs and latent demand for financial services (Lissack and Letiche, 2002). Growth markets present unique problems that mature markets have never faced and also present fertile ground for innovation and creativity. With the advent of FinTech, a gamut of entities such as start-ups, technology companies, and non-bank players compete and collaborate to offer value-added services (Khan et al., 2020).

We term this initial stage the Envisioning stage, as it outlines clear objectives by the government's leadership to propel the state economy into a higher growth trajectory by adopting innovative growth models. Also, it involved analysis and identification of existing resources and capabilities and assessment of the current state of affairs. The diverse agents such as the government, entrepreneurs, and academia acted due to the adaptive tensions (Boamah et al., 2021) created following the behavioral rules, which led to the tangible outcome of developing a strategic vision. The Envisioning stage culminated in charting a strategic roadmap to establish a self-sustaining global FE that is required to capitalize on the emergent business opportunities (Boamah et al., 2021) and promote digital governance. This is the first stage of emergence. It is critical as it establishes the foundation for FE emergence by clearly outlining the objectives to set up a self-sustaining global ecosystem.

Stage 2

Following the Envisioning stage, our findings suggest that the next stage of FinTech emergence is brought on with the entry of start-ups, incubators, and investors and the formation of a FinTech association and the FinTech Valley. The FinTech Association and FinTech Valley are the higher-order entities that were set up to promote the FE and provide the proper infrastructure and process to facilitate the entry of FinTech firms, investors, and incubators. These entities adopted diverse strategies to attract investors, start-up firms, and industry partners by providing them access to subsidized infrastructure, plug-and-play facilities, and market taxes. The interaction among the agents was further facilitated by partnering with financial institutions and technology partners to build a use case repository. To create the right solutions, these use cases were presented to start-ups as real-world industry problems. These strategies adopted by the FinTech Valley helped diverse agents to operate following a set of shared values, methods, and behaviors (Holland, 2002). The degree of correlation across the diverse agents' activities was enhanced, shaping the ecosystem into a coherent whole and leading to resource accumulation. It is defined as merging diverse resources and channeling them synergistically to deliver specific outcomes. It caused the agents to aggregate into an autonomous system (Lissack and Letiche, 2002). Innovation that start-ups create can produce coherence in agents' actions (Holland, 2002). For instance, an Internet of Things (IoT) solution introduced by a start-up was replicated and reused by other start-ups in an FE that needed this functionality, which is a form of emergent structuration (i.e., a structure of similarity emerging among a group of agents leveraging a functionality; Holland, 2002). The key agents and the degree of coherence among them promoted resource accumulation that led to establishing the foundational infrastructure and creating a coherent FE. A coherent FE is an ecosystem with an increased degree of coherence in the individual micro-interactions of the agents and the environment. The action patterns generated at one level are influenced by processes operating at different levels and the overall behavior of the system (Lissack and Letiche, 2002). The foundational infrastructure comprises the basic physical and non-physical structures that support the emergence of the FE. This includes IT facilities, data centers, network infrastructure, platforms, colocation, cloud computing hardware, and human capital. We call this next stage of FE emergence the enacting stage, as it is characterized by the degree of coherence shaping the ecosystem, aided by the active collaboration of the government with global consultants, industry experts, and academia to create a world-class ecosystem. In the Enacting stage, the connections and interactions between the agents are facilitated by the government devising a myriad of strategies. In some instances, the outcome of one group of agents is contingent upon the success of other groups. For example, an investor's success is contingent on the success of the start-up firms under their umbrella (Lee and Shin, 2018). Also, an innovation from one start-up firm could be leveraged by other firms in the FinTech Valley, and the ecosystem's agents may follow and exhibit common values, creating coherence among them.

Stage 3

Followed by increased coherence among the agents in the ecosystem in the Enacting stage, evidence from our case suggests that the next stage of FE emergence that unfolded was the Enlivening stage. In this stage, connections among the agents were strengthened further, and vibrancy was introduced in the system by the diverse initiatives adopted by the government, such as the Bangladesh FinTech Festival, One Million USD Global Challenge, and Startup Market Connect Demo Day. Bangladesh was promoted as a global FinTech hub to attract international players to the FE. The government devised diverse initiatives to adapt financial products and services delivery to local market conditions in response to the emerging global technological trends leading to strategic localization. It refers to a strategy designed to address local market conditions, help accelerate time to market, and ensure that the services delivered comply with all the applicable regulatory requirements. The workspace allocation at subsidized rates and financial capital for firms working on emerging technological trends are some internal aggregating forces in the FE (Goldstein et al., 1999) that influence the system agents and system behaviors at multiple levels. For instance, injecting financial capital into the incubators stimulates interconnections with similar agents. These micro-interactions further influence the system behavior and structure of the emerging FE. Specifically, as the start-ups, government, incubators, and investors in the FE respond to forces or the introduction of resources into the system, the network that connects the agents itself can change. These changes penetrate various system levels and establish non-linear relationships among agents. For instance, one essential function of the incubators in an FE is strengthening the start-up firms' networks and connecting the start-ups to the right resource providers. This enhances the range of actions of the start-up firms, thereby influencing the overall adaptability of the system (Holland, 2002). This led to the collectivization of the resources following the micro- and macro-level changes. Collectivization refers to the organization of and increased coherence of resources in response to the changes occurring at multiple levels of the ecosystem. We term this third stage of emergence the Enlivening stage. In this stage, the government adopted various initiatives to promote the FinTech Valley in the global market and encourage vibrancy in the ecosystem. In the Enlivening stage, our case evidence suggests that combining system and agent-level forces creates coherence among the start-up activities, and the continued supply of resources into the coherent ecosystem stimulates further coherence among agents. Thus, the degree of association among the different agents, their responses to the internal and external forces operating at the micro- and macro-levels of the system, and their relationships produce a complex set of interactions out of which a self-sustaining global FE emerged. This final stage of emergence is essential as it

sets the stage for the ecosystem to reach a state of self-sustenance. A self-sustaining ecosystem is an emergent ecosystem that has reached a state where it can continue to grow without outside assistance

CONCLUSION AND RECOMMENDATIONS

Conclusion

This paper presented a case of a CAS framework for the process of FE emergence. The CAS process model of FE emergence offers empirical grounding and concepts for researchers to outline and evaluate propositions on the FE emergence process. Practitioners and scholars can leverage the CAS framework to comprehend FE emergence mechanisms better and appreciate the significance of micro-interactions that lead to macroscopic global structure through the perspective of CAS theory. In the case of an FE, an ecosystem is an affiliation where conventional boundaries between industries are blurred, leading to symbiotic relationships among the diverse agents of the ecosystem. The bKash ecosystem in Bangladesh is a case of the successful establishment of an FE, which helped reveal the three different stages of unfolding, the dynamics among diverse actors of the ecosystem who have different motivations and respond differently to changes, and specific outcomes from each of the three stages. We hope this study stimulates more significant interest in the novel application of a CAS framework in embracing the multifaceted nature of technology and creates new avenues for advancing the IS field.

Limitations

This paper has proposed a CAS framework as a robust framework for researchers to investigate the emergence of this. This work seeks to understand the different stages of FE emergence and suggests the means to achieve them. Therefore, the emphasis is on the direct relationships of the other agents toward an emergent FE. The framework offers a conceptual framework for researchers to formulate pathways underlying FE emergence. The study could be extended further to provide insight into operationalizing the CAS model, allowing researchers to gain more real-world insights. This study has its limitations. First, although the process model appears to be linear and predictable, we must emphasize that the emergence of ecosystems may neither be sequential nor follow a defined trajectory as myriad factors can give rise to diverse outcomes, and the nature of the stages may vary with the unpredictable contextual conditions in different markets. Future studies can examine whether the trajectory of FE emergence may unfold differently (perhaps in a different sequence) and whether other decipherable patterns can be observed over time. Second, the nature of our research question is retrospective. Thus, our question about what leads to FE emergence may not be able to tease out all possible paths of FE emergence.

However, by selecting a successful case study, we identified the relevant steps of the emergence process. Developing robust theories in the presence of emergence, self-organization, and adaptation presents a daunting task. In an ecosystem with diverse sets of entities with changing policies, meticulous analysis of the impact of complex inter-relationships is required. Third, an emerging and multifaceted phenomenon such as FinTech evolves at multiple levels and must be captured at the ecosystem, topology, and organizational levels. For example, investigating micro-interactions among agents would require simultaneous consideration of ecosystem-level metrics such as institutional stability, efficiency, and robustness. Empirical studies of this nature focused on investigating dynamic and self-organizing behavior inherent in FE emergence will need novel approaches to integrate key constructs based on data collected from multiple levels.

Recommendations and suggestions

Regarding practical implications, our theorizing is one of the earliest attempts at conceptualizing this as CASs. Any change to an ecosystem can have substantial far-reaching effects from not understanding the emergence of Complexity. Creating a regulatory framework and effective policies for this requires a holistic view that recognizes their Complexity. Although CAS theory is primarily based on concepts and theories that seem abstract and cut off from activities and events in ecosystems, the complex systems-based conceptualization of this has several implications for practice, particularly for the policymakers seeking to establish and nurture an FE. First, in the ever-changing "data economy" characterized by FEs dominated by digital platform models that can mobilize diverse stakeholder groups, there is a possibility of mismanagement and communication breakdown among firms. Hence, FinTech firms need to understand the patterns of FE emergence, the pace of technological change, and the innovations likely to impact the financial landscape. Recent advances in technological trends and regulatory regimes have challenged the conventional vertically integrated financial product and services delivery mechanisms, traditional business models, and hierarchical governance structures. The process model presented here is an essential step for managerial decision-making processes on FE emergence, allowing practitioners to manage FinTech firms and stakeholder expectations effectively. Second, the intersection of evolving customer expectations, business models, technology, and data is undergoing a tectonic shift at a global scale, presenting many opportunities for firms in the financial sector and providing diverse challenges for policymakers and investors. This research serves as a blueprint for practitioners to assess and analyze the stages of ecosystem emergence, different agents, the complex inter-relationships among them, and the environment enabling them to adopt organization-wide culture change, novel data governance mechanisms, and technological and business strategies underpinned by a "compliant by design" approach. Third, current regulatory regimes aim for financial stability by focusing on singular joints in a network, termed the fallacy of composition, which is not an optimal approach as it does not protect the solidity of the entire network. The unitary approach towards regulation will not help new FinTech entrants as it can make it difficult to compete with the incumbent financial institutions. This research highlights the need for a new regulatory management framework where the regulation needs to be dynamic, agile, and proactive based on a mix of different approaches by considering the market conditions, consumer demands, and other types of market players.

REFERENCES

Ahmed, O., & Rahman, B. (2020). Employees of Commercial Banks Learning to Unlearn: A Case Study on The Impact of Electronic Banking in The Commercial Banks of Bangladesh. *International Journal of Business and Technopreneurship, 10*(1), 31-50.

Albarrak, M. S., & Alokley, S. A. (2021). FinTech: Ecosystem, Opportunities, and Challenges in Saudi Arabia. *Journal of Risk and Financial Management, 14*(10), 460.

Ashraf, S. (2019). Intellectual Capital in Fin-Tech Services: A Study on Selected Firms of Bangladesh. *Journal Of Business Studies, XI*(3), 23-38.

Azim, G. I. A. (2019). *Promoting digital finance innovations through regulatory sandbox in Bangladesh: The next steps*. In 1st International FIN-B Financial Inclusion Conference and Inclusion Fair, Dhaka.

Baddam, P. R. (2017). Pushing the Boundaries: Advanced Game Development in Unity. *International Journal of Reciprocal Symmetry and Theoretical Physics*, 4, 29-37. https://upright.pub/index.php/ijrstp/article/view/109

Baddam, P. R. (2020). Cyber Sentinel Chronicles: Navigating Ethical Hacking's Role in Fortifying Digital Security. *Asian Journal of Humanity, Art and Literature*, 7(2), 147-158. https://doi.org/10.18034/ajhal.v7i2.712

Bahrami, H., & Evans, S. (1995). Flexible re-cycling and high-technology entrepreneurship. *California Management Review, 37*(3), 62-89.

Boamah, E. F., Murshid, N. S., & Mozumder, M. G. (2021). A network understanding of FinTech (in) capabilities in the global South. *Applied Geography, 135*, 102538.

Casti, J. L. (1994). Complexification: Explaining a paradoxical world through the science of surprise.

Chakraborti, A. (2020). The promise of FinTech for Bangladesh. The Daily Star, p. 1. Retrieved from https://www.thedailystar.net/business/the-promise-fintech-bangladesh-1602703

Dekkati, S. (2021). Python Programming Language for Data-Driven Web Applications. *International Journal of Reciprocal Symmetry and Theoretical Physics*, 8, 1–10. https://upright.pub/index.php/ijrstp/article/view/90

Dekkati, S. (2022). Automotive Software Engineering: Real-World Necessity and Significance. *Engineering International*, *10*(1), 33–44. https://doi.org/10.18034/ei.v10i1.674

Dekkati, S., Gutlapalli, S. S., Thaduri, U. R., & Ballamudi, V. K. R. (2022). AI and Machine Learning for Remote Suspicious Action Detection and Recognition. *ABC Journal of Advanced Research*, *11*(2), 97-102. https://doi.org/10.18034/abcjar.v11i2.694

Dhar, V., & Stein, R. (2016). FinTech Platforms and Strategy. *SSRN Electronic Journal*.

Drummer, D., Jerenz, A., Siebelt, P., & Thaten, M. (2016). *FinTech – Challenges and Opportunities*.

Ellis, B. S., & Herbert, S. (2010). Complex adaptive systems (CAS): an overview of key elements, characteristics, and application to management theory. *Journal of Innovation in Health Informatics*, *19*(1), 33-37.

Goldstein, I., Jiang, W., & Karolyi, G. A. (2019). To FinTech and beyond. *The Review of Financial Studies*, *32*(5), 1647-1661.

Hasan, R. (2021). Factors Affecting Adoption of Fintech in Bangladesh. *International Journal of Science and Business*, *5*(9), 156-164.

Holland, J. H. (2002). Complex adaptive systems and spontaneous emergence. In *Complexity and industrial clusters*. Physica-Verlag HD. pp. 25-34.

Islam, M. (2019). Seamless Finance and Opportunities Fintech in Bangladesh. *Fintech, 30*(2).

Kaluvakuri, S., & Vadiyala, V. R. (2016). Harnessing the Potential of CSS: An Exhaustive Reference for Web Styling. *Engineering International*, *4*(2), 95–110. https://doi.org/10.18034/ei.v4i2.682

Khan, A. G., Mahmud, M. S., & Lima, R. P. (2020). Investigating the relationship between service quality and customer satisfaction of BKash in Bangladesh. *International Journal of Financial Services Management*, *10*(1), 1-17.

Kolesova, I. V., & Girzheva, Y. S. (2018). Impact of financial technologies on the banking sector. *KnE Social Sciences*, 215-220.

Lal, K., Thaduri, U. R., & Dekkati, S. (2022). Internet of Things and Blockchain Revolutionary Integration in the Business and Financial Sector. *Asian Business Review*, *12*(3), 81–88. https://doi.org/10.18034/abr.v12i3.664

Lao, G., Xiao, L., Wang, Q., & Qin, Z. (2008). Research on organizational knowledge sharing framework based on CAS theory. In *2008 International Conference on Service Systems and Service Management*. IEEE. pp. 1-6.

Lee, I., & Shin, Y. J. (2018). Fintech: Ecosystem, business models, investment decisions, and challenges. *Business Horizons*, *61*(1), 35-46.

Lissack, M. R., & Letiche, H. (2002). Complexity, emergence, resilience, and coherence: Gaining perspective on organizations and their study. *Emergence, A Journal of Complexity Issues in Organizations and Management*, *4*(3), 72-94.

Mahadasa, R. (2016). Blockchain Integration in Cloud Computing: A Promising Approach for Data Integrity and Trust. *Technology & Management Review*, *1*, 14-20. https://upright.pub/index.php/tmr/article/view/113

Mahadasa, R. (2017). Decoding the Future: Artificial Intelligence in Healthcare. *Malaysian Journal of Medical and Biological Research*, *4*(2), 167-174. https://mjmbr.my/index.php/mjmbr/article/view/683

Mahadasa, R., & Surarapu, P. (2016). Toward Green Clouds: Sustainable Practices and Energy-Efficient Solutions in Cloud Computing. *Asia Pacific Journal of Energy and Environment*, *3*(2), 83-88. https://doi.org/10.18034/apjee.v3i2.713

Mahadasa, R., Surarapu, P., Vadiyala, V. R., & Baddam, P. R. (2020). Utilization of Agricultural Drones in Farming by Harnessing the Power of Aerial Intelligence. *Malaysian Journal of Medical and Biological Research*, *7*(2), 135-144. https://mjmbr.my/index.php/mjmbr/article/view/684

Mandapuram, M., Mahadasa, R., & Surarapu, P. (2019). Evolution of Smart Farming: Integrating IoT and AI in Agricultural Engineering. *Global Disclosure of Economics and Business*, *8*(2), 165-178. https://doi.org/10.18034/gdeb.v8i2.714

Mueller, J., Zapkau, F. B., & Schwens, C. (2014). Impact of prior entrepreneurial exposure on entrepreneurial intention—cross-cultural evidence. *Journal of Enterprising Culture*, *22*(03), 251-282.

Muthukannan, P., Tan, B., Gozman, D., & Johnson, L. (2020). The emergence of a fintech ecosystem: A case study of the Bangladesh Fintech Valley in India. *Information & Management*, *57*(8), 103385.

Nuyens, H. (2019). How disruptive are FinTech and digital for banks and regulators? *Journal of risk management in financial institutions*, *12*(3), 217-222.

Puschmann, T. (2017). Fintech. *Business & Information Systems Engineering*, *59*(1), 69-76.

Rahman, A. M. (2020). bKash vs. Bank-led Option: Factors Influencing Customer's Preferences–Does it Warrant Voluntary-Insurance-Policy for Rapid-growth Digital-banking in Bangladesh-economy? *Journal of Banking and Financial Economics, 1*(13), 51-69.

Rahman, S. S., & Dekkati, S. (2022). Revolutionizing Commerce: The Dynamics and Future of E-Commerce Web Applications. *Asian Journal of Applied Science and Engineering*, *11*(1), 65–73. https://doi.org/10.18034/ajase.v11i1.58

Ravenswood, K. (2011). Eisenhardt's impact on theory in case study research. *Journal of Business Research*, *64*(7), 680-686.

Rouf, M. A., Babu, M. A., Khatun, M. A., Rasel, M., & Kumar, A. (2019). Measuring Customer's Satisfaction Level and Service Gap Between bKash and Rocket in Bangladesh.'. *American journal of marketing research*, *5*(2), 29-35.

Rouse, W. B. (2007). Complex engineered, organizational and natural systems: Issues underlying the Complexity of systems and fundamental research needed to address these issues. *Systems engineering*, *10*(3), 260-271.

Surarapu, P., Mahadasa, R., & Dekkati, S. (2018). Examination of Nascent Technologies in E-Accounting: A Study on the Prospective Trajectory of Accounting. *Asian Accounting and Auditing Advancement*, *9*(1), 89–100. https://4ajournal.com/article/view/83

Vadiyala, V. R. (2017). Essential Pillars of Software Engineering: A Comprehensive Exploration of Fundamental Concepts. *ABC Research Alert*, *5*(3), 56–66. https://doi.org/10.18034/ra.v5i3.655

Vadiyala, V. R., & Baddam, P. R. (2017). Mastering JavaScript's Full Potential to Become a Web Development Giant. *Technology & Management Review*, 2, 13-24. https://upright.pub/index.php/tmr/article/view/108

Vadiyala, V. R., Baddam, P. R., & Kaluvakuri, S. (2016). Demystifying Google Cloud: A Comprehensive Review of Cloud Computing Services. *Asian Journal of Applied Science and Engineering*, *5*(1), 207–218. https://doi.org/10.18034/ajase.v5i1.80

Zapkau, F. B., Schwens, C., Steinmetz, H., & Kabst, R. (2015). Disentangling the effect of prior entrepreneurial exposure on entrepreneurial intention. *Journal of Business Research*, *68*(3), 639-653.

--0--

How to cite this article