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Integrating Mern Technology In E-Learning: Opportunities and Challenges for SMEs

[1st] Bayu Dwi Satriyo, [2nd]Farid Fitriyadi, [3nd]Dwi Retnonigsih
Sahid University of Surakarta
of Informatics Engineering, Surakarta, Indonesia
[1st] bayudsatriyo@gmail.com, [2st] farid@usahidsolo.ac.id , [3rd] dw1retno2014@gmail.com

Abstract - This article develops an E-Learning application called BrandBiz using MERN technology (MongoDB, Express, React, Node.js) and Progressive Web App (PWA) technology to help MSMEs understand product branding. The lack of accessible, high-quality educational resources often hampers the branding capacity of MSMEs in Indonesia. The research methodology involves literature review and user testimonials to collect data and evaluate the application's effectiveness. BrandBiz provides features such as login, registration, educational path selection and learning, quizzes, and feedback, accessible via https://www.brandbiz.site/. The application effectively helps MSMEs improve their branding and marketing knowledge, potentially increasing their income. By offering an innovative and easily accessible educational solution, BrandBiz supports local economic growth in Indonesia by enhancing MSME branding capabilities.

Keywowrds: SMEs, BrandBiz, E-Learning

I. INTRODUCTION

In the current era of globalization and internet connectivity, opportunities for Micro, Small, and Medium Enterprises (MSMEs) to develop and compete in the global market are increasingly wide open. However, the challenges in carrying out effective branding are often an obstacle for MSMEs. Limited resources, budget, and knowledge about building a strong brand image are some of the obstacles faced by MSMEs[1]. In addition, access to technology and experts in branding and marketing is also often not available to MSMEs[2]. If not handled properly, this can have a negative impact on the success of MSME businesses, causing decreased sales, slow growth, and even business failure[3].

MSME business actors tend to only focus on developing their products, which causes many MSMEs to lose money and go bankrupt, even though in the business world, product branding and marketing techniques are the keys to the success of a business. In this case, the author wants to focus on providing education related to product branding and marketing techniques for MSMEs in Indonesia through E-Learning which will be created later.

In response to this problem, the BrandBiz E-Learning application is designed to educate and assist MSMEs in carrying out effective brand branding. This application is designed using MERN technology (MongoDB, Express, React, and Node.js) to facilitate application design, support SEO. In addition, given the prevalence of mobile use, BrandBiz will also use Progressive Web App (PWA) technology to adjust the mobile display and allow the website to be installed as a mobile application[4].

E-Learning applications is becoming increasingly important in the world of education and training, including for MSMEs. However, there are still many obstacles and limitations in the implementation of E-Learning among MSMEs, especially in integration with MERN technology which has not been widely implemented[5]. This study will discuss the opportunities and challenges faced by MSMEs in integrating E-Learning applications with MERN technology, providing useful insights for the development of MSMEs in the field of E-Learning. The Brandbiz application that we created has the potential to increase knowledge about product branding for entrepreneurs or MSMEs, with the increasing quality of MSME product branding in Indonesia, it is hoped that it can also increase the level of marketing and the local economy in Indonesia. This application will continue to be updated in the future with related content to support MSMEs in Indonesia. With a website-based application, users can open the application anywhere and anytime without having to require certain device specifications.

System Usability Scale (SUS) is a user testing method that provides a reliable "quick and dirty" measurement tool. This method was introduced by John Brooke in 1986, which can be used to perform

various types of products including website devices and applications. The reason for choosing this testing method is because the SUS method has been used and tested for decades and is still proven to be a reliable method for evaluating the usability of a system based on industry standards. With this method, the author evaluates the application by taking a case study of the Brandbiz E-Learning application[6].

II. RESEARCH METHODS

2.1 Research Flow

According to Saravanos & Curinga (2023), the Waterfall model is a sequential software development process where progress flows downwards through phases like a waterfall. Each phase must be completed before the next one begins, and it includes phases such as requirements, design, implementation, verification, and maintenance" (MDPI).

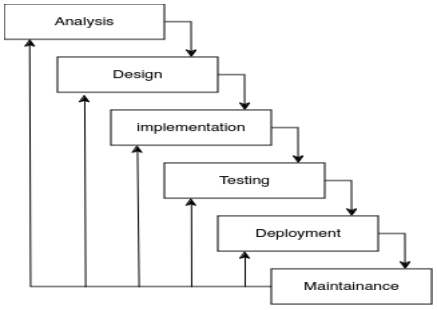

Figure 1 Research Flow[7]

1. System Requirements Analysis
   This stage involves identifying and documenting user and system needs in detail through observation, interviews and literature studies.
2. Design (Software Design)
   After the needs are defined, the developer designs the software architecture to be built. This includes system design, user interface design, and technical planning.
3. Development (Implementation/development)
   This stage turns the design into program code that can run. Developers work to create small parts of the program based on predetermined specifications.
4. Testing
   After the software is developed, the testing phase is carried out to ensure that the software functions according to predetermined needs and standards. Testing includes functionality testing, integration testing, and performance testing.
5. Deployment
   After passing the testing phase, the software is implemented and used by end users. This process involves user training, software installation, and ongoing system maintenance.
6. Maintenance
   This maintenance stage involves bug fixes, feature enhancements, and technical support tensure that the software continues to run smoothly in the long term.

2.2 E-Learning Learning System

E-learning, or electronic learning, is defined as the acquisition of knowledge through electronic technology and media. Typically, e-learning is conducted over the Internet, where students can access their learning materials online anywhere and at any time. E-learning often comes in the form of online courses, online degree programs, or other online learning programs (E-Student).

E-learning has many advantages over traditional learning methods, including the flexibility to choose your own learning environment and pace, as well as cost efficiency because it eliminates the geographic barriers often associated with traditional classrooms (E-Student)[8].

2.3 Website

Website is a collection of web pages and related content that is identified by a common domain name and published on at least one web server" (SFU Library, 2024). Websites are a fundamental aspect of the internet, providing a platform for information sharing, communication, and commerce, among other functions. [9].

2.4 React

React is a JavaScript library created by Facebook for building dynamic user interfaces, open to community contributions, and continuously developed to improve functionality and reliability. React's success lies in its ability to simplify the creation of interactive and complex UIs, making it the primary choice for developers for large and popular projects in today's web development world[10].

2.5 Node. Js

Node.js is a software system specifically designed to facilitate the development of web applications. With Node.js, developers can use the JavaScript language to build applications on both the client and server sides. Node.js enables the development of web applications by combining various components in one platform using npm (Node Package Manager). In addition, Node.js also functions as a runtime and scripting environment, which means it can run and implement the main functions of the programming language [11].

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2.6 Framework of Thought

Website design is one of the crucial factors in determining the dissemination of information and the appeal to users on an E-Learning website. Designing a good website design for the Brandbiz website is expected to help facilitate and be an attraction for MSMEs as a means of learning[12].

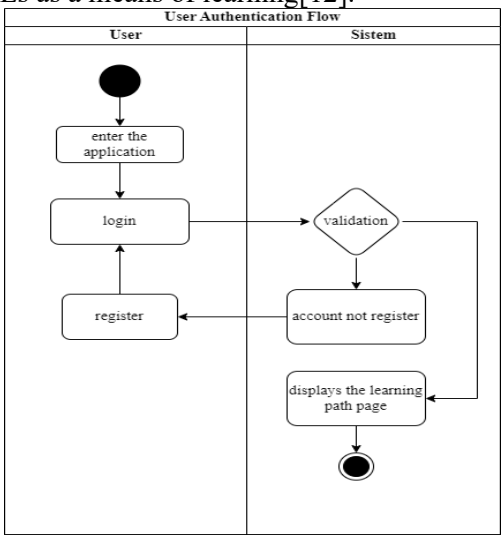

Figure 2 Framework of Thought

2.7 Registration and Authentication Flow

In the Registration and Authentication flow of the user account, the user must first log in, but before that, make sure that the user already has an account on the brandbiz application. If the user does not have an account on the Brandbiz application, the user can create an account first on the Registration page. If the user successfully logs in, the user will immediately enter the Brandbiz Learning Path Dashboard page. On this page there are various Learning Path options.

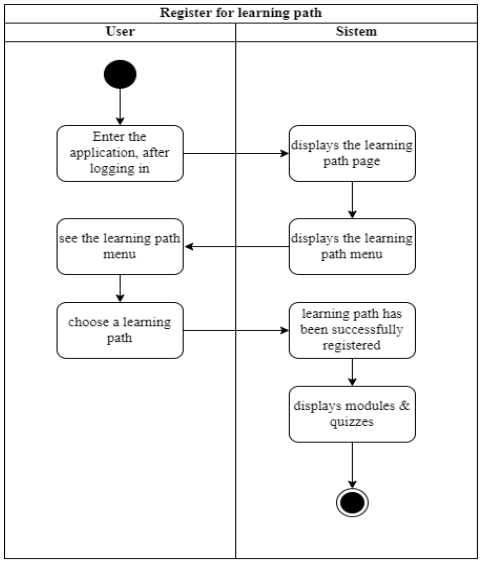

Figure 3 Registration and Authentication Flow

2.8 Learning Path Management Process Flow

In the Learning Path Management process flow, the admin can create, edit and delete Learning Paths. In the Learning Path Management Process Flow above, it is explained how the admin creates a Learning Path where in the Learning Path there is material in the form of text or video and also quizzes.

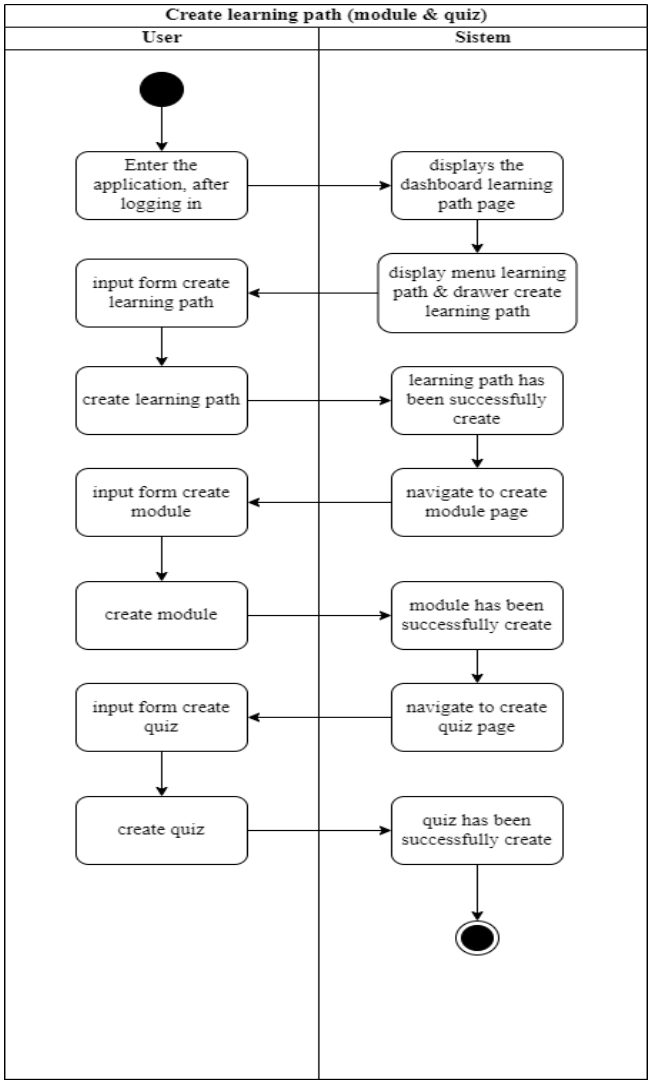

Figure 4 Learning Path Management Process Flow

III. RESULTS AND ANALYSIS

3.1 User Interface

The Brandbiz website can be accessed via https://www.brandbiz.site/. Then the home page will appear on the home page there is a main menu of insight, e-learning, about, login and registration.

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Figure 5 Home Page

The next page is the about page which contains information about the application creator and a description of the application.

Figure 6 About Page

login page, there is input for user email and password as a requirement to login to the learning path page.

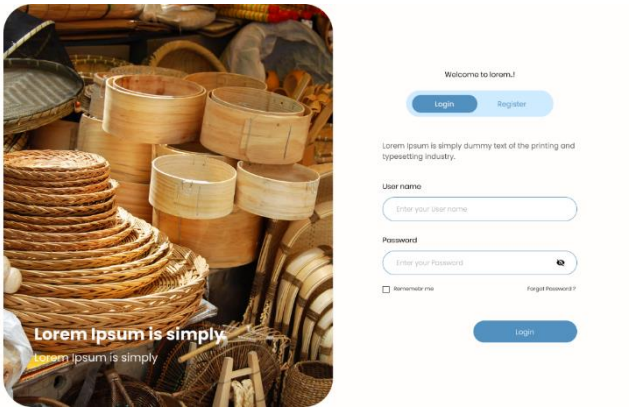

Figure 7 Login Page

The registration page is used If the user does not have an account, there is a registration button on the register option. On the Register page, users can register an account via a gmail account, or want to fill it in manually.

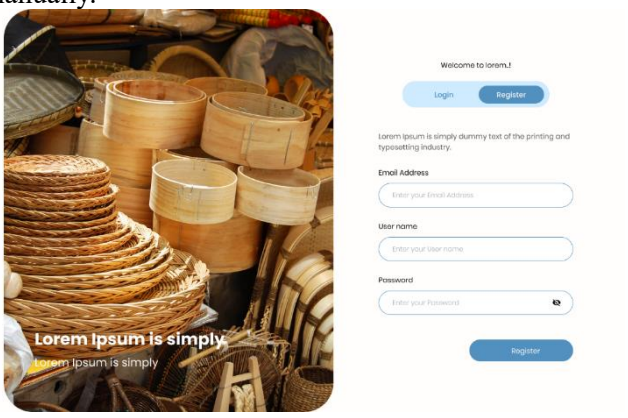

Figure 8 Regristration page

If the user has logged in, the user will be redirected to the Learning Path page, on this page the user can choose which learning path to study. The following is a display of the Learning Path page.
Users can choose various Learning Paths regarding business and branding of MSME products. To select a Learning Path, the user can press one of the available learning paths, then the user will be redirected to the module page.

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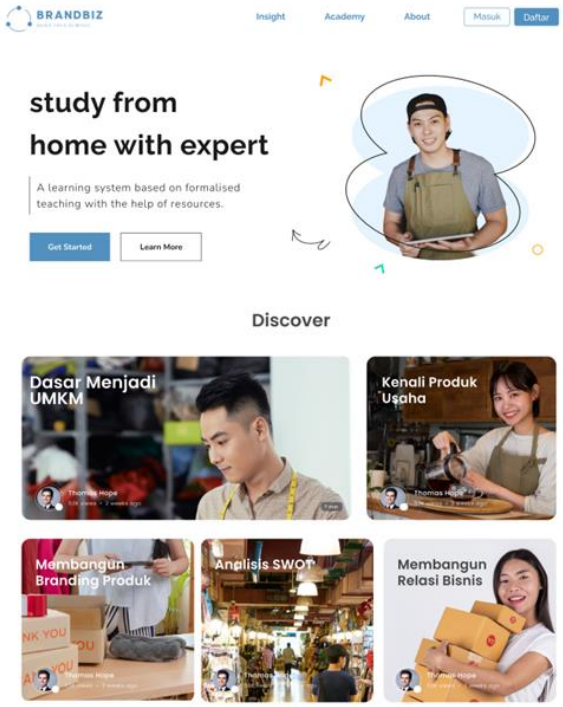

Figure 9 Learning Paths

The user has selected a learning path, the user will be redirected to the module page. On this module page, the user can start learning the material from a discussion about the MSME business.

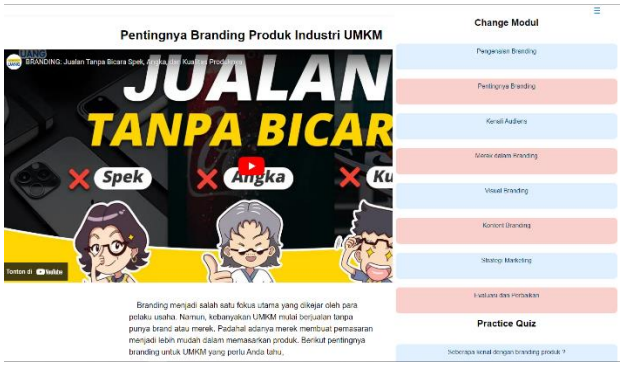

Figure 10 module page

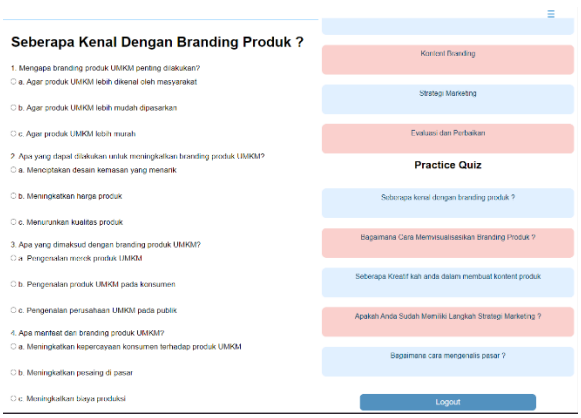

Figure 11 Quis Page

3.2 Testing and Analysis Result

At this stage, the author conducted two stages of data collection in the form of a questionnaire. In the first stage, the author involved 30 respondents consisting of the general public and students. In the second stage, the author involved 4 Brandbiz E-Learning application admins who were tasked with managing the Learning Path, Modules, and Quizzes. This data collection was carried out from July 25-26, 2024. The respondent details are as follows:

Table 1 Respondents from the General Public

Respondents	Total	Percentage
Total Respondents	30	100%
Male	23	76,7%
Female	7	23,3%

Table 2 Admin Respondent

Responden	Total	Percentage
Total Percentage	4	100%
Male	4	100%
Female	0	0%

The list of questions in this study refers to the System Usability Scale (SUS) testing method which consists of 10 questions as follows:

Table 3 Questionnaire List

No	Question
1	I think I will use this system again
2	I found the system complicated to use
3	I found the system easy to use
4	I needed help from another person or technician to use the system
5	I felt the features of the system worked as they should
6	I felt there were many inconsistencies (not harmonious in the system)
7	I felt other people would figure out how to use the system quickly
8	I found the system confusing
9	I felt there were no barriers to using the system
10	I need to get used to it first before using the system

After collecting data through a questionnaire, the author finally obtained the results of data processing as in the following table:

Table 4 Data Processing Results General Public

No	Gender	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total	Result
1	Male	5	1	5	1	5	1	5	1	5	5	34	85
2	Male	5	2	5	3	5	2	5	2	5	2	36	90
3	Male	4	2	4	3	4	1	5	1	4	2	30	75
4	Male	5	3	5	2	5	2	4	2	5	3	36	90
5	Female	3	1	3	4	4	1	5	1	5	3	30	75
6	Male	5	2	5	5	5	2	5	1	5	4	39	97,5
…	…	…	…	...	…	…	…	…	…	…	…	…	…
30	Male	5	2	5	3	5	2	4	2	5	2	35	87,5
		Final result											84,83

From the table above, it can be seen that the column of the total obtained from the Q1 - Q10 column, while in the value column it is obtained from the amount multiplied by 2.5. So that the final result is obtained from the average of all values, namely 84.83 (Grade A) After calculating the usability value of each respondent, the final result is 84.83 (Grade A). This result shows that the Brandbiz application has a good usability score. In addition, from the first stage of research, several recommendations were also obtained in the form of criticism and suggestions for improving the application. The list of recommendations is as in the following table:

Table 5 Recommended Improvements

No	Recommendations
1	Materials need to be increased.
2	Materials need to be improved to be more interesting
3	There needs to be a user profile page, as user identification and so that users can see learning progress
4	There needs to be a certificate of passing the material as a form of appreciation to the user

The author then conducted a second test involving the brandbiz application admin who was tasked with inputting and managing learning paths, materials and quizzes. This research was conducted the same as the previous stage. The results of the second study are as in the following table:

Table 6 Data Processing Results Admin

No	Gender	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total	Result
1	Male	4	3	3	2	3	4	3	3	3	4	32	80
2	Male	5	4	3	2	4	3	2	3	3	3	32	80
3	Male	4	3	3	1	5	2	2	4	2	4	30	75
4	Male	4	3	3	1	4	2	2	2	4	1	26	65
		Final result											75

After calculating the usability value of each Brandbiz Admin respondent, the final result was 75. This result shows that in the admin page test, it has a lower usability score than the user page. The comparison of the SUS value of the two interfaces is not too significant, namely 15 points, where the user page gets a value of 84.83 points (Grade A), while the admin page gets a value of 75 points (Grade B). This shows that there is still a need for improvement on both sides of the interface, especially on the admin page.

IV. CONCLUSION

Based on the descriptions presented by the author in the previous chapters, the author draws several conclusions as follows:

1) The Brandbiz E-Learning application can be used and has good usability so that it can be utilized by MSMEs and the general public.
2) The current usability value of the Brandbiz E-Learning application is 84.83 points or Grade A. In this study, there are also recommendations for improving the application, including improving the quality and quantity of materials so that it can improve MSME knowledge and the attractiveness of application users.
3) The usability value of the Brandbiz E-Learning application on the admin page currently gets a value of 75 points or Grade B. This means that improvements are needed in terms of system flow and features to make it easier for admins to manage learning paths, materials, and quizzes.

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