MYPE-Navigator: A Scalable Web-Based Financial Literacy Platform for Micro and Small Enterprises

Design, Implementation, and Empirical Validation in Emerging Economies

Xiomara Picon
Information System Engineering Department, Universidad Peruana de Ciencias Aplicadas (UPC), Lima, Peru
u202015999@upc.edu.pe

Claudia Palpan
Information System Engineering Department, Universidad Peruana de Ciencias Aplicadas (UPC), Lima, Peru
u20211c510@upc.edu.pe

Jose Santisteban
Information System Engineering Department, Universidad Peruana de Ciencias Aplicadas (UPC), Lima, Peru
pcsilsan@upc.edu.pe (corresponding author)

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ABSTRACT

Financial literacy is a decisive driver of the sustainability and competitiveness of Micro and Small Enterprises (MSEs), especially in emerging economies where access to tailored training is limited. This paper introduces MYPE-Navigator, a scalable web-based platform that strengthens financial competencies through interactive modules, gamification, and partnerships with institutions. The platform was developed in three phases: (i) conceptual modeling, (ii) modular, cloud-based implementation, and (iii) empirical validation via a quasi-experimental design. Fifty MSE owners participated and were assigned to the control and experimental groups; expert reviews and usability tests using the System Usability Scale (SUS) complemented the evaluation. The results show a 19.47% gain in financial knowledge for the experimental group and a SUS score of 90.37, exceeding standard benchmarks. Compared with existing solutions, MYPE-Navigator integrates communication tools, reward mechanisms, and context-specific content designed for Latin American MSEs, with strong potential for adaptation to other regions. This study contributes to the literature by demonstrating the effectiveness of LMS-based interventions in improving financial literacy in informal and resource-constrained business settings.

Keywords-digital financial education; micro and small enterprises; educational technology; platform; learning management system

I. INTRODUCTION

Financial literacy is essential for the sustainable development of Micro and Small Enterprises (MSEs) [1]. MSEs play a significant role in contributing to GDP growth and creating new jobs in both developed and developing countries [2]. According to the OECD [3], Small and Medium-sized Enterprises (SMEs) represent more than 98% of formal enterprises and generate over 50% of all goods and services produced in Europe. These businesses, defined as having up to 99 employees, are further categorized into microenterprises (with up to 9 employees) and small enterprises (with 10 to 99 employees) and represent a particularly vulnerable segment of the business landscape. Most MSEs operate with limited financial resources, restricted access to qualified personnel, and a low level of technological knowledge [4]. Several studies indicate that increased financial literacy among MSE entrepreneurs can reduce financial management errors and enhance business performance. These studies particularly emphasize the importance of practical financial behavior over mere financial knowledge and attitudes [5].

Digital transformation projects have allowed MSEs to utilize technological tools that enhance their processes and improve operational efficiency [6]. In this context, access to digital financial services has streamlined many MSE operations and promoted greater financial inclusion [7]. In India and China, digital financial inclusion has effectively improved the financial literacy of entrepreneurs. This has been achieved through the gradual integration of financial services into digital platforms. Access to electronic payment systems, online public services, and mobile banking tools not only helps microenterprises navigate regulatory barriers but also fosters the development of practical financial skills through the regular use of these technologies [8]. In [9], it was found that the coverage and depth of digital financial service usage positively impact the innovative performance of Chinese technology firms and enhance their understanding of external financing schemes. This study confirmed that the consistent use of digital financial solutions fosters implicit learning processes, which enhance strategic decision-making and financial autonomy for MSEs.

MSEs often demonstrate limited financial literacy, primarily because they lack fundamental knowledge of concepts such as budgeting, financial statements, and tax planning. In addition, they frequently do not recognize the financial instruments available to them and lack the skills necessary to assess risks or plan investments [10]. This situation is worsened by a common misconception among many entrepreneurs: they believe that they have a strong understanding of financial management. However, they often lack a true comprehension of key concepts and do not know how to apply them effectively in their businesses. This misplaced confidence prevents them from recognizing their weaknesses and seeking the necessary support or training [11].

Several studies have shown that financial literacy not only directly affects the financial behavior of MSEs but is also influenced by factors such as their attitudes towards finance and lifestyle [12]. Given these circumstances, adopting inclusive digital financial technologies is a crucial strategy to overcome educational barriers within MSEs. Learning Management Systems (LMS) play a significant role in improving users' educational experiences [13]. Consequently, the focus of this study is to investigate the following research problem: To what extent can the implementation of a digital platform enhance the financial competencies of MSEs?

Despite the global importance of MSEs, there is a limited body of research focusing on digital educational tools designed to improve their financial literacy. The innovative online educational game Financial Escape Room [14] was developed to enhance the comprehension of financial concepts, but this study was specifically aimed at high school students. In [15], reverse mentoring strategies were used to facilitate knowledge transfer, thus promoting innovation and competitiveness in small enterprises. In [16], it was found that financial institutions can create shared value by partnering with universities to offer entrepreneurial education, financial products, advisory services, and exclusive support spaces. These efforts help build ecosystems that integrate educational and financial resources, thus fostering environments that promote financial literacy among MSEs. Expertienda [17] is a free app aimed at digitally training microentrepreneurs. Supported by local promoters, students, and graduates of the University of Colombia, this study highlighted low participation in educational platforms due to the lack of direct guidance and institutional engagement.

These initiatives show that financial education for entrepreneurs can be supported by innovative training strategies. However, there is still a lack of scalable, context-sensitive digital platforms specifically designed for MSEs, particularly in Latin America. Most initiatives target students or general users, and few address the specific educational and operational needs of MSEs. In Latin America, this gap is particularly evident in Peru. To date, only the study in [18] presents a financial-education platform for MSEs, which reports a limited number of validation cases and does not fully account for the structural characteristics of Peruvian MSEs. A large proportion of these enterprises operate with high levels of informality, unstable cash flows, and limited access to tailored financial education programs offered by financial institutions or public agencies, which makes the design and validation of context-sensitive digital training tools especially important.

This research is one of the first initiatives in the region to propose an LMS-based platform to improve the financial literacy of MSEs. This paper introduces MYPE-Navigator, an LMS-based platform that integrates interactive courses, gamification, reward mechanisms, and direct communication channels with financial institutions. Unlike previous efforts, the platform was subjected to empirical validation through a quasi-experimental design, including pre- and post-intervention knowledge tests, expert adoption assessments, and usability evaluations using industry-standard tools. MYPE-Navigator is designed to provide a high-quality digital learning experience and consists of four main modules: (a) Account registration, (b) Course enrollment, assessments, certification, and rewards, (c) Profile management, content creation, and user progress monitoring, and (d) The communication module, which includes forums and chat features for user interaction. The main contributions of this study are:

- Conceptual and technical innovation: Development of a scalable, modular platform architecture adaptable to other emerging economies.
- Methodological rigor: Implementation of a controlled evaluation with statistical analysis to measure both learning outcomes and usability.
- Practical impact: Provision of an operational model for financial institutions and policymakers to deliver targeted, high-impact training to MSEs.

II. METHOD

MYPE-Navigator was implemented using a three-stage method. First, a conceptual model was developed to visually and structurally represent the proposal. This model outlined the key functionalities and modular organization of the system. The goal was to improve and streamline the financial literacy process for MSEs. Second, the model was implemented by outlining its architecture, development process, and modules,

while ensuring its functional integration within a web environment accessible from multiple devices. Finally, the effectiveness of the platform in enhancing financial literacy was validated through an evaluation of its acceptance among users.

A. MYPE-Navigator Model

A web-based platform was proposed to enhance the financial literacy of MSEs through an LSM that organizes content into interactive modules. The main features of the platform include access to structured courses, the ability to request rewards, and automatic issuance of certificates upon completion of the modules. Some of the educational content was sourced directly from the ABC program developed by Banco de Crédito del Perú (BCP), which is publicly available in [19]. In addition, the platform offers communication tools such as forums and chat features, which allow financial institutions to support and guide users throughout their learning process. Lastly, it includes a feedback system that gathers participants' opinions on the quality of the content and enables them to suggest improvements. Figure 1 illustrates two types of users in the platform's workflow: MSEs, which access educational content, and financial institutions, which create, manage, and monitor that content.

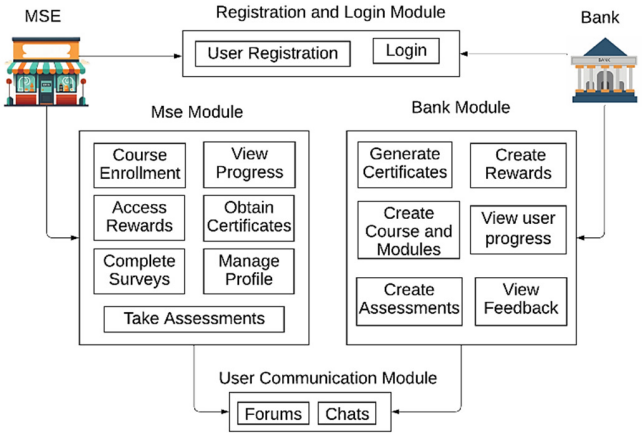


Fig. 1. MYPE-Navigator model.

The process starts when a user, who represents an MSE, accesses the MYPE-Navigator web platform via a computer or mobile device. After registering, the user can browse the available courses and enroll in those that best meet his financial needs. Users can monitor their progress, complete assessments, and request rewards. After completing a course, the system provides digital certificates that validate the knowledge gained. Communication between MSEs and financial institutions is supported through a forum and chat module, which allows users to ask questions, receive guidance, and share experiences with other participants. To enhance quality and relevance, financial institutions can manage courses, generate rewards, and access user feedback on educational content.

B. MYPE-Navigator Implementation

1) Architecture

The MYPE-Navigator platform was designed with a modular and scalable cloud-based architecture (Figure 2), ensuring a modern and reliable environment capable of growing to meet user demand. This architecture features both a front end and a back end, enabling secure and efficient access from any device, whether it is a computer or smartphone connected to Wi-Fi. Additionally, the platform is designed to accommodate two user types: MSEs and financial institutions. Both groups can interact with the system through various access points, ensuring the stability and performance of the services provided.

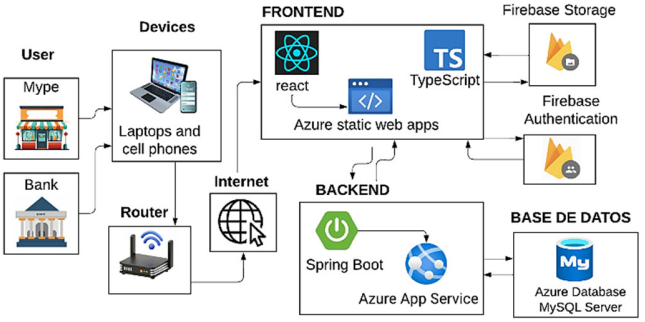


Fig. 2. Physical architecture.

2) Development

The front end was developed using React and TypeScript, with Tailwind CSS for visual customization, and deployed on Azure Static Web Apps, which allows for fast and global delivery of static content. This component communicates directly with the backend through REST services, supporting operations such as user registration, course management, and progress tracking. The backend was developed using Spring Boot in Java and managed with Maven. It is deployed on Azure App Service, where it processes all business logic, validations, and interactions with the data repository. For data persistence, the Azure Database for MySQL is utilized, which offers a highly available and scalable relational database solution. Firebase Authentication was integrated for user and file management, providing secure access through multiple login methods. Additionally, Firebase Storage manages the storage of user-uploaded files, including documents and images (see Figure 3).

```
@GetMapping("/creator/{creatorId}")
@Operation(summary = "Get all courses by creator id")
public List<CourseDto> findAllByCreatorId(@PathVariable("creatorId") Long creatorId)
{       return courseService.findAllByCreatorId(creatorId).stream()
          .map(course -> Mapper.map(course, CourseDto.class))
          .collect(Collectors.toList()); }
```

Fig. 3. Course creation module code.

3) Modules

The MYPE-Navigator was implemented through four main modules described below:

- Registration and Login Module: This module enables users to create accounts based on their roles and securely access the platform. The registration form differs depending on the user type: MSE or financial institution. The login interface provides traditional access methods alongside Google sign-in options.
- MSE Module: This module offers access to courses, assessments, and certificates, along with progress tracking. Users can browse the course catalog and complete assessments with instant feedback.
- Bank Module: This module facilitates content creation, user monitoring, and feedback management. On the home screen, users can view the courses they have created, along with usage statistics and preference graphs. In addition, users can access a complete catalog of available courses.
- User Communication Module: This module features forums and chat functionality to enhance interaction between users and financial institutions. The forum allows users to post comments and replies within course discussions, while the chat section displays ongoing conversations among users.

C. Validation

To evaluate MYPE-Navigator, three key aspects were considered: effectiveness, adoption, and usability. Effectiveness was assessed by measuring the financial knowledge gained by MSE owners. This was done using questions from the BCP [1] courses titled "Grow Your Business" and "My Credit History," developed by BCP. System adoption was evaluated through expert judgment provided by five specialists [20]. Usability was assessed using a perception-based questionnaire that was adapted from an enhanced version of the System Usability Scale (SUS) [21].

1) Population

Five entrepreneurship experts, with professional experience ranging from 10 to 30 years, participated in the survey. They formed an expert panel to evaluate the proposed platform based on their market knowledge. A survey was conducted involving 50 owners of MSEs in Peru. Among the participants, 58% were women and 42% were men, with their market experience varying from 5 to over 15 years. These entrepreneurs operate in diverse sectors: 58% are engaged in commerce, 32% in services, and the remaining 10% are involved in e-commerce, maintenance, and technology. This distribution illustrates a diversification of sectors, including both traditional businesses and modern ventures. In terms of educational background, most participants held university degrees. However, there was also notable representation from entrepreneurs with secondary and technical education, as well as a smaller portion with postgraduate degrees. This variety in academic qualifications emphasizes diversity within the entrepreneurial ecosystem.

2) Instruments

Three questionnaires were utilized: a knowledge assessment questionnaire, an adoption questionnaire to evaluate the effectiveness of MYPE-Navigator, and finally, the SUS questionnaire. The responses to the adoption and SUS questionnaires were collected using a five-point Likert scale, with 1 corresponding to "Strongly disagree," 2 to "Disagree," 3 to "Neither agree nor disagree," 4 to "Agree," and 5 to "Strongly agree."

The knowledge questionnaire included 10 questions randomly chosen from a total of 20. The perception of adoption was evaluated through a survey administered to five entrepreneurship experts. Additionally, usability perception was evaluated using the SUS questionnaire, which was distributed to 50 MSEs.

3) Experiment

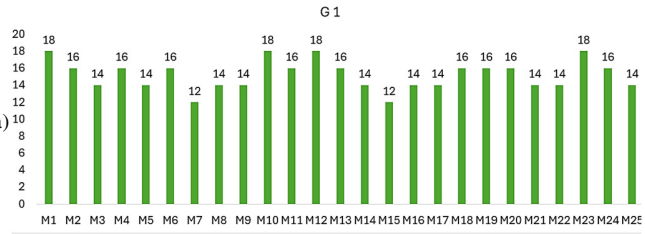
The five experts were introduced to the MYPE-Navigator system during a 30-minute session held within a week, which included practical exercises to interact with the platform and test its functionalities. Fifty MSEs participated in the program, divided into two groups of 25 companies each: Group 1 (G1) and Group 2 (G2). Both groups attended a videoconference via Google Meet, where they were introduced to the course titled "Finance for Entrepreneurs." Both groups received the same course content; however, Group 1 (G1) followed a traditional learning method, which typically included face-to-face workshops, lectures, and seminars, often conducted by financial institutions or consultants, focusing on basic financial concepts. In contrast, Group 2 (G2) utilized the MYPE-Navigator platform as part of their learning process. Additionally, G2 received a 20-minute introductory training session on how to use the MYPE-Navigator platform, followed by 45 minutes of free exploration and familiarization with its features. In contrast, Group 1 (G1) did not have access to the tool during this stage. After completion of the training sessions, all MSEs participated in a knowledge assessment. G1 then received a 20-minute targeted training session on how to use the platform. Then, both G1 and G2 participated in a usability evaluation. Both assessments were conducted using Google Forms, and all experimental activities were carried out over three weeks.

III. RESULTS

A. Effectiveness of MYPE-NAVIGATOR

In G1, which utilized the traditional teaching method, the scores varied from 12 to 18 points, with an average score of 15.2 points (as illustrated in Figure 4a). In contrast, G2, which employed the MYPE-Navigator platform, achieved scores ranging from 14 to 20 points, with a mean score of 18.16 points (as shown in Figure 4b). This resulted in G2 scoring 2.96 points higher than G1, representing a 19.47% improvement.

(a)



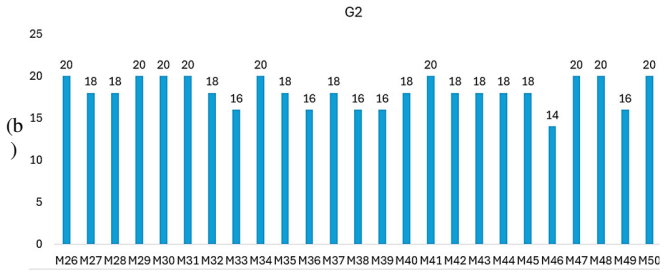


Fig. 4. Knowledge level scores: (a) G1, (b) G2.

B. Usability

The results from the evaluation of MYPE-Navigator's usability indicate that MSEs find the platform easy to use. The detailed response file is available in [22]. To determine the usability score, an extended version of the SUS was employed, which consists of 19 items: 10 positively phrased questions in the odd-numbered positions and 9 negatively phrased questions in the even-numbered positions. The transformation procedure outlined in the original method was followed. For the positively worded items, the user's assigned score was subtracted by 1. In contrast, for negatively worded items, the formula of 5 minus the given score was applied. After transforming all values, they were summed and multiplied by 2.5, according to the traditional SUS methodology. Finally, the resulting score was normalized to a scale from 0 to 100, resulting in an average score of 90.37. This score indicates a positive user experience based on established standards. The results show that most of the participants found the system user-friendly with integrated functionalities and an overall satisfactory experience.

To interpret the results, a standardized scale was used based on SUS values. This scale converts the responses of the participants into a final score that ranges from 0 to 100. The scores were then qualitatively classified into three categories: 0–49 is considered unacceptable, 50–69 is deemed marginal, and 70–100 is classified as acceptable. This interpretation scheme is commonly used in usability studies of digital environments, allowing for a clear and comparative evaluation of the user experience across various systems or interfaces [23].

IV. DISCUSSION

The results of this study indicate that MYPE-Navigator is an effective digital tool to enhance the financial education of Peruvian entrepreneurs. The experimental group experienced an average improvement of 2.96 points, which represents an increase of more than 19%, compared to the minimal improvement noted in the control group. This demonstrates the positive impact of the platform implemented with a structured approach and targeted content. This difference indicates that digital solutions may enable more effective learning compared to traditional methods, in line with findings from recent studies on digital financial literacy in MSEs [12].

The average ratings for expert judgment remained above 4.2 on a five-point scale, indicating that MYPE-Navigator is considered a highly viable and scalable solution for Peruvian MSEs. Experts underscored the clarity of the interfaces, the usefulness of the content, and the potential for replication in real-world financial inclusion programs. Although there was a slight concern about the initial learning curve, the data show a generally positive overall perception.

The impact of the platform goes beyond cognitive improvement. It achieved a score of 90.37% on the SUS, indicating strong usability for educational digital products and suggesting that MYPE-Navigator adheres to the principles of user-centered design. Ease of navigation, clear interface design, and seamless integration of features are essential components of the overall user experience. In a context like Peru, where many MSEs still encounter technological barriers, user-friendliness is critical for ensuring sustained adoption. This conclusion aligns with the findings of [13], which highlighted that favorable perceptions of technology are a key predictor of the success of LMS.

When comparing MYPE-Navigator with initiatives such as Expertienda, a distinct advantage is apparent due to its integration of multiple functionalities, including courses, rewards, feedback, and direct communication with financial institutions, all contextualized within the Peruvian reality. This method aligns with the findings of [17], which highlighted the significance of institutional support in the technological adoption process for MSEs.

The platform's strategy, which includes direct communication channels between users and financial institutions, not only enhances educational opportunities but also strengthens institutional relationships, a vital component for financial inclusion. This capacity to cultivate learning and exchange communities positions MYPE-Navigator not just as a course platform, but as an evolving digital ecosystem for business development.

The findings of this study not only validate the effectiveness of MYPE-Navigator as a financial literacy tool but also establish it as a strong alternative to traditional methods and other digital platforms that are not specifically designed for the context of Peruvian MSEs. These findings align with previous research in other emerging economies, where targeted digital interventions have yielded measurable gains in entrepreneurial competencies [7]. In particular, MYPE-Navigator's improvement rate of 19.47% surpasses the gains reported in Colombia [17], where adoption barriers limited impact to under 10%. Furthermore, the SUS score of 90.37 positions the platform in the "excellent" category, outperforming benchmarks for similar educational systems. This suggests that integrating localized content, gamification, and institutional engagement is a key differentiator for sustained adoption.

V. THEORETICAL AND PRACTICAL IMPLICATIONS

A. Theoretical Implications

This study advances the theoretical understanding of digital financial literacy interventions for MSEs in emerging economies. By integrating an LMS architecture with gamification, reward mechanisms, and institutional engagement, MYPE-Navigator provides empirical support for the applicability of technology acceptance and information system success models in the context of informal and semi-

formal businesses. The significant interaction effect between group and time suggests that digitally mediated learning can outperform traditional methods when designed with context-sensitive content and motivational features. Furthermore, the platform's modular structure offers a replicable blueprint for future research on scalable, technology-based educational interventions targeting underserved entrepreneurial segments.

B. Practical Implications

From a policy and industry perspective, MYPE-Navigator demonstrates that accessible, localized digital platforms can substantially enhance financial knowledge among MSE owners, yielding measurable improvements in both learning outcomes and usability perceptions. Financial institutions and government agencies can adopt this model to deliver targeted training programs that enhance entrepreneurs' decision-making, creditworthiness, and long-term business sustainability. Inclusion of reward-based motivation and direct communication channels with financial institutions addresses common adoption barriers identified in previous initiatives. Moreover, the platform's cloud-based architecture ensures scalability and adaptability, making it suitable for deployment in other emerging markets facing similar challenges in financial inclusion and digital literacy.

C. Economic Efficiency and Implementation Cost

MYPE-Navigator stands out for its cost efficiency, using a low-cost architecture with open-source technologies (React, Spring Boot, TypeScript) and cloud services (Microsoft Azure and Firebase), which minimizes the initial investment. The estimated implementation cost for 500 users is less than USD 1,200, with monthly operating costs below USD 60, representing less than USD 0.12 per user per month.

The modular design reduces development and maintenance costs, and the use of existing educational content from BCP minimizes production expenses. Compared to traditional financial literacy workshops (USD 20–30 per participant), MYPE-Navigator reduces costs by more than 80%. Its capacity for asynchronous learning eliminates the need for physical space and printed materials, improving the cost-benefit ratio. This makes MYPE-Navigator an economically sustainable model that is easily replicable in other emerging economies.

VI. CONCLUSIONS

This study described the design, development, and validation of MYPE-Navigator, a web-based platform designed to enhance the financial education of Peruvian MSEs. The platform incorporates essential features, including reward mechanisms, automatic certificate generation, and an architecture that facilitates navigation and understanding for entrepreneurs with basic digital literacy skills. A modern and scalable technological architecture was implemented, utilizing React for the front end, Spring Boot for business logic, and a combination of Firebase and Azure services for authentication, data storage, and cloud deployment. This architecture fosters the development of an agile, secure, and adaptable system. Its effectiveness was validated through a pilot implementation involving 50 MSEs in Peru, aimed at assessing its impact on strengthening financial competencies.

This study offers a unique contribution in the Peruvian context, as it is among the first efforts to integrate an LMS tailored specifically for MSEs. In contrast to other proposals discussed in the literature, MYPE-Navigator includes features such as communication, gamification, and certificate issuance, which enhance its ability to promote meaningful and sustainable learning. These findings have both theoretical and practical implications. Theoretically, the results confirm that LMS-based platforms can significantly improve financial literacy in informal economies, aligning with [12]. Practically, MYPE-Navigator offers a scalable tool for financial institutions and policymakers to deliver targeted education, potentially improving credit behavior and financial decision-making among underserved entrepreneurs. However, the improvement rate varied according to engagement, revealing the critical role of user motivation and support mechanisms—an issue that requires further attention in future implementations.

A. Limitations

However, a significant limitation identified is the high level of informality that characterizes much of the entrepreneurial ecosystem in Peru. This structural issue limits participation in digital educational platforms because many entrepreneurs lack formal registration and have minimal involvement in organized training programs. This barrier highlights the need to develop additional strategies for integrating informal sectors into future implementation phases.

B. Future Research

Longer-term follow-up research would also be valuable to monitor the retention of acquired knowledge and its practical use in business. Beyond the Peruvian case, the design principles and modular architecture of MYPE-Navigator offer a replicable framework for enhancing financial literacy among MSEs in other emerging economies facing similar constraints. Its integration of user-centered design, adaptive content delivery, and reward-based motivation mechanisms demonstrates a pathway for bridging the digital and educational divide in underserved business communities. Looking ahead, comparative studies across countries should be explored to validate scalability, as well as the incorporation of artificial intelligence to create personalized learning pathways and predictive analytics to reduce dropout rates. These advances have the potential to accelerate progress toward the Sustainable Development Goals (SDGs) related to financial inclusion and economic resilience.

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