

Understanding Mental Model of Islamic Banking System using System Dynamics

N Atikah^{1,2}, A Hidayatno^{1,3}, Komarudin^{1,4}

¹Department of Industrial Engineering, University of Indonesia, Depok, Indonesia

²nur.atikah34@gmail.com, ³akhmadhidayatno@ui.ac.id, ⁴komarudin74@ui.ac.id

Abstract. Islamic banking development in Indonesia is significantly growing in total global asset yet stagnates in increasing its target market shares compared with the conventional. Board of Sharia Financial Architecture, stated this situation occurred due to systemic impacts, mains of them is the system structure, limited IB capital, lack of human resources in sharia, and sharia products. Due to its complexion, the understanding of the IB's whole system and its dynamic changes are being essential for all stakeholders nowadays. Thus this research is modeling a mental model of the Islamic Banking system as a financial intermediary. The research goal is revealing the underlying feedback loop structures to get a better understanding of dynamic behaviors. By using system dynamics as a tool for analyzing a complex system, this paper could portray stakeholders' conceptions of the system. The output indicator of the model, as a representative of the owner's goal, is the amount of IB deposit.

Keywords: islamic banking, mental model, system dynamics

1. Introduction

Banking and financing sector developments cannot separate from the dynamic of economic development. In the monetary side, banks play a crucial role as channels of money circulation in the market. Even in this modern life, major transactions involve the banking sector through its financing technology (Fintech). Furthermore, as financial intermediaries, banks contribute to the economic growth by pooling excessive deposits from the public and offering various lending/financing products and services, which may lead to investment and production.

Most of the banks generate their profits in the interest-based scheme and noninterest based scheme. The noninterest profit earns by charging fees on various financial services, like automatic teller machine (ATM) facility, cash management, safety deposit boxes [1]. While the interest margin, as a primary source of profit, is earned by charging a higher rate on lending than the cost of paying interest to depositors [1,2]. Thus the conventional banks are susceptible to the volatility of the interest rate, which driven by the market scheme. The evidence showed up in financial turmoil in 2007 when the traditional system reached its limits and presenting the difficulties to absorb the shock [2,3]. Meanwhile, special attention has been given to Islamic banking (IB) due to their stable conditions and resilient powers [2,3]. Therefore, the world began to recognize the consistency of sharia (Islamic based Law) concept on Financing.

The Islamic Banking (IB) is a banking activity that emerged based on sharia compliance. Sharia prohibits any transactions with usury (*Riba*), defined as a lending activity with interest, uncertainty (*Gharar*), speculation (*Maysir*) and all business that considered contrary (*haram*) to Islamic principles (e.g., gambling, weapon manufacture, pork, alcohol). Thus IB provides different financial activities from the conventional bank, by replacing interest rate scheme with profit-loss sharing scheme. In Indonesia, an interest-free bank established since 1992 and growing triggered by the presence of dual banking system regulations in 1998. This regulation brings about IB as an integral part of the national banking system, which competes for side by side with the conventional as financial intermediaries in the fairness market [3,4,5]. IB industry continues growing in line with increasing the number of service providers, the networks, and the infrastructure of Islamic-financial support system [6, 7]. Whereas, as one of the biggest countries with the majority in Islam, IB stagnates in compete with the conventional, measured by 5% in 2014 – 2016 of its market share compared with total national banking market [8].

Board of Sharia Financial Architecture, stated this situation occurred due to the systemic impacts of the system's structure, limited IB capital, human resources, and sharia products [8]. The uniqueness of IB structure is on its sharia governance according to many regulators with various policies. The regulators that supervised the financial-intermediary activities are Central Bank of Indonesia (BI), The Financial Services Authority (OJK), Indonesia Deposit Insurance Corporation (known as LPS), and National Sharia Council (known as DSN - MUI). Besides, [8] stated other barriers of the system to grow are sharia product, due to its variability, profitability, and accessibility, limited capital, which leads to limited financing capacity, limited potential financing sectors, and less efficient.

The complexion of the system, due to its stakeholders, variables, and interconnections among them, various policies that are underlying any decision-making, makes each stakeholder has their big picture of the system, which related to their preferences and knowledge. That kind of conceptual picture of a phenomenon known as a mental model [9]. In policy-making studies, the general concept of the mental model among policymakers must be defined to minimize distortions. Thus this research is modeling a mental model of Islamic banking system as a financial intermediary, as a stage of IB policy analysis.

Furthermore, the dynamic behavior understanding is being essential for stakeholders/policymakers in deciding on a complex system. Therefore this research goal is revealing the underlying feedback loop structures to understand the system's dynamic behaviors. In model development, this research used a system dynamic approach with a causal-loop diagram as a modeling tool. As in Ref. [9] System dynamics could analyze a complex system with emphasis on the feedback information, and causal-loop diagram as a tool that could portray the dynamic behaviors.

2. Methods

In developing the mental model using system dynamics, there are four common stages as a methodology: define a research question, develop model conceptualization and formulation, then verification-validation. In defining the research question, this research started with the problem owner and identified the problem owner goal. In this case, the problem owner is the board of IB regulators, BI, OJK, LPS, DSN-MUI, on behalf of Indonesia government and the IB itself. The problem owner goal is increasing IB market share. After knowing the objective, the next step is mapping government intervention protocols with setting input and output indicators. In mapping government policies, this research collecting secondary data from each regulator's official websites. The data includes regulations and previous interventions. The result of regulations mapping was translated into input indicators. The output indicator is quantitative variables that will drive by input indicators, which should represent the problem owner goal, and in this case, the output indicator is IB deposits. The market share of IB is not set as the output variable because of limitation of this research that excludes the commercial and total market share of the banking industry.

In the second stage is conceptualization and formulation, this research developed a causal-loop diagram to visualize a mental model of the IB system as a financial intermediary in the dual banking system. Causal-loop diagram is a communication tool that informs cause and effect relationship with the closed chain as feedback information of a system. The causal loop diagram of the IB system consists of three parts; funding activities, financing activities, and public sector activities. After the model has developed, the research continues to the verification-validation stage. In this stage, we verify the logic of the mental model with common sense and data collection. Then model validated by focus group discussion that consists of 12 experts on behalf Government, Bankers, Sharia economic experts, and academics.

3. Results and Discussions

After passing all four stages, this research results in the mental model of IB policy framework, as shown in Figure 1. The need for behavior understanding makes the feedback loops essential to discuss. Before further discussion about the underlying feedback loop of the IB mental model, several feedback loop symbols have to be stated clearly, as shown in Table 1.

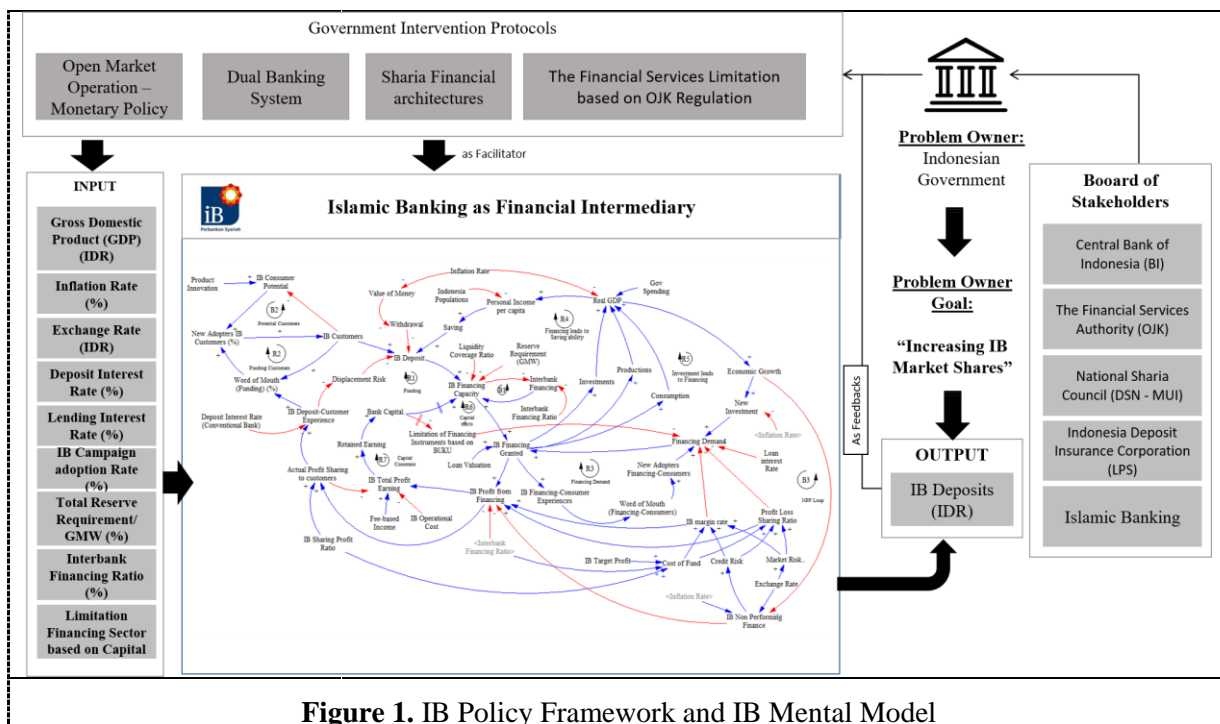
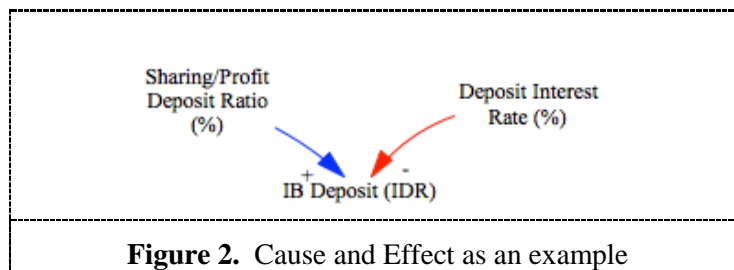


Figure 1. IB Policy Framework and IB Mental Model

As in Table 1, there are ten loops with specific symbols and codes. The clockwise loop symbol, with R-code, indicates the reinforcing effect, and counter loop symbol, with B-code, show the balancing force. Besides, there are also blue/red arrows with two symbols of positive and negative. The arrows describe the direction and positive/negative show the effect. For instance, Fig. 2 shows customer’s decision making on saving their cash in Islamic banking. The IB deposit describes the amount of saving, and it depends on sharing profits deposit ratio, which offered by IB and deposit interest rate, which provided by a conventional bank. So, sharing profit ratio and deposit interest rate as causes and IB deposit as an effect. The causal effect describes as “If sharing profit ratio increase could also increase the deposit amount (The positive sign with blue arrow),” whereas if the deposit interest rate increase, the IB deposit will decrease tend to less unprofitable (The negative sign with red arrow).”

Table 1. Feedback loop symbols definition.

Symbol	Code	Loop Definitions
Clockwise Loop	R1	Funding Activity
	R2	Funding Customers
	R3	Financing Demand
	R4	Financing Leads to Saving Ability
	R5	Investment Leads to Financing
	R6	Bank's Capital Effects
	R7	Capital Constraint
Counter loop	B1	Interbank Financing
	B2	Potential Customers
	B3	Non-Performing Finance (NPF) Loop



The development of a mental model started with the first loop, R1, as the IB funding activities. It is a reinforcing loop that consists of 15 variables, as shown in Fig.3. The amount of deposit is driving by saving ability, withdrawal, IB deposit customers. In increasing “IB Deposit” leads to increasing the financing capacity then increase the amount of financing granted. The amount of financing capacity depends on reserve requirement (RR) and liquidity coverage ratio (LCR). Therefore, as financing granted is increase, the actual profit sharing to customers would positively increase as long as the profit from financing increase. If the actual profit sharing meet the customer expectation, the positive trend of customer experience will occur and suppress the displacement risk, which would lead to positive feedback for deposit. Besides, as in Ref [10], the displacement risk occurs when the return on assets is under-performing as compared with competitors’ rate.

Further, in order to maintain economic and bank stability, BI and OJK require every bank to maintain liquidity by RR and LCR policy. RR defined based on BI policy, which forces the bank to save an amount of current account to the central bank. Beside the LCR is based on OJK regulation as an average minimum rate of liquid assets to cover all short-term liquidity obligations for the next 30 days. Then, if IB cannot meet those policies, IB will require using interbank financing mechanism as shown in Fig 3. This mechanism gives a balancing loop (B1), due to its effect on financing capacity. The amount of interbank financing will depend on the financing ratio which negotiated between banks.

In this research, the model also concerns the bass diffusion model as innovation diffusion of how an adoption process of a product works between users and potential users [12, 13]. There is two side of the diffusion, in funding mechanism and financing, as shown in Fig. 4 and 5. In Fig. 4, there is word of mouth effects that affected by consumer experiences. As the experiences are positive, the word of mouth effect would be as a positive effect. Then the effect would influence the potential consumer to be new adopters, next to the adopters gradually being a loyal consumer of IB, and so on (R2). In balancing mechanism on IB customers (B1) shows there would be decreasing potential customers as there are switches to new adopters unless the bank opens new market with product innovation. In the

financing side (R3), the bass diffusion model begins with good consumer experiences lead to increasing financing demand and financing granted, as in Fig. 5.

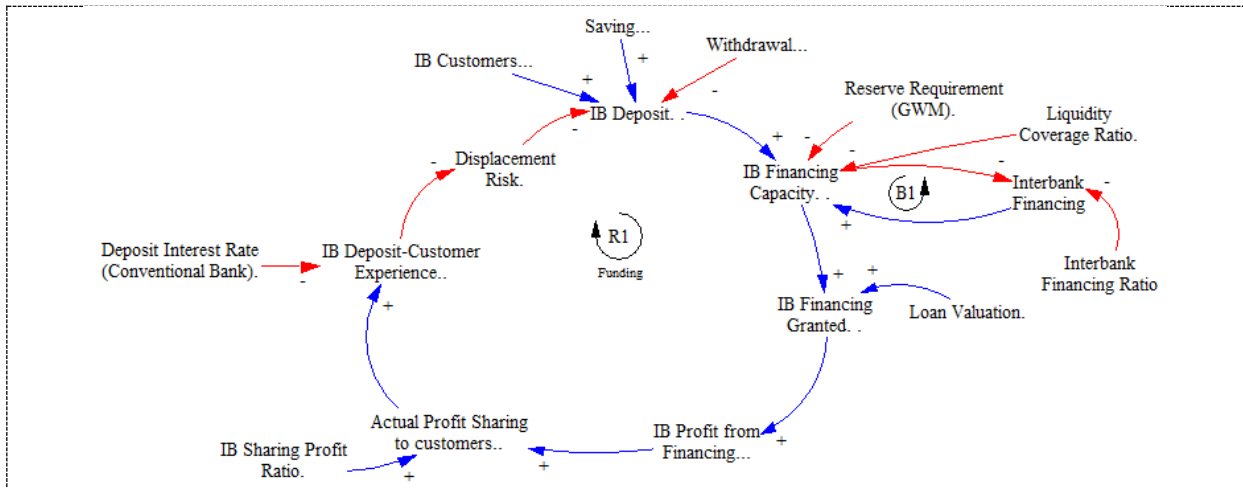


Figure 3. Funding Activity loop and interbank financing

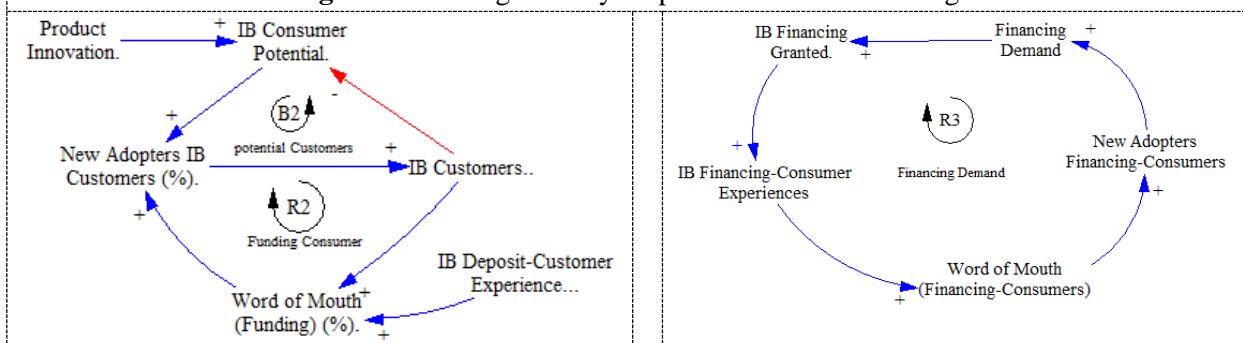


Figure 4. Bass diffusion loops on the funding side

Figure 5. Bass diffusion loops on the financing side

The model development continues in modeling financing effects on funding and financing demand. As in Fig. 6, granted financing schemes from IB have multiplier effects on national investment, production, and consumption. If the national production, consumer and investment increase, then the real GDP will follow in the same trend. The Increasing GDP will affect positively personal income per capita. Then saving ability and IB deposit will follow in the same patterns. Meanwhile, Increasing GDP will affect economic growth positively, and then the desire of new investment and the financing demand would also increase, as symbolized with R5 in Fig. 7.

Furthermore, the increasing of economic growth because of GDP (B3) lead to lessening the number of nonperforming financing (NPF) but volatile against inflation rate and exchange rate as shown in Fig. 8. This Loop also describes the additional variables on Financing Demand. The financing demand affected by IB profit loss sharing ratio, IB margin rate, and loan interest rate. Two of the IB rates determined by analyzing credit risk, market risk, and IB’s cost of fund (CoF). When those rates are higher than the loan interest rate proposed by the commercial bank, the consumer will not choose IB financing, as it is less profitable.

The financing activities depend on the capital amount, and it is one of the constraints to IB compete with the conventional [8]. As shown in Fig. 9, limited bank’s capital of IB will affect the financing instruments (R7) based on OJK regulation on POJK/No.6/POJK.03/2016. The rule stated the limitation on business activities and networks based on the bank’s core capital (known as BUKU).

Thus the model shows the Bank's capital limits financing instruments and leads to limited financing demand. Therefore, refer to the OJK regulation on POJK/No.11/POJK.03/2016, the amount of financing capacity determined based on Bank's Capital to hold a bank's liquidity. Thus, the R6 loop is developed which will hamper financing activities. In those two loops, there are delay symbols (//) which mean "in according to increase financing capacity, IB has to increase its core capital in such level that would be reached with a delay as cumulative over time."

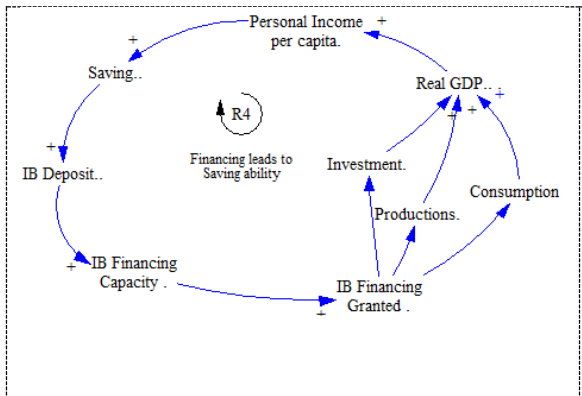


Figure 6. Financing activities affect the saving ability

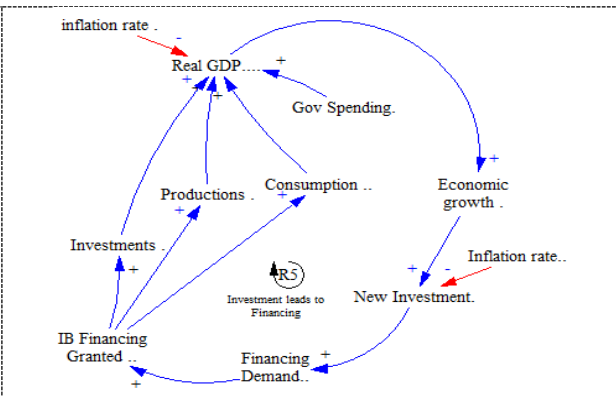


Figure 7. Investment leads to financing demand

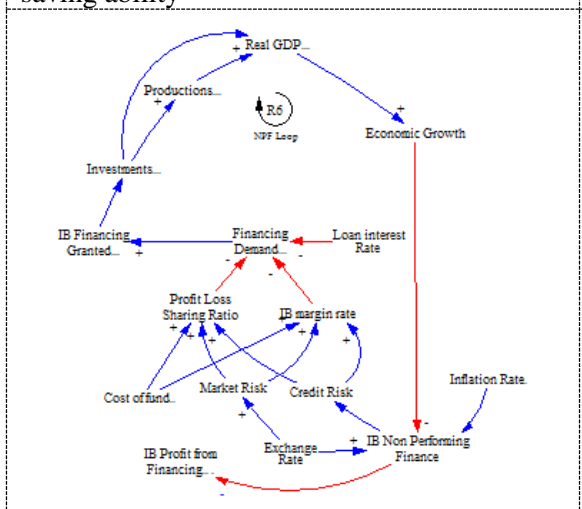


Figure 8. Non-Performing Finance leads to decrease in demand

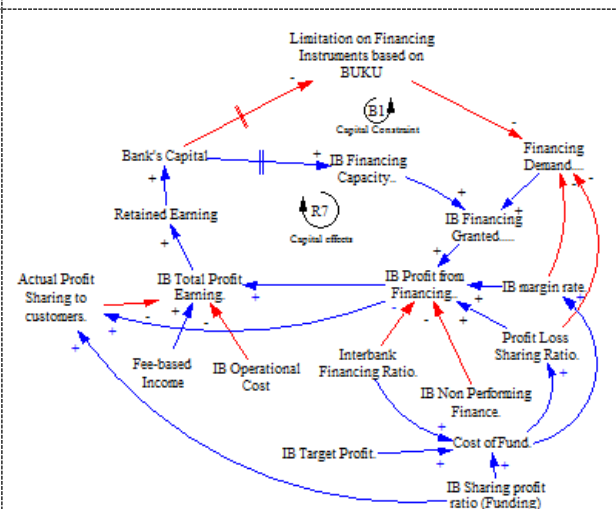


Figure 9. Bank's capital as a constraint

4. Conclusion

A mental model of the IB system as a financial intermediary has discussed in the previous section. By using system dynamics as a tool for analyzing a complex system, this research could capture stakeholders' mental model of the IB system. As a representative of the owner's goal, the amount of IB deposit is the output indicator of the model. There are seven reinforcing loops and three balancing loops in IB mental model. There are some highlights from the mental model and the development:

- To increase the deposit amount, IB has to invest in product innovation to open a new market, with better accessibility and profitability, as shown in Fig.4.
- By minimizing CoF, the actual return to IB depositors will be maintained in the target to minimize the displacement risk, as shown in Fig. 9 then Fig. 3.
- The main balancing loop that counters the growth of IB deposit is NPF loof (B3) in Fig. 8.

- Beside NPF, there are constraints of IB growth, such as a higher CoF than commercial bank and bank's capital.
 - Higher IB's CoF leads to higher margin rate then the IB financing scheme is less attractive than the commercial. Further, the financing demand would decrease as it is less profitable for consumers. The decreased demand would lead to decrease profit, then less actual sharing profit on deposit (as shown in Fig.9). Then unattractive on deposit return would drive higher displacement risk (as shown in Fig.3). Thus over time, the IB would not be as a competitive as now.
 - The limited capital makes IB's scope of demand and financing capacity narrower than the commercial. Due to its limitations, IB's financing consumers mostly are from small-medium enterprises (SME's), which more susceptible to business failure, then higher risk on NPF. Thus in the effort to generate profits, IB have more difficulties than the commercial.
- To give a significant impact, IB need Gov. interventions as a channel to diminish the capital barrier, which makes IB challenging to compete with the conventional in return on assets.

As a stage of IB's policy analysis, the further research recommendations are expanding the model with adding more details on interbank activity, sharia product in both of funding and financing side, considering fiscal intervention, and developing stock and flow diagram to get quantitative behaviors of the system.

Acknowledgments

This work is supported by University research program FY 2018 under 'Penelitian Terapan Unggulan Perguruan Tinggi, Kementerian Riset Teknologi dan Pendidikan Tinggi,' Contract No: 498/UN2.R3.1/HKPO5.00/2018.

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