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Development of E-Achievements for Mapping Student Achievements in Vocational High Schools

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ABSTRACT

This study focuses on the description, development, and determination of the feasibility level of a web-based management information system to assist in mapping students' achievements, talents, and interests. The benefits of developing a management information system can be felt from the perspective of students and schools, as it facilitates the management and mapping of achievements and helps schools improve accreditation. The development method used in this study refers to the 4-D development model, which has four stages: define, design, development, and deployment. The software testing results by software experts in terms of functionality showed a percentage of 100.00%, and the media validation results showed a percentage of 90.00%, with both criteria being very valid and feasible. The My Achievements website was implemented by 40 students from classes XI RPL 2 and XI TKJ 1 of SMKN 2 Singosari. User trial results showed a percentage of 82.20% with good criteria. Meanwhile, the system usability scale test results showed a percentage of 84.70% with good criteria. Based on the described data, it can be concluded that the My Achievements website has passed feasibility testing by software and media experts and is suitable for supporting the management, mapping of achievements, and dissemination of information for students at vocational high schools.

I. INTRODUCTION

The Industrial Revolution 4.0 has been widely embraced by society, particularly in the field of technology, where the advancement of computer science has produced various digital products that aid both industrial work and institutions, especially educational institutions. [1], [2], [3]. An educational unit serves as a means to realize one of the noble ideals of the Indonesian nation, as stated in the fourth paragraph of the Preamble to the 1945 Constitution, which is to educate the nation's life. A good educational process is inseparable from three main components: teachers, students, and curriculum. [4], [5], [6], [7]. If these three components are well-coordinated, they will enhance students' potential, allowing them to achieve various accomplishments. Achievement is the result of an effort made by an individual or group in the form of knowledge or skills. [8]. Student achievements can be academic or non-academic.

Moreover, since this research is in the context of vocational high school education, skill certification is another essential aspect for students. Individual skills are talents that can help when solving tasks or overcoming obstacles. [9]. The numerous achievements obtained by students will also positively impact the school, such as by improving school accreditation.

However, based on observations of several educational units such as SMKN 2 Singosari, SMK Muhammadiyah 3 Singosari, and SMK PGRI 3 Malang, there is a situation where digital media is insufficiently provided to manage student achievements. Consequently, many educational units still use conventional methods to document student talents and interests and disseminate information about activities such as competitions and self-development programs inside and outside the school.

Based on the issues above, the researcher proposes developing a web-based management information system using the Laravel framework, which will also be tested for feasibility. The goal is to assist in documenting, managing, and mapping student achievements. A management information system is a method of integrating multiple data sources to produce solid, coordinated, and applicable information [10], [11], [12], [13]. This management information system is expected to help students develop their talents and interests, as well as report

achievement certificates and skill certifications to the school. Hopefully, this application will assist the school in managing and mapping student achievements.

II. METHODOLOGY

The 4-D development model serves as the research and development method for the E-Achievement application. This development model consists of four stages: Define, Design, Develop, and Deploy. [14]. The 4-D model was chosen because it has straightforward stages and can save time and development costs. The developed product then undergoes initial feasibility testing using white box testing techniques by the researchers, followed by black box testing through expert judgment from software and media experts. After the expert testing stage, the product is then tested by users.

1. *Define*

In the Define stage, observations are conducted to gather data on the problems and system requirements that will be developed. The results of these observations reveal that no specific management information system is available for managing student achievements, and several administrative tasks, such as data collection and mapping, are still being done conventionally.

2. *Design*

At this stage, the results of the system need analysis using the brainstorming method, which will be implemented into an overall depiction of the system development in the form of a flowchart to understand the program's flow, a use case diagram to understand the interactions users can have with the system, and a low-fidelity wireframe to understand the initial sketches of the application along with the features that will be developed.

3. *Develop*

In this stage, the development of the MyAchievement website will be carried out according to the results of the system requirements analysis using the Laravel framework as the development platform. Once the application is developed, two validation stages will be conducted: functionality aspect test cases and media expert validation by professors. Additionally, system testing will be performed with potential users using both small and large-group testing methods. Usability scale testing will also be conducted. Subsequently, an evaluation will be conducted by distributing questionnaires to potential users.

4. *Deploy*

In this stage, the system validated by experts, tested with users, and deemed suitable for use will be deployed to the development team of the research object school, namely SMKN 2 Singosari, to assist the school administration process. Afterwards, the final step of developing this product is publishing an article in a journal to serve as a reference for future researchers and developers.

III. RESULTS

Based on the system requirements analysis in the Define stage, the MyAchievements website is developed with features tailored to support the management and mapping of student achievements and enhance the effectiveness of disseminating information about competitions and self-development programs. Some of the developed features include:

- Dashboard feature: To monitor the achievements attained by students.
- Certificate feature: To upload achievement certificates owned by students.
- Events feature: To disseminate information about competitions and self-development programs.
- Curriculum vitae feature: To assist in creating and printing curriculum vitae for students.

The development of these features for the MyAchievements website is presented below.

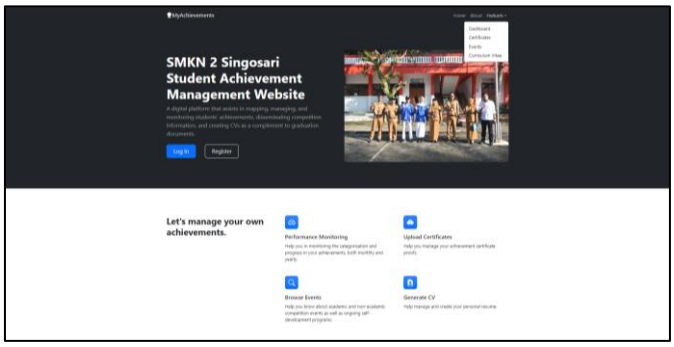

Fig. 1. Landing Page MyAchievements

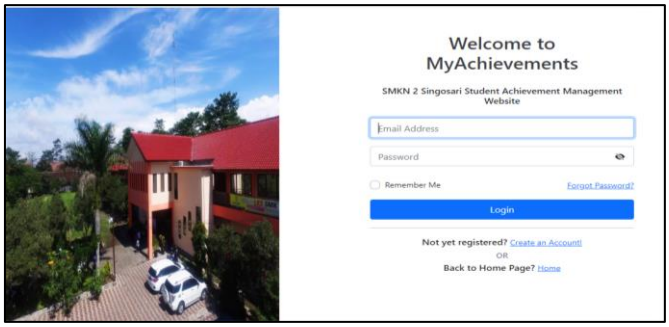

Fig. 2. Login Page MyAchievements

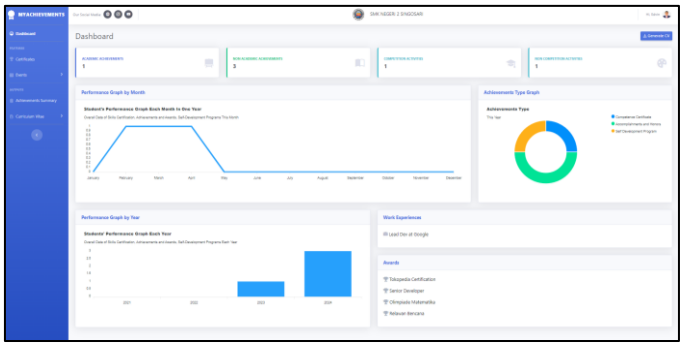

Fig. 3. Dashboard Page MyAchievements

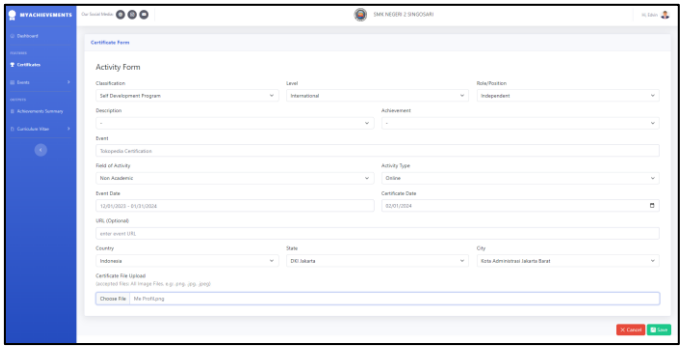

Fig. 4. Certificate Page MyAchievements

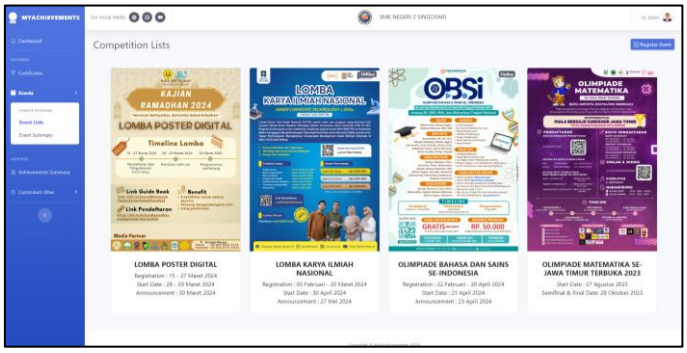

Fig. 5. Events Page MyAchievements

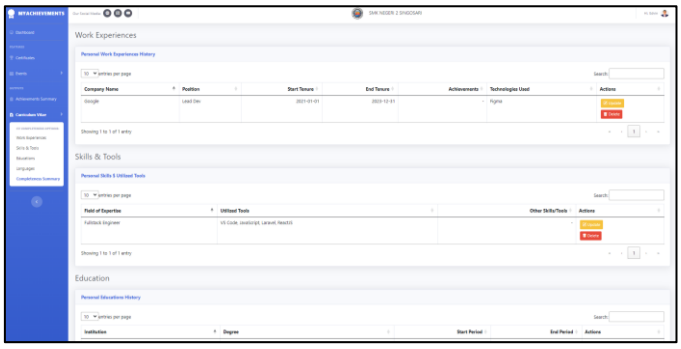

Fig. 6. Curriculum Feature MyAchievements

5. *MyAchievements as Student Achievement Mapping in Vocational High Schools*

A management information system is a series of procedures humans create with a specific pattern to carry out certain activities. The management information system called My Achievements was developed to assist in managing student achievements. The development of this web-based management information system is based on the problem arising from the lack of a specific management information system in schools to manage student achievements. Additionally, several school administrative activities are still being done manually, including disseminating competition information and recording student talents and interests. My Achievements was developed using the 4D development model, and functionality testing was performed using ISO 9126, media testing, user testing, and system usability scale testing.

The purpose of developing the My Achievements website is to assist in mapping student achievements. Mapping can be used to understand and monitor an individual's progress through their achievements. Therefore, several features developed within the My Achievements website have been tailored, including monitoring student achievement progress by presenting student achievement data using graphs, text, and numbers. Other features have also been developed to facilitate the management of student achievements, such as the certificate feature and achievements summary to view the progress of achievements obtained. There is also an events feature to address the issue of disseminating information about competitions or self-development programs that are still distributed through school bulletin boards. Additionally, a curriculum vitae (CV) feature generates CVs, which are additional outputs or benefits obtained after using the My Achievements website.

6. *Expert Judgement and User Testing Results*

The My Achievements product that has been developed is subsequently tested for validity and feasibility through expert judgment, user testing, and the system usability scale test. The test results for the My Achievements website are presented as follows.

Functionality Test

The results of the functionality aspect testing by software expert validators were processed using the formula from the Feature Completeness matrix. Functionality aspect testing is used to measure the implementation of developed features based on the designed features. The calculation results of the feature completeness value for the My Achievements website are presented in Table I.

The calculation results conclude that the test case results for the functionality aspect of the My Achievements website fall into the excellent category. The obtained value, x, ranges between 0.85 and 1.00, indicating that the system is feasible and does not require revision. The feedback criteria from software experts, as shown in previous research, indicate that the functionality aspect of the My Achievements website is highly valid and capable of ensuring smooth functionality to support its usefulness.

TABLE I. FUNCTIONALITY TEST RESULT

No.	Assessment Aspect	Tse	Tsh	Percentage	Criteria
1	*Landing Page*	2	2	100%	Very Good
2	*Register*	3	3	100%	Very Good
3	*Login*	3	3	100%	Very Good
4	*Forgot Password*	3	3	100%	Very Good
5	*Dashboard*	7	7	100%	Very Good
6	*Generate CV*	2	2	100%	Very Good
7	*Profile*	4	4	100%	Very Good
8	*User Information*	3	3	100%	Very Good
9	*Certificate*	2	2	100%	Very Good
10	*Event Lists*	4	4	100%	Very Good
11	*Event Summary*	3	3	100%	Very Good
12	*Achievements Summary*	4	4	100%	Very Good
13	*Curriculum Vitae*	2	2	100%	Very Good
14	*Completeness Summary*	3	3	100%	Very Good
15	*Log Out*	2	2	100%	Very Good
	Total	47	47	100%	Very Good

The calculation results conclude that the test case results for the functionality aspect of the My Achievements website fall into the excellent category. The obtained value, x, ranges between 0.85 and 1.00, indicating that the system is feasible and does not require revision. The feedback criteria from software experts, as shown in previous research, indicate that the functionality aspect of the My Achievements website is highly valid and capable of ensuring smooth functionality to support its usefulness.

Media Expert Validation

The calculation of media expert testing results is used to determine the validity criteria of the research. The calculation results of the media expert validation percentage for the My Achievements website are presented in Table II.

TABLE II. MEDIA EXPERT VALIDATION RESULT

No.	Assessment Aspect	Tse	Tsh	Percentage	Criteria
1	Suitability	54	60	90.00%	Very Good
2	Interoperability	51	55	92.72%	Very Good
3	Accuracy	12	15	80.00%	Good
4	Security	9	10	90.00%	Very Good
5	Compliance	9	10	90.00%	Very Good
	Total	135	150	90.00%	Very Good

The media expert validator gave a score of four to 15 items and a score of five to another 15 items on the instrument. The total score obtained from the media expert validator was 135 points out of 150 points. The percentage derived from the calculation formula was 90.00%. The validity criterion was determined based on this percentage, concluding that the media expert validation results fall into the "very good" category, with a percentage between 90-100%, indicating that it is feasible and does not need revision. As shown by previous research results, this expert judgment criterion indicates that the My Achievements website is valid for use, ensuring its functionality and usability and supporting its intended benefits.

User Test

The user trial results are calculated to determine the product feasibility criteria. The calculation results of the user trial data percentage for the My Achievements website are presented in Table III.

TABLE III. USER TEST RESULT

No.	**Assessment Aspect**	**Tse**	**Tsh**	**Average**	**Percentage**	**Criteria**
1	Understandability	336	400	4.200	84.00%	Good
2	Learnability	319	400	3.987	79.75%	Good
3	Operability	484	600	4.033	80.66%	Good
4	Attractiveness	505	600	4.208	84.16%	Good
	Total	1644	2000	4.11	82.20%	Good

Based on these calculations, the user trial results for the MyAchievements website are classified as good, with a percentage score between 75-89%, indicating that it is feasible but requires minor revisions. The purpose of the user trial is to measure the feasibility of the developed product. [15]. The My Achievements website is considered feasible for facilitating the management and mapping of student achievements.

System Usability Scale Test

The system usability scale (SUS) test results are calculated to determine the product's feasibility and acceptance criteria. The calculation results of the system usability scale data for the My Achievements website are presented in Table IV.

TABLE IV. SYSTEM USABILITY SCALE TEST RESULT

No.	**Assessment Aspect**	**Tse**	**Tsh**	**Average**	**Percentage**	**Criteria**
1	Optimization of media usage	172	200	4.3	86.00%	Good
2	Ease of media	173	200	4.325	86.50%	Good
3	Media understanding	163	200	4.075	81.50%	Good
4	Integration of features	169	200	4.225	84.50%	Good
5	Media design	173	200	4.325	86.50%	Good
6	Media consistency	159	200	3.975	79.50%	Good
7	Time to understand media	161	200	4.025	80.50%	Good
8	Completeness of information	169	200	4.225	84.50%	Good
9	Usefulness of media	177	200	4.425	88.50%	Good
10	Impact of media	178	200	4.45	89.00%	Good
	Total	1694	2000	4.235	84.70%	Good

Based on these calculations, the system usability scale (SUS) test results for the My Achievements website are classified as good, with a percentage score between 75-89%, indicating that it is feasible but requires minor revisions. The usability aspect is used to measure the feasibility and acceptance of the developed product. [16], [17], [18]. Referring to the SUS test results and previous research, the My Achievements website is deemed feasible and acceptable for use by students and demonstrates sustainability.

IV. CONCLUSION

This research developed a web-based platform called My Achievements to manage, disseminate information, and map student achievements in vocational high schools (SMK), featuring performance monitoring, certificate uploads, exploration of competitions, self-development activities, and curriculum vitae creation for job applications. The platform was developed using the 4D model, encompassing the stages of defining, designing, developing, and deploying. The final product underwent functionality and validity testing by software and media experts, as well as trials with prospective users. The results indicated that this platform is highly suitable

for the needs of vocational high schools in facilitating the management and dissemination of student achievement information. Expert testing showed an excellent feasibility level (software: 100%, media: 90%) with no revisions needed, while user trials indicated a good feasibility level (82.20%) with minor revisions recommended, and the system usability scale test scored 84.70%, also recommending minor revisions. Overall, the My Achievements platform is considered feasible and effective in assisting with the management, dissemination, and mapping of student achievements in vocational high schools.

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