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Simulation of the effect of COVID-19 outbreak on the development of branchless banking in Iran: case study of Resalat Qard–al-Hasan Bank

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Abstract

Purpose – COVID-19 has become a global challenge with a significant rate of prevalence, and it has exerted devastating consequences in epidemic, economic and social terms. Therefore, a number of studies have already been, or are now being, conducted on the detrimental effects of the virus. In this respect, a question may arise: Is there any possibility to turn the threat of the virus outbreak into an opportunity in some sectors such as the banking industry? In this research, the effects of COVID-19 outbreak as an intervening element on the acceptance of branchless banking were studied.

Design/methodology/approach – In this research, the factors affecting the acceptance and development of branchless banking in Iran at the time of COVID-19 outbreak were identified by systematically studying the theoretical framework, conducting further research and interviewing the experts; then, a causal loop diagram of the problem in the proposed case study and the flow rate model were presented.

Findings – The simulation results showed that banking transactions and a bank's financial resources would increase by implementing the package policy of reducing the number of branches, promoting incentive policies and increasing the budget rate of the bank in Information Technology (IT). Further, by promoting customers' acceptance of new technologies, the spread of COVID-19 can be viewed as a positive factor, or even a catalyst, in the acceptance and development of branchless banking in Iran.

Originality/value – Based on the proposed model, the difficulties faced by individuals during the spread of COVID-19 could act as justifiable incentives to boost appropriate organizational preparations for making changes to the classic working processes. Processes such as telecommuting, job rotation and so on are among these changes.

Keywords Technology acceptance model, Branchless banking, COVID-19, System dynamics modeling approach

Paper type Research paper

Introduction

The outbreak of COVID-19 not only represents a major health crisis but also changes the structure of the global economic order. The shock to our lives resulting from the economic

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consequences of the measures taken to control the virus has been unprecedented over the last century. Further to that, apart from the recent crisis, an overview of digital developments in the banking industry suggests that the role of banks in the financial sector has changed considerably (Chipeta and Muthinja, 2018) and, in turn, altered the preferences and demands of customers (Adel Zaffer *et al.*, 2019). Currently, customers are more willing to use digital operating systems to attend to their banking-related activities (McKinsey & Company, 2016). Novel financial technologies allow banks to efficiently provide their customers with more exclusive services at any time and geographical locations. New banking technologies and tools can facilitate customers' collaboration with them and promote their loyalty (Abualsauod and MajedOsman, 2019). The growing customer involvement allows banks to be more efficient and cost-effective (Wang *et al.*, 2019).

One of the most important dimensions of the fourth-generation banking following the industrial revolution is branchless banking, which is a step beyond electronic banking. E-banking tools first reduce customers' need to visit branches, and the latest novel tools seek to remove branches in their traditional form. However, it is not possible to develop new banking channels and technologies without customers' acceptance, the conditions of which may vary based on environmental and cultural conditions (Hassan and Wood, 2020). In the case of the United Kingdom, Moutinho and Smith (2000) found that customers considered convenience and simplicity as their top priority in E-banking. Karjaluoto *et al.* (2002) concluded that Finnish customers' previous experience of using E-banking services was the most important factor in the acceptance and use of E-banking. Suh and Han (2002) showed that trust represented one of the major factors influencing customers' attitudes toward the use of E-banking services in Korea. In the case of Malaysia, it was found that the perceptual ability, feasibility and previous experience of using E-banking services were among the most notable factors in the E-banking acceptance (Guriting and Ndubisi, 2006). Hosseini *et al.* (2015) simulated the acceptance of new technology in Iran and showed that habit as a notable variable regarding the use of technology had a significant role in the acceptance of E-banking in Iran. Tran and Comer (2016) demonstrated that the intention to use E-banking services and their utility and benefits for customers in New Zealand were of priority. Zhang *et al.* (2018) studied 62 samples from 27 countries and regions and showed that some characteristics of every national culture could impose negative impact on the acceptance of E-banking.

A majority of studies in this field have focused primarily on the development and adoption of technology, while the technical development of a particular technology regardless of the factors affecting its acceptance by users would reduce the capabilities of a system and waste a great deal of resources of an organization and a country. Therefore, it is critical to consider the issue of technology acceptance and development systematically and simultaneously. Of note, to implement branchless banking, the banking service supply chain should be redesigned in such a way that personal visits would not be necessary; to this end, various electronic banking tools should be developed and accepted by customers. This research investigates the acceptance and development issues regarding E-banking.

In the wake of COVID-19 outbreak, there have been various reports on this epidemic, mostly on the destructive effects of the virus. However, the question is: Could this epidemic turn into an opportunity? McKenzie Company reported that this crisis would not only reveal systematic vulnerabilities but also provide opportunities to improve the performance of businesses. This study attempts to answer the following questions:

(1) What is the impact of COVID-19 epidemic as an external intervening element on customers' acceptance and development of branchless banking?

(2) What is the impact of implementing the policy of reducing the number of branches on customers' acceptance and development of branchless banking?

(3) What is the impact of the bank's incentive policies on customers' acceptance and development of branchless banking?

(4) What is the impact of implementing the policy of increasing the bank's capital budgeting in the IT sector on customers' acceptance and development of branchless banking?

This paper studies Resalat Qard–al-Hasan Bank, which is one of the leading banks in providing all types of E-services. This research primarily focuses on technology acceptance model (TAM; Davis, 1989) and Rogers' innovation diffusion model (Source: Rogers, 1995) and then, presents a compound model of the acceptance and development of branchless banking through system dynamics modeling with particular emphasis on the outbreak of COVID-19 as an external intervening element.

Theoretical frameworks

Technology acceptance model (TAM)

Various models have been proposed so far to investigate different factors influencing customers' technology acceptance (Kripanont, 2007). Some of the most important models include theory of reasoned action (TRA) (Fishbein and Ajzen, 1975), innovation diffusion theory (IDT) (Rogers, 1995), technology acceptance model 1 (TAM1) (Davis, 1989), theory of planned behavior (TPB) (Ajzen, 1991) and technology acceptance model 2 (TAM2) (Venkatesh and Davis, 2000).

Among the various technology acceptance models, the TAM is one of the most widely used technology acceptance models provided by Davis. As observed in Figure 1, perceived ease of use and perceived usefulness are the basic features of the TAM model.

In 2000, Venkatesh and Davis developed the original "theme" model to which new theoretical structures were added including social effects and cognitive tool processes to examine the voluntary and compulsory use of technology. Numerous studies proved the relationship between the variables of the technology acceptance model, showing that this model enjoys a very capable analytic capability (Wang *et al.*, 2003; Singh *et al.*, 2006; Cho, 2007; Hernandez *et al.*, 2008; Hossain and Silva, 2009; Nasri and Charfeddine, 2012; Pandey *et al.*, 2015; Setiyono *et al.*, 2019). Therefore, this study proposes a model based on TAM and the IDT.

The IDT was proposed by Rogers in 1991. He considered innovation acceptance as a process of gathering information and reducing uncertainty with respect to the technology evaluation model. Individuals' perceptions of technology including comparative advantage, compatibility, complexity, testability and observability determine their intention and decision to use technology.

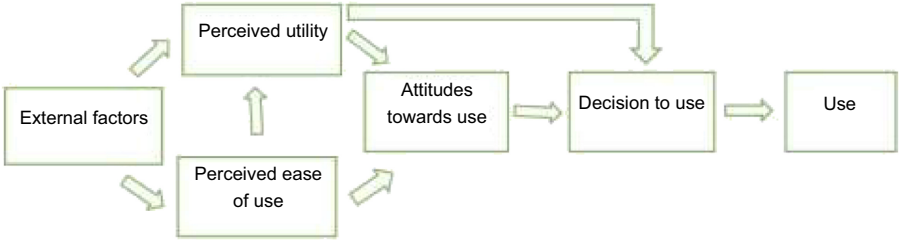

Figure 1.
The initial model of TAM acceptance (Davis, 1989)

Branchless banking

The concept of branchless banking (or direct banking) is an almost new concept, the implementation of which is a large step in entering the industry 4.0. A direct bank (sometimes referred to as a branchless bank, a virtual bank, an Internet bank or an Internet-only network) is a bank operating without any branch network that offers its services remotely through online banking and telephone banking or an independent banking network and service delivery. Access can also be provided through ATMs (often through interbank network alliances) and mail and mobile (Wang *et al.*, 2019).

One of the important indicators in this regard is the ratio of the number of branches to the country's population. Regardless of different regions, although people in Iran have access to a considerable number of bank branches, the efficiency of these branches is unsatisfactorily low. Global reports show that the operational continuity of traditional branches has been recently questioned, and the number of branches per 100,000 people has dramatically declined. In Figure 2, the diagrams on the right and left show statistics for the related bank branch shutdowns in Europe and Iran, respectively.

Branchless banking offers great potential for expanding the distribution of financial services to individuals with no access to traditional networks of bank branches (Dzombo *et al.*, 2017). The smaller number of branches is the new benchmark in the banking industry, which is ensured mainly through agents and IT applications. It has been anticipated that the global mobile payment market would reach $50.56m by 2026 and further develop from 2019 to 2026.

Three types of branchless banking are distinct from the main owner or those business owners that offer different BB services (Mas, 2009). The first model is run by a mobile network operator called MNO and is characterized by a strong distribution channel and many customers who are generally unacquainted with banks. These individuals are sometimes called "the unbanked." The main drawback of this model is its inability to implement the main banking process.

The second model is a bank-led model that is created based on the principle of the banking institution. Banks are licensed and supervised by the central bank. They also develop risk management systems and advanced fraud detection skills.

The third case of the BB model is managed by a third party. This model can help ensure balanced cooperation and viable partnership among banks, telecommunications companies and other member partners. However, the downside of this model is that the latter organizations may not be as powerful as larger banks and telecommunications companies.

How to study the impact of COVID-19 on the acceptance and development of branchless banking and build intellectual bases to achieve the research model

The application of the process of defining a concept or a theory related to social issues in a way that makes the concept clearly recognizable, measurable and understandable in terms of empirical observations requires in-depth analysis. To interpret how a pervasive social phenomenon such as a virus outbreak functions, it is required to examine the issue in social, economic and personal terms.

Since the start of COVID-19 outbreak, according to the latest statistics (up to April 18, 2020), 2,250,790 individuals have been infected and 154,266 have died around the world. In Iran, 80,868 individuals have been infected and 5,031 individuals have died, respectively. In Iran, more than 3,000 bank employees have been infected, 42 of whom have lost their lives. Besides, this outbreak has had and will have further economic repercussions. The following table shows the analysis done by several reputable international organizations in this regard (see Table 1).

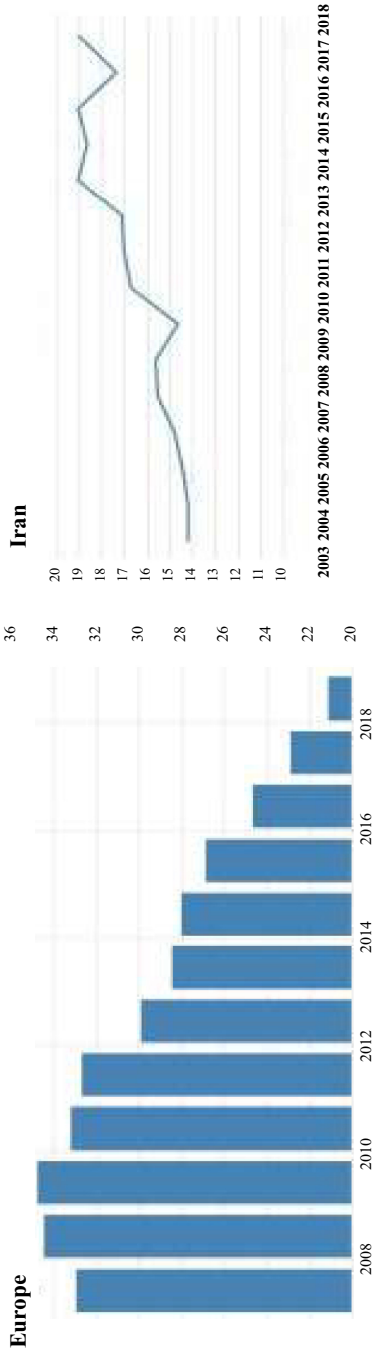

Figure 2.
The number of bank branches in the world and Iran (Banker site, 2019)

Organization	Description of COVID-19	COVID-19 effects on the global economy/market in 2020	
World Bank, IMF	Human tragedy, grave economic challenges	Reduction by more than a one-unit percentage	
OECD	The most fatal risk after the 2008 crisis	Reduction by more than a one-and-a-half unit percentage	
McKinsey & Company	First contemporary tragedy	Rapid recovery scenario	Reduction of economic growth to 2%
		Decreasing rate of growth scenario	Reduction of global economic growth to 1–1.5%
		Widespread contagion and global recession scenario	Global economic recession within the domain of +0.5 to −1.5%
National Research Institute for Economic Policymaking	Exacerbation of human pain and agony all over the world	Reduction in the domain of 0.5–1%	

Table 1.
Economic effects of COVID-19 outbreak in the world (http://iccima.ir/)

The spread of the virus has had considerable repercussions on the world's financial markets. The following table shows the fall of the world's stock markets, including the Hong Kong and US stock markets, over the news of COVID-19.

Since the spread of COVID-19 in Europe and the United States, numerous organizations have been swiftly reviewing and preparing their countermeasures. In fact, effective solutions to this problem are not easy to find due to the following reasons: first, the dynamic of this disease is not predictable; second, simple instructions to take control over this pandemic have not been provided by governments or international organizations. Although conditions differ from country to country, there is still an opportunity for many companies to share their experiences. The Iranian government has allocated 20% of its budget (100,000bn Tomans) to counteract the effects of COVID-19. Three-month deferment of installments of bank loans, providing support packages and monthly allowances for low-income groups, imposing restrictions on working hours of banks and organizations and so on are some of the effective measures taken by the government so far.

The present study aims to investigate the effects of COVID-19 outbreak on the acceptance and development of branchless banking in Iran. To this end, the variables involved in the relationship between the structures of the proposed analysis model have been identified, as shown in the following table (see Table 2).

Research methodology

Given that the process of accepting and developing new technologies is formed over time, the proposed research model is formulated by using the system dynamics approach. Backed by its analytical and critical approach to the modeling process, system dynamics can provide a better understanding of the system structure. The system dynamics modeling process comprises six main steps, as presented in Figure 3.

As shown in Figure 3, the first step in modeling the dynamics of a system is to recognize the system itself and understand the problem; then, the relationships and dynamics of this model are presented. In the next step, a number of related variables and corresponding mathematical relationships are defined, and the model simulation is performed. Finally, after testing the model and examining different scenarios on the dynamic model, the best policies on the functionality of the desired system are found.

	Factor	Source
1.	Perceived ease of use, perceived utility, attitude to use, willingness	Davis (1989), Hernandez *et al.* (2008), Hossain and Silva (2009), Pandey *et al.* (2015), Inegbedion (2018), Setiyono *et al.* (2019)
2.	Notification and awareness	Rogers (1995), Pikkarainen *et al.* (2004), Totolo (2007), Hamner and Qazi (2009), Reis *et al.* (2011), Vuković *et al.* (2019), Jiménez and Díaz (2019)
3.	Habit	Limayem *et al.* (2001), Ivano (2008), Park *et al.* (2009)
4.	Trust and satisfaction	Lee and Lin (2005), Cho (2007), Pandey *et al.* (2015), Hamid *et al.* (2018), Setiyono *et al.* (2019)
5.	Quality and technical support	Venkatesh and Davis (2000), Jong-Ae (2005), Vathanophas *et al.* (2008), Gu *et al.* (2009), Ali *et al.* (2017)
6.	Policies and rules	Nasri and Charfeddine (2012), Sunny *et al.* (2019), Osman *et al.* (2019)
7.	Cultural norms and conditions	Straub *et al.* (1997), Anandarajan *et al.* (2000), Zhang *et al.* (2018), Hassan and Wood (2020)
8.	Technological development of banks	Neuberger (1997), Sullivan and Wang (2005), Yuliaty *et al.* (2017), Adeel Zaffar *et al.* (2019), Shahabi and Faezy Razi (2019)

Table 2.
The main variables involved in the acceptance and development of the technology (comments of the model supporters)

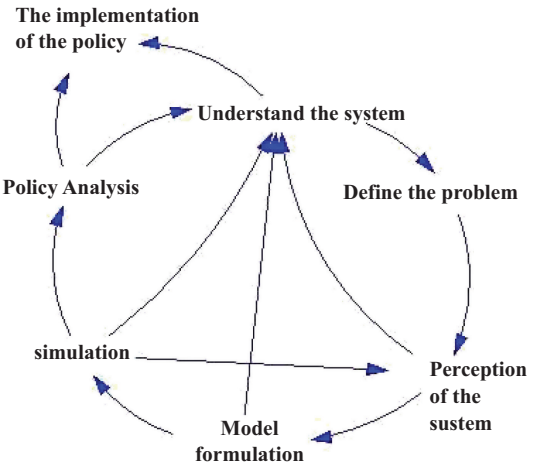

Figure 3.
System dynamics modeling process (Richardson and Pugh, 1981)

Dynamic hypotheses

After extracting those variables that affect the system, the modeling of the existing interactions begins. Thus, the extracted variables and their relationships are expressed in the form of dynamic hypotheses. Based on the observations made from the reference diagrams, the theories borrowed from the literature and the information obtained from the interview with the experts, the following assumptions can be expressed in the following phrases. To design these hypotheses, two supportive theories were considered: Davis' Technology Acceptance Model (1989) and Rogers' Innovation Diffusion Model (1995).

H1. COVID-19 pandemic condition can positively raise awareness and willingness of common customers (driven by the new attitude of using E-banking and bank incentive policies) concerning E-banking services and reduce personal visits to bank branches, thereby reducing the risk of infection (circle of awareness and motivation).

H2. Using electronic services increases banking transactions and revenue significantly, which in turn leads to the growth of the financial resources of a bank. In addition, electronic banking equipment is developed through investments, which improves the quality of the system, brings about customer satisfaction and ensures the continuity of and willingness for the frequent use of E-banking services (circle of reception and development).

H3. The number of branches is directly related to the customers' personal visit, which increases branch costs. Therefore, reducing the number of branches will lead to less personal visits and significant cost-effectiveness for a bank (circle of branchless banking).

The dynamic model of acceptance and development of branchless banking with COVID-19 outbreak as an intervening element

Figure 4 shows the causal loops of the E-banking acceptance and development model with COVID-19 as an intervening role. The case study here is Gharz-al-Hasna Resaalat Bank as the leading bank in providing E-services under the motto of branchless banking. The involved variables were determined based on systematic studies, research records and experts' opinions. Of note, many variables were not included in this model due to their negligible impact on the simulation time. In the cases examined by the system dynamics modeling approach, the causal loops help determine the dynamic relationships within the problem (Sterman, 2000).

Given that the present study is tasked with investigating the acceptance and use of new technology as a process over time and that the effects of the model components on technology acceptance and development and on each other have been received with high regard, the application of dynamic system modeling is properly justified. The casual loops are presented in the form of a dynamic model. The aforementioned model illustrates that while the development of technology is strongly influenced by the customers' level of acceptance of it,

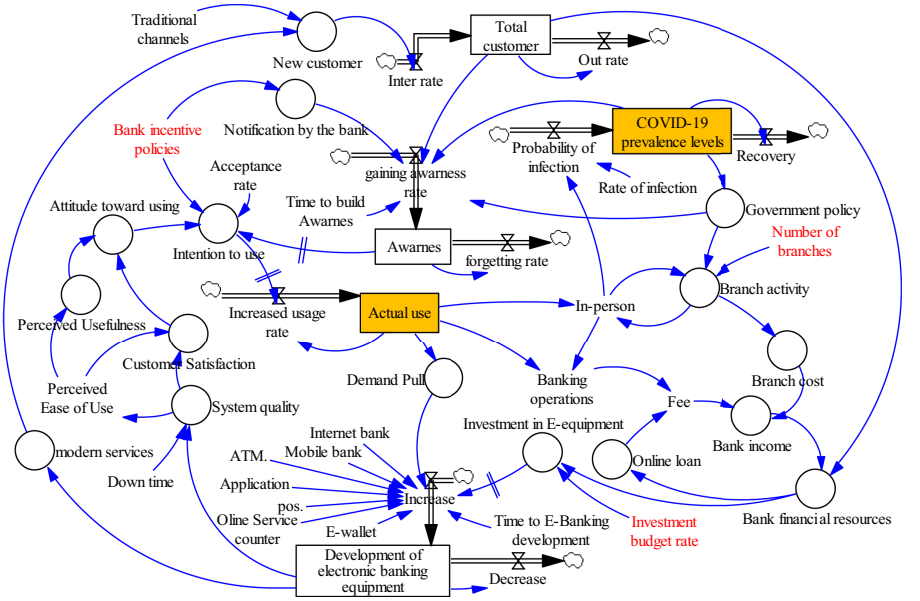

Figure 4.
The casual model of acceptance and development of E-banking with COVID-19 as an intervening role

the tendency to use E-banking tools is affected by the customers' level of awareness of such services, especially during COVID-19 pandemic. Other relations are clearly given in the aforementioned model.

Model formulation

The first step in formulating a model is to create flow state charts for the causal loops of the analysis model (Sterman, 2000). The dynamic system simulation model was developed in Vensim PLE environment; then, the model variables including accumulation, rate, auxiliary, exogeneity and temporality variables along with the instructions given to calculate them were presented. Experts, especially those who were familiar with modern banking and system dynamics, contributed to the formation of the formulas through their opinions. The coefficients and constant values were calculated using the previous statistics of the bank under study and the experts' opinions. Given that it takes a month to prepare the reports and review the results of the rate of banking transactions as a basis for the actual acceptance of E-banking, the time unit and the length of the simulation were considered one month and one year, respectively, until the end of the fiscal year.

Simulation parameters
FINAL TIME = 1
Units: year
Simulation algorithm: Euler's method
Step size (dt) = 1 month
The final time for the simulation.
INITAL TIME = 0

Explanation: Resalat Qard–al-Hasan Bank intends to reduce the number of its branches to zero by the end of 2020 (end of the simulation period). The bank has commenced this process since 2013 and, ever since, with a fivefold increase in resources, it has managed to reduce 39% of its branches and develop necessary infrastructure to provide E-services, from opening an account to allocating services. In this regard, the bank under study is one of the leading banks in Iran.

Figure 4 shows the flow rate model of the acceptance and development of branchless banking in which the variables such as (accumulation), rate (flow), auxiliary, exogeneity and temporality are presented.

Model validation

The following tests were performed to validate the model:

(1) Limit comparison test: This test examines whether the model still behaves correctly when the fixed values or parameters tend to zero or infinite (Sterman, 2000).

The validity of the proposed behavioral model was confirmed through this method such that the variable of investment in the bank's information technology would reach zero at the end of the first year with a ramp function and that the actual level of using electronic tools would tend to zero. The following chart confirms this claim. As is clear, with a time divergence following a sharp decline in the investments made in the bank's IT, the actual use of electronic devices has plummeted to almost zero, but never to zero due to the capabilities of the tools available on the banking network (see Figure 5).

(2) Model structure test: Does the model structure match the existing knowledge about the system?

The variable behavior of using electronic tools (the number of electronic tool transactions) in simulating the basic model was S-shaped, which is very similar to the variable behavior of the

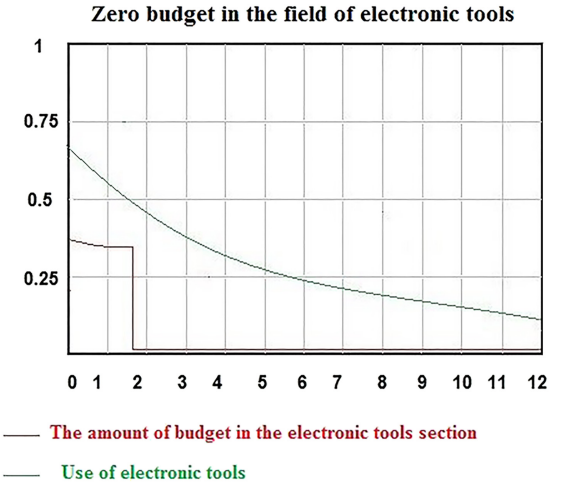

Figure 5.
Limit comparison test

present research. Usually, the growth of variables such as use, learning, population growth and industrial growth follows an S-shaped pattern (Sterman, 2000). Figure 6 shows the system behavior in diffusion of innovation. Moreover, the infectious disease transmission model is characterized by an S-shaped pattern.

This type of growth is a combination of exponential growth and asymptotic growth due to positive and negative feedbacks, respectively. Asymptotic growth occurs due to a change in the polarity of the circle after the turning point or a change in the dominance of the two positive and negative interacting circles.

Figure 7 shows the variable behavior of using electronic tools in simulating the basic model (before implementing the policy).

(3) Re-behavior test: The main purpose of running the re-behavior test is to compare simulation results with real data to ensure the correctness of behavior pattern

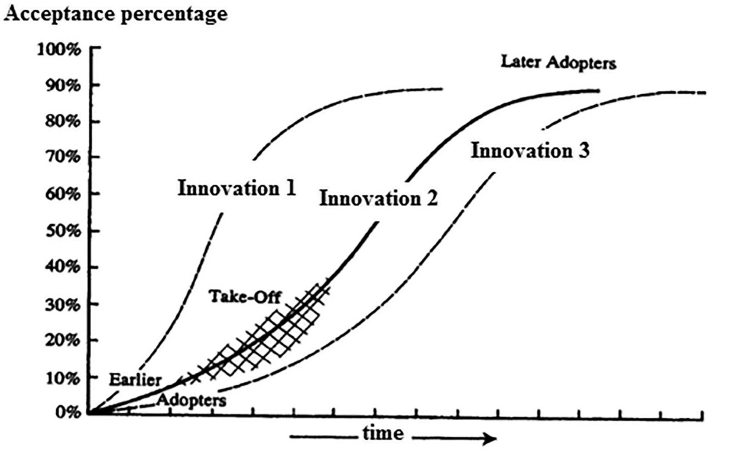

Figure 6.
Innovation diffusion (percentage of acceptance over time) (Rogers, 1995)

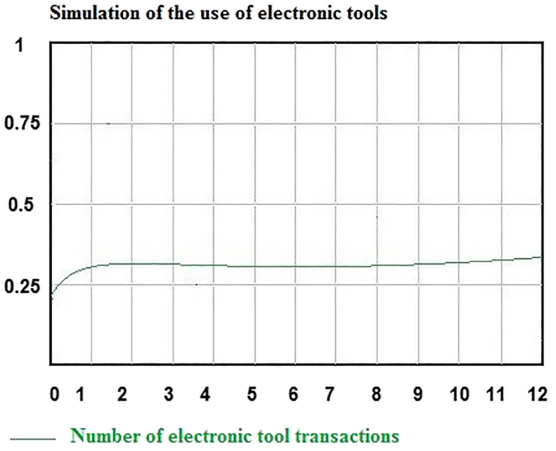

Figure 7.
Variable behavior of using electronic tools in the basic model

function. In this section, the variables of COVID-19 prevalence and transaction rate are examined based on the officially published statistics (see Figures 8–11).

- Comparison of the actual statistics of infection and simulation of infection rate.
- Comparison of the actual statistics of the number of transactions and simulation of the number of transactions.

Simulation and its results

The simulation of the variables in the dynamic system begins with the simulation of the base model. In the basic simulation, no change occurs in the condition of the pattern variables. In fact, the basic simulation shows the basic behavior of the pattern variables using their given initial values. However, in the case of simulation with various scenarios, the behavior of the pattern variables is examined when the situation changes. In order to study the system behavior, accumulation variables are considered as the basis in this study.

The main assumptions used in the simulation are given as follows:

(1) The boundary of the research model concerning the interorganizational relationships of the bank under study with the intervening role of COVID-19 is considered first.

(2) The rate of budget allocation to investing in the development of electronic banking equipment over the last two years has been about 55% on average according to the costs listed in the bank's financial statements.

$$\mathrm{IIIE} = \frac{1}{1 + \mathrm{EXP}(-g^{*}(B + \mathrm{BFR}))}$$

The constant "g" as a fractional growth defined by Sterman (2000) is the slope of the growth curve.

(1) The incubation time of the COVID-19 in Iran, according to the Ministry of Health, is estimated to be 5–14 days, with no symptomatic transmission for five days. The percentage of the population susceptible to the disease and its transmission rate within the country are 60% and 3.4%, respectively.

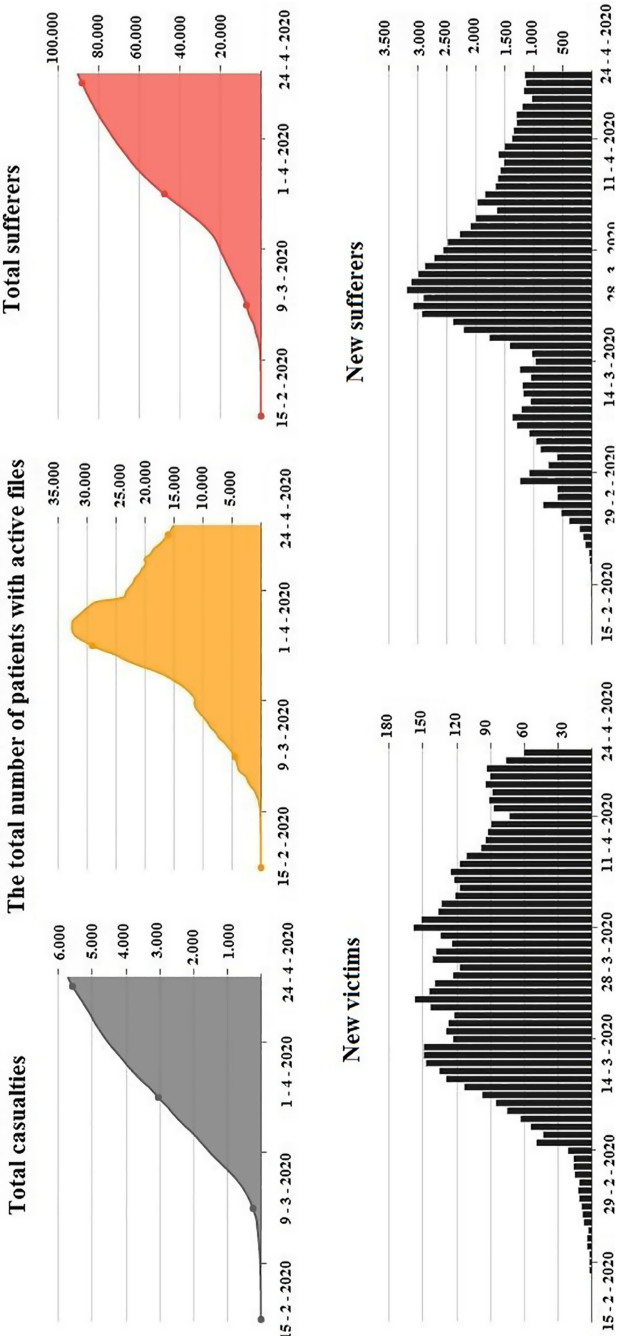

Figure 8.
The trend of the number of COVID-19 cases in Iran

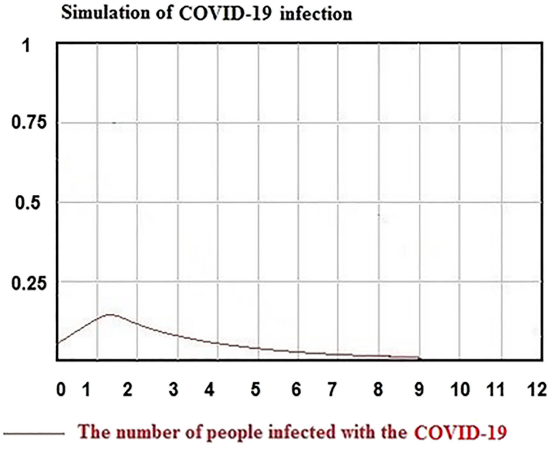

Figure 9.
Simulation of the infection rate in Iran

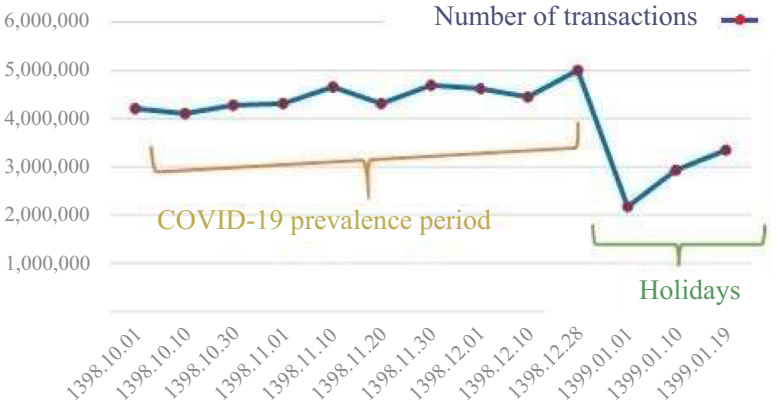

Figure 10.
The actual total number of electronic tool transactions

(2) The impact factor of COVID-19 outbreak on public awareness was considered 30% based on interviews with the media experts and the level of awareness provided by mass media and social networks; further, the reduction coefficient of branch activities is 35% because the banks have served people with one-third capacity during the outbreak of COVID-19.

(3) The simulation was performed in a one-year time frame from March 2017 to the end of March 2012.

(4) The development of electronic equipment in the bank is considered to be a predominantly internal process according to the research objectives studied during a limited time interval.

(5) All statistics and information used in this simulation were extracted from the performance statistics report and interviews with the managers of the bank under study, and other information was obtained based on the statistics of international and domestic organizations.

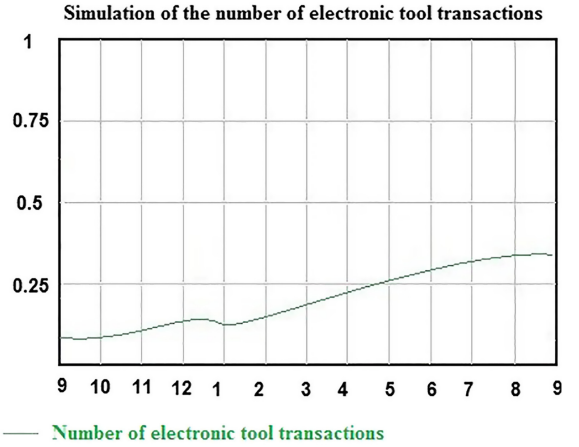

Figure 11.
Simulation of the number of electronic tool transactions

(6) Policy (leverage) variables were taken into consideration based on upstream documents and accurate bank strategies.

(7) In the simulation model, no independent or unintended development was made for increasing customers' awareness and willingness to use E-banking. Only deliberate and well-formulated attempts may promote and realize these factors.

(8) The timeframe for temporal variables was determined based on global and domestic studies and adapted to conditions specific to Iran.

(9) Given that one cannot define an explicit equation to illustrate the relationship between two qualitative variables, the lookup variable was used instead. Then, by defining the ordered pairs of data as (y, x), which are obtained through past data or expert opinions for two regular variables, the software draws a diagram out of the previous data (see Figure 12).

The simulation of the base model shows that if the current situation (without a special scenario) keeps going on, the application of electronic tools to banking will increase by about 20% in one year. This suggests that the development rate of E-banking will increase by 25% in a year. However, some policies may affect this growing trend, too.

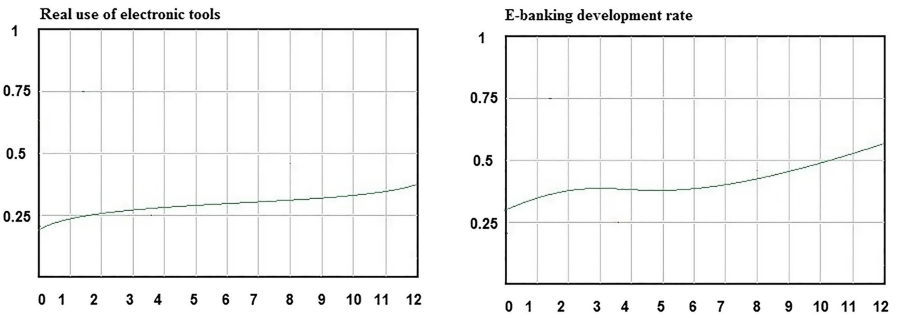

Figure 12.
Simulation results of the base model

Investigation of different scenarios

In the process of simulating dynamic patterns, the variables and parameters controlled by planners and policymakers may change based on different scenarios. This will facilitate a better understanding of the system behavior and the decision of policymakers in the real world. The results of implementing these scenarios can be analyzed after model completion. To design scenarios, first, the leverage points of the problem are identified. According to the variables in the cause-and-effect model and the experts' recommendations, the leverage points of the dynamic model of acceptance and development are as follows:

(1) Bank's incentive policies during the outbreak of COVID-19

(2) Reduction in the number of branches

(3) Increasing the investment budget in E-banking

Besides, variables such as the number of transactions, personal visits and so on are the primary variables used in studying the effects of policy implementation.

(1) Implementing incentive policies on E-banking tools during COVID-19 outbreak

All interviewed individuals agreed that the necessity of greater customer notification and other incentive programs to keep customers interested in E-banking should be prioritized. In this case, the rate of customer notification in a year will increase from 20% to about 30%. Figure 13 demonstrates how this policy is implemented.

The effects of implementing this scenario on the behavior of base variables are presented in Figure 14.

As shown in Figure 14, the usage level of electronic devices increased from 20% to 50% in a year. Moreover, the level of E-banking development increased from 30% to 60% in a year. Of note, in order to achieve the desired goals, implementation of this policy alone is not enough; thus, other possible policies must be simultaneously taken into account.

(2) Scenario 2 – the policy of reducing the number of branches

This policy is one of the approved and ongoing policies of Resalat Qard–al-Hasan Bank. It has been estimated that the number of its branches would reduce to zero by the end of March 2021 (research simulation period).

Figure 15 clearly demonstrates how this policy is implemented.

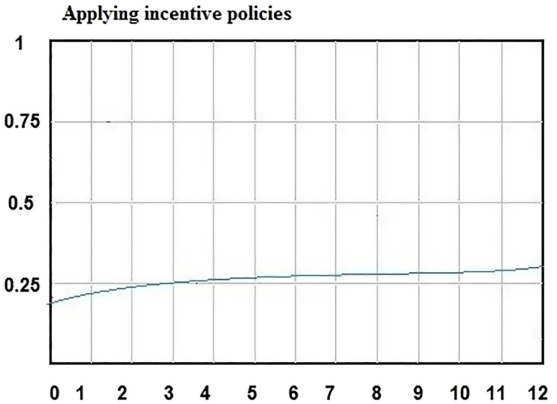

Figure 13.
Implementation of the notification policy

The implementation of this policy will significantly promote the use of electronic devices (from 20% to 60%) and, thus, develop E-banking (from 30% to 60%); however, the real effects of implementing this policy will be visible at its peak in the coming year, as shown in Figure 16.

(3) Scenario 3 – policy of increasing the investment budget for the development of E-banking

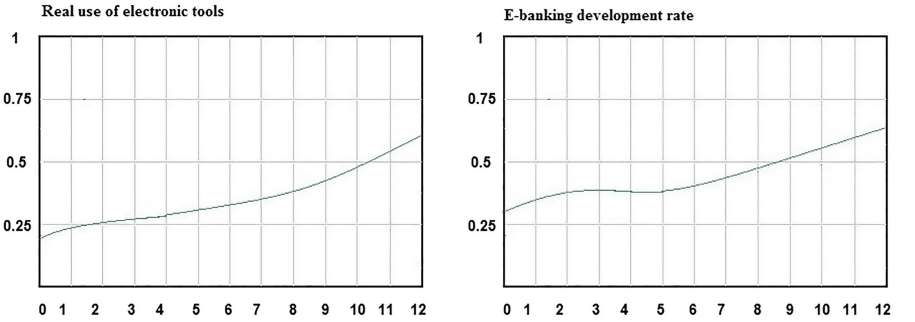

Figure 14.
The effect of the implementation of notification policy on the base variables

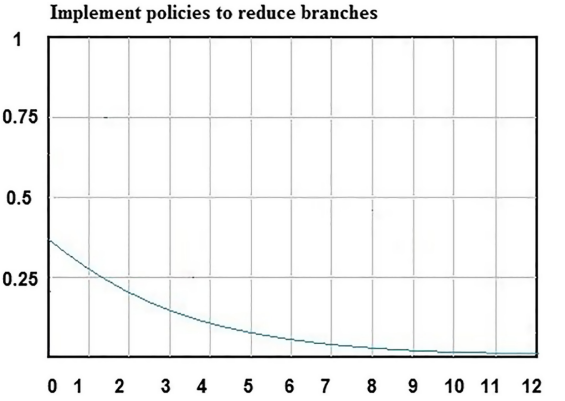

Figure 15.
Policy of branch reduction policy

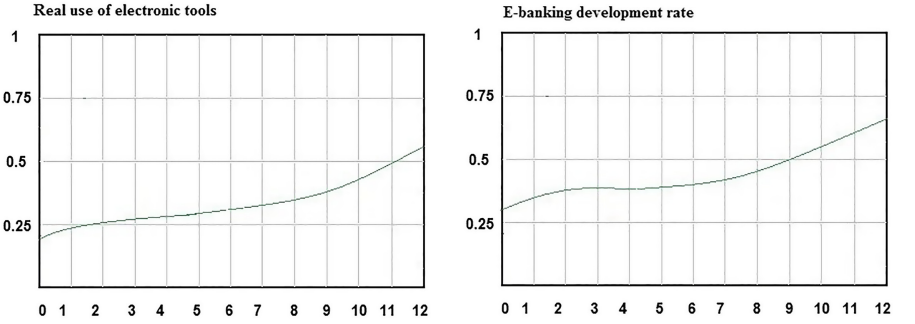

Figure 16.
The effect of implementing branch reduction policy on a base variable

All managers and experts of banking networks unanimously emphasize the necessity of this policy and believe that implementing it in this sector will have significant effects on the development of electronic banking. In this respect, this study considered the budget variable in a one-year time frame in the form of the RAMP function and increased the budget by 10% every three months (see Figure 17).

Figure 18 shows how this policy is implemented.

The results of simulating the implementation of this policy show that a 40% increase in investment in the IT sector will increase the usage of electronic devices from 20% to 75% over the course of a year. In addition, the rate of the development of E-banking will increase from 30% to 80%.

(4) Scenario 4 – a compound scenario

Given that the proposed scenarios do not contradict each other and that their simultaneous implementation is interdependent, they can be combined to form a package policy. Thus, as shown further, through simultaneous implementation of the proposed policies, dynamic capabilities and network output will be significantly enhanced. Figure 19 shows the implementation of the compound policy that comprises a reduction in the rate of shift or any changes in management and network experts, an increase in the number of joint meetings and the allocation of greater specific budget to networks.

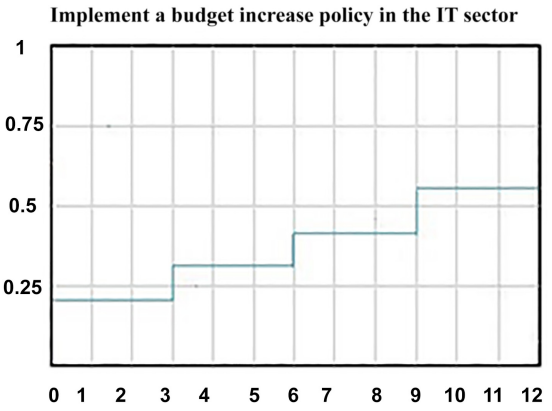

Figure 17.
Budget increase policy

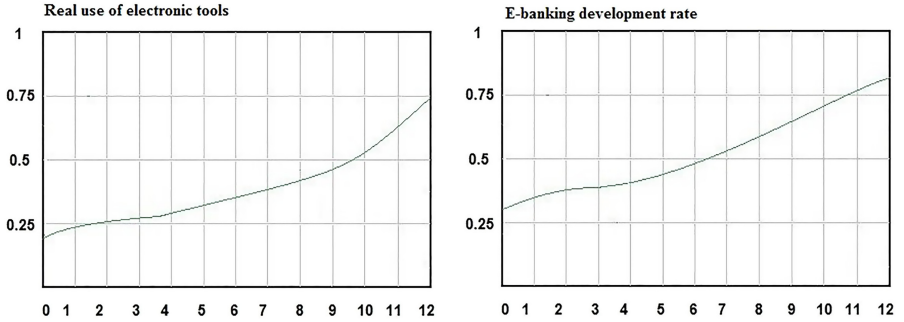

Figure 18.
The effect of implementing budget policy on the base variables

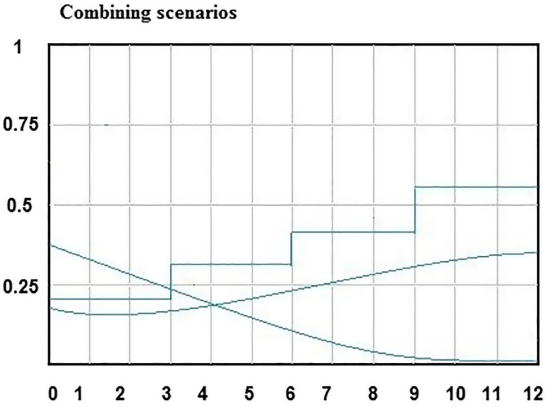

Figure 19.
Implementing the policy package

Figure 20 presents how the policy package is implemented (simultaneous implementation of the three scenarios).

The results show that this package policy is effective in practice since it improves the level of the base variables. Of note, following the outbreak of COVID-19, the opportunity to use services offered by branchless banking has significantly increased; however, given the effect of a marked change in the attitude and willingness of customers toward E-banking services, even with a considerable decrease in the rate of infection over time, the growth rate of E-banking services will not decrease significantly. This demonstrates the considerable positive effect of COVID-19 outbreak on customers' attitudes and willingness regarding the use of E-banking, which will remain unchanged even after the outbreak. This pandemic will remain an impressive turning point in the history of branchless banking, provided that the banks take this opportunity and develop their services with proper planning.

The compound policy package presented in this study was found to be in line with the strategy of Resalat Qard–al-Hasan Bank. The bank intends to reduce its branches to zero in number by the end of 2021 and all banking processes would be done without the need for face-to-face customer visits. In addition to mobile and Internet banking, this bank offers more services by launching a virtual counter so that customer requests such as new account opening, services, checks and canceling, Satna and Paya and so on can be met online. Gradual elimination of the bank's branches over the past five years has increased the willingness and perceived utility of both current and potential customers of the bank to use online/E-services. After all, the customers will be encouraged to use these services and may be compelled to do

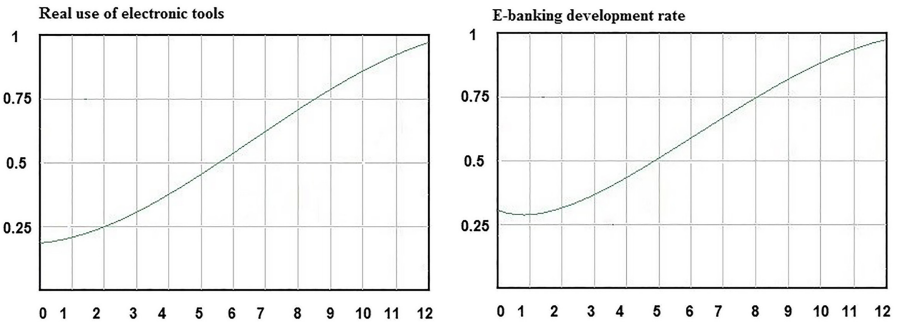

Figure 20.
Results of the implementation of the policy package

so due to what can be called "branchlessness." Therefore, the implementation of the bank's compound policy has greatly increased customers' acceptance and use of online/E-services. The word of such a package policy will reach out to other banks all around the world.

Conclusion

The present study analyzed the intervening role of COVID-19 in the acceptance and development of branchless banking. To this end, an attempt was made to simultaneously examine the issues of acceptance and development of E-banking as the main infrastructure of branchless banking. Resalat Qard–al-Hasan Bank, the case study, is one of the leading banks in industry 4.0 and intends to be the first branchless banking in Iran by 2021–2022. It has also taken necessary measures including the fast pace of branch closure, development of social banking, development of the required platforms for branchless banking (Resalat Qard–al-Hasan Bank website, 2020) and design and implementation of centralized banking in the form of only one branch across the country to offer entirely online banking services. This bank offers most of its services from opening an account to receiving facilities and so on online.

To extract the variables that affect the design of the dynamism at play here, Davis' Technology Acceptance Models (1989) and Rogers' Innovation Diffusion Model (1995) were used as the bases of the initial model. Finally, the compound model of acceptance and development of E-banking was presented using system dynamics modeling approach with an emphasis on the outbreak of COVID-19 as an intervening element. Other variables were added to the compound model of acceptance and development of E-banking based on the theoretical frameworks and experts' opinions. Of course, many variables were not included in the model due to their negligible impact during the simulation period.

The results of simulating the implementation of the package policy designed to reduce the number of branches, improve the bank's incentive policies and increase the bank's investment budget rate in IT showed that the outbreak of COVID-19, as a factor along with its repercussions, played a key role in changing the social and cultural attitudes toward the acceptance and development of branchless banking in Iran. The spread of COVID-19 turned out to be an opportunity to raise the rates of awareness and acceptance by providing an intellectual and social atmosphere. Of note, this requires careful planning and implementation of rapid response policies during and after the outbreak of the virus. According to an interview conducted with the managers of Resalat Qard–al-Hasan Bank, since the outbreak of COVID-19, the complex task of persuading customers to use online banking services has become much easier and, by the same logic, the branch closure has become less burdensome.

There is no doubt that the development of branchless banking in Iran and the necessity of encouraging fundamental changes in customer attitudes require structural changes in the banking processes and employees' performances. Besides, according to the proposed model, the difficulties faced by individuals during the spread of COVID-19 could enhance the appropriate organizational preparation to make changes in the classic working processes. Processes such as telecommuting, job rotation and so on are among these changes.

In this regard, using the data of 1,238 banks in 94 developing countries, Klomp and Haan (2015) suggested that banks' supply chains were key factors in banking systems and procedures. Gharz-al-Hassaneh Rasaalat Bank has designed and implemented many of the necessary platforms for providing completely online services and redesigned the supply chain and personnel work processes. In a similar case, the China Construction Bank launched a good financial business in its online banking platform (banking platform) to offer micro-loans to individuals (Xing and Bai, 2016).

Acar and Çıtak (2019) argued that in order to develop new technologies in banking, banks need to strengthen their cooperation with their associates and partners. This measure is necessary to achieve resource completion and competitiveness and to secure profitability, efficiency and resilience in the supply chain. In this regard, Gharz-al-Hassaneh Rasalat Bank

cooperates with a data processing company to analyze the creditability of customers and provides more than 95% of the allocated services to customers in the form of adding colleagues to its supply chain.

A background check regarding Iranians' acceptance of various matters illustrates if Iranians become accustomed to a system in any way, the functionality and applicability of that system will accelerate. Therefore, adaptability to new technologies is an instrumental matter here, and forcing more people to stay at home because of the COVID-19 can be helpful to the matter under study. In a study titled "From Fintech to Finlife: the case of Fintech Development in China" (2016), Chen stated that financial technology was no longer a traditional financial product, but was more integrated into everyday life. He considered the financial needs in the current scenario to provide satisfactory solutions for customers through a platform (scenario). However, Yuliaty *et al.* (2017) argued that lack of knowledge about branchless banking, socialization and public education in this regard were some of the challenges that stand in the way of realizing branchless banking development.

From a larger perspective, the acceptance and development of E-banking and branchless banking will have different effects such as a considerable reduction in traffic, lower fuel consumption, attenuated spread of infectious diseases and better public health, less paper consumption and so on. To this end, it is required to simultaneously develop electronic banking and online banking processes. In addition, the use of online banking services should gradually become a social and cultural norm.

Limitations of the study

The limitations of this study may, to some extent, reduce the quality of the obtained results and further suggestions. Among these limitations are the qualitative nature of some research variables and the lack of econometric information about the quantitative effects of the parameters in the model, which are the reasons why the relationships in the computer model have been defined merely based on initial estimates. Although these relationships may be responsible for the structural behavior of the system, it is required to evaluate these relationships accurately through other economic techniques to ensure more accurate predictions. Moreover, conducting this research at the time of COVID-19 outbreak with its unknown functions may affect the simulation results.

There are other variables and effective factors that could have been included in the proposed model; however, due to the complexity of the simulation and lack of accurate information, only the structures of the proposed model were considered. In addition, it is required to draw attention to the functions of the systems dynamics approach. This approach recommends a modeling process in which a better understanding of the structure and behavior of the real system is continuously forming. Since the model developed in this study does make sense only from the aforementioned perspective, readers should soften their expectations of the results of the econometrics models.

In fact, this research, which is one of the first simulation studies of the effects of the spread of a virus in Iran in the field of banking, can only be considered as a starting point for further investigations regarding branchless banking. Turning this starting point into a scientific process requires further complimentary research. However, due to the complex behavior of COVID-19, some of the views presented in this article may be questioned in the coming months.

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