Jurnal Teknokes
Homepage: teknokes.org; Vol. 18, No. 4, pp. 291-302, December 2025;
e-ISSN: 2407-8964
p-ISSN: 1907-7904

RESEARCH PAPER
OPEN ACCES

Development of Madura Herbal Medicine Database System using Software Development Model of Fast Collaboration Competencies Model

Muhammad Yusuf[1], Moch Kautsar Sophan[2], Wahyudi Agustiono[1], Firli Irhamni[1], Mohammad Syarief[1], Eza Rahmanita[1]

[1] Department of Information Systems, Universitas Trunojoyo Madura, Bangkalan, Indonesia
[2] Department of Informatics Engineering, Universitas Trunojoyo Madura, Bangkalan, Indonesia

ABSTRACT

Herbal medicine is an original Indonesian product made with natural ingredients. Furthermore, Madura also offers many herbal medicines, such as strong and healthy for men and women after giving birth, beauty and body maintenance, cold, smooth breast milk, and others. Various research and development projects worldwide on technology related to traditional or herbal medicine exist. However, a limited database contains data and information about Madura Herbal medicine. This research aims to develop the Madura Herbal Medicine Database System using the Fast Collaboration Competencies (FCC) to facilitate fast and collaborative teamwork as well as based on competencies. The FCC is a software development method that manages and collaborates across diverse skills, expertise, and competencies. The Madura Herbal Medicine database system was developed using a use case diagram, system architecture, and database design. After that, we created a mock-up or prototype. Then, we implemented the system using PHP Rad and a Decision Tree. Moreover, it provides a Madura Herbal Medicine Database system for research, marketing, and production mapping. The research result is a Madura herbal database system that contains herbal medicine data from Bangkalan, Sampang, Pamekasan, and Sumenep. The Madura herbal database system is essential for buyers, producers, marketers, sales personnel, researchers, and other institutions to provide herbal medicine information and support decision-making. Those four cities are located in Madura. Those two websites have combined through a landing page and API. Therefore, two databases can access each other's data. The Madura Herbal Medicine system can apply Fuzzy KNN and Open data for herbal medicine in the future.

PAPER HISTORY

Received October 05, 2025
Revised October 30, 2025
Accepted November 30, 2025
Published December 08, 2025

KEYWORDS

Madura Herbal Medicine;
Database System;
Fast Collaboration Competencies (FCC);

CONTACT:

muhammadyusuf@trunojoyo.ac.id
kautsar@trunojoyo.ac.id
Wahyudi.agustiono@trunojoyo.ac.id
firli.irhamni@trunojoyo.ac.id
mohammad.syarief@trunojoyo.ac.id
eza.rahmanita@trunojoyo.ac.id

I. INTRODUCTION

Herbal is an original Indonesian medicine product made with natural ingredients. Furthermore, Madura also produces many herbal medicines, known as Madura Herbal Medicine. Various research and development projects worldwide on technology related to traditional or herbal medicine exist. The state of the art in this research area is the mobile application using the cloud for herb identification using the CNN model Xception, the Encyclopedia of Middle Kalimantan herb, the Web-based Herb, and the traditional medicine information system, and the Android-based Decision support system for traditional medicine based on light disease symptoms using the AHP method [1]. SMART: An Integrated Cloud Computing Web Server for Traditional Chinese Medicine for Online Virtual Screening, de novo Evolution and Drug Design [2], A Cloud Based Knowledge Sharing System for Traditional Medicine [3], Android-based information system for Kalimantan traditional medicine [4], Ar plants: Herbal plant mobile application utilizing augmented reality [5], Herb selection using Expert system for Human disease diagnose using Forward Chaining method [6]. However, Madura Herbal Medicine requires a database system due to the limited data and information available about Madura Herbal medicines. Therefore, this research aims to develop a Madura Herbal Medicine Database System using the Software Development model of the Fast Collaboration Competencies (FCC) and Decision Tree. The FCC was selected as the model that supports fast and collaborative teamwork based on competencies. The decision tree method was chosen to facilitate the decision-making process. Moreover, it provides a Madura Herbal Medicine Database system for research, marketing, and production mapping. Therefore, the Madura herbal medicine database system is essential for buyers, producers, marketers, sales personnel, researchers, and other institutions to provide herbal

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

medicine information and support decision-making. The novelty of this research is a database of Madura herbal medicine for research, marketing, production, and trade purposes. This paper is an improvement work from [7].

There are various clinical and research issues related to Herbal Medicine nowadays, as the large and growing use of natural-derived substances all over the world. Herbal medicine is a therapeutic method of indigenous medicine. A tropical country, Indonesia is among the countries that produce herbal medicinal plants. These are materials of traditional medicine. More than 30,000 herbal plant varieties are grown in Indonesia [1].Therefore, there are thousands of traditional medicines in Indonesia, including herbals. Furthermore, a database system or encyclopedia is needed to manage traditional medicine and herbal data and information about the benefits, materials, and other information [8] [2]. Also, there is a repository to help the user find traditional medicine, usage details, and benefits faster and more accurately [3]. Moreover, traditional medicine information systems research is moving toward a recommendation system [4]. Analysis of the literature shows that the researchers have developed a web-based traditional medicine information system [2] cloud computation [5] [9] , and mobile devices [6]. Fig. 1 below presents the Traditional Chinese Medicine database.

Furthermore, the literature shows that researchers use the newest technologies to develop traditional medicine information systems using augmented reality to be more interactive [10] [11]. Augmented reality technology has developed learning media about conventional medicine in the natural environment [12] . The literature review points out that there is research about the Expert System for Herb selection using disease diagnosis using *the* Forward Chaining method [13] . Madura herb has been proven as one of the alternatives for early prevention of COVID-19 attacks and other diseases [14] . Furthermore, the decision tree algorithm was selected as it is highly accurate based on previous research [15] . Also, there is existing literature related to application developments, such as [15] developing an early warning system using social media for flood disasters, [16] capturing the application of E-Test on the English Subject Using the Model View Controller, [17] An Android Application for Tomato Leaf Disease Prediction Based on MobileNet, [18] developed a Production Monitoring System Using IIoT Based on a Mobile Application, and [19] pointed out a Middleware Applications Design for Health Information Sharing. Furthermore, another research about the Herbal Medicine Knowledge Base System that uses semantic technology, which facilitates knowledge representation in RDF formalism and knowledge discovery[20]

Moreover, [21]examined the Madura herbal medicine information system using PIECES analysis and Unified Modeling Language (UML) and took data from Bangkalan and Sampang (Madura). Moreover, the research aims to develop a learning medium for students in junior high schools about Madura herbal medicine ethnoscience [24]. Moreover, the research applied informatics to support herbal medicine learning [23].

Furthermore, a decision-support system has been used for herbal medicine prescriptions [24]. Moreover, the research applied an information system for Chinese herbal medicines [25]. Also, [26] utilized the Waterfall model to develop the Herbal Medicine Sales Information System. Furthermore, [27] proposed a new algorithm for a herbal information system in cancer treatment. Another research is [28] developed an herbal medicine information system in a mobile system, [29] examined herbal medicine in the German health care system. Moreover, [30] applied traditional health care and the herbal medicine system.

This paper contains an Introduction section with the research background, gap, aim, and contribution. Moreover, the literature review section reviews Madura Herbal Medicine, the Database system, and the Decision Tree. Furthermore, the research methods section contains a step-by-step description of the research. Also, in the analysis and discussion section, the research is examined to identify novel insights, new findings, and other important aspects. After that, the conclusion section contains a summary, conclusion, and future research.

II. MATERIALS AND METHOD

This research has several stages, as shown in Fig. 1. First, we conducted literature reviews from various sources, including papers, YouTube, websites, books on databases, decision trees, and Madura herbal medicines. Furthermore, we designed the Madura Herb database system using a use case diagram, system architecture, and database design. After that, we developed a mock-up or prototype. Then, we implemented the system using PHP Rad and a Decision Tree. First, we conducted literature reviews across various sources, including papers, YouTube, websites, books on databases and decision trees, and Madura herbal medicines. Furthermore, we designed the Madura Herb database system using a use case diagram, system architecture, and database design. After that, we developed a mock-up or prototype. Then, we implemented the system using PHP Rad and a Decision Tree. Furthermore, we created a detailed system. Moreover, we asked some users for feedback about the system. Then, we conducted testing and deployed the system. The testing procedure was performed by a programmer and a tester using the black box testing method. The programmer and tester executed all the menus and made sure that all functionalities are validated and worked properly. Therefore, the evaluation criteria are functionality of the menus and features. The stages for the Madura Herbal Medicine Database system development were based on the Fast Collaboration Competencies (FCC) model as presented in Fig. 2. The FCC consists of user requirements, system design, mock-up/prototype development, implementation, detailing the system, getting feedback from the user, testing, deployment, and maintenance [31].

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

e-ISSN: 2407-8964
p-ISSN: 1907-7904

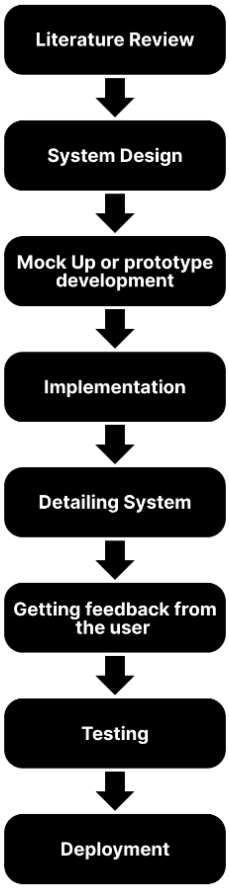

Fig. 1 Step-by-step of the research

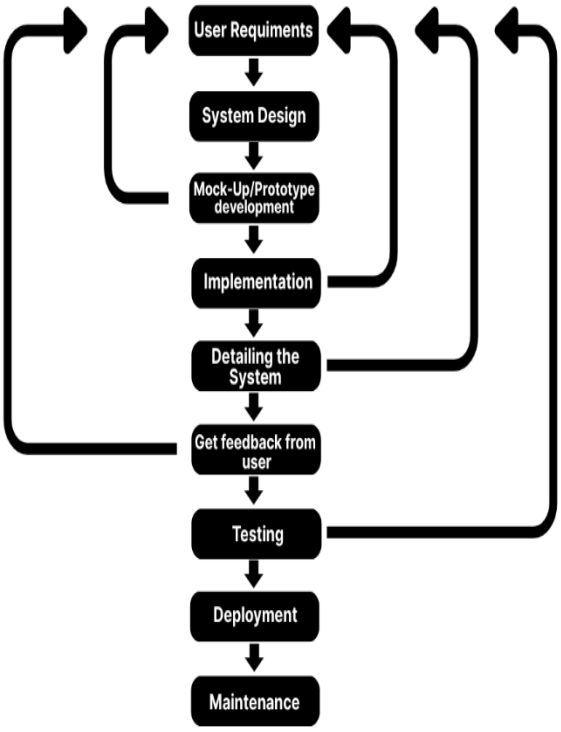

Fig. 2 Step-by-step of Fast Collaboration Competencies (FCC) [31]

Team competencies were mapped based on the requirements of the Madura Herbal Medicine Database system. Five competencies and roles were required, including a business process analyst, system analyst, programmer, tester, and implementer. Collaboration among team members was managed through regular weekly meetings, occasional meetings as needed, and the use of Trello software for progress monitoring and management. Furthermore, a Decision Tree is utilized to help the user choose the best Madura herbal medicine for their symptoms. Details of the Decision Tree stages are explained in Fig. 5 of the results section. The data were collected through interviews with Madura herbal medicine sellers and producers. The data attributes are product name, benefits, ingredients, drink rule, producers, and production permit. The database system architecture is shown in Fig. 4. There are some challenges in data collection, such as limited data sources from production and seller stores. Furthermore, there are limited herbal medicine stores in Madura. Most herbal medicine stores in Pamekasan and Sumenep sell products made in Bangkalan. Moreover, there is limited data about the variation of Madura herbal medicine on the internet.

III. RESULTS

This database will be combined with another database, http://sijabasa.com, which collects Madura Herbal Medicine data from Bangkalan and Sampang cities. Moreover, Fig. 3 presents a use case diagram for the herb database system. It consists of admin and user actors. The system also supports the following use cases: adding herbal medicine data, updating herbal medicine data, deleting herbal medicine data, adding user data, updating user data, removing user data, viewing user data, logging in, updating account data, and viewing herbal medicine data. The data on Madura herbs is still limited, as collection is limited to 3 stores in Pamekasan and 3 in Sumenep.

Moreover, the attributes of the data presented in Table 1 include Herbal Medicine name, benefit, ingredients, consumption rule, producer, and production permit. Therefore, the herb data collection is based on these attributes.

Table 1. Database Attributes

Number	Attributes
1	Herbal Medicine name
2	Benefits
3	Ingredients
4	Consumption rule
5	Producer
6	Production permit

Moreover, the system architecture is shown in Fig. 4 below. The architecture consists of sijibasa.com, the herb database from Bangkalan and Sampang, and Jamu-madura.id, the herb database from Pamekasan and Sumenep. Those two databases are integrated via an API, enabling data exchange between them. Users can access those databases through client computers. Furthermore, the web system includes an API that the user accesses from the client's computer. The database integration has worked effectively to support quicker data

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

e-ISSN: 2407-8964
p-ISSN: 1907-7904

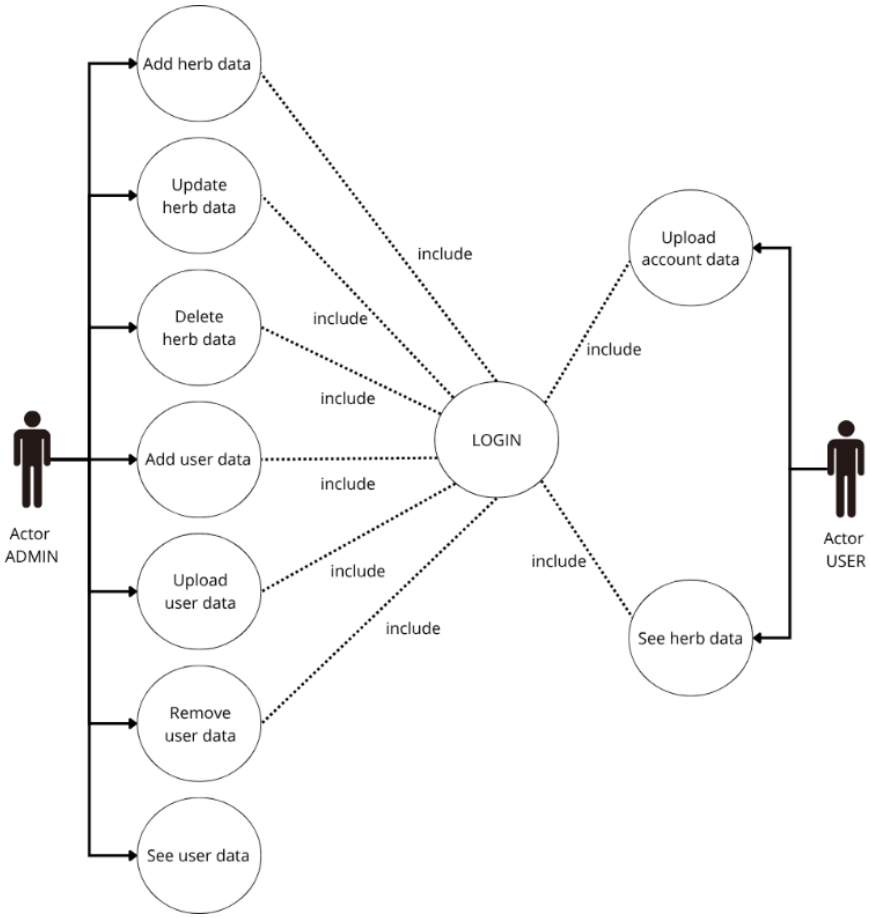

Fig. 3 Use Case Diagram

queries and data consistency. Also, Data communication can be conducted through the integration easily.

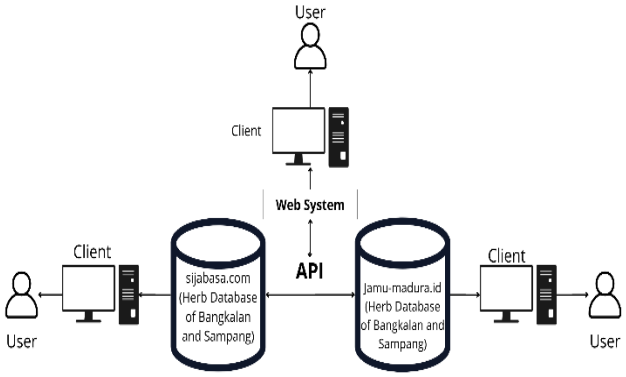

Fig. 4 Database System Architecture

Moreover, Table 2 presents an algorithm for the API function as shown in Fig. 4.

Table 2 algorithm for the API function

Number	Algorithms
1	// Endpoint: GET /api/search-jamu?criteria=...&keyword=...
2	function handleApiRequest():

3	// Ambil parameter dari URL
	criteria = GET['criteria']
	keyword = GET['keyword']

4	// Validasi input
	if criteria is empty OR keyword is empty:
	return JSON response with error message and status 400

5	// Tentukan kolom pencarian berdasarkan kriteria
	if criteria == "symptoms" OR criteria == "herb_benefits":
	column = "Benefits"
	else if criteria == "herb_name":
	column = "Herbal Medicine name"
	else if criteria == "producer":
	column = "Producer"
	else:
	return JSON response with error "Invalid criteria" and status 400

6	// Bangun query SQL
	query = "SELECT * FROM jamu WHERE " + column + " LIKE '%" + keyword + "%'"

7	// Eksekusi query ke database lokal
	results = executeQuery(query)

8	// Kembalikan hasil dalam format JSON 29. return JSON response with results and status 200

Furthermore, the rule of the decision tree C4.5 is presented in Fig. 6 and can be explained as follows:

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

e-ISSN: 2407-8964
p-ISSN: 1907-7904

1. Are the symptoms suitable for the user? If not, do not choose to consume the herb.
2. If the symptoms are suitable, check the benefits of the herb. Are these suitable for the user? If not, then cancel to choose and consume the herb.
3. If the benefits are suitable, then check the herb name. Is the name right for the user? If not, then cancel to choose and consume the herb.
4. If the name is suitable, then check the expiration date. Is it still OK to drink for the user? If not, then cancel to choose and consume the herb.
5. If the expired date is acceptable, check with the producer. Is the producer suitable for the user? If not, then cancel to choose and consume the herb.
6. If the producer is suitable, then check the consumption rules. Are the regulations appropriate for the user? If not, then cancel to choose and consume the herb. If yes, then the user can select and consume the herb.

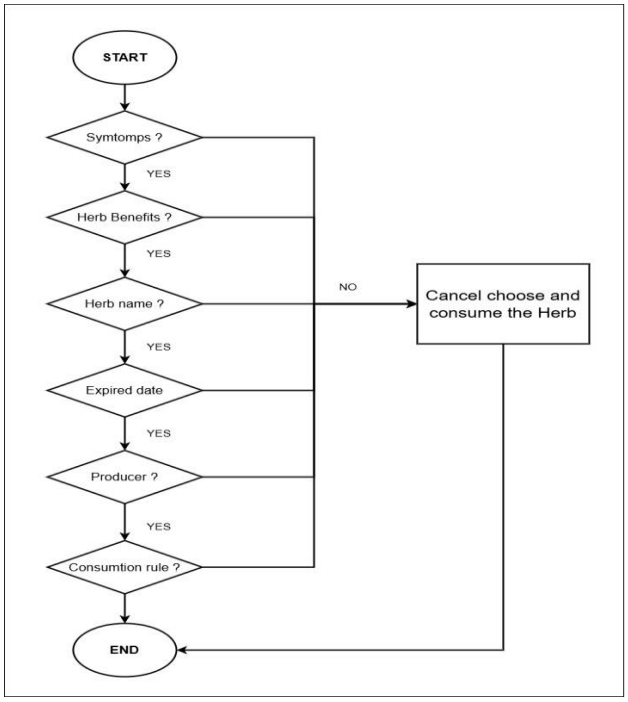

Fig. 6 Decision Tree flowchart

Table 3 Algorithm for the Searching function

Number	Algorithms
1	// Main function to handle herbal medicine search function searchHerbalMedicine(criteria, keyword):

2	// Initialize SQL query
	query = ""

3	// Step 1: Check if the search is based on symptoms if criteria == "symptoms":

4	// Search in the 'Benefits' column
	query = "SELECT * FROM jamu WHERE Benefits LIKE '%" + keyword + "%'"

5	// Step 2: If no symptoms, check if based on herb benefits else if criteria == "herb_benefits":

6	// Also search in the 'Benefits' column
	query = "SELECT * FROM jamu WHERE Benefits LIKE '%" + keyword + "%'"

7	// Step 3: If not herb benefits, check if based on herb name else if criteria == "herb_name":

8	// Search in the 'Herbal Medicine name' column
	query = "SELECT * FROM jamu WHERE `Herbal Medicine name` LIKE '%" + keyword + "%'"

9	// Step 4: If not an herb name, check if based on the producer else if criteria == "producer":

10	// Search in the 'Producer' column
	query = "SELECT * FROM jamu WHERE Producer LIKE '%" + keyword + "%'"

11	// Step 5: If no valid criteria are matched
	else:
	return "Invalid search criteria."

12	// Execute the SQL query
	results = executeQuery(query)

13	// Return the search results return results

Furthermore, the algorithm of the searching function is presented in Table 3. Also, the Madura Herbal Medicine database system has been developed, as shown in Figs. 8, 9, 10, and 11. Fig. 8 presents the Madura Herbal Medicine system front page in Bahasa, and Fig. 9 shows the front page in Madura. Moreover, Fig. 10 identifies the Madura Herbal Medicine database, and Fig. 11 identifies the search results.

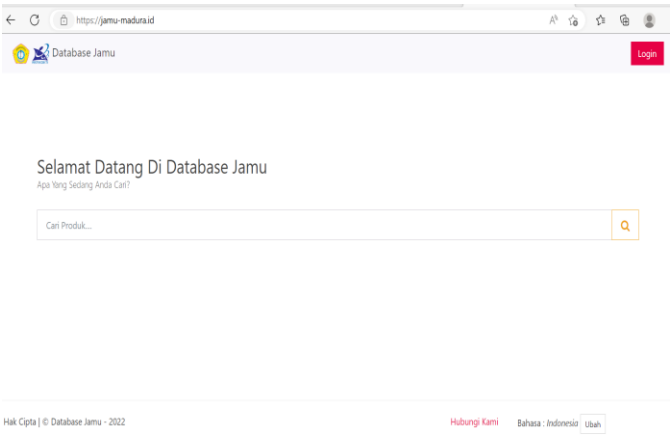

Fig. 8 Front page of Madura Herbal Medicine website

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

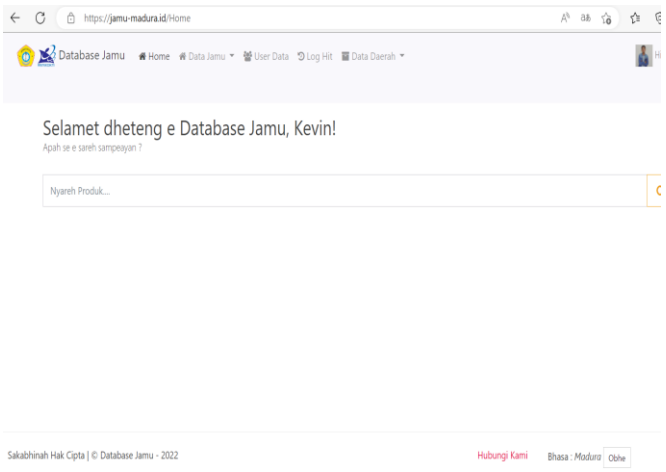

Fig. 9 Madura Herbal Medicine Website in Madura Language

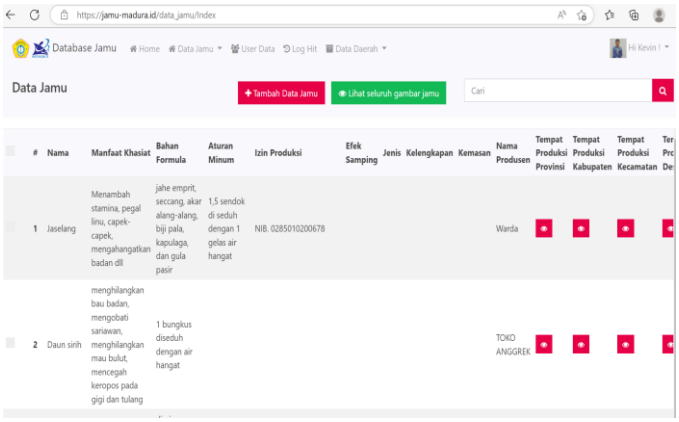

Fig. 10 Madura Herbal Medicine Database

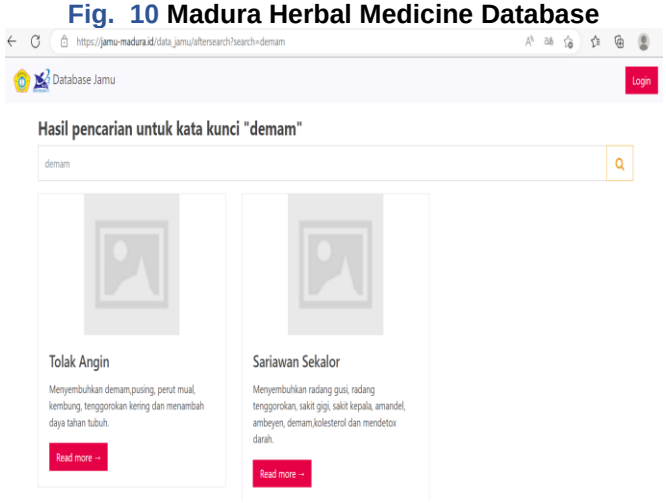

Fig. 11 Searching result

The Madura Herbal Medicine database system was built using the Fast Collaboration Competencies (FCC) model [31]. The FCC is a novel software development model focusing on speed, collaboration, and competencies. The team comprises a research manager, a product manager, a programmer, and two data collectors. The programmer must be able to learn quickly, as the development process is only 3 months. Also, in this project, each team member has competencies and collaborates with others. Furthermore, there is limited primary and secondary data about the Madura Herbal Medicines. Data collection was conducted by visiting stores and asking the owners. The original Madura Herbs products from Pamekasan and Sumenep were also limited. Some of the Madura herbs were produced in Bangkalan and Sampang. This is one of the challenges in this project. Moreover, the Madura Herbal Medicine database system remains limited and is important for herbal researchers, as only a few websites list Madura herbal medicines. Some marketplaces probably have data, but are not specific to Madura Herbal Medicines. The Madura Herbal Medicine database system is one of the systems related to Herbal Medicine, such as the Herbal Medicine Knowledge Base System [20] , the Chinese Herbal Information System [25]. Decision Support System for Herbal Medicine Prescription [24]**.** Additionally, this system is developed using the Fast Collaboration Competencies (FCC) Model. The development model is a complement to other models, such as DevOps [32], [33], and Scrum [34]. Also, the herbal medicine database system was evaluated using the System Usability Scale (SUS). The questionnaire included 10 questions, as presented in Table 4.

Table 4 Statements in the questionnaire

Number	Statements
1	I will use this system again
2	I think this system is complicated to use
3	I think this system is easy to use
4	I need help from others or a technician to use this system
5	I think the features of this system are working well.
6	I think many inconsistencies in this system
7	I think others will quickly understand how to use this system.
8	I think this system is confusing
9	I do not see any obstacle to using this system.
10	I need to adapt to this system before using it.

Additionally, the survey used a Likert scale from 1 to 5, as shown in Table 5. The scale ranges from 1 (very disagree) to 5 (very agree).

Table 5 Likert scales

Scale	Comments
1	Very Disagree
2	Disagree
3	Neutral
4	Agree
5	Very Agree

Moreover, the number of respondents is 50 users, as shown in Table 6. The respondents consist of 15 producers, 15 sellers, and 20 buyers.

Table 6 Users and the number of respondents

Users	Number of respondents
Producers	15
Sellers	15
Buyers	20
Sum of all respondents	50

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

Table 7 SUS score from the Questionnaire

Q	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Sum	Values
R1	4	1	3	1	3	1	4	1	4	2	32	80
R2	3	1	4	1	4	1	4	1	4	1	34	85
R3	4	1	4	1	3	1	4	1	4	2	33	82.5
R4	3	2	4	2	3	2	3	4	3	2	24	60
R5	4	1	3	1	4	1	4	1	4	3	32	80
R6	4	1	3	1	4	2	4	4	4	2	29	72.5
R7	3	2	4	1	4	1	4	2	4	3	30	75
R8	4	2	3	2	4	1	3	3	3	2	27	67.5
R9	4	1	3	1	3	1	4	2	4	3	30	75
R10	4	1	4	1	4	2	4	3	3	1	31	77.5
R11	3	2	4	2	3	1	3	2	4	1	29	72.5
R12	4	1	3	1	3	1	4	1	3	3	30	75
R13	3	1	4	2	4	2	3	4	4	2	27	67.5
R14	3	1	4	2	4	2	4	2	3	1	30	75
R15	4	2	3	1	3	1	4	4	3	2	27	67.5
R16	4	1	4	1	3	1	4	3	4	4	29	72.5
R17	3	1	4	1	4	2	3	2	4	1	31	77.5
R18	4	2	3	2	4	1	3	2	4	2	29	72.5
R19	4	1	4	1	3	2	4	2	4	3	30	75
R20	4	1	4	1	3	2	3	4	3	1	28	70
R21	4	2	3	1	4	1	4	2	3	2	30	75
R22	3	1	3	1	4	1	4	2	4	3	30	75
R23	4	2	4	1	4	1	4	2	4	1	33	82.5
R24	4	1	4	2	3	1	3	4	4	2	28	70
R25	4	1	4	1	4	1	4	2	3	1	33	82.5
R26	4	1	3	1	4	1	3	3	3	2	29	72.5
R27	4	2	3	2	3	2	4	1	3	1	29	72.5
R28	3	1	4	2	3	1	4	3	4	2	29	72.5
R29	4	2	4	2	4	2	3	1	4	3	29	72.5
R30	4	1	4	2	3	1	3	2	4	1	31	77.5
R31	3	1	3	1	3	2	4	3	3	2	27	67.5
R32	4	2	4	2	4	1	4	2	4	1	32	80
R33	4	1	4	2	4	2	3	4	3	4	25	62.5
R34	4	1	3	1	3	2	4	4	3	2	27	67.5
R35	3	1	4	2	4	1	4	4	4	4	27	67.5
R36	4	1	1	1	1	1	4	2	4	2	27	67.5
R37	3	2	1	1	4	2	3	2	3	2	25	62.5
R38	3	1	3	1	1	1	4	3	3	4	24	60
R39	4	1	4	2	3	1	4	2	4	2	31	77.5
R40	3	2	1	2	1	1	4	4	4	4	20	50

Additionally, Table 7 shows the SUS scores from the respondents' responses. As a result, the SUS score is 71.35 across producers, sellers, and buyers. Based on [35], If the SUS score is above 70.4, the system is classified as good.

IV. DISCUSSION

The database system architecture shows that the API plays a significant role as a bridge for communication and data exchange between sijibasa.com and jamu-madura.id. It makes it easier for sijibasa.com to obtain

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

herbal medicine data from Pamekasan and Sumenep, which are stored on jamu-madura.id. Also, the API makes the jamu-madura. It is easier to find data on herbal medicine in Bangkalan and Sampang on sijibasa.com.

approach for applications of its database in rural or marginalised populations with distinct and unique languages and cultures. However, the FCC model supported constructive communication among stakeholders and negotiation of contesting

Table 8 (Continue)

Q	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Sum	Values
R41	4	1	3	2	3	2	3	4	3	2	25	62.5
R42	3	2	1	1	3	2	4	2	3	3	24	60
R43	3	1	2	1	2	2	3	4	4	2	24	60
R44	4	1	3	1	1	1	4	4	4	1	28	70
R45	4	1	3	1	2	2	4	3	3	3	26	65
R46	4	2	1	2	4	1	4	1	3	1	29	72.5
R47	3	1	2	1	4	1	3	4	4	2	27	67.5
R48	4	1	3	2	1	1	3	2	4	1	28	70
R49	3	1	4	1	1	2	4	1	2	1	28	70
R50	4	1	4	1	2	1	4	2	2	1	30	75
Average score from final results												71.35

Moreover, the database system has been measured using SUS, and the results show that it is a good system. Therefore, a database system can be implemented to collect, store, and publish data on herbal medicine in Madura. Researchers, sellers, producers, buyers, practitioners, or herbal medicine companies can use the system as a reference for Madura Herbal Medicine.

Madura Island has a long history of herbal medicine, including local plant varieties, preparation techniques, traditional production, and ethnomedical knowledge. The main finding of this research is a Madura Herbal Medicine Database system that contains data on herbal medicine from Bangkalan, Sampang, Pamekasan, and Sumenep. The Madura Herbal Medicine Database system was built using the FCC model, intersecting the Health Information System and traditional knowledge systems. Furthermore, the FCC supports software development projects by managing and collaborating with diverse skill sets, expertise, and competencies, including traditional Madura herbal practitioners. It also focuses on fast processes, adaptability, and effectiveness. Therefore, the database system as an ethnobotanical information system preserves cultural relevance, botanical and traditional taxonomies of medical plants in Madura, and practical applicability. Moreover, the FCC model supported parallel development streams, including a modular task structure and competency mapping at its core. This structure also addresses user interface design and database development. The parallel workflow reduced database development time, accelerated prototype development, and enabled feedback from individuals with limited technical expertise on database usability. One of the important findings highlighted the need for a user-centric design epistemological visions between traditional and modern medical paradigms.

This research points out that the development project is not only about producing a system, but also encourages collaboration among diverse herbal medicine stakeholders, software development through rapid adaptation and collaboration, and shared learning.

Another important thing is standardising traditional herbal knowledge and the database system. It helps to preserve herbal medicine knowledge and standardise herbal medicine data, such as uses, dosages, ingredients, and contraindications. Furthermore, the system supports accessibility to its data for herbal medicine practitioners and researchers. This research is not only a technical database project, but also a collaboration between ethnopharmacology and information technology. Moreover, it supports the preservation of herbal medicine through digital media. Also, the research has overcome some challenges in herbal medicine, such as the undocumented or loss of knowledge about Madura herbs.

There is limited data available from sellers and herbal producers, especially in Pamekasan and Sumenep, as most herbal products originate from Bangkalan. In the interview, the research team communicated with the sellers and producers using Bahasa. Additionally, the data collectors were Maduranese students; therefore, they communicated with the sellers and producers using Maduranese. There are numerous nomenclatures, methods, techniques, and properties in different local areas in Madura. Classifying traditional medicine using scientific nomenclature and pharmacological approaches is a challenge. Finally, people and

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

collaboration are essential to preserve conventional and herbal medicine on a structured digital platform. Moreover, Table 8 points out a comparison of this research result with others, such as CHMIS-C for anticancer drug recovery [36], augmented reality for medical plant learning media [11], an expert system for herbal medicine selection using the Forward Chaining method [12], and the Herbal Medicine Knowledge Base System [20].

Table 9 Comparison with other research

Research	Results
This research	This research developed a Madura Herbal Medicine Database System that contains data from Bangkalan, Sampang, Pamekasan, and Sumenep.
CHMIS-C: A Comprehensive Herbal Medicine Information System for Cancer [36]	This research captured an information system for anticancer drug recovery
Augmented Reality-Based Medicine Plants Learning Applications [11]	This research developed an augmented reality for medical plants learning media.
Development of Expert system for Herbal Medicine Selection to diagnose human disease using Forward Chaining method. [12]	This research developed an expert system for herbal medicine selection using Forward Chaining method.
Herbal Medicine Knowledge Base System [20]	The research developed a semantic technology for Herb, Traditional Medicine, Process, and Pharmacology.

The research has some practical implications, such as the database system providing information and data about Madura herbal medicine. Buyers, producers, marketers, sales personnel, researchers, and other stakeholders need to provide accurate information on herbal medicines and support informed decision-making. An herbal medical institution, such as a clinic or hospital, or an herbal research institution, can adopt the system with additional, more complete data and features in the future.

V. CONCLUSION

This research aims to develop a Madura Herbal Medicine Database System using the Software Development model of the Fast Collaboration Competencies (FCC) and Decision Tree. The research contributed by providing a Madura Herbal Medicine Database for research, marketing, and production mapping. The system was measured using the SUS and scored 71.35, which is considered a good system based on the survey respondents. The respondents consist of 15 producers, 15 sellers, and 20 buyers**.** Therefore, the Madura herbal medicine database system is essential for buyers, producers, marketers, sales personnel, researchers, and other institutions to provide accurate herbal medicine information and support informed decision-making. The novelty of this research is a database of Madura herbal medicine for research, marketing, production, and trade purposes. Furthermore, the system has a broader impact on the digitalisation of the traditional medicine system by providing digital information about Madura Herbal medicine. Furthermore, we have collected data on Madura herbal medicine from three stores and producers in Pamekasan and three stores and producers in Sumenep. This database of Jamu Madura will be combined with another Sijibasa database. Those two websites have been combined through a landing page and an API. Therefore, two databases can access each other's data. The research still has some limitations, including the limited data collected and entered into the database system, as well as the limited features. In conclusion, applying the FCC model in the design and development of the Madura Herbal Medicine Database System proves its contribution to facilitating multidisciplinary and multicultural collaboration. The model also facilitated the design of a technical process and culture-based electronic repository. Future research will contribute to the existing data on Madura herbal medicine and utilise Fuzzy KNN or other AI methods to enhance the classification capabilities of the Madura Herbal Medicine Database System. Additionally, Open data for herbal medicine can be developed to support researchers and practitioners with larger data. Moreover, the database description can be extended by adding note numbers, plant variation, or completeness statistics.

ACKNOWLEDGMENTS

We want to thank the Research and Community Development Body of the University of Trunojoyo Madura, Indonesia. Also, thank you very much to the Information System Study Programme of the Engineering Faculty, our

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

research team (Kevin Maulana, Desi Damayanti, Syahril Mobin), our partner Madura herb store, and producers in Pamekasan and Sumenep.

REFERENCES

[1] F. Haris and S. Jayanti, "Rancang Bangun Ensiklopedia Tanaman Obat Kalimantan Tengah Berbasis Android," *Sebatik*, vol. 23, no. 1, pp. 218–223, 2019, doi: 10.46984/sebatik.v23i1.481.

[2] C. Niesa and Z. Viki, "APLIKASI SYSTEM REPOSITORY GREEN ACEH UNTUK PADA PENYAKIT INFEKSI Dosen Fakultas Komputer dan Multimedia Universitas Islam Kebangsaan Indonesia," vol. 5, no. 3, pp. 110–115, 2020.

[3] A. S. Aditya, "Sistem Pendukung Keputusan Memilih Obat Tradisional Berdasarkan Gejala Penyakit Ringan Berbasis Android Dengan Metode Ahp," *Ubiquitous: Computers and its Applications Journal*, vol. 3, pp. 13–16, 2020, doi: 10.51804/ucaiaj.v3i1.13-16.

[4] C. Muriana, T. Piazza, and G. Vizzini, "An expert system for financial performance assessment of health care structures based on fuzzy sets and KPIs," *Knowl Based Syst*, vol. 97, pp. 1–10, 2016, doi: https://doi.org/10.1016/j.knosys.2016.01.026.

[5] M. Naz, T. Waheed, M. Aslam, and A. M. Martinez-Enriquez, "A Cloud Based Knowledge Sharing System for Traditional Medicines," in *Recent Advances in Information and Communication Technology 2021*, P. Meesad, Dr. S. Sodsee, W. Jitsakul, and S. Tangwannawit, Eds., Cham: Springer International Publishing, 2021, pp. 298–309.

[6] D. Agustina, A. Mardianti, and R. Fahmi Farid Aziz, "Perancangan Aplikasi Augmented Reality Pengenalan Jenis - Jenis Tanaman Herbal Berbasis Android," *Seri Prosiding Seminar Nasional Dinamika Informatika*, vol. 4, no. 1, pp. 218–221, 2020, [Online]. Available: http://prosiding.senadi.upy.ac.id/index.php/senadi/article/view/160/151

[7] M. Yusuf, M. K. Sophan, A. K. Darmawan, D. R. Anamisa, B. D. Satoto, and N. Alamsyah, "SakeraHerbDB: Proposing an Integrated Indonesian Traditional Herbal Medicine Database (IITHM-DB) for Madura Island's Herbs," *Technium: Romanian Journal of Applied Sciences and Technology*, vol. 16, pp. 259–265, 2023.

[8] E. Wati, I. Kuantan Singingi, I. K. Jl Gatot Subroto, K. Nenas, D. Jake, and K. Kuantan Singingi, "Sistem Informasi Tanaman Herbal Dan Ramuan Obat Tradisional Sebagai Alternatif Pengobatan Alami Berbasis Web," *Jurnal Perencanaan, Sains, Teknologi dan Komputer*, vol. 3, no. 2, pp. 463–472, 2020, [Online]. Available: https://ejournal.uniks.ac.id/index.php/JUPERSATEK/article/view/1091/733

[9] M. H. Qamaruzzaman, S. Sutami, and S. Sam'ani, "Rancang bangun informasi obat tradisional kalimantan dengan permodelan air terjun berbasis android," *Jurnal Pendidikan Informatika dan Sains*, vol. 10, no. 1, pp. 80–89, 2021, doi: 10.31571/saintek.v10i1.2567.

[10] J. M. Angeles, F. B. Calanda, T. V. V Bayon-on, R. C. Morco, J. Avestro, and M. J. S. Corpuz, "Ar plants: Herbal plant mobile application utilizing augmented reality," in *Proceedings of the 2017 International Conference on Computer Science and Artificial Intelligence*, 2017, pp. 43–48.

[11] M. Julkarnain, M. T. A. Zaen, and ..., "Augmented Reality-Based Medicine Plants Learning Applications," *… of Informatics and …*, vol. 5, no. 2, pp. 151–159, 2021, doi: 10.30865/ijics.v5i2.3157.

[12] T. Pradana, Moch. Z. Ilmi, and T. Arifianto, "Pengembangan Sistem Pakar Pemilihan Jamu Dengan Diagnosa Penyakit Pada Manusia Dengan Metode Forward Chaining," *Jurnal Ilmiah Informatika*, vol. 9, no. 01, pp. 11–18, 2021, doi: 10.33884/jif.v9i01.3661.

[13] B. Fatimah, D. S. S. Kinasih, W. Retnowati, and Y. Setiawati, "Antibacterial Activity Test of Turmeric Extract (Curcuma longa) From Madura Island Against Staphylococcus aureus," *Jurnal Kesehatan Prima*, vol. 16, no. 1, pp. 74–82, 2022.

[14] A. Tomaru, K. Toshimoto, W. Lee, K. Ishigame, and Y. Sugiyama, "A Simple Decision Tree Suited for Identification of Early Oral Drug Candidates With Likely Pharmacokinetic Nonlinearity by Intestinal CYP3A Saturation," *J Pharm Sci*, vol. 110, no. 1, pp. 510–516, 2021.

[15] R. Sistem, "JURNAL RESTI Development of an Early Warning System Using Social Media for Flood Disaster," vol. 5, no. 158, pp. 169–180, 2026.

[16] S. R. Ningsih, F. Suryana, Y. Desnelita, S. Andini, and U. Metamedia, "JURNAL RESTI The Aplication of E - Test On English Subject Using The Model View," vol. 5, no. 158, pp. 7–8, 2026.

[17] M. Fadhilla and D. Suryani, "Android Application for Tomato Leaf Disease Prediction Based on," *Jurnal Resti*, vol. 5, no. 158, pp. 1–6, 2023.

[18] Gun Gun Maulana, Siti Aminah, and B. Aji Nugraha, "Implementation of a Production Monitoring System Using IIoT Based on Mobile Application," *Jurnal RESTI (Rekayasa Sistem dan Teknologi Informasi)*, vol. 7, no. 5, pp. 1077–1087, 2023, doi: 10.29207/resti.v7i5.5221.

[19] K. A. Seputra, A. A. G. Y. Paramartha, G. A. Pradnyana, and K. Y. E. Aryanto, "A Middleware Applications Design for Health Information Sharing," *Jurnal RESTI (Rekayasa Sistem dan Teknologi Informasi)*, vol. 8, no. 3, pp. 321–332, 2024, doi: 10.29207/resti.v8i3.5707.

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

[20] S. Mustaffa *et al.*, "Herbal Medicine Knowledge Base System," p. 13, 2012, [Online]. Available: https://www.academia.edu/2169032/Herbal_Medicine_Knowledge_Base_System
[21] R. Yunitarini and E. Widiaswanti, "Analysis and Design of Indonesian Traditional Medicine (Jamu) Information System by using Prototyping Model (Case Study: Madura Island)," *E3S Web of Conferences*, vol. 483, pp. 1–14, 2024, doi: 10.1051/e3sconf/202448303012.
[22] M. Adelia and A. Widowati, "Mapping Science Learning Materials Integrated Ethnoscience ' Jamu Madura ' for Middle Schools / MTs," pp. 31–36, 2023.
[23] V. Lertnattee and B. Wangwattana, "Using informatics courses to support learning in herbal medicine," *Adv Sci Lett*, vol. 24, no. 11, pp. 8467–8470, 2018.
[24] S. A. O. Ogirima, "Web-based decision support system for prescription in herbal medicine," *Journal of Emerging Trends in Engineering and Applied Sciences*, vol. 6, no. 7, pp. 245–254, 2015.
[25] W. Zhang and Q. Wei, "Information system of attributes and functions of Chinese herbal medicines," *Network*, vol. 8, no. 3–4, pp. 27–63, 2023.
[26] N. Hidayati, "Using of the Waterfall Model in the Development of Herbal Medicine Sales Information System," *IJISTECH (International Journal of Information System and Technology)*, vol. 8, no. 4, pp. 254–266, 2024.
[27] J. Ziemann, A. Lendeckel, S. Müller, M. Horneber, and C. A. Ritter, "Herb-drug interactions: a novel algorithm-assisted information system for pharmacokinetic drug interactions with herbal supplements in cancer treatment," *Eur J Clin Pharmacol*, vol. 75, pp. 1237–1248, 2019.
[28] M. J. C. Samonte, M. T. P. Cadiz, B. M. R. M. Camba, and G. G. Esguerra, "Herbal medicine information system using push and pull technology in mobile application," in *TENCON 2018-2018 IEEE Region 10 Conference*, 2018, pp. 2098–2103.
[29] A. N. Welz, A. Emberger-Klein, and K. Menrad, "The importance of herbal medicine use in the German health-care system: prevalence, usage pattern, and influencing factors," *BMC Health Serv Res*, vol. 19, pp. 1–11, 2019.
[30] C. P. Kala, "Traditional health care systems and herbal medicines," *Eur J Environ Public Health*, vol. 1, no. 1, p. 3, 2017.
[31] M. Yusuf, M. K. Sophan, A. K. Darmawan, B. D. Satoto, D. R. Anamisa, and W. Agustiono, "Fast Collaboration Competencies Model for Software Development Life Cycle (SDLC)," *Proceeding - IEEE 9th Information Technology International Seminar, ITIS 2023*, pp. 1–6, 2023, doi: 10.1109/ITIS59651.2023.10420226.
[32] C. Ebert, G. Gallardo, J. Hernantes, and N. Serrano, "DevOps," 2016.
[33] L. Zhu, L. Bass, and G. Champlin-Scharff, "DevOps and Its Practices," *IEEE Softw*, vol. 33, no. 3, pp. 32–34, 2016, doi: 10.1109/MS.2016.81.
[34] A. Srivastava, S. Bhardwaj, and S. Saraswat, "SCRUM model for agile methodology -DOI: 10.1109/CCAA.2017.8229928," *Proceeding - IEEE International Conference on Computing, Communication and Automation, ICCCA 2017*, vol. 2017-Janua, pp. 864–869, 2017.
[35] A. Bangor, T. Staff, P. Kortum, J. Miller, and T. Staff, "Determining What Individual SUS Scores Mean : Adding an Adjective Rating Scale," vol. 4, no. 3, pp. 114–123, 2009.
[36] X. Fang, L. Shao, H. Zhang, and S. Wang, "CHMIS-C: A comprehensive herbal medicine information system for cancer," *J Med Chem*, vol. 48, no. 5, pp. 1481–1488, 2005, doi: 10.1021/jm049838d.

AUTHOR BIOGRAPHY

Muhammad Yusuf received his Bachelor's Degree in Industrial Engineering from STT Telkom (Telkom University) in 2002, Master's Degree in Management of Information Technology from ITS in 2008, and Ph.D. degree in Computing from University of Portsmouth, UK, in 2017. Since 2018, he has been an Assistant Professor of Information Systems, Department of Information Systems, Universitas Trunojoyo Madura, Indonesia. Since 2025, he has been the Director of the Curriculum and Accreditation Support Department of AISINDO. He is also a reviewer for various reputable national and international journals and conferences. His current research interests include Information Systems, E-Government, E-Participation, Open Data, IT Service Management System, Actor-Network Theory, DevOps.

Moch Kautsar Sophan is an Assistant Professor at the Informatics Engineering, Faculty of Engineering, Universitas Trunojoyo Madura. He received a Bachelor's Degree in Informatics Engineering and a Master's Degree in Management of Information Technology from ITS, Indonesia. He is an active researcher and obtains many research funding from Universitas Trunojoyo Madura about the Herbal Medicine Database System, Salt Management Information System, E-Government Service Management System, KEDAIREKA about Digital Village Index (DVI), BIMA about Village Open Data and Disability Open Data, and IEEE about E-learning. Also, he is an IT consultant for some companies. Moreover, he is

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36

a coordinator for the teaching practitioner program at Universitas Trunojoyo Madura. His research interests are in software engineering.

Wahyudi Agustiono received the Bachelor of Engineering in informatics engineering from Institut Teknologi Sepuluh Nopember Surabaya, Indonesia, M.Sc in Global Information and Telcom Studies, Waseda University, Japan, and a Ph.D degree in School of Information and Business Analytics from Deakin University, Australia. He is a Professor of Information Systems at Universitas Trunojoyo Madura. He obtained research funding from Universitas Trunojoyo Madura, BIMA, and KONEKSI for smart farming, green IT, and Artificial Intelligence. Also, he is a Customer Satisfaction manager at SEVIMA company. His research interests include information systems, Inter-organizational Information systems, green IS/IT, e-commerce, e-Business, Digital preneurship, and IS/IT governance.

Firli Irhamni received his Bachelor of Engineering in Electrical Engineering and his Master's degree in Informatics Engineering from Institut Teknologi Sepuluh Nopember (ITS), Surabaya, Indonesia. His academic background combines engineering fundamentals with advanced information systems and software development. His research interests focus on Requirements Engineering, including requirements analysis, modeling, and automation techniques. He also works in IT/IS Project Management, focusing on project methodologies, risk management, and aligning technological solutions with organizational goals. With a strong interdisciplinary foundation, he aims to improve software development practices and enhance the effectiveness of information systems across various domains.

Mohammad Syarief received his Bachelor of Engineering in Electrical Engineering in 2006 from Universitas Brawijaya, Malang, Indonesia. In 2015, he completed his postgraduate studies and earned a Master's Degree in Computer Science from Universitas Gadjah Mada, Yogyakarta. He began his academic career as a lecturer at Universitas Trunojoyo Madura in 2008. During his early years, he taught in the Diploma Program of Information Management (D3 Manajemen Informatika). In 2016, with the establishment of the Information Systems Study Programme, he was assigned to the new program and has since been actively involved in curriculum development and academic activities. Syarief's primary research interests include Software Engineering, Database, Semantic Web, and Data Science. His passion for software development began even before entering academia. Since around 2007, he had been working as a freelance web developer for several institutions in Sumenep. After becoming a lecturer, he continued to pursue his interest in software engineering by developing various internal applications to support academic and administrative processes at the university. Additionally, he has been entrusted on several occasions to serve as an IT expert on software development projects at the Bangkalan local government. With his academic background and professional experience, he remains committed to contributing to education, research, and technological implementation in both academic and public sectors.

Eza Rahmanita received her Bachelor's Degree in control system engineering and and Master's Degree in Intelligent Multimedia Network in Electrical Engineering from Institut Teknologi Sepuluh Nopember Surabaya, Indonesia. She is a lecturer in Information System study programme, Informatics Engineering Department, Engineering Faculty of Universitas Trunojoyo Madura, Indonesia. Additionally, she taught Discrete Mathematics, Digital Preneurship, Visual Programming, Operation Research, Engineering Logic, Linear Algebra Computation, Information Technology (IT) Project Management, Decision Support System (DSS), and Enterprise Resource Planning (ERP). She is a member of the journal management team in the Department of Informatics Engineering. Additionally, she also obtained research funding from the Institute of Research and Community Development, Universitas Trunojoyo Madura. Also, she is interested in various businesses. Her research interests are Data Mining, Decision. Support System.

Corresponding author: Muhammad Yusuf, muhammadyusuf@trunojoyo.ac.id, Department of Information System, Universitas Trunojoyo Madura, Jl. Raya Telang, Kamal, Bangkalan, Madura, Indonesia.
DOI: https://doi.org/10.35882/teknokes.v18i4.36