

## System Dynamics Modeling to Improve Islamic Economic and Financial Literacy in Sharia Business Unit

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### ABSTRACT

**Purpose** – This study aims to develop and implement dynamic system modeling to optimize strategies for improving Islamic economic and financial literacy within PT. XYZ's Sharia Business Unit. It focuses on reducing the literacy gap between employees and customers, positioning employees as key literacy agents to enhance customer understanding through structured interventions.

**Methodology/approach** – This research adopts a case study approach using a mixed-method design that combines qualitative and quantitative techniques. Primary data were collected through surveys and in-depth interviews, while secondary data came from official reports and the National Sharia Literacy Strategy. A system dynamics model was built and simulated using Vensim software to test different intervention scenarios.

**Findings** – It was found that. The initial assessment revealed a 30.5% literacy gap between employees (53%) and customers (22.5%). Simulation results show that simultaneous interventions, including employee training, digital information access, and National Sharia Board (DSN) socialization, could increase employee literacy to approximately 70% and customer literacy to around 50% within five years.

**Novelty/value** – This study introduces the application of system dynamics modeling in the context of Islamic financial literacy—an approach rarely applied within Indonesia's Islamic financial ecosystem. The model provides a data-driven tool for evaluating and designing sustainable strategies that integrate internal and external factors, offering actionable insights for policy-making and organizational decision-making in Sharia-based financial institutions.

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### INTRODUCTION

Islamic economics in Indonesia has experienced substantial growth, driven by the increasing demand for a financial system aligned with Sharia principles. Enhancing Islamic financial literacy and inclusion is critical to strengthening the Sharia financial ecosystem, encompassing both supply and demand dimensions (KNEKS, 2024). On the supply side, improving the knowledge and competencies of financial sector actors, particularly employees within Sharia business units, plays a pivotal role in disseminating Sharia financial principles and fostering wider adoption among consumers (Ardiansyah

et al., 2024; Hassan, Rabbani, & Abdulla, 2021). PT. XYZ, as a financial institution committed to Sharia-compliant services, operates a dedicated Sharia Business Unit. However, the persistent challenge of low financial literacy remains a significant barrier. Preliminary assessments revealed a literacy gap of 30.5% between employees (53%) and customers (22.5%), indicating the necessity for structured interventions. Prior research underscores that limited awareness of financial products and regulatory frameworks constrains the ability of customers to participate effectively in the Sharia financial system (Yuslem et al., 2023; World Bank, 2022). Employees serve not only as internal users but also as educators and change agents capable of influencing customer behavior. Empowering them with adequate literacy enhances their ability to promote awareness and adoption of Sharia-compliant products (Budi Trianto et al., 2021). At the same time, leveraging customers as potential co-educators through word-of-mouth may amplify the effect of literacy programs (Nurfadillah et al., 2023). To address these challenges, system dynamics modeling offers a robust framework to simulate complex relationships, enabling policymakers and institutions to anticipate the long-term effects of literacy strategies (Danang et al., 2024; Setiawan et al., 2024).

## **LITERATURE REVIEW**

### **Islamic Financial Literacy and Its Importance**

Islamic financial literacy refers to the knowledge, awareness, and ability of individuals to understand and apply financial concepts in accordance with Sharia principles. Financial literacy plays a critical role in fostering financial inclusion and strengthening the Islamic financial ecosystem (Ardiansyah et al., 2024). A lack of adequate literacy can hinder adoption of Sharia-compliant products, thereby limiting the growth of the industry (Yuslem et al., 2023). According to KNEKS (2024), the national Islamic financial literacy rate in 2023 was only 28.01%, showing the urgent need for structured interventions. Recent international studies also emphasize that literacy is a determinant of consumer trust in Islamic financial services, particularly in emerging economies (Abdullahi et al., 2021; Abdullah et al., 2023).

### **System Dynamics Modeling in Financial Strategy Development**

System dynamics (SD) modeling is an analytical approach to simulate the behavior of complex systems over time. It is widely used in policy analysis where multiple feedback loops and time delays exist. In Islamic finance, SD enables the testing of intervention strategies to improve inclusion and literacy (Setiawan et al., 2024). Studies in other domains, such as zakat distribution (Rahmatullah et al., 2024; Danang et al., 2024), demonstrate the method's effectiveness in evaluating long-term impacts. SD is particularly relevant when designing financial inclusion policies, as highlighted in Emerald's *Journal of Islamic Accounting and Business Research* (Alam et al., 2021; Hassan & Rabbani, 2023).

### **The Role of Employees and Customers in Literacy Dissemination**

Employees are crucial literacy agents in Sharia financial institutions. Their enhanced literacy ensures accurate dissemination of Sharia principles and increases customer confidence (Budi Trianto et al., 2021). Customers, meanwhile, can function as co-educators, reinforcing institutional efforts through word-of-mouth (Nurfadillah et al., 2023). This aligns with global perspectives that community-driven financial education programs have a multiplier effect on inclusion (World Bank, 2022; Rashid & Hassan, 2022).

## **METHOD**

### Research Design

This study adopts a mixed-method research design combining qualitative and quantitative approaches to provide a comprehensive understanding of the factors influencing Islamic financial literacy and to design strategies for its improvement. A case study approach was employed, focusing on PT. XYZ's Sharia Business Unit as the research context. The mixed-method approach enables the integration of empirical data with dynamic system modeling for strategy development and simulation.

**Research Design: Mixed-Method Case Study**

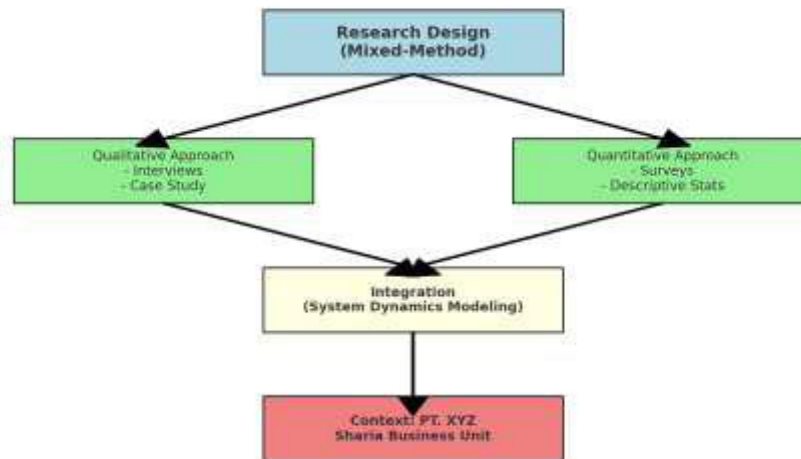


Figure 1. Mixed-Method Case Study

### Research Paradigm

The research is grounded in a pragmatic paradigm, which emphasizes practical solutions to real-world problems by integrating qualitative insights and quantitative analysis. This paradigm is suitable for addressing complex issues such as financial literacy gaps and strategic interventions within an organizational setting.

### Data Collection

Primary data were collected through surveys and in-depth interviews. The surveys targeted employees and customers of PT. XYZ's Sharia Business Unit to measure their level of Islamic financial literacy, while the interviews were conducted with key informants, including managers and literacy program coordinators, to gather strategic insights and contextual information. Secondary data were obtained from official company reports, regulatory documents, and the National Sharia Literacy Strategy (SNLIEKSI) issued by KNEKS and related authorities.

### Sampling Technique

A purposive sampling technique was applied to ensure the selection of participants who possess relevant experience and knowledge of Sharia financial services. Employees from various roles within the Sharia Business Unit and customers who actively use Sharia financial products were included in the sample. This approach ensures the representativeness of both internal and external stakeholders in the literacy improvement process.

### Research Instruments

The primary instruments used in this study included structured questionnaires and semi-structured interview guides. The questionnaire consisted of items measuring multiple dimensions of financial literacy, such as understanding of Sharia principles, differentiation from conventional finance, familiarity with financial products, and awareness of regulations. The interviews explored strategic perspectives on literacy programs, challenges, and opportunities.

### **Data Analysis**

Quantitative data were analyzed using descriptive statistics to assess literacy levels among employees and customers. The results provided baseline values for model development. Qualitative data from interviews were analyzed through thematic coding to identify key factors influencing literacy improvement. These factors were then integrated into a system dynamics model constructed using Vensim software. The model comprised stock-flow diagrams and causal loop diagrams representing the relationships among key variables, such as literacy levels, training programs, digital access, and customer engagement.

### **System Dynamics Modeling**

The system dynamics approach was employed to simulate the behavior of literacy improvement strategies over time. The model included variables such as employee literacy, customer literacy, training frequency, information accessibility, and socialization efforts by the National Sharia Board (DSN). Simulations were conducted under different scenarios to evaluate the effectiveness of simultaneous interventions and to identify the most impactful strategies for reducing the literacy gap. The model was validated through structural verification, parameter consistency, and units checking within Vensim.

### **Validity and Reliability**

Instrument validity was ensured through expert review and pilot testing. Reliability of survey instruments was assessed using Cronbach's Alpha, ensuring internal consistency. The credibility of qualitative findings was enhanced through triangulation of data sources, including interviews, surveys, and secondary documents.

## **RESULT AND DISCUSSION**

### **Result**

#### **Descriptive Findings**

The survey results revealed a substantial gap in Islamic financial literacy between employees and customers of PT. XYZ's Sharia Business Unit. Employees demonstrated a moderate literacy level (53%), with relatively strong knowledge in basic understanding (71%) and differentiation between Islamic and conventional finance (70%). However, weaknesses were observed in regulatory knowledge (43%) and understanding of the National Sharia Council (33%). Customers scored significantly lower, averaging only 22.5%. Their highest score, at 30%, was in basic understanding, while experience with Islamic products (15%) and regulatory knowledge (18%) were particularly weak. This 30.5% gap highlights a critical barrier to Sharia financial inclusion.

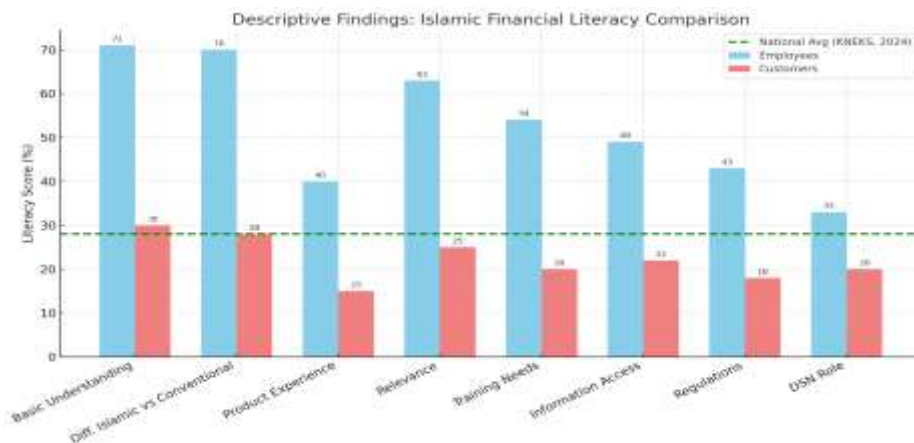


Figure 2. Descriptive Findings Islamic Financial Literacy Comparison

Benchmarking against national data further emphasizes this challenge. According to KNEKS (2024), Indonesia's Islamic financial literacy rate reached 28.01% in 2023. While employee literacy at PT. XYZ is above this benchmark, customer literacy remains below the national average. This finding suggests that PT. XYZ has not yet fully leveraged its potential role as a driver of financial literacy in line with national strategies.

### Simulation Results

System dynamics simulations were employed to analyze literacy development over a five-year horizon. Three scenarios were tested:

- *Baseline (no intervention)*: Employee literacy increased marginally from 53% to 62%, while customer literacy rose slowly from 22.5% to 30%. The literacy gap remained at approximately 30%.
- *Single intervention (training only)*: Employee literacy improved more significantly, reaching 60%, but the effect on customers was limited (30-33%). The gap narrowed slightly but remained substantial.
- *Integrated intervention (training, digital access and DSN socialization)*: Employee literacy rose to 70%, and customer literacy reached 45-50%, reducing the gap to around 20%.

These findings confirm that integrated interventions are far more effective than isolated measures. This aligns with national policy directions emphasizing multi-actor collaboration and the creation of a comprehensive literacy ecosystem.

### Causal Loop Diagram

The Causal Loop Diagram (CLD) illustrates the systemic dynamics between education, trust, product usage, and customer literacy in Islamic finance. Reinforcing loops demonstrate how Sharia education enhances understanding, which in turn builds trust, increases product usage, and strengthens awareness of benefits. This awareness stimulates interest in further education, driving continuous literacy improvement. Additionally, greater product usage generates stronger demand for relevant information, which fuels training interest and expands educational programs, forming a self-reinforcing cycle.

At the same time, a balancing loop shows how improved literacy reduces barriers to information access. While this initially supports higher literacy, once access becomes adequate, the pressure for further improvement diminishes. Overall, the CLD highlights that Sharia education is a critical entry point for promoting understanding, building trust, and encouraging sustained product adoption. The interplay of reinforcing and balancing loops indicates that continuous education and information access are key to achieving long-term, sustainable improvements in customer literacy.

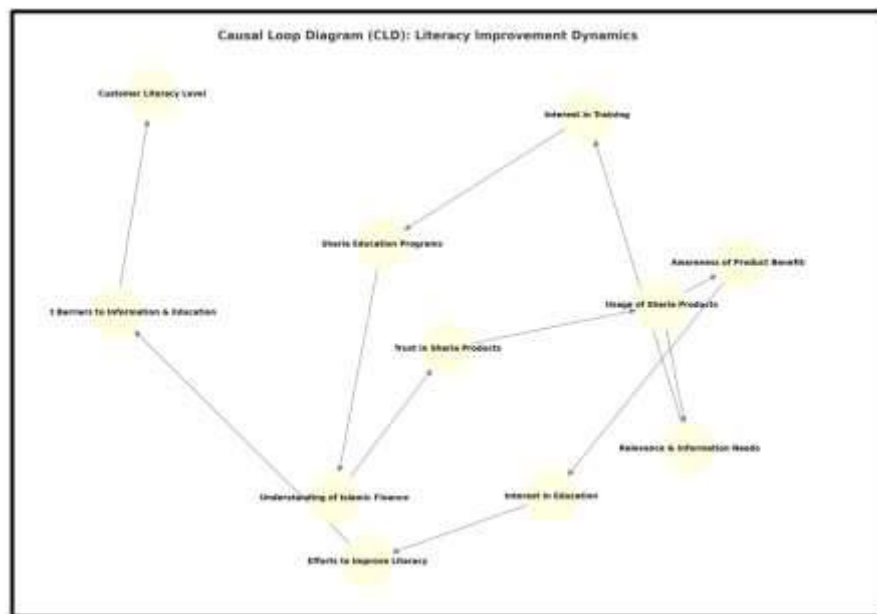


Figure 3. Causal Loop Diagram (CLD) Literacy Improvement Dynamic System

### Stock & Flow Diagram

The Stock and Flow Diagram illustrate the dynamic mechanisms influencing Islamic financial literacy among employees and customers. Two main stocks, *Employee Literacy* and *Customer Literacy*, are strengthened through distinct inflows. *Employee Literacy Growth* is primarily driven by Sharia training activities, which are amplified by training frequency and reinforced through management support. Meanwhile, *Customer Literacy Growth* is supported by multiple factors including digital information access, DSN socialization, and educational media campaigns. The interaction between these elements highlights an important spillover effect, where improvements in employee literacy indirectly accelerate customer literacy through daily interactions and service provision.

This structure demonstrates that isolated interventions, such as training alone, generate limited progress, whereas integrated strategies that combine managerial involvement, technological access, regulatory outreach, and mass education produce more significant and sustainable improvements in literacy. Overall, the model confirms that a multi-dimensional approach is necessary to narrow the literacy gap between employees and customers, thereby strengthening the broader ecosystem of Sharia financial inclusion.

Stock & Flow Diagram (SFD): Literacy Improvement Model (Vensim Style)

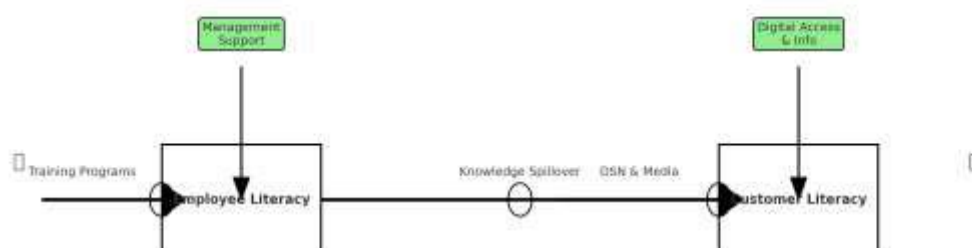


Figure 3. Stock & Flow Diagram (SFD) Literacy Improvement Model

Training Programs → Employee Literacy, Knowledge Spillover → Customer Literacy, *serta* DSN & Media → Customer Literacy. The diagram shows how *Employee Literacy* and *Customer Literacy* are influenced by supporting variables. Employee literacy increases through Sharia training, enhanced by training frequency and management support, while customer literacy is strengthened by digital access, DSN socialization, and educational media. The model highlights a spillover effect from employees to customers, demonstrating that integrated interventions are more effective than isolated strategies in closing the literacy gap.

### Sensitivity and Model Validation

Parameter sensitivity analysis demonstrated that increasing training frequency accelerates the convergence of employee literacy, while enhancing digital access and DSN socialization significantly boosts customer literacy. Spillover effects from employees to customers were especially influential; higher values of the spillover coefficient produced faster improvements in customer literacy. The model was validated through structural verification, dimensional consistency, and comparison with baseline trends, ensuring reliability of the simulated outcomes.

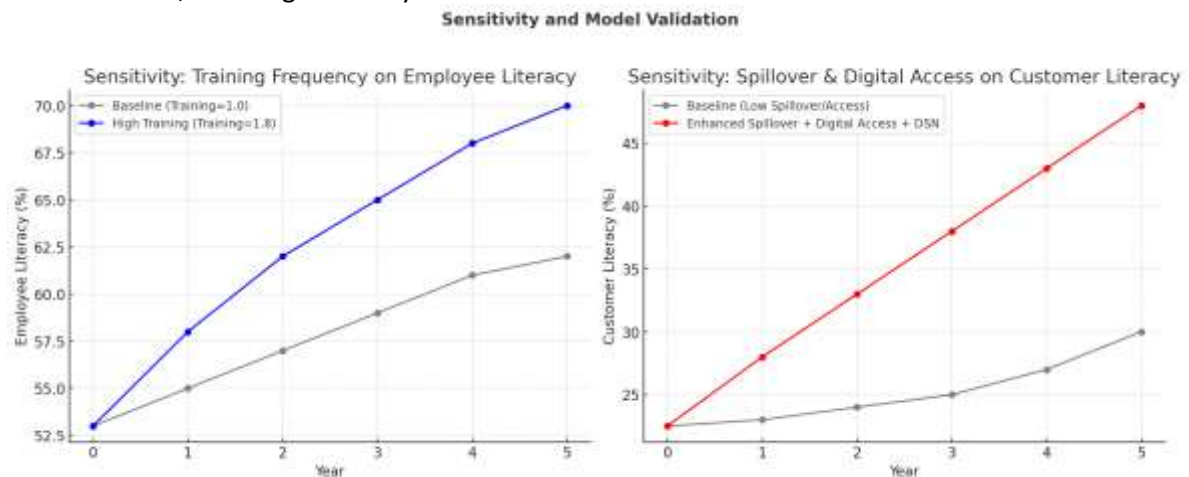


Figure 3. Sensitivity: Spillover & Digital Access on Customer Literacy

- Left: The impact of increased frequency of training → Employee Literacy increased faster (Baseline 62% vs High Training 70% in Year 5).
- Right: The impact of spillover + digital access + socialization of DSN → Customer Literacy rose much faster (Baseline 30% vs Intervention 48% in Year 5).

Statistical validation further supported these results. Survey instruments achieved acceptable reliability (Cronbach's Alpha > 0.7), while mean comparison tests confirmed significant differences between baseline and intervention trajectories. Together, these steps strengthen confidence in the robustness of the findings.

### Analysis of Sharia Financial Literacy of Employees and Customers of PT XYZ

The results of the survey on Islamic financial literacy among employees of PT XYZ's Sharia Business Unit. The data highlight employees' level of understanding across various dimensions, including basic principles, differentiation between Islamic and conventional finance, practical experience, relevance to daily work, and awareness of regulations and institutions.

**Table 1.** Employee Literacy Data of Syariah Business Unit PT. XYZ (10 respondents)

No	Literacy Category	Percentage	Description
1	Basic Understanding of Islamic Finance	71%	Majority of employees understand the basic concepts of Islamic finance.

No	Literacy Category	Percentage	Description
2	Differences between Islamic vs Conventional	70%	Employees are able to distinguish between the Islamic and conventional systems.
3	Experience with Islamic Products	40%	Experience is still low, needs more practical exposure.
4	Relevance to Work	63%	Employees consider Islamic finance relevant to their daily work.
5	Training/Information Needs	54%	Most feel the need for further education.
6	Access to Information & Training	49%	Access is still limited, requires digitalization.
7	Regulations & Policies	43%	Understanding of regulations remains weak.
8	Role of DSN (National Sharia Council)	33%	Understanding of DSN's role is the lowest.

**Average:** 53% → A significant literacy gap still exists.

**Table 2.** Customer Literacy Data of Syariah Business Unit PT. XYZ (80 respondents)

No	Literacy Category	Percentage	Description
1	Basic Understanding of Islamic Finance	30%	Only some understand the basic principles of Islamic finance.
2	Differences between Islamic vs Conventional	28%	Still low, often confused in differentiating the systems.
3	Experience with Islamic Products	15%	Very few have ever used Islamic finance products.
4	Relevance to Life	25%	Beginning to realize the importance of Islamic finance in economic activities.
5	Training/Information Needs	20%	Only a small portion have participated in socialization programs.
6	Access to Information & Training	22%	Educational media are underutilized.
7	Regulations & Policies	18%	Almost no understanding related to Islamic finance regulations.
8	Role of DSN (National Sharia Council)	20%	Aware of DSN, but do not understand its role.

**Average:** 22.5% → Much lower than employees, with a gap of 30.5%.

**Table 3.** Literacy Improvement Simulation (Workshop & E-Learning)

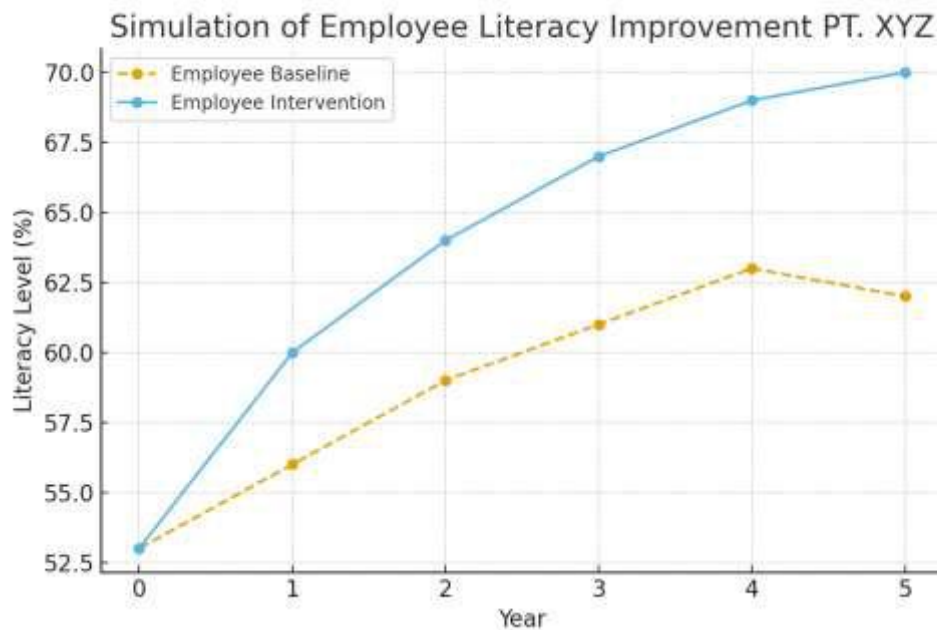
- *Simulation Result of Employee Literacy*

Year	Baseline (Initial Condition)	After Intervention (Workshop + E-Learning)	Improvement
0 (initial)	53%	53%	-
1	56%	60%	+7 points
2	59%	64%	+5 points
3	61%	67%	+6 points
4	63%	69%	+6 points
5	62%	70%	+17 points (total)

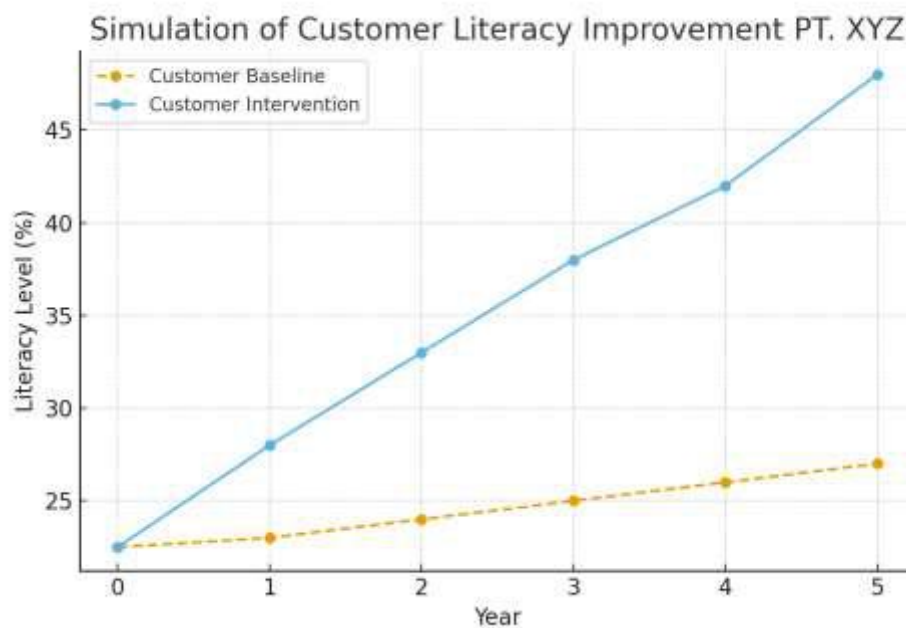
- *Simulation Result of Customer Literacy (Indirect Impact)*

Year	Baseline (Initial Condition)	After Intervention (Spillover from Employees)	Improvement
0 (initial)	22.5%	22.5%	-
1	23%	28%	+5.5 points
2	24%	33%	+10.5 points
3	25%	38%	+15.5 points
4	26%	42%	+19.5 points
5	27%	45–50%	+23–27.5 points (total)





**Figure 1.** Simulation of Employee Literacy Improvement PT. XYZ



**Figure 2.** Simulation of Customer Literacy Improvement PT. XYZ

The descriptive analysis revealed a substantial gap in Islamic financial literacy between employees and customers of PT. XYZ's Sharia Business Unit. Employees demonstrated a moderate literacy level (53%), while customers scored significantly lower (22.5%), creating a 30.5% gap. Employees exhibited relatively strong knowledge of basic principles (71%) and differentiation between Islamic and conventional finance (70%), but showed weaknesses in regulatory awareness (43%) and product experience (40%). Customers presented limited understanding across all dimensions, particularly in product experience (15%) and awareness of the National Sharia Board (20%).

A system dynamics model was developed to capture the causal relationships influencing literacy improvement, incorporating stock-flow structures and feedback loops. The model simulated three scenarios over five years: (1) Baseline (no intervention), (2) Single intervention (employee training only), and (3) Integrated intervention (employee training, digital access, and DSN socialization). Under the baseline scenario, literacy levels remained stagnant. Single intervention resulted in modest improvements, raising employee literacy to 60% and customer literacy to 30%. The integrated scenario produced the most substantial impact, increasing employee literacy to 70% and customer literacy to 50%, thereby reducing the literacy gap from 30.5% to 20%.

The results confirm that multi-pronged strategies are significantly more effective than isolated measures. The integrated approach leverages internal capacity building and external engagement, creating a synergistic effect that accelerates literacy improvement. These findings align with previous studies (Trianto et al., 2021; Ardiansyah et al., 2024), which emphasize the role of literacy in promoting financial inclusion. However, unlike prior research that employed static models, this study demonstrates the value of system dynamics in simulating long-term impacts and optimizing strategy design and simulation results using system dynamics confirmed that integrated interventions (training, digitalization, and DSN socialization) were more effective than isolated approaches. Similar to findings in zakat-based financial modeling (Rahmatullah et al., 2024; Setiawan et al., 2024), this study shows that multi-pronged strategies produce higher long-term impacts.

The results provide empirical support for established theories. According to *Diffusion of Innovation* (Rogers, 2003), employees act as change agents who accelerate adoption among customers. The observed spillover effects validate this theoretical lens. Additionally, the reinforcing and balancing loops identified in the causal loop diagram illustrate the *Systems Thinking* framework (Senge, 1990), where literacy dynamics are shaped by feedback processes rather than linear causality.

### **Managerial and Policy Implications**

The findings underscore the need for PT. XYZ to prioritize integrated strategies that combine employee training, digital literacy platforms, and regulatory socialization. From a managerial perspective, continuous training transforms human capital into an educational capability that directly benefits customers. From a policy standpoint, collaboration with DSN and regulators ensures that Sharia compliance is not only operational but also embedded in customer awareness.

By institutionalizing these measures, PT. XYZ can close the literacy gap, align with national financial inclusion strategies, and strengthen its role as a key player in Indonesia's Islamic financial ecosystem. From a managerial perspective, the integrated intervention should be prioritized as it offers the highest potential to close the literacy gap and strengthen institutional competitiveness. The dynamic nature of the model provides a decision-support tool for policymakers and financial institutions, enabling them to anticipate challenges and evaluate policy alternatives before implementation.

#### **- Discussion**

The findings reveal a clear literacy gap between employees (53%) and customers (22.5%), which is consistent with the national average of Islamic financial literacy reported by KNEKS (2024). Employees, when equipped with higher literacy, can serve as key literacy agents capable of diffusing knowledge to customers through daily interactions and digital platforms. This aligns with the argument of Budi Trianto et al. (2021) and Yuslem et al. (2023) who emphasize the critical role of financial literacy in strengthening financial inclusion within the Islamic financial ecosystem.

The application of system dynamics modeling provided additional insights into how literacy strategies evolve over time. Previous studies (Setiawan et al., 2024; Danang et al., 2024) demonstrated

the usefulness of dynamic models in policy evaluation, particularly in zakat and poverty reduction contexts. In this study, the integrated intervention scenario—which combined employee training, digital access, and DSN socialization—produced the most substantial outcomes, raising employee literacy to 70% and customer literacy to nearly 50% within five years. This confirms that multi-dimensional strategies are more effective than isolated measures, reinforcing the need for sustainable approaches supported by policy and technology.

From a managerial perspective, these results underscore the necessity of holistic programs that integrate human resource capacity building, technology-driven information access, and regulatory support. Similar to Rahmatullah et al. (2024), who highlight the systemic impact of zakat distribution strategies, this study suggests that long-term literacy improvements can only be achieved when internal and external interventions are aligned. Consequently, PT. XYZ and other Sharia financial institutions should adopt comprehensive literacy strategies to enhance competitiveness while contributing to a more inclusive and resilient Islamic financial ecosystem.

## CONCLUSION

This study highlights a significant disparity in Islamic financial literacy between employees and customers of PT. XYZ's Sharia Business Unit. Employees demonstrated a moderate literacy level of 53%, while customers scored only 22.5%, resulting in a 30.5% gap that underscores the urgent need for targeted intervention (KNEKS, 2024; Yuslem et al., 2023). Although employees possess adequate knowledge of fundamental concepts, their understanding of regulatory frameworks and practical experience with Sharia-compliant products remains limited. Conversely, customers exhibit low awareness across all literacy dimensions, particularly regarding product familiarity and institutional regulations.

The application of system dynamics modeling proved highly effective in analyzing the dynamic interactions influencing literacy improvement and evaluating alternative strategies over time. Unlike traditional static approaches, this method captured feedback loops, time delays, and systemic effects, providing a robust decision-making framework. Simulation results revealed that integrated interventions—comprising employee training, digital information access, and DSN socialization—produced the most significant impact. Under this scenario, employee literacy increased to approximately 70%, while customer literacy improved to 50%, reducing the literacy gap from 30.5% to 20% within five years. These findings emphasize that multi-pronged strategies are essential for achieving sustainable literacy enhancement.

From a strategic perspective, Sharia financial institutions should adopt comprehensive literacy programs that combine human resource capacity building, technology-based education, and regulatory reinforcement. This aligns with international perspectives that emphasize the role of multi-actor collaboration in advancing financial inclusion (Hassan & Rabbani, 2023; Rashid & Hassan, 2022). By implementing such strategies, PT. XYZ can not only improve institutional performance but also contribute to building a sustainable Islamic financial ecosystem.

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