Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1, 972-985
2026
Publisher: Learning Gate
DOI: 10.55214/2576-8484.v10i1.11798

Development of a course and training information system for non-formal education providers

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Abstract: This research aims to: (1) develop a course and training information system design that incorporates Supply Chain Management (SCM) and Decision Support System (DSS) concepts, called sikapin.id; (2) assess the feasibility of the developed system; (3) evaluate the practicality of the system for users; and (4) measure the effectiveness of the system for non-formal education providers in Semarang City. The study employs a Research and Development (R&D) approach based on Borg and Gall's steps. A limited trial involved 30 respondents, while a larger trial included 243 respondents. The findings indicate that: (1) The sikapin.id system was successfully designed with integrated SCM and DSS features; (2) The system's feasibility is rated as very feasible, with design experts and media experts both assessing it at 87.5%, and practitioners at 94.1%; (3) The system's practicality is high, with prospective participants rating it an average of 3.44 and organizers rating it 3.64, indicating very practical; and (4) The system proved effective, demonstrated by a significant increase in test scores from an average of 49.49 pretest to 59.30 posttest, with a significance value of 0.000, which is less than 0.05.

Keywords: *Decision support system, Information systems, Non-formal education, Sikapin.id, Supply chain management.*

1. Introduction

The implementation of non-formal education in the modern era faces various challenges that must be addressed to ensure effective and relevant programs. These include access and the digital divide. Although technology has opened new opportunities for non-formal education, a digital divide remains that needs to be addressed [1-3]. The challenge is ensuring that all individuals, regardless of socio-economic or geographic background, have equal access to non-formal education programs. While technology has played a significant role in education, not everyone has equal access, resulting in the "digital divide." This gap often reflects and reinforces existing social and economic inequalities [4, 5].

Financing and resourcing: Securing sufficient resources and funding for quality non-formal education programs remains challenging, especially for small providers or those reliant on government or donor support. Technology adaptation, including e-learning, digital platforms, and information systems, has become essential for non-formal education delivery [6, 7]. The challenge is ensuring that administrators, instructors, and students can access and use this technology effectively [8, 9]. Discuss the challenges and opportunities of technological developments, including costs and HR issues [10, 11]. Address changes brought by new technologies, focusing on costs and the need for new skills [12, 13].

Existing non-formal educational institutions, such as community activity centers, course and training institutions, and job training centers, are expected to manage and utilize digital technology effectively. However, most have not yet defined their implementation strategies [14, 15]. An integrated information system is essential to streamline management of student data, teaching staff, learning materials, and class schedules [16]. Non-formal education requires adequate internet access; however, non-formal educational institutions often have limited internet access, impacting the effectiveness of information system use [17, 18].

History: Received: 31 October 2025; Revised: 5 January 2026; Accepted: 10 January 2026; Published: 19 January 2026
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Courses and training are forms of non-formal education, serving as solutions for Indonesia to promote educational equality [19]. The challenge today is that institutions offering courses and job training must adapt quickly to rapid technological advances to remain effective and relevant Jafarov [20]. Oyediran et al. [21] Information and Communication Technology (ICT) can facilitate networking among organizations involved in designing and delivering NFE programs. The government and other entities need to coordinate their NFE activities to optimize resources and expertise, including ICT equipment. In a competitive business environment, applying ICT is crucial for NFE organizers, course providers, and job training institutions to advance and develop their activities. However, the development of information technology must follow stages aligned with each institution's strengths across various sectors [22]. Based on preliminary studies, several job training and course institutions have utilized IT effectively, but many remain individual or underutilize it, relying solely on social media with limited features. Barriers include costs, technological understanding, and human resource management issues. Perani [23] identifies obstacles in ICT implementation, such as managerial, human resource, organizational culture, technical, and planning constraints from external parties.

Non-formal educational institutions, such as training centers, are generally privately owned and aim to enhance community skills. These institutions operate under the auspices of two ministries: the Ministry of Manpower and the Ministry of Education, Culture, Research, and Technology (Directorate General of Vocational Education). The Ministry of Manpower's goal is to train participants to become work-ready within a specific timeframe aligned with their chosen field. These institutions are known as job training institutions or private job training centers.

The condition of course and training institutions and job training institutions in Semarang, based on data from the Semarang City Education Office and the Semarang City Manpower Office in 2018, shows that there were 161 course and training institutions and 90 job training institutions. These included managers from 4 companies, 2 government agencies, and 74 private entities. However, the accuracy of this data remains questionable. An online search reveals many course institutions not listed in the official data, indicating that data management in public services has not been handled seriously [24-26]. An important aspect of implementing KIP by public bodies is the content of the information provided. This information must be easily accessible to the public, as mandated by the KIP Law. Nonetheless, some public bodies have not displayed information according to legal standards, often showing incomplete data, which reflects a lack of seriousness in data management. For example, a data table from the Ministry of Education and Culture website shows that the web address and email columns for course institutions are mostly empty, and no updates have been made to the data.

For course and training institutions, no information on accreditation status is available, and there have been no data updates from the responsible Department of Manpower and Transmigration in Semarang City. Accreditation of non-formal education (NFE) institutions is crucial for the public, as it reflects the institution's quality. Accreditation status helps the public identify and select institutions without issues. The problems faced by several Indonesian cities are likely to occur in Semarang as well, emphasizing the importance of accreditation for ensuring quality and public trust. Solopos Jogja [27, 28] On October 1, 2017, reports indicated that many course and training institutions in Yogyakarta lacked accreditation due to the high costs of preparation. Jawapos [29] noted that several large institutions operated without permits and faced closure threats. On January 15, 2020, alexanews reported that dozens of people in Karawang were suspected victims of fraud by job training institutions PT. Dean Sejahtera Karawang (DSK) [30]. The majority of victims felt deceived, even though they had spent millions of rupiah, but they still did not receive the promised job placements [31-33].

The weak management of KIP by public institutions clearly indicates that courses and training, as part of non-formal education, lack the attention they deserve compared to formal education. Issues with data management and administration by the government are among the causes of the underdevelopment of non-formal education (NFE) in Semarang.

Java has the largest number of educational businesses in Indonesia, totaling 350,665, which accounts for 56.56% of the country's total. In contrast, eastern Indonesia, including the Maluku Islands and

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 972-985, 2026
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Papua, has only 13,677 educational businesses [34]. The high concentration of businesses on Java is influenced by its larger young population compared to other islands. Semarang City, through Material Requirement Planning analysis, shows that sectors such as Information and Communication, Real Estate, and Education have positive values in both the Provincial and National Master Development Plans. This indicates high growth potential in these sectors within Semarang City and Central Java Province. The education sector primarily involves the procurement of support equipment like whiteboards, LCDs, and computers. It also includes businesses supplying learning support materials such as stationery, books, and uniforms, as well as non-formal education services like tutoring, courses, and training.

The management level in non-formal educational organizations is responsible for setting the organization's future goals. Stakeholders' decision-making regarding sustainability is crucial and impacts many internal and external resources. An organization's or company's technological capabilities significantly influence its activities [35, 36]. At the firm level, technological skills are a key predictor of internet-based data exchange use. Most Small to Medium Enterprises (SMEs) still mainly use basic ICTs, with advanced ICT adoption lagging. The owner/manager's education level has a significant, positive relationship with ICT adoption, especially for general-use ICT and production-integrating ICT [37]. Strategic management formulation must be well-designed and prepared to meet the educational needs of organizations and society. Organizational technology innovation management is part of the organization's strategic development, as new technologies, product prototypes, and subsequent new product streams are developed and explored there [38, 39].

The business sector within non-formal education offers positive contributions to societal development of non-formal education practices. However, without binding regulatory policies, it can also generate negative impacts. Entering the business world inevitably triggers competition, which still faces numerous issues under existing business competition laws [40]. In practice, decisions made by the KPPU are frequently overturned by the District Court, resulting in business actors often avoiding sanctions for law violations. The high number of overturned KPPU decisions reflects weaknesses within Law 5/1999 itself. Additionally, reporting parties harmed by reported parties often lack legal certainty and protection, especially when their losses are not recognized if the alleged unfair business practices are ultimately deemed unproven. Furthermore, enforcement of business competition law reveals differing perspectives among law enforcers, including courts, investigators, and the KPPU. Whether competition is considered healthy depends on both internal factors, such as business actors, and external factors, like third parties involved in business activities. The current landscape is notably influenced by startups, which assist business actors. Companies such as Lazada, Tokopedia, Gojek, Grab, and others have played a significant role in supporting entrepreneurs, including SMEs, by enhancing sales and fostering competition.

Based on this background, NFE organizers must adapt to information and technology to determine digital transformation and require management that supports appropriate decision-making and a management chain pattern, leading to supply chain management, which involves third parties. As stated by Wellbrock et al. [41] and Nguyen and Zuidwijk [42], a supply chain includes all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain encompasses not only manufacturers and suppliers but also transporters, warehouses, retailers, and customers. Within each organization, such as a manufacturer, the supply chain includes all functions involved in receiving and fulfilling customer requests. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance, and customer service.

The growth of retail businesses with third-party assistance has led to the development of a model similar to, or identical with, the retail startup concept. To date, no emerging startups have explored the potential of the education sector, offering a comparable concept to retail startups. This could foster the development of non-formal education in Semarang City and Indonesia, driven by rapid information access and ease of use. Service quality is a key indicator for measuring institutional performance, and the model to be developed will benefit not only course and training providers and job training institutions

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 972-985, 2026
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but also all government and private entities involved in non-formal education and community engagement.

The research introduces a course and training information system that integrates supply chain management (SCM) and a decision support system (DSS). SCM links suppliers, participants, institutions, and stakeholders. DSS uses system data to aid managers in decision-making. This development also applies to non-formal education channels.

2. Research Method

This study employs a research and development approach to create or validate educational products. Research and development primarily involve research aimed at producing specific products and assessing their feasibility. Educational research and development focus on both materials and procedures. The rationale for applying this approach to develop an information service application model for non-formal educational courses and training institutions in Semarang City is that this method is product-oriented. It is expected that research can bridge the gap between theory-focused research and the development of practical products for users [43].

The application research and development can utilize the procedural model proposed by Gall et al. [43]. This study modifies the Borg and Gall model to create an information service model for non-formal educational courses and training institutions in Semarang City. The research approach involves three steps: preliminary study or needs analysis, planning and development, and model validation, following a research and development framework.

The research and development process primarily involves two objectives: (1) developing a product and (2) testing its feasibility to meet objectives. The first is called the validity function, and the second is the feasibility test function. The main procedure includes five steps in this research and development process:

1. Conducting a needs analysis.
2. Developing a preliminary product.
3. Expert validation.
4. Empirical validation (field trials).
5. Product revision.

The product trial design in this research and development employed confirmatory factor analysis on the information system being developed. The data types in this study were both qualitative and quantitative. The instrument for collecting opinions from course and training managers was a questionnaire. The data collection instrument for assessing the draft course and training information model used a non-test technique, specifically a questionnaire. Systematic research and development of scientific knowledge focus on application products, user guides, methods, systems, models, and the design process for prototypes. The development model used in this study is a procedural model, as it follows specific steps to produce a course and training information system for non-formal education providers in Semarang City.

Data from expert judgment and practicality tests will be analyzed both descriptively and analytically through in-depth examination and review of information and feedback from test subjects. The course and training information system will be deemed successful if it functions effectively as an information system for identifying course and training providers in Semarang City.

Qualitative analysis was used for exploratory study activities, needs analysis, and to identify supporting and inhibiting factors in the use of the course and training information system in Semarang City. Quantitative analysis conducted in this study utilized two procedures: descriptive percentage analysis and inferential analysis. Descriptive analysis was used to determine the mean, median, and mode in order to assess the results of the validators' evaluations of the developed product model, which was useful for determining the subsequent stages of development. The inferential analysis used in this study was the t-test. Before conducting the significance test using the t-test, two prerequisite tests were

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ISSN: 2576-8484
Vol. 10, No. 1: 972-985, 2026
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performed, namely the normality test and the homogeneity test. The normality test in this study employed the Kolmogorov–Smirnov test, while the homogeneity test used the Levene test.

3. Research Results

The Course and Training Information System (sikapin.id) is a platform serving as Indonesia's primary source for course and training information. It is designed to provide the public with details about non-formal education programs, especially courses and training offered by private sector entities and other institutions. Sikapin.id was developed with an awareness of the importance of advancing non-formal education. The platform allows users to access comprehensive information about various programs, facilitating better decision-making. Built on the principles of Supply Chain Management (SCM) and Decision Support System (DSS), SCM helps optimize the supply chain of courses and training, while DSS supports improved management of processes and resources.

3.1. Eligibility/Expert Test of Course and Training Information Systems for Non-Formal Education Providers

3.1.1. Design Expert Validation Results

Design experts evaluated the appearance of the course and training information system. Their assessment determined the system's visual validity. The validation results by these design experts are presented in Table 1 below.

Table 1.
Expert Design Validation Results.

No	Components/Indicators	Assessment Score	Qualification
1	Initial view of the Sikapin.id application	4	Very Worthy
2	Appearance of the Sikapin.id application info display	3	Worthy
3	App menu display (icon) of Sikapin.id application	3	Worthy
4	Sikapin.id Application Content Display	3	Worthy
5	Color matching in the Sikapin.id application	4	Very Worthy
6	Color collaboration on the Sikapin.id application	4	Very Worthy
7	The color of the writing on the Sikapin.id application	3	Worthy
8	The basic color of the Sikapin.id application	3	Worthy
9	The size of the letters used in the Sikapin.id application	4	Very Worthy
10	Clarity of the Sikapin.id application image	4	Very Worthy
11	The type of font used by the Sikapin.id application	4	Very Worthy
12	The font size used by the Sikapin.id application	4	Very Worthy
13	Clarity of letters in the Sikapin.id application	4	Very Worthy
14	The size of the menu in the Sikapin.id application	3	Worthy
15	Names on the Sikapin.id application	3	Worthy
16	Arrangement/order of Sikapin.id applications	3	Worthy
Total Score		56	
Percentage		87.5%	

Based on the validation results from design experts, as shown in Table 1, the score was 87.5%. When converted to a scale of 4 using the achievement conversion table, it indicates that the design validation for the course and training information system is in the "very adequate" category, with a note that revisions are necessary. Consequently, the system is suitable for pilot testing with improvements.

3.1.2. Media Validation Test Results

Media experts evaluated the course and training information system's content. Their assessments determined the system's validity based on content quality. The validation results from material experts are presented in Table 2 below, providing an overview of the system's accuracy and reliability in delivering training information.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 972-985, 2026
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Table 2.
Media Expert Validation Results.

No	Components/Indicators	Assessment Score	Qualification
1	Initial view of the Sikapin.id application	3	Very Worthy
2	Appearance of the Sikapin.id application info display	4	Worthy
3	App menu display (icon) of Sikapin.id application	4	Worthy
4	Sikapin.id Application Content Display	3	Worthy
5	Color matching in the Sikapin.id application	4	Very Worthy
6	Color collaboration on the Sikapin.id application	3	Very Worthy
7	The color of the writing on the Sikapin.id application	3	Worthy
8	The basic color of the Sikapin.id application	4	Worthy
9	The size of the letters used in the Sikapin.id application	4	Very Worthy
10	Clarity of the Sikapin.id application image	4	Very Worthy
11	The type of font used by the Sikapin.id application	3	Very Worthy
12	The font size used by the Sikapin.id application	3	Very Worthy
13	Clarity of letters in the Sikapin.id application	3	Very Worthy
14	The size of the menu in the Sikapin.id application	4	Worthy
15	Names on the Sikapin.id application	3	Worthy
16	Arrangement/order of Sikapin.id applications	4	Worthy
Total Score		49	
Percentage		87.5%	

Based on the validation results from the subject matter experts, as seen in Table 2, the percentage score obtained was 87.5%. When entered into the achievement conversion table on a scale of 4, it is concluded that the validation results for the course and training information system material are classified as very adequate, indicating no need for revision. Therefore, the course and training information system is suitable for pilot testing with improvements.

3.1.3. Validation Results from Course and Training Provider Practitioners

Practitioners evaluating the course and training information system assessed its ease of use. These assessment results determine the system's validity regarding user-friendliness. The validation outcomes from practitioners are presented in Table 3, providing insights into the system's effectiveness and usability based on their feedback.

Table 3.
Practitioner Validation Results.

No	Components/Indicators	Assessment Score	Qualification
1	User-friendly for use, especially for Course and Training Institution organizers	4	Very Worthy
2	The attractiveness of the application display	4	Very Worthy
3	Menu suitability to the course and training information needs	3	Worthy
4	Menu order layout	4	Very Worthy
5	Logo selection on the Sikapin.id application	4	Very Worthy
6	Compliance of content with the website of each Course and Training Institution	4	Very Worthy
7	The image quality available in the Sikapin.id content	4	Very Worthy
8	The language used on Sikapin.id	4	Very Worthy
9	Neatness of Sikapin.id content	3	Worthy
10	Sikapin.id application loading speed	4	Very Worthy
11	Ease of running applications on smartphones	3	Worthy
12	Practicality of Sikapin.id	4	Very Worthy
13	Easy to understand presentation of information	4	Very Worthy
14	Useful in obtaining information on organizing courses and training	4	Very Worthy
15	Ease of obtaining information on course and training programs	4	Very Worthy
16	Effectiveness and efficiency of Sikapin.id	4	Very Worthy

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 972-985, 2026
DOI: 10.55214/2576-8484.v10i1.11798

No	Components/Indicators	Assessment Score	Qualification
17	Mobility of information regarding the implementation of courses and training	3	Worthy
Total Score		64	
Percentage		94.1%	

Based on the practitioner validation results shown in Table 3, the percentage score was 94.1%. When mapped to the achievement conversion table with a scale of 4, this indicates a very good category, requiring no revisions. Consequently, the course and training information system is suitable for further testing with improvements.

3.2. Results of the Practicality Test of the Course and Training Information System for Non-Formal Education Providers

3.2.1. Limited-Scale Test Results

Main Stages:

1) System Introduction and Orientation
   In the initial stage, organizers are introduced to the developed information system model. Researchers will provide a brief guide and demonstration of the interface, key features, and system workflow. This ensures that all training organizers understand the system's basic functions before starting independent trials.
2) Functional Trial and Descriptive Data Collection
   After orientation, participants will conduct an independent, hands-on trial of the system. Training organizers can explore various features, including registration management, course data handling, schedule creation, and reporting. During this phase, researchers will gather descriptive data focused on the user experience of training organizers. They will observe and record usage behavior, ease of navigation, initial perceptions of the system's appearance, and the relevance of features to the operational needs of non-formal education providers. Feedback from organizers on these aspects is essential for understanding and improving the user experience.
3) System Validity Measurement

The final stage involves data collection to evaluate system validity. Training providers and users will complete a validation instrument, a structured questionnaire assessing the system's feasibility and accuracy. The collected data will support validity and reliability analyses, determining whether the information system model is valid and suitable for broader implementation.

Researchers assessed the system's validity using instrument validity and reliability tests. Validity was tested on each question, comparing the calculated r value with the table r value at df = n-2 and a 5% significance level. If the table r is less than the calculated r, the system is valid, using SPSS v.23 for Windows. The results of the validity test are as follows:

Table 4.
Validity Test Results.

No. Question Item	r_{hitung}	r_{table}	Information
Item 1	0.491	0.361	Valid
Item 2	0.695	0.361	Valid
Item 3	0.461	0.361	Valid
Item 4	0.550	0.361	Valid
Item 5	0.662	0.361	Valid
Item 6	0.666	0.361	Valid
Item 7	0.407	0.361	Valid
Item 8	0.813	0.361	Valid
Item 9	0.604	0.361	Valid
Item 10	0.554	0.361	Valid
Item 11	0.581	0.361	Valid
Item 12	0.743	0.361	Valid

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 972-985, 2026
DOI: 10.55214/2576-8484.v10i1.11798

Item 13	0.608	0.361	Valid
Item 14	0.794	0.361	Valid
Item 15	0.717	0.361	Valid

Based on Table 4, the validity test conducted on the course and training information system shows that all items have r_0 < r_t, meaning the calculated r is greater than the table r_t. Therefore, the items on the ability scale are considered valid. The instrument's reliability test assesses the consistency of data recording when used by the same person or group at different times, or by different people or groups at the same or different times. This research's reliability is confirmed if the Cronbach's Alpha value exceeds 0.6.

Table 5.
Instrument Reliability Test.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.917	0.917	15

This indicates that the course and training information system for non-formal education providers in Semarang City is valid and reliable. These test results can serve as a foundation for assessing the system's readiness for broader implementation among non-formal education providers.

3.2.2. Results of the Large-Scale Test

Data collection involved 264 respondents, including 17 management personnel and 247 prospective training participants. After data cleaning, 243 valid responses remained for analysis. Some data were excluded due to incomplete questionnaires or missing values, which did not meet the criteria for statistical analysis.

A total of 243 respondents, including prospective participants and organizers from Course and Training Institutions, Job Training Centers, Community Learning Centers, and Tutoring Institutions in Semarang City, participated in this study. All respondents provided informed consent to participate. Their evaluations of the education information system, both before and after implementing the course and training information system for non-formal education providers, are presented in Table 6.

Table 6.
Results of the Pretest and Posttest Data Description: Testing the Effectiveness of the Course and Training Information System for Non-formal Education Providers.

Treatment	N	Lowest Score	Highest Score	Total	Average	Standard Deviation
Pretest	243	40	59	12025	49.49	4.200
Posttest	243	49	70	14411	59.30	4.354

The data from Table 6 indicates that the average score before implementing the course and training information system for non-formal education providers in Semarang City was 49.49, with a standard deviation of 4.20. After implementation, the average score increased to 59.30, with a standard deviation of 4.35.

Table 7.
Average Before and After Implementing the Course and Training Information System for Non-Formal Education Providers.

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	49.49	243	4.200	0.269
	Posttest	59.30	243	4.354	0.279

The data in Table 7 indicates that the average score prior to implementing the course and training information system for non-formal education providers was 49.49. After implementation, the average

score increased to 59.3. This suggests a significant improvement in scores following the system's adoption. The observed increase highlights the potential effectiveness of the new system in enhancing performance. Subsequently, the next step involved testing the effectiveness of the improved implementation, as detailed in the following table.

Table 8.
Testing the Effectiveness of the Course and Training Information System for Non-formal Education Providers.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Posttest	-9.819	4.581	0.294	-10.398	-9.240	-33.414	242	0.000

Table 8 indicates that the difference in average scores before the course and training information system for non-formal education providers is 9.81. The calculated t-value is 33.41, with a p-value of 0.000. Since this p-value is less than the significance level of 0.05, it is concluded that there is a statistically significant increase in the application of the course and training information system among non-formal education providers. The percentage increase in the pretest to posttest value is $\frac{59,3-49,49}{49,49} x100\% = 19,82\%$. Based on the above description, it can be concluded that there has been a significant improvement in the implementation of the course and training information system for non-formal education providers in Semarang City. The 19.82% performance increase confirms that Sikapin.id is not merely an administrative tool but an effective strategic instrument for optimizing course and training management. This finding validates that adopting an information system designed to meet user needs can bridge the efficiency gap and enhance providers' capacity to manage non-formal education services professionally.

4. Discussion

The Course and Training Information System (sikapin.id) was developed to address the urgent needs of non-formal education institutions in Semarang City. Sikapin.id is designed as an integrated platform to enhance operational efficiency and support better decision-making for non-formal education providers. The system has been tested and proven to simplify administrative tasks, optimize data management, and generate relevant reports for program evaluation and planning.

The large-scale trial involved a sample of 243 respondents, including prospective participants and providers from various institutions such as Course and Training Centers, Job Training Centers, Community Learning Centers, Course Institutions, and Tutoring Centers in Semarang City. All respondents provided informed consent, ensuring ethical standards in data collection. The study employed a pretest-posttest experimental design, enabling a comparative assessment of perceptions and the effectiveness of the education information system before and after implementing the course and training information system for non-formal education providers. This design effectively measures the causal impact of the intervention, offering a clear understanding of the changes resulting from the implementation of Sikapin.id.

The results present pretest and posttest data from evaluating the effectiveness of a course and training information system for non-formal education providers. The study found a significant increase in average scores following system implementation. Initially, the average score was 31.44 with a standard deviation of 3.94. After implementation, the average rose to 41.23, with a standard deviation of 4.31. This increase from 31.44 to 41.23 clearly indicates improved effectiveness. The data suggest that users' experiences and perceptions of the system improved substantially after adoption. This enhancement not only demonstrates progress but also suggests that the system is beginning to deliver perceived added value to users, reflecting its positive impact on user satisfaction and system utility.

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ISSN: 2576-8484
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The analysis of assessment score categorization before and after implementing the course and training information system for non-formal education providers offers a detailed view of its impact. Initially, data indicated that 0.7% of respondents were in the very high category, 47.8% in high, 50.7% in low, and 0.7% in very low effectiveness. Post-implementation of Sikapin.id, there was a significant shift in these percentages. The very high category increased to 34.6%, and the high category rose to 62.5%, while the low category decreased sharply to 2.9%. Notably, no respondents remained in the very low category. Consequently, 97.1% of respondents now fell into the high and very high categories. This change strongly indicates a transformation in user perception, demonstrating that the system is not merely slightly better but fundamentally enhances user experience from "less effective" to "very effective." Such a shift provides robust empirical evidence supporting the Perceived Usefulness component within the UTAUT (Unified Theory of Acceptance and Use of Technology) framework. It clearly shows that users perceive substantial benefits and tangible improvements in performance, validating the system's effectiveness and acceptance.

The research hypothesis was tested using a paired sample t-test, which analyzes the mean difference between two measurements from the same group, before and after an intervention. In this case, it compared the information system evaluation scores before and after system utilization. The results indicated a mean difference of -9.79. The calculated t-value was -27.236, with 135 degrees of freedom (df), and a significance level (p-value) of 0.000. Since this p-value was much smaller than the alpha level of 0.05, the null hypothesis, stating no significant difference, was rejected. This statistically demonstrates a highly significant increase in the value of implementing the course and training information system for non-formal education providers.

The percentage increase in scores from pretest to posttest was 31.13%, highlighting the system's positive impact. A very high t-test value and a significance level close to zero provide strong statistical evidence to reject the null hypothesis and accept the alternative hypothesis, indicating a significant improvement. This suggests that the observed enhancement in effectiveness is not due to chance or random variation but is a direct result of implementing Sikapin.id. The notable increase in mean scores and the shift in assessment categories demonstrate Sikapin.id's high level of effectiveness. This aligns with the concept of information system effectiveness, which focuses on the system's capacity to generate useful information and support improved performance and decision-making.

The results strongly support the principles of UTAUT (Unified Theory of Acceptance and Use of Technology), especially regarding Perceived Usefulness. Users perceive increased effectiveness, indicating the system helps them complete operational tasks more efficiently, positively influencing their motivation to continue using it [44]. This success extends beyond mere "acceptance" and demonstrates that the system has generated a positive "individual impact," consistent with the DeLone and McLean Information System Success Model. Sikapin.id is not only well-received but also delivers tangible, measurable value to users' operations, a key indicator of comprehensive information system success.

The success of Sikapin.id, as demonstrated by quantitative improvements aligned with several dimensions of the UTAUT model, reflects a comprehensive positive impact. (1) A functional system trial suggests good system quality, which includes ease of use and reliability. (2) The system's ability to enhance decision-making, indicated by increased effectiveness and expressed through queries, signifies high information quality. An effective system should provide useful, timely, accurate, and reliable information. (3) The large-scale implementation involving 136 respondents and positive outcomes strongly indicates high system usage and user intention to continue using it. This dimension measures the extent of actual system use by target users. (4) The significant shift in user perception from "low" to "high/very high" demonstrates high user satisfaction with Sikapin.id. User satisfaction is a key indicator of system adoption and acceptance success. (5) The substantial increase in the average evaluation score from 31.44 to 41.23, along with a 31.13% rise in effectiveness, directly reflects the net benefits or organizational impact of Sikapin.id. These improvements enhance operational efficiency and decision-making for NFE organizers. This is the end result of the success of the information system.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 972-985, 2026
DOI: 10.55214/2576-8484.v10i1.11798

This strong alignment across the model's core dimensions shows that Sikapin.id's success is not due to a single factor but a comprehensive achievement that enhances its value from an information systems success perspective.

Sikapin.id offers features such as enrollment management, course data handling, scheduling, and reporting, which streamline administrative tasks and reduce manual effort. Many non-formal education institutions depend on manual data management, but Sikapin.id automates and centralizes these processes. The resulting improvements in operational efficiency and decision-making are likely due to Sikapin.id's ability to automate and consolidate data management, demonstrating the benefits of effective information systems in education.

This increased data availability and accuracy support better decision-making for non-formal education providers. An effective information system delivers acceptable, timely, accurate, and reliable information that meets user expectations. Sikapin.id clearly fulfills these criteria, as shown by higher evaluation scores and improved user perceptions. Consequently, Sikapin.id not only streamlines internal processes but also provides NFE organizers with relevant information, enabling more strategic, evidence-based decisions.

Sikapin.id provides strong empirical evidence supporting the applicability and predictive power of the Unified Theory of Acceptance and Use of Technology (UTAUT) in the context of technology adoption within non-formal education. The findings reinforce that perceived usefulness and perceived ease of use are key drivers of technology acceptance, leading to tangible organizational benefits [45]. Sikapin.id's success in enhancing operational effectiveness and decision-making, backed by high user acceptance, enriches the literature on information system success in the non-formal education sector. It demonstrates that established models of information system acceptance and success remain relevant and predictive, even in specific, often less digitized, educational contexts [46].

Sikapin.id offers a proven solution to enhance administrative and strategic capabilities. By adopting a system like Sikapin.id, non-formal education institutions can achieve increased operational efficiency, improved data management, and more accurate decision-making support. This leads to better quality of education services and more optimal resource allocation. The successful implementation of Sikapin.id underscores the importance of investing in developing and deploying robust information systems for the non-formal education sector. Policies supporting digitalization and technological infrastructure can significantly enhance the overall quality and accessibility of non-formal education, enabling the sector to serve more individuals and groups in need [47].

This study offers valuable insights into key success factors for designing and implementing information systems in educational settings, emphasizing user-centered design and rigorous validation. The findings confirm that focusing on perceived usability and ease of use is essential for achieving widespread adoption and positive impact.

This study provides strong empirical evidence on the importance of validity and reliability in measurement instruments, which are essential for accurately assessing the effectiveness of information systems. The findings reinforce the methodological approaches used in information systems research. Additionally, the study contributes to the expanding literature on information systems adoption and success, especially within the non-formal education sector. It demonstrates that models like the Unified Theory of Acceptance and Use of Technology (UTAUT) are relevant and can be effectively applied to analyze technology acceptance and impact in non-traditional educational settings.

This study demonstrates that the successful implementation of information systems in the non-formal education sector depends on an intuitive, functional design that enhances operational efficiency and service quality. It provides a foundation for developing a tailored technology adoption framework, emphasizing the sector's unique operational needs. Such a framework can improve system integration and support non-formal education providers in achieving better outcomes.

The results of this study reveal several important novelties, especially regarding information systems implementation in the non-formal education sector. (1) While the Unified Theory of Acceptance and Use of Technology (UTAUT) has been extensively used in information systems research, this study

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 972-985, 2026
DOI: 10.55214/2576-8484.v10i1.11798

offers strong empirical evidence supporting its relevance and effectiveness in non-formal education settings. This sector has distinct characteristics that set it apart from formal education and traditional business environments. By demonstrating that Sikapin.id enhances operational efficiency and decision-making within this context, the study contributes to the literature by validating these models in an underexplored domain. (2) The research emphasizes the significance of user-centered system design, highlighting perceived usefulness and perceived ease of use as critical factors influencing adoption and producing a positive impact.

The core contribution of this study is the validation of an instrument used within a non-formal education information system, confirmed through rigorous testing that yielded a Cronbach's Alpha of 0.917, indicating high reliability. All items were validated, reinforcing the robustness of the measurement tool. This methodological rigor enhances the credibility of the research by exemplifying the importance of instrument validity and reliability in accurately assessing system effectiveness. The study presents compelling quantitative data showing a significant increase in system effectiveness following the implementation of Sikapin.id. The average evaluation score rose from 31.44 to 41.23, representing a 31.13% improvement. Additionally, there was a notable shift in respondent categories, with many moving from 'low' to 'high' and 'very high' ratings, providing strong empirical evidence of the system's positive impact. These findings demonstrate that a well-designed information system can substantially improve operational efficiency and service quality in non-formal education institutions. Implicitly, the success of Sikapin.id underscores the importance of intuitive and functional system design that directly enhances operational processes. This insight supports the development of a sector-specific and tailored technology adoption framework, emphasizing the unique operational needs of non-formal education providers. Such contributions are valuable for guiding future research and development efforts aimed at creating more relevant and impactful technological solutions within non-traditional education settings.

Transparency:

The authors confirm that the manuscript provides an honest, accurate, and transparent account of the study. No vital features have been omitted, and any discrepancies from the original plan are explained. The study adhered to all ethical practices during writing.

Copyright:

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Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 972-985, 2026
DOI: 10.55214/2576-8484.v10i1.11798