

A Web-based Decision Support System for Boarding House Accreditation Using Forward-Chaining Rules

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Abstract: *The study introduces a web-based decision support system designed to streamline the accreditation of the boarding houses using a forward chaining rule-based algorithm. The system was developed to address the limitation of existing manual accreditation processes which are often inconsistent and error prone. Evaluated using ISO 25010 quality model, the system was assessed by 40 participants, including boarding house owners, dorm managers, and IT experts. Results revealed excellent rating across most software quality characteristics, indicating the systems compliance with standard benchmarks for usability, reliability, portability, and maintainability. The findings support the system's practicality in improving decision-making and enhancing the efficiency of accreditation procedure.*

Keywords: boarding house accreditation, decision support system, rule-based algorithm, ISO 25010, forward chaining

1. Introduction

Boarding houses serve as vital, affordable accommodations for students and transient workers, with their quality assurance governed by a formal accreditation process (Batara, 2022; SPC-OSAS, 2023). This evaluation ensures a conducive living environment by assessing facilities against established standards for safety, hygiene, security, and amenities. The importance of this process is underscored by the Commission on Higher Education (CHED), which considers student housing part of student welfare services (CMO No. 21 s. 2006; CMO No. 9 s. 2013). In areas like Sibalom, Antique, accreditation, though voluntary, is crucial as only accredited units are officially recommended, guiding residents and parents toward safe, quality options. Local accreditation efforts, led by the Student Welfare and Other Services Unit and a Boarding House Owners Association, evaluate critical areas including structural standards, safety, sanitation, and rent reasonableness, ultimately benefiting operators through enhanced reputation and residents through secured quality living (Boarding Schools' Association, 2024; Batara, 2022).

Despite its critical role, the current accreditation practice suffers from a reliance on manual, inconsistent, and fragmented methods that are slow and error-prone. A key deficiency is the lack of integration of automated decision-making tools, such as rule-based algorithms, which could significantly enhance objective evaluation and efficiency (Andrianus, 2024). This gap necessitates the development of a decision support system utilizing a rule-based algorithm. Such a system would provide a scalable, user-friendly platform, automating rule applications, reducing manual labor, and expediting accreditation decisions. This effort directly aligns with CHED's mandate by ensuring consistent and efficient quality assurance in boarding house accommodations (Saputra, 2025; Mangca, 2023).

This study is significant as it provides a scalable and reliable tool to enhance accreditation transparency and operational

efficiency. By leveraging rule-based automation, it ensures consistency in evaluations and supports in aligning with evolving quality assurance mandate. Thus, the study.

2. Research Objectives

General Objective

This study was conducted to develop a Web based Decision Support System for Boarding House Accreditation Using Rule Based Algorithm that streamlines compliance monitoring and enhances efficiency.

Specific Objectives:

Specifically, this study was intended to:

- 1) Develop a database system for managing boarding house application information, ocular inspection details, and supporting documents;
- 2) Employ Forward Chaining Rule-based Inference Engine to recommend accreditation decisions (approved, deferred, or rejected), accreditation level (number of stars), notice of deficiencies, and areas for improvement; and
- 3) Evaluate the system based on ISO 25010 criteria.

3. Methodology

Research Design

This study utilized developmental research design. To achieve the study's objectives, different developmental research methods were employed. This included careful analysis of data and findings. This methodology was deemed appropriate as it aimed to develop a system that will facilitate the accreditation process of the boarding houses. Descriptive survey results were used to refine the system's functionalities and basis for data-driven improvements.

Participants of the Study

Forty participants were included in the study and evaluated the Web-based Decision Support System for Boarding House Accreditation Using Rule Based Algorithm.

This included 33 selected boarding house owners, 2 dorm managers and 5 IT experts.

The number of participants was deemed sufficient for a pilot evaluation considering the targeted end-users and the developmental scope of the study.

Data Gathering Instruments and Techniques

The data gathering commenced with the interview of the authorities who are processing boarding house accreditations to provide necessary information in the development of the system. Moreover, the researcher gathered and analyzed literature to develop insights about boarding house accreditation and identified possible research gaps. Another data gathering tool was a researcher-made Evaluation Instrument for End-User Evaluation using the ISO/IEC 25010 Software Quality Model Characteristics that underwent validity and reliability testing.

Data Gathering Procedure

In the data-gathering phase, the researcher sought the approval of the concerned agencies to administer the research instrument. Moreover, a consent form was also given to each respondent to ensure that their participation was voluntary. After which, the researcher personally administered the data gathering instrument among the respondents. After the evaluation, all administered data gathering instruments were personally retrieved by the researcher.

Statistical Tools Used

The data gathering instrument was designed similar to the characteristics of the system based on the ISO 25010 which were analyzed using weighted mean and standard deviation.

Weighted Mean

The weighted mean for a particular characteristic was computed by taking the sum of the products of each indicator's assigned weight and the number of respondents who selected that response, divided by the total number of respondents.

$$\bar{x}_w = \frac{\sum fx}{n}$$

Where:

$\bar{x}_w$ = weighted mean

f = frequency

x = scores

n = total number of participants

Σ = summation symbol

Likert Scale

The data gathering instrument was in the form of a 5-point Likert scale from where the weighted mean was derived. Adjectival interpretation of the weighted mean is shown below:

Table 1: Weighted Mean and its Verbal Interpretation

Range	Interpretation
1.00 – 1.80	Poor
1.81 – 2.60	Fair
2.61 – 3.40	Good
3.41 – 4.20	Very Good
4.21 – 5.00	Excellent

Software Model

This area presents a description of the software model used in developing the system. The researcher utilized the Rapid Development (RAD) model because it ensures a user-centered design with iterative development cycles incorporating user feedback. In addition, the application requirement is well documented, fixed, and clear. The following are the stages of Rapid Application Development: (1) Requirements Planning, (2) User Design, (3) Construction, and (4) Implementation or Cutover.

4. Results and Discussion

This section presents the analysis and interpretation of the data.

Table 2: Mean and Standard Deviation of the Functional Suitability of the System

Functional Suitability	Rating					Mean	SD	Interpretation
	1	2	3	4	5			
Completeness	0	2	5	13	20	4.28	0.88	Excellent
Correctness	0	3	3	4	30	4.53	0.93	Excellent
Appropriateness	0	1	2	2	35	4.78	0.66	Excellent

As shown in Table 2, the three indicators of the functional suitability namely completeness (M=4.28, SD=0.88), correctness (M=4.53, SD=0.93) and appropriateness (M=4.78, SD=0.66) were excellent. This means that the system's function covers all the specified tasks, provides accurate results, and can accomplish tasks and objectives in a very desirable manner.

Table 3: Mean and Standard Deviation of the Performance Efficiency of the System

Performance Efficiency	Rating					Mean	SD	Interpretation
	1	2	3	4	5			
Time Behavior	0	2	2	20	16	4.25	0.78	Excellent
Resource Utilization	0	1	1	20	18	4.38	0.67	Excellent
Capacity	0	0	2	18	20	4.45	0.60	Excellent

Table 3 shows that as to performance efficiency, the system was excellent in terms of time behaviour (M=4.25, SD=0.78), resource utilization (M=3.38, SD=0.67) and capacity (M=4.45, SD=0.60). This suggests that the system's processing time, resource usage, and capacity meet the required standards.

Table 4: Mean and Standard Deviation of the Compatibility of the System

Compatibility	Rating					Mean	SD	Interpretation
	1	2	3	4	5			
Co-existence	0	0	1	23	16	4.38	0.54	Excellent
Interoperability	0	1	1	14	24	4.53	0.68	Excellent

As reflected in Table 4, the results revealed that as to system compatibility, both indicators namely co-existence ($M=4.38$, $SD=0.54$) and interoperability ($M=4.53$, $SD=0.68$) were excellent. This means that the system possesses high degree of function efficiency while sharing a common environment and resources with the other product. The results also suggest that the system can easily exchange and use information.

Table 5: Mean and Standard Deviation of the Usability of the System

Usability	Rating					Mean	SD	Interpretation
	1	2	3	4	5			
Appropriateness Recognizability	0	0	1	23	16	4.38	0.54	Excellent
Learnability	0	0	5	15	20	4.38	0.70	Excellent
Operability	1	1	3	20	15	4.18	0.87	Very Good
User error protection	1	2	1	16	20	4.30	0.94	Excellent
User interface aesthetics	0	1	0	25	14	4.30	0.61	Excellent

Table 5 shows that four out of five indicators of usability were rated excellent. These are appropriateness recognizability ($M=4.38$, $SD=0.54$), learnability ($M=4.38$, $SD=0.70$), user error protection ($M=4.30$, $SD=0.94$) and user aesthetic interface ($M=4.30$, $SD=0.61$). Moreover, though system's operability ($M=4.18$, $SD=0.87$) rated lowest among the five indicators, it was also classified as very good.

These figures suggest that the users found the system is easy to use, recognize that this is helpful in accrediting existing and prospective boarding houses.

Table 6: Mean and Standard Deviation of the Reliability of the System

Reliability	Rating					Mean	SD	Interpretation
	1	2	3	4	5			
Maturity	2	1	1	13	23	4.35	1.03	Excellent
Availability	0	0	0	19	21	4.53	0.51	Excellent
Fault tolerance	2	2	1	23	12	4.03	1.00	Very Good

Table 6 presents reliability characteristics using three indicators. Two of these indicators, namely maturity ($M=4.35$, $SD=1.03$) and availability ($M=4.53$, $SD=0.51$) were rated excellent while fault tolerance ($M=4.03$, $SD=1.00$) garnered a very good rating. These values suggest that the users can rely on the ability of the system. Furthermore, the system is also accessible and can operate even if there is a presence of minimal hardware and software faults.

Table 7: Mean and Standard Deviation of the Security of the System

Security	Rating					Mean	SD	Interpretation
	1	2	3	4	5			
Confidentiality	1	0	3	27	9	4.08	0.73	Very Good
Integrity	1	1	3	16	19	4.28	0.91	Excellent
Accountability	1	1	1	35	2	3.90	0.63	Very Good

The figures in Table 7 revealed that only its integrity ($M=4.28$, $SD=0.91$) was rated excellent while the confidentiality ($M=4.08$, $SD=0.73$) and accountability were rated very good. This implies that the system can only be

accessed by authorized user and the system itself is safe from unauthorized modifications.

Table 8: Mean and Standard Deviation of the Maintainability of the System

Maintainability	Rating					Mean	SD	Interpretation
	1	2	3	4	5			
Reusability	2	1	2	16	19	4.23	1.03	Excellent
Analyzability	0	0	2	15	23	4.53	0.60	Excellent
Modifiability	2	2	3	20	13	4.00	1.04	Very Good
Testability	0	0	0	24	16	4.40	0.50	Excellent

As reflected in Table 8, the values suggest that the system can be maintained easily. Namely, reusability ($M=4.23$, $SD=1.03$), analysability ($M=4.53$, $SD=0.60$) and testability ($M=4.40$, $SD=0.50$) were rated excellent while its modifiability ($M=4.00$, $SD=1.04$) was rated very good. These values mean that the system can be used in multiple computers and can effectively and efficiently test criteria that may be established in the system.

Table 9: Mean and Standard Deviation of the Portability of the System

Portability	Rating					Mean	SD	Interpretation
	1	2	3	4	5			
Adaptability	1	1	6	12	20	4.23	0.97	Excellent
Installability	0	0	0	13	27	4.68	0.47	Excellent

Table 9 revealed that system's portability is excellent. This was indicated in its adaptability ($M=4.23$, $SD=0.97$) and installability ($M=4.68$, $SD=0.47$). This result means that the system can be easily adjusted for evolving software and be installed and uninstalled easily in a specified environment.

5. Conclusion

After the thoughtful analysis and evaluation of the data collected from the participants, initial testing and evaluation of the system and considering the findings derived, the following conclusions were formulated:

The boarding house accreditation officers can now use and manage a web-based boarding house accreditation support system using boarding houses' application information and other details and supporting documents.

The forward chaining rule-based system inference engine is a suitable algorithm used to recommend accreditation decision, accreditation level, notice of deficiencies and areas for improvement of the boarding houses.

The Web-based accreditation system effectively automates evaluation using rule-based algorithms, helping authorities manage application, issue recommendations, and ensure compliance with quality standards as outlined in ISO 25010.

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