IFA
IRAN FINANCE ASSOCIATION

Iranian Journal of Finance

Print ISSN 2676-6337
Online ISSN 2676-6345

Dynamic Product Portfolio Management Modeling for the Financial Technology Industry

Seyed Behnam Khakbaz
Ph.D. Candidate, Department of Business Management, Faculty of Management, University of Tehran, Tehran, Iran. (Email: KhakbazBehnam@gmail.com)

Mohammad Ali Shahhoseini*
*Corresponding author, Associate Prof., Department of Business Management, Faculty of Management, University of Tehran, Tehran, Iran. (Email: Shahhoseini@ut.ac.ir)

Ali Divandari
Prof., Department of Business Management, Faculty of Management, University of Tehran, Tehran, Iran. (Email: divandari@ut.ac.ir)

Hamidreza Rabiee
Prof., Faculty of Information Technology, Sharif University of Technology, Tehran, Iran. (Email: rabiee@sharif.edu)

Abstract

Resource allocation, as the main objective of managerial science, requires analyzing the long- and short-term effects of a policy, although this analysis would be more difficult in dynamic and volatile industries such as financial technology. Moreover, the integration of industries leads to more diverse product categories for a single company and makes it difficult for the implementation of decision making about resource allocation. In this regard, systemic PPM (PPM) models can be applied to balance long- and short-term generated values of the company by adopting policies about resource allocation for different products with respect to risk management concepts. The proposed systemic model should include interrelationships between different products, time relevant, and most importantly the potentials of dynamic analysis of product strategies, which is the main purpose of this research. The research strategy is to conduct a case study on the Iranian financial technology industry, by using systemic PPM modeling. In this research, a dynamic model was used in the payment industry, due to its competitive forces. Thus, system dynamics methodology was the research tool for analyzing data. Further, four cycles of risk management, resource allocation, innovation, and development were identified and then, analyzed in a dynamic approach to evaluating their efficiency for business development. Based on the results, the system dynamics methodology provided great outcomes for this problem. Finally, scenario analysis, focus, deep understandings of the decision-making process with respects to mental models, and stock and flow diagrams were among the most significant findings of this article.

Keywords: Product portfolio management, System dynamics, Resource allocation, Fintech industry, Financial services.

DOI: 10.22034/ijf.2020.209903.1092

Introduction

Sustainable competitive advantage is regarded as a critical issue for companies in all industries, especially in a competitive industry like information technology. In the competitive industry, companies would provide a wide variety of products (Rothaermel, Hitt, & Jobe, 2006). However, managing the limited resources of the company to deliver the most value for the customers and the company is the most important concern related to this strategy (Kester, Hultink, & Griffin, 2014). Furthermore, innovation management and product and business development play an important role in gaining competitive advantages, especially in product and business portfolio management (Otten, Spruit, & Helms, 2015).

Resource allocation has been considered the main subject for managers and practice, and various theories have been proposed to evaluate this subject. On the other hand, a large body of research has been conducted on the PPM, as a controversial problem for this objective (resource allocation) (Jugend & da Silva, 2014). Nowadays, multi-business firms, which are active in different sub-industries, are faced with similar problems concerning business portfolio management (Tanriverdi & Venkatraman, 2005).

The financial technology industry, which is considered a joint subset of financial industry and information technology industry, is somehow competitive (both the financial industry and information technology industries are very competitive and somewhat competitive ones), especially in the Iranian Fintech industry.

This can be concluded by some of the company specifications like fundamental innovation and technology disruption (Brown & Eisenhardt, 1997; Schmalensee, 2000), revenue, market share and profitability volatility (Lee, Venkatraman, Tanriverdi, & Iyer, 2010; Schmalensee, 2000). For example, Payment, as a subset of financial technology, is one of the most competitive industries in Iran with 1440 Herfindahl-Hirschman indexes[1] related to Central Bank of Iran (CBI), according to the Shaparak Report. For comparison, see table1 (www.shaparak.ir, 2020) (McKinsey & Company, 2020):

[1] The Herfindahl-Hirschman Index (HHI) is a common measure of market concentration that is used to determine market competitiveness

Table 1. Payment Industry Compartment

	Iran	International (Advanced Countries)
Market Share from Banking	3%	10-15%
Share of GDP	0.3%	0.7-1.5%
Share of Total Transaction (B2C)	95%	+90%
Average Instruments per Capita	1 per 10	1 per 60
EFT-POS	6.5 million	1.1 million in Germany[2]
Card Issuing	321 million	165 million in Germany[3]
Payment HHI	1440	Below 1200

Although Iranian payment industry has many opportunities to grow as observed in the first and second row of table1, its industrial structure is mature now. Consequently, active companies in this market should be innovative and deliver a wide variety of valuable products and services to their customers and consumers, highlighting the PPM as a critical tool for the managers (Villasalero, 2018).

Risk management and the complexity of decision-making are two important aspects of PPM in these industries. Variety can reduce the risk of investment but increases the complexity of the decision-making process. Therefore, PPM is not an easy task and requires addressing multi-factor models for these problems (Fernhaber & Patel, 2012). Accordingly, companies in these industries should optimize resource allocation in their portfolio to reach their strategic goals in a comprehensive model (Lee, Venkatraman, Tanriverdi, & Iyer, 2010).

This article aims at proposing a dynamic, comprehensive and systemic modeling method to model PPM for making better decisions about resource allocation in a competitive industry. The performance of the proposed method was analyzed in financial technology of Iran to verify its capabilities.

The rest of this article is organized as follows. Section 2 presents the literature review section on what is PPM, why is important, and how it can be applied for the main problem of this study. Section 3 explains the methodology of this article, which is based on case study research strategy and system dynamics research method for PPM model development. Section 4 provides the results from the research's analysis of mental models with PPM models for developing dynamics PPM model of the payment industry in Iran. Finally, Section 5 concludes the research and gives suggestions for future research.

2 Country with the same population for analyzing the maturity level of acquiring in the payment industry.

3 Country with the same population for analyzing the maturity level of issuing in the payment industry.

Background

So far, various portfolio models have introduced the notion of resource allocation as a key decision for firms for financial investment and product development (Kester, Hultink, & Griffin, 2014). Portfolio concept is a useful management tool for enforcing a discipline in the allocation of the company's limited resources to an optimal combination of business operations, which will maximize long-term returns at a given level of risk (Turnbull, 1990; Cooper, Edgett, & Kleinschmidt, 1999). Generally, currently developed portfolio approaches are mostly based on industrial organization, political economy (socio-economic influences), resource-based capability, and strategic approach (Jugend & da Silva, 2014). The portfolio approach for industrial marketing and purchasing management originated from the financial investment context, from which it expanded to product investments, corporate strategy, and business relationships contexts (Turnbull, 1990).

The inherent logic of many models still follows Markowitz's (1952) argument to maximize portfolio returns and minimize risks, by carefully choosing a portfolio compiled of different assets and equities. According to this theory, optimal outcomes cannot be achieved when stock investments are considered independent from each other. Instead, it is more efficient to consider each individual stock as an element of a portfolio that needs to be calibrated carefully to reach an optimal balance of risk and return (Markowitz, 1952). PPM is somehow very similar to investment portfolios and aims to optimize risk and return of the portfolios and their main proposition for this objective is to make a portfolio more diverse to optimization point in an uncertain situation (Kester, Hultink, & Griffin, 2014). Firms have different products and services in their portfolio, each of which represents a certain level of return (i.e., size of future cash flows) and riskiness (i.e., the uncertainty in those cash flows). Similar to stocks in a financial portfolio, these return and risk need to be balanced in a product/service portfolio (Cooper, Edgett, & Kleinschmidt, 1999). The Markowitz theory assumes that investors are rational and markets are efficient, which often do not hold in the context of product/services portfolio decision-making. The product/services portfolio decision-making is a dynamic resource allocation process that should address strategic considerations across projects in the portfolio, as well as interdependencies between projects, in addition to dealing with multiple decision-makers who are often dispersed across locations (Kester, Hultink, & Griffin, 2014; Chao & Kavadias, 2008; Killen, Jugdev, Drouin, & Petit, 2012). Therefore, considering different causes and effects of a resource allocation decision making is a critical analysis tool for PPM. Moreover, the importance

of time is another difference between these portfolio management models. Many PPM policies depend on operation time and operation duration (Cooper, Edgett, & Kleinschmidt, 1999; Kester, Hultink, & Griffin, 2014; Chao & Kavadias, 2008). Some of these researches are demonstrated in the next table.

In summary, PPM has five different specifications as follows:

1. PPM is based on strategic alignment: strategy should address which products must be proposed (McNally, Durmusoglu, Calantone, & Harmancioglu, 2009; Chao & Kavadias, 2008).
2. The main objective of the PPM is to optimize and upraise stakeholders' value (Kester, Hultink, & Griffin, 2014) (McNally, Durmusoglu, Calantone, & Harmancioglu, 2009).
3. PPM is a tool for a company to assess its products and decide how to allocate resource to the asset (Cooper, Edgett, & Kleinschmidt, 1999; Cooper, Edgett, & Kleinschmidt, 2004)
4. Dynamic capability management is the main source of effective PPM (Eggers & Kaplan, 2009; Eggers J., 2012; Killen, Jugdev, Drouin, & Petit, 2012).
5. The structure of PPM is to make balance such as balancing risk-return; balancing short- and long-term performance; balancing product life cycles, balancing market position with the profitability of products; and the like (Kester, Hultink, & Griffin, 2014).

Table 2. PPM Studies

Researcher	Year	Approach
BCG	1973	Market growth and related market share matrix
Walker	1984	Three different matrix: Profitability analysis matrix, Market-Competitor Matrix, Maket and sales growth matrix
Cooper Edget & Kleinschmidt	2000	Applying financial indicators for assessing products with respect to their importance in portfolio
Chao and Kavadias	2008	Financial indicators (NPV, RoI, IRR) for assessing product portfolio
McKinsey & Company	2008 (Last Version)	Industrial analysis and company's competitive advantage matrix
McNally, Durmusoglu, Calantone & Harmancioglu	2009	Applying TRM
Bausch and Pils	2009	Portfolio vs non-diversified analysis
Killen Jugdev, Drouin & Petit	2012	Assessing financial indicators for strategic alignment (long term effects)
Yang & Lee	2012	Scoring the products with respects to performance indicators
Kester, Hultink & Griffin	2014	Assessing importance of products in portfolio
Jugend & Da Silva	2014	Scoring the products with respects to criterias
Ralf W.Seifertab, Jean-SébastiennTancrezc ,Işık Biçera	2016	Dynamic product portfolio management with life cycle considerations
Erno Mustonen, Jonne Seppänen, Arto Tolonen, Janne Harkonen	2019	Strategic targets and key performance indicators over life-cycle of products
Cooper and Sommer	2020	Applying Agile Perspective in product portfolio management

Thus, PPM should consist of a comprehensive analysis of how to allocate a specific resource in a given time for different products, by considering the strategic objectives of the company. This tool provides a dynamic analysis of PPM, which can be used for selecting a proper mixture of products for a company and investing on them in a systemic perspective (Merten, Reiner, & Wiedmann, 1987). This is a dynamic procedure for decision making about different products of a company and how to operate regarding their long- term proposed value for the company. To this aim, considering different subjects in a comprehensive and related manner (systemic view) is a critical issue (Kortelainen, Piirainen, & Tuominen, 2008; Killen, Jugdev, Drouin, & Petit, 2012).

PPM (PPM)

In general, different PPM models mainly focus on evaluating aspects of strategic, technological, market and marketing, risk, and economical return issues of the studied company in a simple mode (Jugend & da Silva, 2014; Cooper, Edgett, & Kleinschmidt, 2000). In summary, there are four distinct categories of PPM models, which are presented in the following:

- Financial models: The main objectives of these PPM models is to maximize the value of the portfolio with respects to the efficiency of the portfolio, which can be assessed by the ratio of revenue to consumed resources for making revenue. For this objective, different indicators should be analyzed, some of which are net present value (NPV), generated expected commercial value, internal rate of return (IRR), return on investment (RoI), and point of equilibrium of the portfolio (Cooper, Edgett, & Kleinschmidt, 2000; Chao & Kavadias, 2008). Consequently, financial models can be used for prioritizing products of the portfolio and are the most common methods for PPM. However, these models fail to consider some long term and market-oriented subjects such as innovation and changing the demand side of the market or strategic alignment of the portfolio (Killen, Jugdev, Drouin, & Petit, 2012; Chao & Kavadias, 2008). Moreover, these models neglect related effects of the products (some products are supplied to the market only for acquisition or awareness and companies would make a profit from them in other products), leading to limited optimized portfolios (Lindstedt, Liesio, & Salo, 2008).
- Scoring and ranking models: These models are applied for scoring and ranking the degree of importance of products in the portfolios (Cooper, Edgett, & Kleinschmidt, 2000; Kester, Hultink, & Griffin, 2014). Furthermore, these models are based on two factors of perspective (perspective is defined with company's goals and objectives such as

competitive advantages, sustainability, customer satisfaction, quality of service, innovation, profitability, etc.) and criteria (each perspective can be described by some criteria; for example, the quality of service can be assessed by sales, customer's retention, and market growth rate). The products in a portfolio are ranked with respects to each product's point in each criterion and their multiplication by the weight of these criteria (Jugend & da Silva, 2014). Some of these models are AHP (Analytic Hierarchal Process) and BSC (Balances Score Card), which can be applied for strategic alignment and market orientation aspects of the product portfolios (Jugend & da Silva, 2014; Oh, Yang, & Lee, 2012). However, ranking models mainly neglect interrelationships of products, such as financial models, and are based on the intuition of experts (financial models are based on data); as a result, these models have somehow important limitations (Kester, Hultink, & Griffin, 2014).

- Roadmap models: Product and technology road map is a good tool for strategic alignment and balancing portfolios. Technology Roadmap Method (TRM) is the most applied method for this category (Jugend & da Silva, 2014). In this method, companies would apply road maps of future technological advances in their industries. Thus, gradual and disruptive innovations can be used by TRM (McNally, Durmusoglu, Calantone, & Harmancioglu, 2009).
- Graphs and Diagrams models: Utilizing diagrams, graphs and matrixes like Boston Consultancy Group (BCG) matrix or General Electric (GE) quadrant (developed by Mckinsey & Company) are the last categories of PPM models. These models can make strategic alignment for companies and help them to design balanced portfolios (Cooper, Edgett, & Kleinschmidt, 1999). However, the effectiveness of these models depends on operational and strategic alignment in companies, as well as their leadership capabilities (Chao & Kavadias, 2008). Positioning models are based on the simultaneous analysis of internal (for example competitive power, quality of service, cost of service, processes of service delivery, workforce capabilities, marketing mix policies, etc.) and external (market attractiveness, market growth rate, market size, a contribution margin of industry, etc.) factors (Oh, Yang, & Lee, 2012; Cooper, Edgett, & Kleinschmidt, 2000; Jugend & da Silva, 2014)

PPM in practice

The models of PPM are designed as a response to different problems of resource allocation (Jugend & da Silva, 2014). However, almost all of these models have their own limitations, especially in the competitive and complex industries (Lindstedt, Liesio, & Salo, 2008), including financial technology in Iran. In these industries, strategic decision-making is far beyond some simple criteria, which have been applied in different models of portfolio management (Fernhaber & Patel, 2012). Because of the lasting effects of PPM, organizations should consider it in a system-wide approach. Therefore, systemic view for PPM is another issue for many PPM models (Tiedemann, Johansson, & Gosling, 2020). As mentioned, these models have three main limitations, which made PPM models be considered a simplistic approach[4]:

1. Time is not included in the models: One of the most important hypotheses for these models is the independence of time and delay. Time and delays are not included in the models, and therefore, they are all short-term models and have many limitations in the long-term analysis.
2. Dependency and independency of products: Concerning most PPM models, products are independent of each other, although it is impractical in a complex industry with a wide variety of products.
3. They are all static and simplistic: All of these models considered the world as a static one and all of the relationships between variables are simplistic and limited. Conversely, this is a myth in the real world, especially in competitive industries, and everything should be considered systemic and dynamics.

The present study seeks to respond to these limitations. Applying a control based decision support model is a suitable tool for managers in a volatile world (Kortelainen, Piirainen, & Tuominen, 2008). Managers can use these models for analyzing different scenarios with respects to these limitations and manage cannibalization, cross elasticity, and marketing mix policies, by conducting a comprehensive analysis on different mental models of all stakeholders of the company (Teece, Pisano, & Shuen, 1997). Up to now, some researchers have applied system dynamics approaches for these issues (Kortelainen, Piirainen, & Tuominen, 2008) and stated system dynamics capacities for solving problems.

[4] Concluded from Surveyed Articles.

PPM in the financial technology industry

As mentioned, the main objective of PPM is to balance allocated resources, strategic alignment, and risk management, as well as to maximize generated value of a company (Chao & Kavadias, 2008; Cooper, Edgett, & Kleinschmidt, 2004; Kester, Hultink, & Griffin, 2014). This research first attempts to design a dynamic PPM model for the financial technology industry in Iran to demonstrate the possibilities of applying system dynamics in this field. For this purpose, we considered the BCG matrix, the best static model of PPM models, as the base model. In this matrix, market growth demonstrates investment attractiveness while market share is the criteria for assessing cash flows (Cooper, Edgett, & Kleinschmidt, 1999; Jugend & da Silva, 2014). However, market share depends on competitive power and market growth may affect market share and cash flows. Moreover, cash flows have effects on investment capabilities. Figure 1 illustrates the analysis of the BCG matrix for a portfolio with two products (Chao & Kavadias, 2008). As shown, the base model is the process of investment optimization in the market, which consists of four variables of cash flow, related market development of each product, competitive power of each product, and strategy and structure of decision-making. This cycle can be named as resource allocation cycle.

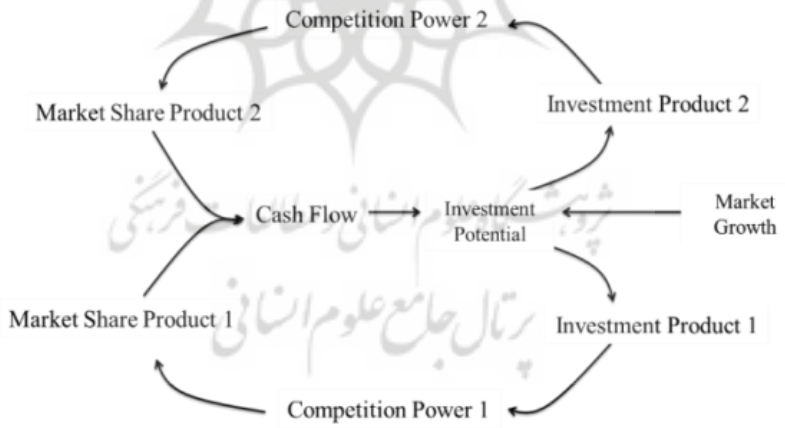


Figure 1. Base cycle for resource allocation

The optimization of the generated value of the company is another subject in PPM. Value can be demonstrated as profit, return on investment, internal rate of return, and net present value. Further, the value cannot be seen as a one-dimensional variable and depends on risks generated by-products and their

lifecycle (Voss, 2012; Cooper, Edgett, & Kleinschmidt, 1999; Kester, Hultink, & Griffin, 2014). Product lifecycle somehow relies on the business structure of the company, such as strategy, structure, marketing policies, and the like (Voss, 2012; Jugend & da Silva, 2014). This cycle is the second important cycle of PPM, which can be named as Risk-Return cycle. Figure 2 demonstrates this cycle in a portfolio with two products (operational activities are separated from the business model structure).

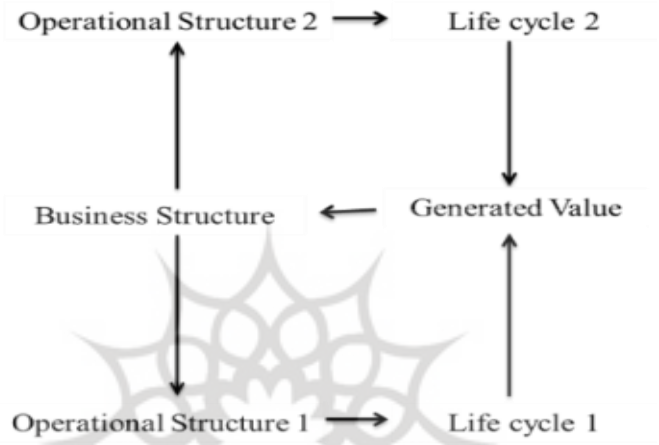


Figure 2. Risk management cycle

As observed, competitive power could affect product lifecycle, which comprised of operational structure. Furthermore, the strategy and business model can cause cash flows, which are the points of integration for these cycles (Voss, 2012; Jugend & da Silva, 2014). It should be noted that generated value for customers is a long-term criterion while cash flow is a short term variable, and thus, these factors are separated from each other.

The alignment and development cycles are other important issues for PPM, which can be evaluated by gradual and disruptive innovation. The development cycle is used for operational excellence while the innovation cycle is a cycle for disruptive innovation, which is dependent on technological and business trends (Killen, Jugdev, Drouin, & Petit, 2012). Figure 3 shows the systemic PPM model.

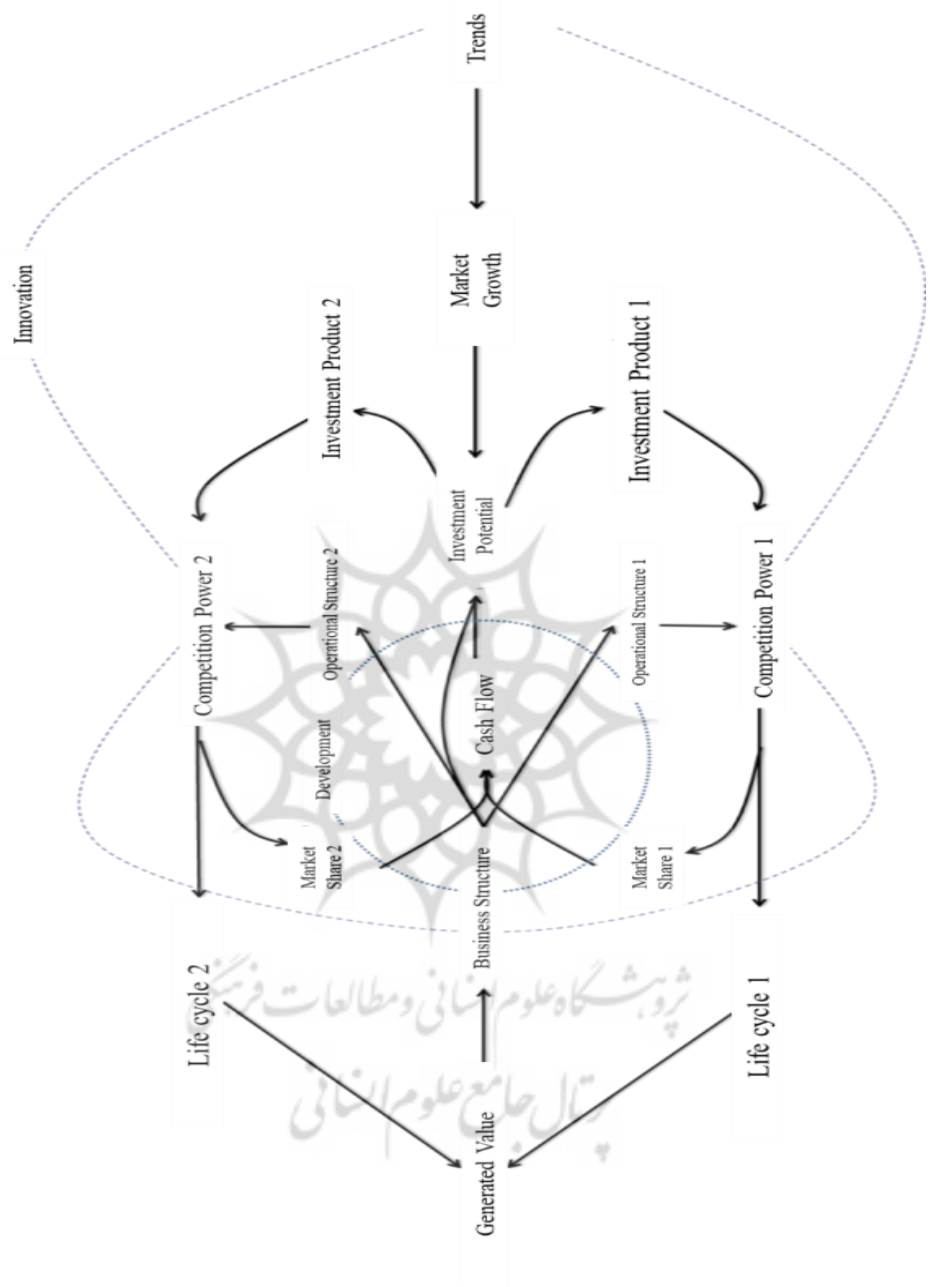


Figure 3. Systemic PPM Model

Research Methodology

The research question is to develop an approach that is useful for designing a PPM model in a systemic approach. Since the main goal of this study is to analyze a corporate with different products, which is active in the industry, deeply and inclusively, the research strategy is a case study to facilitate gaining a comprehensive understanding of the PPM models in financial technology of Iran. The case study included different research methodologies, with a common feature of deep understanding of a real case (Blaikie, 2009). The case study could be applied for a specific company or organization, and consequently, we used it for a given issue in a determined industry in a specific market and analyzed details of this objective with a comprehensive method (system dynamics). Therefore, system dynamics was used as the analyzing methodology. This section addresses the main methodology (case study) and its approaches (system dynamics) to the problem (PPM model).

Case Study

The case study focuses on understanding the dynamics of a contemporary phenomenon present within a single setting or its real-life context, especially when the boundaries between the phenomenon and context are not evident (Yin, 2011). The case study methodology is a tool for researchers to study complex phenomena within their contexts (Stake, 1995). Case study collaborates perspectives of the researcher and participants from phenomena's context and guides the researcher to better analyze phenomena concerning different views of participants. Case Study can be applied when (Yin, 2011):

- The researcher wants to focus on "why" and "how" questions
- The researcher should manipulate the behavior of participant and different player in phenomena
- The researcher wants to know contextual conditions related to phenomena
- There are unclear boundaries for the definitions of phenomena.

In this study, a "how" question for Iranian financial technology industry (Case as it defined by Yin definition with specific boundaries- market, technology and geography) is the main driver for applying case study methodology. Therefore, a single case, explanatory approach (explaining presumed causal links in real life and too complex context) must be considered.

In this way, we defined a four-phase method for applying case study methodology with respects to Yin methodology, which are as follows:

1. Designing a case study: Design refers to the logical sequence that connects the empirical data to a study's initial research questions and, ultimately, to

its conclusions. Yin identified four types of designing, which consisted of a single holistic design, embedded design, multiple holistic designs, and multiple embedded designs. We applied a single holistic form of designing, which has five different components:

a. A study's questions (how product portfolio can be managed in Iranian financial technology industry to provide balance to the present and future of a company in this industry, which has been defined in the introduction section);
b. Its propositions, if any systemic model of product portfolio can help organization on balancing present and future;
c. Unit(s) of analysis (a company in Iranian financial technology industry);
d. The logic linking of the data to the propositions (Literature review section);
e. The criteria for interpreting the findings (relative to analyzing method-system dynamics, which is described in this section).

2. Data collection and implementation of case study: Yin defined this stage as follows: "Data gathering is influenced by case study investigator's skills, training for a specific case study, the development of a protocol for the investigation, the screening of the case study nominations (making the final decision regarding the selected case), and the conduct of a pilot study". He also identified six tools for this subject, namely, documentation, archival records, interviews, direct observations, participant observation, and physical artefacts. In this study, we have applied:
   a. Archival record as secondary sources (from different sources like regulatory and player's strategies and plans),
   b. Semi-structured interviews (Interviewees were 21 people, 7 of which were top managers of payment industry (CXO levels), three of which were top managers of the regulatory body, and the others (eleven people) were experts of the payment industry in business and technical fields, project managers, business and software development managers, etc. Interviewees were selected based on the expertise required in the research process, as well as their availability. In total, 11 short interviews, with an average of 45 minutes, were conducted with some of the main influential people to players like most important CXOs and regulator's people. The questionnaire was designed based on the literature's causal loop diagram, which was demonstrated in the last subsection of the Background section).
   c. Direct observations of market and player (researcher has a business development job in this market)
   d. Participant observation.

Moreover, we have applied causal loop diagrams for modelling collected data and information. These models are the main structure of the analysis.

3. Analyzing and validating the data: The procedure for conducting the interviews was aimed at improving validity and reliability by careful preparation and feedback from the respondents. The data analysis in the study partly coincided with the data collection, because of the inherent flexibility in case study research. After each interview, the data was transcribed, summarized, and grouped, and ultimately, the relevant qualitative data were coded into themes. Subsequently, the code phrases were reduced and related to the key theoretical concepts. At the same time, we kept the meaning of what the participant said intact. First searching for similarities and differences in the transcripts, and second by editing and sorting common themes in the transcripts identifies themes. The analysis progressed steadily during the data collection so that to easily identify which issues should be explored further in the subsequent interviews. Data analysis consisted of examining, categorizing, tabulating, testing, or otherwise recombining both quantitative and qualitative evidence to address the initial propositions of a study. In this article, a system dynamics approach was utilized for analyzing data, which is further described in this section.
4. Reporting: This article is the report of our research.

In the following, we analyzed the PPM modelling and its capabilities in Iranian financial technology industry for corporate activity in this market. The studied company is one of the top three players in this industry, the name of which was not mentioned in this article, because of its confidentiality.

System Dynamics

As it has been defined in last subsection (Case Study), system dynamics is the main research method in second (gathering data and execution) and third (analyzing and validating gathered data) in this research's methodology.

System dynamics is an approach to analyze complex problems in their environment. Moreover, causal loop diagram models are helpful instruments for modelling the qualitative problems in a simple way especially in the most complex problems. Scenario planning is another of system dynamics capacities, which can help analyzer assess different solutions concerning the environment (Sterman, Business Dynamics: Systems Thinking and Modeling for a Complex World, 2000). As results, we have selected system dynamics as one of our analysis instruments for its three main capabilities in lots of instruments which we have seen in the literature, like static financial analysis

for PPM which have lots of problems, especially in the competitive industries like financial technology (PayTech sub-industry).

The world is becoming more and more complex which make conceptual designing a difficult process. Consequently, the concept "Micro-world" is a good approach to analyze some of the pre-defined variables to understand the behavior of different phenomena. Creation, modification and manipulation of "Micro-world" increase our knowledge about a different phenomenon we live in, work or stop working with (Woodside, 2006). A managing phenomenon like payment industry requires a holistic and comprehensive method, which is system dynamics. System dynamics is based on studying complex feedback systems. It can be applied to managing non- linear aspects of phenomena with internal/ external interaction between its elements. Forrester has applied system Dynamics in 1958. Afterwards, it has been used for different problems like economic analysis, strategy development etc. (Khakbaz & Hajiheydari, 2015).

With its main feature (analyzing a complex system with feedbacks); it can provide a valuable model. These models would identify factors that affect the outcomes of processes, programs, and decisions. System Dynamics is a suitable analyzing approach that can help researchers to build formal computer simulations for their systems. They can use it to assess their policies and design organizations that are more productive. It can be used to analyzing long term effects of decisions for developing better strategies for the success of companies (Sterman, System dynamics modeling: Tools for learning in a complex world, 2001).

System dynamics models were control feedback models, which one of the main qualitative methods for this objective is causal loop diagrams. Causal loop diagrams provided a high-level means of conceptualizing models in terms of their feedback loop structure (Sterman, Business Dynamics: Systems Thinking and Modeling for a Complex World, 2000). Causal loop diagrams could be used in a freestanding model without computer simulation to assist issue structuring and problem-solving. Causal loop diagrams can be used for analyzing systems (quantitative) and for providing insight to managerial issues by inferring (not calculating) the behavior of systems. This tool with assistance to system thinking can be applied for solving different complex problems. It can be done by modeling complex phenomena and analyzing the problem of making a better understanding of it in its context (Wolstenholme, 1998).

Consequently, this research applied causal loop diagrams as a tool to analyze the complex phenomenon of Iranian financial technology industry in a systemic approach. Causal loop diagrams would be used in the results section

for making an insightful model for managers with respects to PPM concepts (a dynamic model for Iranian financial technology industry for help to the managers handles their product portfolio).

Research Findings

This section includes three subsections, one of which presents data gathered from interviews; the second one is the payment industry system identified from literature and interviews, and the last subsection is the scenario of planning and analyzing the studied case strategies for PPM.

Information from Interviews

We have identified different aspects of the systemic model for PPM in Iranian financial technology industry in interviews, which are as follows:

- Rapid technological advance: Technological changes in this industry are very rapid and there is no distinct roadmap for technology management. Therefore, the technology trend is a volatile variable for the PPM system, which should be considered.
- Industry structure: Regulation in financial technology of Iran is somehow complex and is a barrier for business development. The regulatory department provides rules for operations and prohibits many innovative approaches, which limited the innovation cycle for this industry.
- Marketing: Because of the last issue, marketing and especially advertisement is a critical subject for competition in this industry and makes them dependent on the advertisement. Consequently, the market high prices are sensitive.
- Players: There are many active players in this industry and every huge and small company in Iran want to provide financial technology services, especially payment services. As a result, the distinction between services and quality of service has been neglected in the market.
- Human resource: Crowded industry makes the human resource a very scarce resource in the market and financial technology industry in Iran is one of the most competitive industries in this market for recruiting human resources.
- Wide variety of products: Many huge information technology companies in Iran are active in financial technology and they provide many other sub-industry services like satellite, telecom, etc.; therefore, they have a very complex decision-making process about PPM.

Causal Loop Diagram for Iranian Payment Industry

Analyzing a real PPM model for Iranian financial technology industry should contain causal loop diagrams (CLDs). As a result, we assess mental models for different stakeholders, which comprised of high-level managers, business customers, payment service consumers, industrial's experts and shareholders. The most important causes identified in this process are as follows:

Regarding the existence of different aspects for Iranian financial technology industry and its main issues, a systemic model for product portfolio in this industry is summarized in Figure 4.

Figure 4 also depicts the CLD of this ecosystem, the variables of which are defined in Table 1. Note that quantitative variables are described in the appendix section of this article.

Table 3. CLD for PPM model in the financial technology industry of Iran

Variable	Definition	Variable Type
Profit	Total operational profit of the company (contribution margin of products)	Result[5]
Investment Potential	Stored financial resources for investment purposes in the tenure of analysis	Result
Market Growth	Average market growth rate (market attractiveness index)	-
Investment	Financial resources which invest in the different product (product and market development)	Internal[6]
HRM	Quantity and quality of the human resources in the company	Internal
Operation	Delivered quality of services to the customers and number of it	Internal
KM	The knowledge that developed by a company which results in cost reduction in service delivery	Internal
Synergic Knowledge	Knowledge which gathered from different sources and can be used for product development	Internal
HRD	Developing human resources for new product and business lines	Internal
Technical Trend Analysis	The analysis of technological trends which can be used for product development	Internal
Biz Trend Analysis	The analysis of business trends which can be used for business development	Internal
New Biz Dev	Service, product and business design for new products	Internal
Regulatory Issues	Issues which comprised of regulatory and effects on products	-
NP/SD	Developing new product/ service or value-added services	Internal
Product Development	Product improvement process which comprised of gathered knowledge about market and product	Internal
Brand Awareness	Awareness of the brand which can be created by advertisement or	Internal

5 Internal variables which are results of others

6 Variables with the internal origin

Variable	Definition	Variable Type
	other promotional tools	
Brand Loyalty	The loyalty of customers to the brand which concluded to purchasing service from the company	Results/ Internal
Rivalry Force	The competition power between a rival company in the industry	-
Market Quality	Market maturity and potential to growth	-
Market Position	Company's position in the market	Results
Expected Market Share	Future market share (with analysis)	-
Product Lifetime Value	Total generated value of the product in its lifecycle	Results
Shareholder's Long- Term Value	Total generated value of the company for its shareholders in long-term	Results

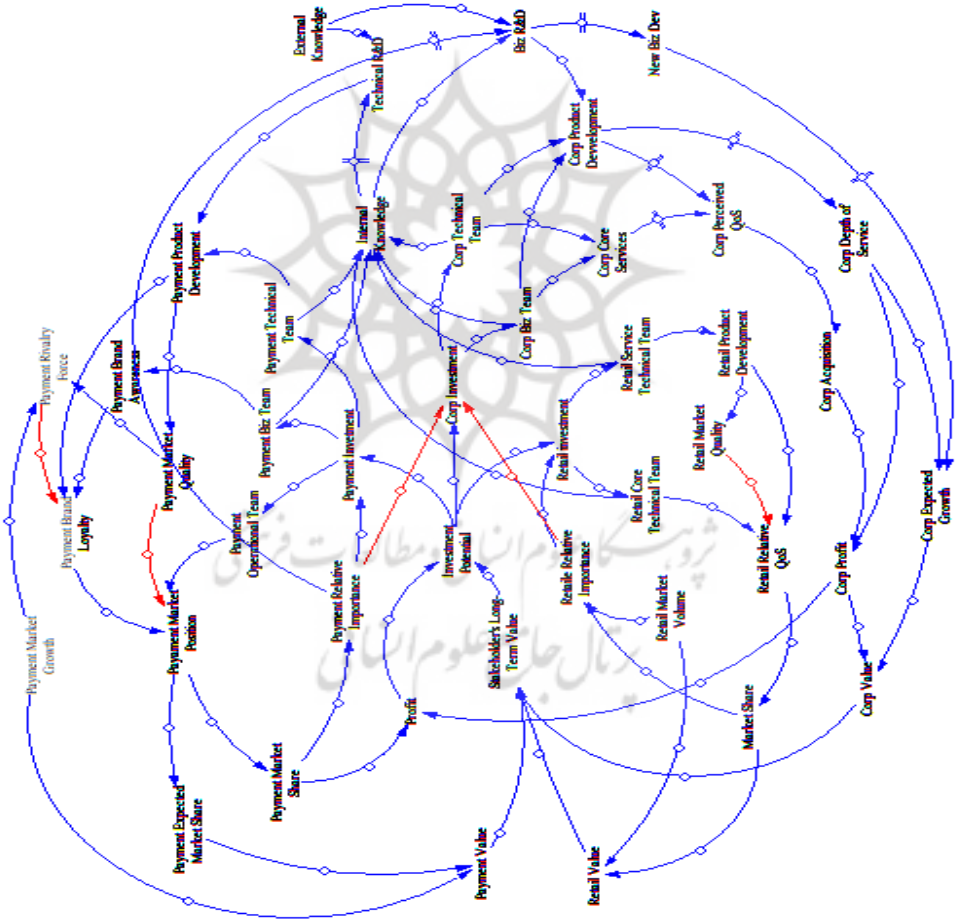


Figure 4. CLD for PPM model in financial technology ecosystem of Iran

Case study

To analyze the proposed model, five different dynamic hypotheses (scenarios) were tested, which are as follows[7]:

- A 100% increase in B2B budget: Because of high contribution margin of B2B services in the financial technology industry (and nowadays, low budget), it can be raised by 100%.
- A 20% payment advertisement: another scenario for Subject Company is to raise its awareness budget for payment service, which is its main product.
- Innovation: a 30% increase in research budget and a 20% increase in product development budget (including value-added service) is another scenario for this company.
- Hybrid model: increasing payment advertisement by 10%, B2B budget by 20%, and budget by 15%, and product development budget by 10%.

The second scenario (payment advertisement) is the desired scenario for the managerial team of our study, regardless of systemic PPM model. It should be noted that these scenarios would be analyzed under the current situations of the studied company.

The objectives of the studied company for assessment are market share of payment, profitability, and the time required to reach 60 trillion Rls. value.

Table 4 reports the analysis of scenarios, in which first and last scenarios (product and infrastructure development) are desired scenarios for this article's practical problem, which the company was not interested in at the beginning of the analysis. In a detailed analysis of scenarios would be illustrated.

Table 4. Analyzing of scenarios

Targets Scenarios	Payment Market Share	Profitability	# of the month to generate 60 trillion Rls. value
Base Scenario (without change)	-	-	12 month
100 Percent increase in B2B budget	-	12 Percent	8 month
20 Percent payment advertisement	2 Percent	5 Percent	10 month
Innovation	-1 Percent	24 Percent	3 month
Hybrid Model	-	16 Percent	5 month

[7] Based on Strategies of the studied case

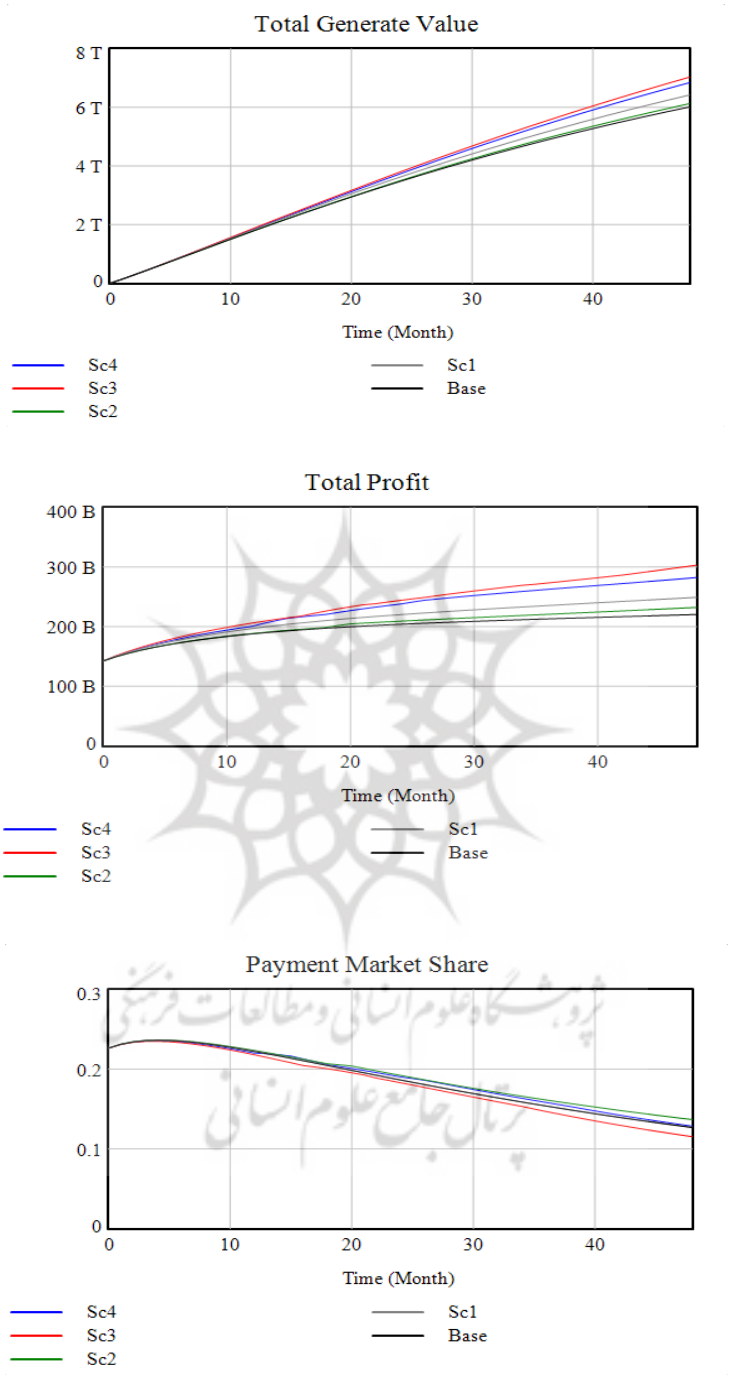


Figure 5. Detailed Analysis of studied case's scenarios for resource allocation with respects to systemic PPM model

Conclusion

Technological advances and business trends make industries more complicated and dependent on each other. Therefore, active companies should serve different customer's requirements simultaneously, which make them corporate with different business lines and products (Schmalensee, 2000; Villasalero, 2018). On the other hand, resources are limited and every company should prioritize its business lines and products to serve them to the market (Kester, Hultink, & Griffin, 2014). Under this situation, PPM is a critical issue and should be considered in a perfect way to make organizations more sustainable (Rothaermel, Hitt, & Jobe, 2006).

PPM is a new approach to designing a strategy for competition in today's volatile and competitive market (Schmalensee, 2000; Fernhaber & Patel, 2012). As described in this article, the main issue for any multi-product- the multi-business company is managing its resource allocation for uprising generated value of its stakeholders (Tanriverdi & Venkatraman, 2005). Moreover, PPM can be used to reach this main objective (Chao & Kavadias, 2008; Kester, Hultink, & Griffin, 2014). Strategic alignment is another issue for active companies, which can make them a successful or a failed company (McNally, Durmusoglu, Calantone, & Harmancioglu, 2009). Furthermore, firm value consists of short and long-term factors and allows balancing the best companies (Rothaermel, Hitt, & Jobe, 2006; Eggers & Kaplan, 2009). As a result, PPM models should provide a balance in a company and aligns it with strategic goals of a company in the industry (Otten, Spruit, & Helms, 2015) (Kester, Hultink, & Griffin, 2014). Therefore, product portfolios should present different specification, the most important of which is its ability to balance future with today's operation, strategic alignment for organizational development, and the potential for prioritizing products and resource allocation model. This is the main objective of this article.

Traditional PPM models have three main limitations. Time is not included in these models (especially when a policy should be implemented), for how many times and how it would make results for the company. The second limitation of traditional models is their failure to analyze a holistic portfolio with all dependency of products to each other. Traditional models consider every product as a standalone one, which is not practical, especially in highly competitive industries. Another limitation is the form of analysis. All models take everything a simple and static thing while it is not a reality especially in highly dynamic markets (Fernhaber & Patel, 2012) (Lindstedt, Liesio, & Salo, 2008). Consequently, we proposed a systemic and holistic approach for

analyzing product portfolios for a competitive industry with a system dynamics methodology.

This holistic perspective had been customized for Iranian payment industry in a case study approach to demonstrate the power of systemic PPM model in practice. The financial technology industry in Iran is somewhat different from other parts of the world. Regulatory issues make this industry a highly competitive one and players should define their strategies in a more precise approach. As mentioned in the Literature Review section, four distinct cycles can be proposed for modeling this industry's product portfolio, which are resource allocation cycle, innovation cycle, risk cycle, and development cycle. Resource allocation cycle concentrates on how to allocate resources and invest in different product strategies. Risk cycle refers to providing a design to balance the value generation for the company with product policies. Innovation and development cycle is designed to respond to market and make products aligned with strategic objectives. This model can be used for the product portfolio, although it should be analyzed so that the main problems of product portfolio are handled by the proposed approach, as shown in the Results section.

Another contribution of this article is aiming at different factors for a systemic PPM model in the financial technology industry of Iran. As explained in the studied case model, some factors are manageable while others cannot be managed. Some of the unmanageable factors are causing and the others are effects, some have more important effects and some are less important and it can be used by active managers in this industry and also researchers in a similar industry.

This article sought to describe the possibilities of dynamic scenario planning for assessing product strategies of a company. Based on the results, it can be said that dynamic modelling can be applied to making better decisions. Moreover, the results indicated that hybrid scenarios are not preferable in reality (the most desirable strategies for large-scale companies).

Another and last contribution of this article is identifying the importance of feedbacks and dynamics perspectives in designing strategies. Applying this perspective can help companies to make a better choice with known long term effects (lots of companies can't analyze long-term effects and thus, they only focus on short-term effects and select their strategies with respect to the effects). As a result, systemic modeling for product portfolios can be applied for strategizing activities in a holistic approach.

References

Bausch, A., & Pils, F. (2009). Product diversification strategy and financial performance: meta-analytic evidence on causality and construct multidimensionality. *Review of Management Science*, 90-157.

Blaikie, N. (2009). *Designing Social Research: The Logic of Anticipation* (2nd ed.). Oxford: Polity Press.

Brown, S., & Eisenhardt, K. (1997). The art of continuous change: linking complexity theory and time-paced evolution in relentlessly shifting organizations. *Administrative Science Quarterly, 42*(1), 1-34.

Chao, R. O., & Kavadias, S. (2008). A theoretical framework for managing the new product development portfolio: When and how to use strategic buckets. *Management Science, 54*(5), 907-921.

Cooper, R. G., & Sommer, A. F. (2020). New-PPM with Agile. *Research-Technology Management*.

Cooper, R. G., Edgett, S. J., & Kleinschmidt, E. J. (1999). New PPM: practices and performance. *Journal of Product Innovation Management, 16*(4), 333-351.

Cooper, R. G., Edgett, S. J., & Kleinschmidt, E. J. (2004). Benchmarking Best NPD Practices—II. *Research-Technology Management, 47*(3), 50-59.

Cooper, R., Edgett, S., & Kleinschmidt, E. (2000). New problems, new solutions: making portfolio management more effective. *Research-Technology Management, 43*(2), 18-33.

Eggers, J. (2012). All experience is not created equal: learning, adapting, and focusing in PPM. *Strategic Management Journal, 33*(3), 315-335.

Eggers, J., & Kaplan, S. (2009). Cognition and renewal: comparing CEO and organizational effects on incumbent adaptation to technical change. *Organization Science, 20*(2), 461-477.

Fernhaber, S. A., & Patel, P. C. (2012). How do young firms manage product portfolio complexity? The role of absorptive capacity and ambidexterity. *Strategic Management Journal, 33*(13), 1516-1539.

Jugend, D., & da Silva, S. L. (2014). Product-portfolio management: A framework based on Methods, Organization, and Strategy. *Concurrent Engineering: Research, 22*(1), 17-28.

Kester, L., Hultink, E. J., & Griffin, A. (2014). An Empirical Investigation of the Antecedents and Outcomes of NPD Portfolio Success. *Journal of Product Innovation Management, 31*(6), 1199-1213.

Khakbaz, S. B., & Hajiheydari, N. (2015). Proposing a basic methodology for developing balanced scorecard by the system dynamics approach. *Kybernetes, 44*(6/7), 1049-1066.

Killen, C., Jugdev, K., Drouin, N., & Petit, Y. (2012). Advancing Project and Portfolio Management Research: Applying Strategic Management Theories. *International Journal of Project Management, 30*(5), 325-538.

Kortelainen, S., Piirainen, K., & Tuominen, M. (2008). A System Dynamics Model of Learning and Innovation Process Profitability. Athens, Greece: The International Conference of the System Dynamics Society.

Lee, C.-H., Venkatraman, N., Tanriverdi, H., & Iyer, B. (2010). Complementarity-based hyper-competition in the software industry: Theory and empirical test, 1990–2002. *Strategic Management Journal, 31*(13), 1431-1456.

Lindstedt, M., Liesio, J., & Salo, A. (2008). Participatory development of a strategic product portfolio in a telecommunication company. *International Journal of Technology Management, 42*(3), 250-265.

Markowitz, H. (1952). Portfolio selection. *The Journal of Finance, 7*(1), 77-91.

McKinsey & Company. (2020). *McKinsey on Payments.* McKinsey Insights.

McNally, R. C., Durmusoglu, S. S., Calantone, R. J., & Harmancioglu, N. (2009). Exploring new PPM decisions: The role of managers' dispositional traits. *Journal of Product Innovation Management, 38*(1), 127-143.

Merten, P. P., Reiner, L., & Wiedmann, K.-P. (1987). Portfolio simulation: a tool to support strategic management. *System Dynamics Review banner, 3*(2), 81-101.

Mustonen, E., Seppänen, J., Tolonen, A., & Harkonen, J. (2019). PPM Strategic Targets And Key Performance Indicators Over Life-Cycle – A Case Study In Telecommunications Business. *Business and Society*.

Oh, J., Yang, J., & Lee, S. (2012). Managing uncertainty to improve decision-making in NPD portfolio management with a fuzzy expert system. *Expert Systems with Application, 39*(10), 9868-9885.

Otten, S., Spruit, M., & Helms, R. (2015). Towards decision analytics in PPM. *Decision Analytics, 2*(4), 1-25.

Rothaermel, F. T., Hitt, M. A., & Jobe, L. A. (2006). Balancing Vertical Integration and Strategic Outsourcing: Effects on Product Portfolio, Product Success, and Firm Performance. *Strategic Management Journal, 27*(11), 1033-1056.

Schmalensee, R. (2000). Antitrust issues in Competitive industries. *American Economic Review, 99*, 192-196.

Stake, R. E. (1995). *The art of case study research.* Thousand Oaks: SAGE Publications.

Sterman, J. D. (2000). *Business Dynamics: Systems Thinking and Modeling for a Complex World* (1st ed.). Boston, MA.: McGraw-Hill Education.

Sterman, J. D. (2001). System dynamics modeling: Tools for learning in a complex world. *California Management Review, 43*(4), 8-25.

Tanriverdi, H., & Venkatraman, N. (2005). Knowledge relatedness and the performance of multibusiness firms. *Strategic Management Journal, 26*(2), 97-119.

Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509-533.

Tiedemann, F., Johansson, E., & Gosling, J. (2020). Structuring a new product development process portfolio using decoupling thinking. *Production Planning & Control*.

Turnbull, P. W. (1990). A review of portfolio planning models for industrial marketing and purchasing management. *European Journal of Marketing, 24*(3), 7-22.

Villasalero, M. (2018). Multi-Business Firms, Knowledge Flows and Intra-Network Open Innovations. *Journal of the Knowledge Economy, 9*(1), 162-179.

Voss, M. (2012). impact of customer integration on project portfolio management and its success—developing a conceptual framework. *International Journal of Project Management, 30*(5), 567-581.

W.Seifertab, R., Jean-SébastiennTancrezc, & Biçera, I. (2016). Dynamic PPM with life cycle considerations. *International Journal of Production Economics*, 71-83.

Wolstenholme, E. (1998). Qualitative v. Quantitative Modelling: The Evolving Balance. *Journal of the Operational Research Society, 50*(4), 422-428.

Woodside, A. (2006). Advancing systems thinking and building microworlds in business and industrial marketing. *Journal of Business and Industrial Marketing, 21*(1), 24 -29.

www.shaparak.ir. (2020). Retrieved from www.shaparak.ir: https://shaparak.ir/content?id=754

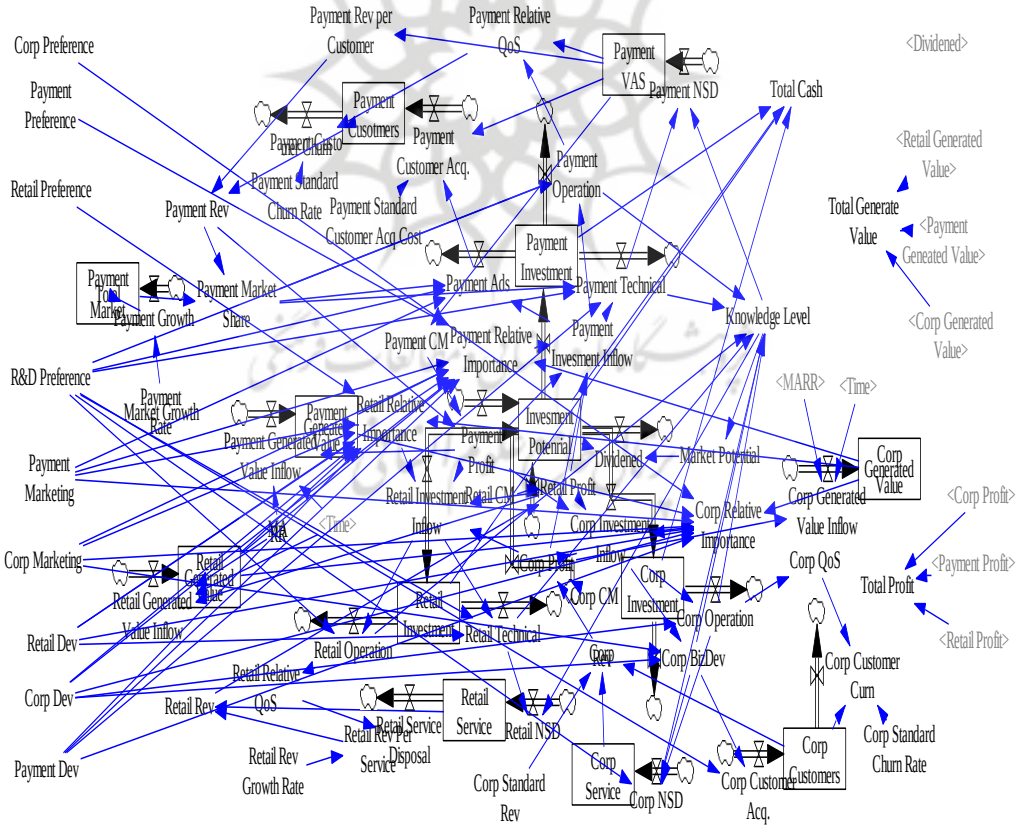
Yin, R. K. (2011). *Applications of case study research* (3rd ed.). SAGE Publications, Inc.

Bibliographic information of this paper for citing:

Khakbaz, Seyed Behnam; Shahhoseini, Mohammad Ali; Divandari, Ali & Rabiee, Hamidreza (2020). Systemic Product Portfolio Management Modeling for Iranian Financial Technology Industry. *Iranian Journal of Finance*, 4(3), 49-79.

APPENDIX

Quantitative Model



Business Services Section

(01) Corp BizDev=SQRT(Corp Dev*Corp Marketing)*0.6*Corp Investment Inflow

(02) Corp CM= 0.3

(03) "Corp Customer Acq."= DELAY1(INTEGER("R&D Preference"*Corp BizDev/1e+09), 6)

(04) Corp Customer Curn=DELAY3(INTEGER(Corp Standard Churn Rate/Corp QoS*Corp Customers), 4)

(05) Corp Customers= INTEG ("Corp Customer Acq."-Corp Customer Curn,500)

(06) Corp Dev= 1 [0.1,2,0.1]

(07) Corp Generated Value= INTEG (Corp Generated Value Inflow,1)

(08) Corp Generated Value Inflow=Corp Profit/((1+MARR)^Time)

(09) Corp Investment= INTEG (Corp Investment Inflow-Corp BizDev-Corp Operation,1e+10)

(10) Corp Investment Inflow=DELAY3((Retail Profit+Payment Profit+Corp Profit)*Corp Relative Importance, 12)

(11) Corp Marketing= 1 [0.1,2,0.1]

(12) Corp NSD=INTEGER(DELAY1(INTEGER(("R&D Preference"*Knowledge Level*Corp BizDev+Knowledge Level*Corp Operation)/(10*1e+12)), 12))

(13) Corp Operation= Corp Dev*0.4*Corp Investment Inflow

(14) Corp Preference= 1

(15) Corp Profit=Corp CM*Corp Rev

(16) Corp QoS= LOG (Corp Operation/1e+10,10)/100+1

(17) Corp Relative Importance=((Corp Dev+Corp Marketing)/(Corp Dev+Corp Marketing+Payment Dev+Payment Marketing+2*Retail Dev))*Corp Preference*Corp Generated Value/(Corp Generated Value+Payment Geneated Value+Retail Generated Value)

(18) Corp Rev= Corp Customers*Corp Service*Corp Standard Rev

(19) Corp Service= INTEG (Corp NSD, 2)

(20) Corp Standard Churn Rate= 0.01

(21) Corp Standard Rev=2e+07

Consumer Payment Section

(29) Payment Ads=Payment Marketing*(1-"R&D Preference"*Payment Market Share)*Payment Invesment Inflow

(30) Payment CM=0.2*(1+LOG(Payment VAS, 100))

(31) Payment Cusotmers= INTEG ("Payment Customer Acq."-Payment Customer Churn, 1e+06)

(32) "Payment Customer Acq."=DELAY1(Payment Ads/Payment Standard Customer Acq Cost*(1+LN(Payment VAS)/10), 2)

(33) Payment Customer Churn=DELAY3(INTEGER(Payment Standard Churn Rate/Payment Relative QoS*Payment Cusotmers), 2)

(34) Payment Dev=1 [0.1,2,0.1]

(35) Payment Generated Value= INTEG (Payment Generated Value Inflow, 1)

(36) Payment Generated Value Inflow= Payment Profit/((1+MARR)^Time)

(37) Payment Growth= Payment Market Growth Rate*Payment Total Market

(38) Payment Invesment Inflow= DELAY3((Retail Profit+Payment Profit+Corp Profit)*Payment Relative Importance , 12)

(39) Payment Investment= INTEG (Payment Invesment Inflow-Payment Ads-Payment Operation-Payment Technical, 1e+11)

(40) Payment Market Growth Rate=0.015

(41) Payment Market Share= Payment Rev/Payment Total Market

(42) Payment Marketing= 1 [0.1,2,0.1]

(43) Payment NSD=INTEGER(DELAY1(INTEGER((Knowledge Level*Payment Technical/5e+09)), 8))

(44) Payment Operation= (1/LN("R&D Preference"))*Payment Invesment Inflow*Payment Market Share

(45) Payment Preference= 1 [0.1,2,0.1]

(46) Payment Profit=Payment CM*Payment Rev

(47) Payment Relative Importance=((Payment Dev+Payment Marketing)/(Corp Dev+Corp Marketing+Payment Dev+Payment Marketing +2*Retail Dev))*Payment Preference*Payment Geneated Value/(Payment Geneated Value +Retail Generated Value+Corp Generated Value)

(48) Payment Relative QoS= LOG (Payment Operation*Payment VAS/1e+10,10)/100+1

(49) Payment Rev=Payment Cusotmers*Payment Rev per Customer

(50) Payment Rev per Customer= 350000*(1+LOG(Payment VAS,5))

(51) Payment Standard Churn Rate=0.01

(52) Payment Standard Customer Acq Cost=1e+07

(53) Payment Technical= Payment Dev*LN("R&D Preference")*Payment Market Share*Payment Invesment Inflow

(54) Payment Total Market= INTEG (Payment Growth,1.5e+12)

(55) Payment VAS= INTEG (Payment NSD, 1)

Account-Based Services (Retail) Section

(57) Retail CM= 0.2

(58) Retail Dev=1 [0.1,2,0.1]

(59) Retail Generated Value= INTEG (Retail Generated Value Inflow,1)

(60) Retail Generated Value Inflow=Retail Profit/((1+MARR)^Time)

(61) Retail Investment= INTEG (Retail Investment Inflow-Retail Operation-Retail Technical, 1e+11)

(62) Retail Investment Inflow= DELAY3((Retail Profit+Payment Profit+Corp Profit)*Retail Relative Importance , 12)

(63) Retail NSD=INTEGER(DELAY1(INTEGER((Knowledge Level*Retail Technical/3e+09)), 12))

(64) Retail Operation=(1/LOG("R&D Preference",10))*Retail Investment Inflow/10

(65) Retail Preference=1 [0.1,2,0.1]

(66) Retail Profit=Retail CM*Retail Rev

(67) Retail Relative Importance= ((2*Retail Dev)/(Corp Dev+Corp Marketing+Payment Dev+Payment Marketing+2* Retail Dev))*Retail Preference*Retail Generated Value/(Payment Geneated Value+Retail Generated Value+Corp Generated Value)

(68) Retail Relative QoS= LOG (Retail Operation/1e+09,10)/100+1

(69) Retail Rev=Retail Rev Per Service*Retail Service

(70) Retail Rev Growth Rate=0.015

(71) Retail Rev Per Service=Retail Rev Growth Rate*1.5e+11

(72) Retail Service= INTEG (Retail NSD-Retail Service Disposal,100)

(73) Retail Service Disposal=INTEGER(DELAY3(INTEGER(LN(Retail Relative QoS)), 2))

(74) Retail Technical=Retail Dev*LOG("R&D Preference",10)*Retail Investment Inflow

Public Variables

(22) Dividened= Max (DELAY3((1-Market Potential)*Invesment Potenrial/15, 12),0)

(23) FINAL TIME = 48 Units: Month

(24) INITIAL TIME = 0 Units: Month

The initial time for the simulation.

(25) Investment Potenrial= INTEG (Corp Profit+Payment Profit+Retail Profit-Corp Investment Inflow-Dividened -Payment Invesment Inflow-Retail Investment Inflow,5e+11)

(26) Knowledge Level=Max(0, LOG((Payment Operation+2*Payment Technical+Retail Operation+2*Retail Technical+Corp BizDev*3+Corp Operation)/1e+11 ,10))

(27) Market Potential=0.5+Knowledge Level/10

(28) MARR= 0.02

(56) "R&D Preference"=2.7

(75) SAVEPER = TIME STEP

(76) TIME STEP = 1

(77) Total Cash=Corp Investment+Invesment Potenrial+Payment

Investment+Retail Investment

(78) Total Generate Value= Corp Generated Value+Payment Geneated Value+Retail Generated Value

(79) Total Profit=Corp Profit+Payment Profit+Retail Profit