Development of a Work Readiness Assessment Application Using AHP Method for Final-Year Electronics Engineering Students at Universitas Negeri Padang

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***Abstract* - Work readiness is defined as a benchmark for various stakeholders, including universities, which are responsible for producing graduates who are prepared to enter the workforce. This study aims to evaluate student work readiness based on employability skills, ICT literacy, and English proficiency using the Analytical Hierarchy Process (AHP) in a web-based application. The system provides objective and accurate assessments, supporting students in identifying areas for improvement and better preparing for the workforce.**

***Keywords*— Work Readiness, 4D Model, AHP Method, Employability Skills, ICT Literacy, English Proficiency.**

I. INTRODUCTION

The high number of graduates who are not absorbed into the workforce is often attributed to the low competency levels of graduates and a mismatch between the competencies expected by industries and those taught at universities[1]. Graduates of higher education institutions are required to possess not only theoretical knowledge but also practical skills that are relevant and adaptable to real-world work environments [2].

In the era of rapid technological advancement and the emergence of Society 5.0, the integration of digital technologies into all sectors, including education, has become essential. Educational institutions are therefore urged to realign their curricula and teaching methods with the demands of a digital society. This includes embracing information and communication technology (ICT) in order to prepare graduates for a technology-driven labor market [3]. The vision of Society 5.0 emphasizes the use of technology to create a human-centered society, making it critical for education systems to produce graduates who are not only digitally literate but also able to solve complex problems and adapt to continuous technological change.

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However, despite these shifts, many universities still lack a structured and objective system to assess the work readiness of their students particularly one that can integrate multiple competencies such as employability skills, ICT literacy, and English proficiency. This creates a gap between educational outputs and industrial expectations.

To bridge this gap, a reliable and systematic assessment tool is needed. This study proposes the development of a work readiness assessment application using the Analytical Hierarchy Process (AHP) method. The AHP allows for structured evaluation based on multiple criteria, enabling departments such as the Department of Electronic Engineering to better understand students' strengths and areas for improvement. By measuring self-competency through this model, institutions can establish clear parameters for graduate readiness, enhance curriculum development, and offer constructive feedback to help final-year students prepare more effectively for entering the workforce.

II. METHODS

A. Development Model (4D Model)

This study employs the 4D development model, which consists of four sequential stages: Define, Design, Develop, and Disseminate [4]. In the Define stage, a needs analysis is conducted to identify the requirements of the system and the problems to be addressed. The Design stage involves preparing the conceptual framework of the model along with the design of relevant learning tools. During the Develop stage, the application prototype is created and then validated to evaluate its feasibility and functionality. Finally, the Disseminate stage is carried out by implementing the validated model with actual target users, specifically final-year students in the Department of Electronics Engineering. An illustration of the four stages of the 4D model is presented in Figure 1.

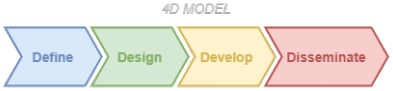

Figure 1. Four stages of the 4D Model

B. *AHP Method for Assessment*

The Analytical Hierarchy Process (AHP) method was used to assess students' work readiness by converting qualitative judgments into quantitative weights [5], [6]. The AHP steps implemented in this study are illustrated in Figure 2.

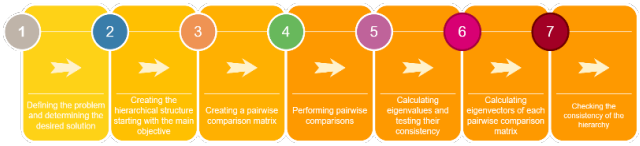

Figure 2. The steps of the AHP Method

The AHP process involves pairwise comparisons of criteria and sub-criteria, allowing the system to derive relative weights that reflect the importance of each aspect. To ensure consistency, eigenvalue analysis is used to calculate the eigenvector of the comparison matrix, which is then normalized to obtain consistent weights. This quantitative structure facilitates reliable decision-making in evaluating students' competencies.

C. *Criteria for Work Readiness*

To determine the most relevant criteria as parameters for assessing work readiness in the current digital era, this study identified three key criteria: employability skills, ICT literacy, and English proficiency.

Employability skills refer to general work-related competencies that are essential across various job sectors and are critical for adapting to the work environment [7], [8], [9]. The criteria and sub-criteria for employability skills are illustrated in Figure 3.

Learning and Adaptability	Communication Skills	Problem-Solving Capabilities
Ability to manage personal learning	Ability to convey ideas clearly	Able to develop creative and innovative solutions
Ability to use a variety of mediums to learn	Able to listen and understand	Able to develop practical solutions
Readiness to accept new ideas and techniques	Ability to persuade effectively	Able to solve problems in a team
Have enthusiasm to continue learning	Able to empathize	Able to apply various strategies to solve problems

Technology Skills	Creative Thinking Skills	Ability to work in a team
Have a wide range of basic IT skills	Able to develop strategic, creative, and long-term vision	Able to work with people of different ages, genders, races, religions, or political views
Able to apply IT as a management tool	Able to identify opportunities that are invisible to others	Know how to define roles as part of a team
Able to use IT to organize data	Able to put ideas into action	Able to identify the strengths of team members
Able to learn new IT skills	Have innovative solution initiatives	Implementing teamwork in a variety of situations

Figure 3. Criteria and Sub-Criteria Of Employability Skill

ICT literacy has become increasingly important in the era of digital transformation, which has given rise to concepts such as Industry 4.0 and Society 5.0 [10], [11], [12]. ICT literacy enables students to effectively access, manage, evaluate, and communicate information using digital tools. The criteria and sub-criteria used to measure ICT literacy are shown in Figure 4.

Ability to Define Information	Ability to Access Information	Ability to Manage Information
Able to define information effectively at home	Able to access information effectively at home	Able to manage information effectively at home
Able to define information effectively on campus	Able to access information effectively on campus	Able to manage information effectively on campus
Able to define information effectively in the workplace	Able to access information effectively in the workplace	Able to manage information effectively in the workplace
Able to define information effectively in society	Able to access information effectively in the community	Able to manage information effectively in society

Ability to Integrate Information	Ability to Communicate Information
Able to integrate information effectively at home	Able to communicate information effectively at home
Able to integrate information effectively on campus	Able to communicate information effectively on campus
Able to integrate information effectively in the workplace	Able to communicate information effectively in the workplace
Able to integrate information effectively in society	Able to communicate information effectively in the community

Figure 4. Criteria and Sub-Criteria Of ICT Literacy

In the context of Industry 4.0, English proficiency plays a vital role as a tool for understanding and utilizing advanced technologies in the global industrial environment [13], [14], [15], [16], [17], [18]. English proficiency includes listening, speaking, reading, and writing skills, all of which are critical for communication in the workplace. The criteria and sub-criteria for English proficiency are presented in Figure 5.

Ability to Master Concepts	Ability to Explain Information	Ability to Convey Facts
Able to listen in English	Ability to speak with the right intonation	Ability to verify news facts
Able to speak in English	Ability to communicate with body language	Ability to know facts from writing style
Able to read in English	Able to explain information creatively	The ability to detect facts from the way it spreads on the internet
Able to write in English	Ability to convey information	Ability to detect facts by investigating the credibility of sources

Ability to Express Ideas and Ideas
Ability to express ideas fluently
Ability to express ideas with good grammar
Ability to express ideas with good pronunciation
Ability to understand an idea

Figure 5. Criteria and Sub-Criteria Of English Proficiency

D. System Overview

The context diagram in Figure 6 outlines the interaction between users and the system. The Admin manages system settings, while users including Department Staff, the UHI Team, and Students interact with the platform.

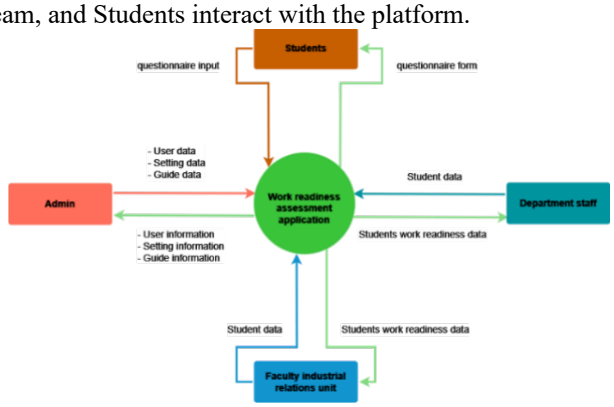

Figure 6. Context Diagram of the Work Readiness Assessment application

The activity diagram in Figure 7 illustrates the process of questionnaire submission, where the student completes the form, uploads responses, and the system stores the data for analysis.

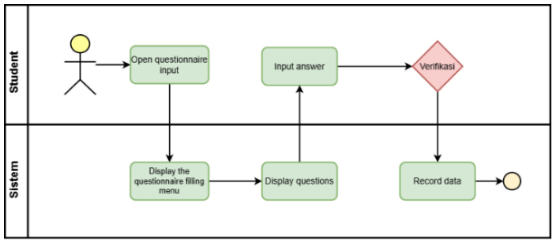

Figure 7. Questionnaire Filling Activity Diagram

III. Results and Discussion

This section is divided into two main parts: the implementation of the web-based application using the Laravel framework according to predefined requirements, and the testing phase, which includes usability, validity, and reliability testing.

A. Web Application Implementation

The developed system allows only the admin to register users. To access the system, users must log in using the email and password provided by the admin.

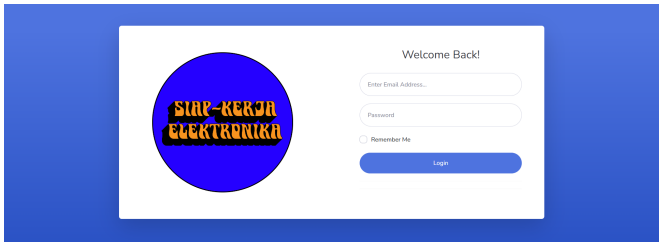

Figure 8. Login Interface

Figures 9 to 13 illustrate the user interface (UI) for the admin, including the dashboard, study program list, student list, analysis table, and analysis results. These interfaces are designed to facilitate administrative tasks and to manage and analyze student data.

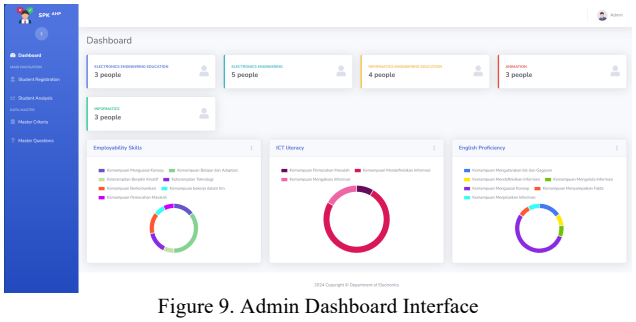

Figure 9. Admin Dashboard Interface

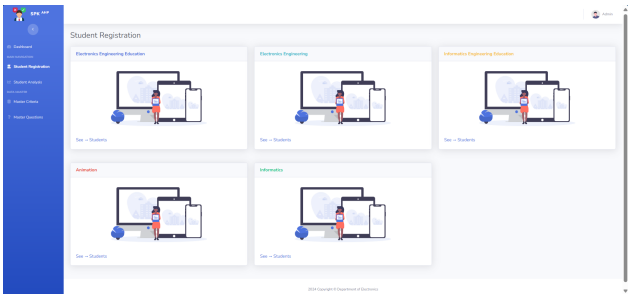

Figure 10. List Of Study Programs Interface

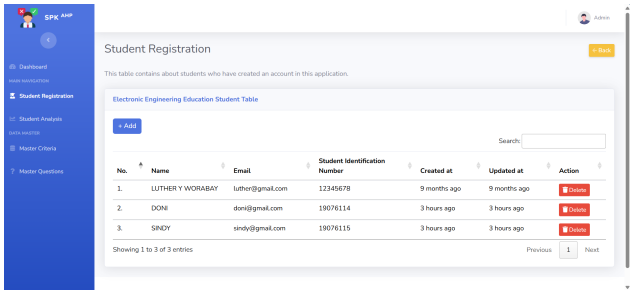

Figure 11. List Of Students Interface

The *List of Students* interface presents a tabular view of students participating in the work readiness assessment. The admin can add or delete entries, categorized by study program.

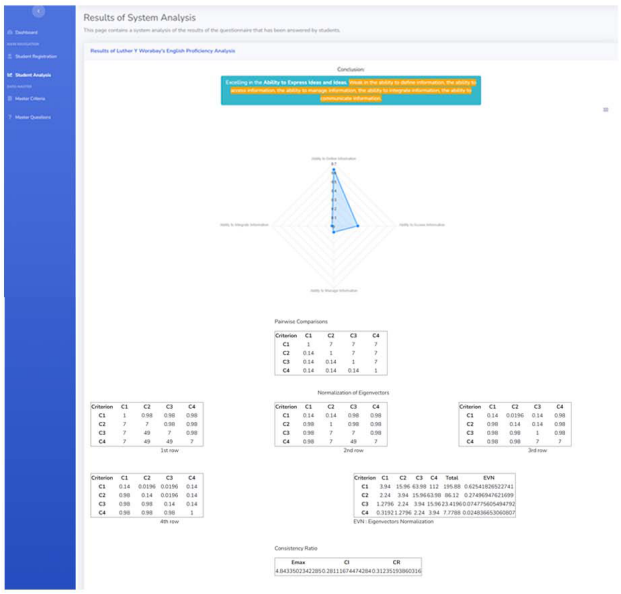

Figure 12. Results Of System Analysis

Figure 12 presents the analysis results using the Analytic Hierarchy Process (AHP) method, including the pairwise comparisons and eigenvalue calculations.

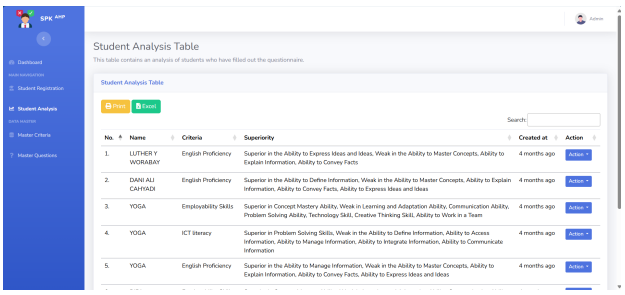

Figure 13. Students Analysis Table Interface

This interface contains the analysis results for individual students. By clicking the action button, the admin can view detailed results or delete data.

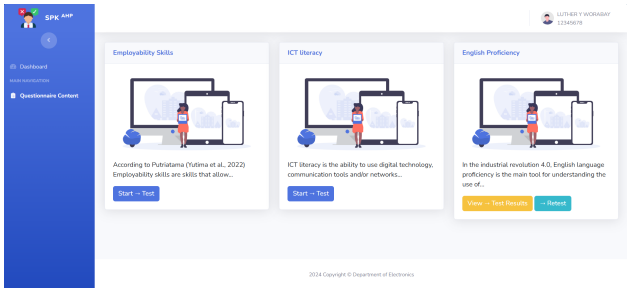

Figure 14. Students Test List Interface

Figure 14 shows the menu interface for students to access and fill out the questionnaires based on three key aspects: employability skills, ICT literacy, and English proficiency.

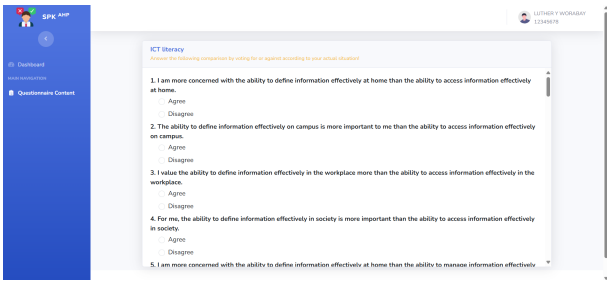

Figure 15. Questionnaire Filling Form

This form serves as the interactive questionnaire interface where students respond to items, and the system automatically records and processes their answers.

B. *Application Testing*

a. *Usability Testing*

[19] Usability Testing was conducted to evaluate how easily users could interact with the system and how effectively it supported their tasks. The testing involved three validators completing a predefined set of tasks within the application. Their responses were measured using a questionnaire adapted from the System Usability Scale (SUS).

TABLE I
TOTAL AND AVERAGE VALIDATOR SCORES

Question	Validator 1	Validator 2	Validator 3
Question 1	5	5	5
Question 2	5	4	5
Question 3	5	5	5
Question 4	5	5	5
Question 5	5	4	5
Question 6	4	5	5
Question 7	5	5	5
Question 8	5	4	5
Question 9	4	5	5
Question 10	5	4	5
Question 11	5	5	5
Question 12	5	4	5
Question 13	5	5	4
Question 14	5	5	4
Question 15	4	4	5
Total Score	**72**	**69**	**73**
Average Score	**71.33**		

Based on SUS scoring interpretation [20], scores between 70–80 are categorized as "Good". The average score of 71.33 suggests that the application is sufficiently usable for implementation. However, it also indicates that some refinements could still improve the user experience.

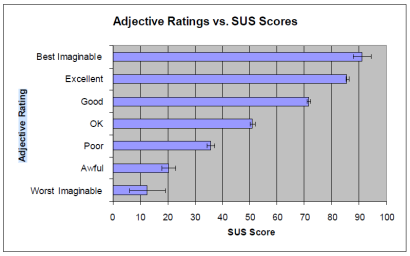

Figure 16. Average SUS Score According to Adjective Ratings

The score category results for each validator can be summarized as follows: Validator 1: 72 (Good), Validator 2: 69 (OK), Validator 3: 73 (Good). The average score from all three users is 71.33, categorized as "Good".

These results demonstrate that while the application meets usability standards, future iterations could enhance interface intuitiveness and responsiveness.

b. *Reliability Testing*

To assess the internal consistency of the questionnaire, reliability testing was conducted using both Cronbach's Alpha and the Intraclass Correlation Coefficient (ICC). Twenty-one randomly selected raters participated using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

ICC	Kriteria
<0,50	Poor
0,50-0,75	Fair
0,75-0,90	Good
0,90-1	Excellent

Figure 17. ICC Reliability Coefficient

Case Processing Summary

		N	%
Cases	Valid	21	95.5
	Excluded[a]	1	4.5
	Total	22	100.0

a. Listwise deletion based on all variables in the procedure.

Figure 18. Case Processing Summary

All 21 cases in the dataset were included in the analysis. No data were missing, and all necessary variables for calculating the ICC were available for each respondent or item. Consequently, no cases were excluded, and the entire dataset was used in the ICC analysis.

Reliability Statistics

Cronbach's Alpha	N of Items
.975	124

Figure 19. Reliability Statistics

The Cronbach's Alpha value is 0.975, indicating excellent internal consistency among the 124 questionnaire items. This suggests that the instrument items are closely related as a group and reliably measure the construct of student work readiness.

Intraclass Correlation Coefficient

	Intraclass Correlation[b]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.242[a]	.154	.403	40.518	20	2460	.000
Average Measures	.975	.958	.988	40.518	20	2460	.000

Two-way random effects model where both people effects and measures effects are random.

a. The estimator is the same, whether the interaction effect is present or not.

b. Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

Figure 20. ICC Reliability Results

The ICC result of 0.975 (95% CI: 0.958–0.988, Sig. = 0.000) also indicates excellent inter-rater reliability. This implies that when average ratings across raters are considered, the instrument maintains high consistency, making it suitable for reliable and repeated assessments.

These high values of Cronbach's Alpha and ICC demonstrate that the assessment instrument is both reliable and valid, ensuring consistency across different raters and items. Therefore, the questionnaire can be confidently used for evaluating student work readiness.

c. AHP-Based Analysis

The Analytic Hierarchy Process (AHP) was implemented to analyze students' work readiness through a structured hierarchy of goals, criteria, and sub-criteria. Students completed pairwise comparisons among these criteria and alternatives during the questionnaire phase.

Each student's comparisons were processed by the system to compute weight values and normalized eigenvectors (EVN). The criterion with the highest EVN was identified as the most significant in determining readiness. This AHP-based approach supports objective decision-making by quantifying qualitative assessments across employability skills, ICT literacy, and English proficiency.

IV. CONCLUSIONS

This work readiness assessment application is developed to support the evaluation process of students in the Department of Electronic Engineering, utilizing the Analytic Hierarchy Process (AHP) to analyze and weight criteria such as employability skills, ICT literacy, and English language proficiency. Through this method, the system offers a structured assessment, enabling students to reflect on their strengths and identify areas for improvement by presenting their readiness in terms of well-defined criteria and sub-criteria.

The application computes AHP-derived weights and ranking results, allowing each student to perform deeper self-evaluation and focus their efforts on competencies that need enhancement. This not only facilitates individual development but also prepares students to compete more effectively in the job market.

However, several limitations are acknowledged. The current system operates in isolation and is not yet integrated with the Industrial Relations Unit System of the Faculty of Engineering at Universitas Negeri Padang. Future development should prioritize this integration to create a cohesive and unified platform that supports career monitoring, internship placement, and institutional tracking of graduate outcomes.

Additionally, scalability across departments, the potential for AI-based analytics (e.g., predictive scoring or personalized development plans), and broader institutional adoption are areas for future exploration. This application stands out due to its incorporation of structured decision-making via AHP; however, it would benefit from benchmarking against existing models that utilize machine learning or competency frameworks aligned with national qualification standards.

In conclusion, while the system currently provides significant value in assessing work readiness, its impact can be further enhanced through continuous development, system integration, and cross-departmental scalability moving toward a more intelligent and institutionally integrated student development ecosystem.

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