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Android Based Job Search Application "Megawe" for The Segment of Workers with an Education Level Below a University Degree

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Abstract

Indonesia is a vast market for talents recruiting, with around 203 million people that count into work age definition (above 15 years) and around 138 million of them are workforce, while 7 percent of the workforce are open for hire. There are several players of job-seeking apps in Indonesia. But most of them are targeting talents with undergraduate degrees and above. Mid to high-level jobs have become such an attractive market for these players. We can see it on several job seeker hub websites, where job seekers proudly post their personal profiles to attract recruiters from top employers. It is not possible for lower-level job seekers to post their profiles on these websites. They will just be under the recruiter's radar. Whereas from the report data released by the Indonesian statistical center bureau regarding the percentage of open unemployment based on education level, the total unemployment rate from diploma education and below is very large compared to the unemployment rate with university education (undergraduate and above). The Covid-19 pandemic also gave a negative impact on the lower job segment, with a decrease in demand and sales resulting in a higher layoff rate which also means an increased percentage of the open unemployment rate. We need a solution to this problem. A solution that can erode a large chunk hidden under an iceberg. This paper offers "Megawe", a mobile application-based solution to assist both job seekers and low-level job recruiters. This segment may have a smaller contract value than upper segments but has a much larger quantity of labor force. Because we are focusing on development speed and accuracy of requirements, we used the prototyping methodology in the implementation of the solution. Moreover, before it is launched publicly, we conducted usability testing to gain a deeper understanding of the user experience directly from users of the targeted segment.

Keywords: mobile app; job search; usability testing

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1. Introduction

The job search app arena in Indonesia is already filled with a bunch of players, big and small, domestic, or foreign made, old and new, and almost all of them are targeting the high-level segment of the job market. If we're doing a survey of those apps or websites, we can find that both job seekers and job recruiters are dominated by undergraduate to graduate degrees. Based on the surveys we conducted on three popular job search applications; we've found that there is no minimum education filter on the search menu (Table 1).

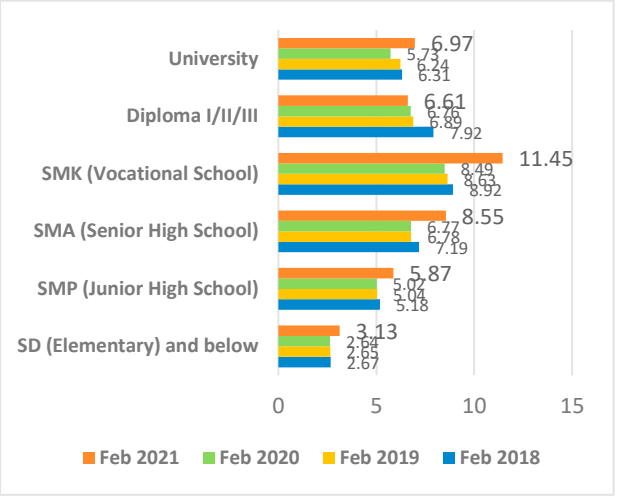

Fig. 1. Open unemployment rate according to the highest enrolled education (percent), February 2018 - February 2021 [3].

The reality of unemployment in Indonesia can be seen from OJK's report of Indonesia's employment condition (Fig. 1). From the numbers presented, we can draw a summary that total unemployment from elementary school (SD) to Diploma contributes the largest portion. Meanwhile, the pandemic of Covid-19 has made the situation even worse where 29.12 million workforces are impacted [1]. It can be seen also from the chart below (Fig. 1) that the unemployment rate as of February 2021 is spiking quite high and it is impacting more on the lower education level more than the university [2].

This fact is contrasting with the other fact that the job search app facilitated more or is being utilized more by the higher education segment from the diploma above while the lower segment still has not been fully addressed. Things get complicated when combined with the other fact that access to job vacancies is somewhat difficult. Sixty percent of the workforce is searching for job vacancies through word of mouth [4].

The question that arises here is what can we do to help fix this situation? From the IT perspective, we could build an app that mediates the businesses and the job seeker, and gives it features that ease the process of posting, seeking, and applying for jobs for lower segments of education.

Table 1. Feature comparison of job search applications.

Features	A	B	C
Search based on position	Yes	Yes	Yes
Search based on location	Yes	Yes	Yes
Search based on industry	Yes	Yes	Yes
Search based on salary range	Yes	Yes	Yes
Search based on education	No	No	No
User data management	Yes	Yes	Yes
Platform	Web and Mobile app	Web	Web

2. Literature Review

The term application (app) has evolved into software specifically designed to be implemented on mobile platforms [5]. Generally, mobile platforms include user interfaces that take advantage of the interaction mechanisms available on the mobile platform, interoperability with web-based resources that provide access to a variety of information relevant to applications, as well as local processing capabilities that collect, analyze, and format information in the most appropriate way. according to the mobile platform. In addition, mobile applications provide persistent storage capabilities within the platform.

React Native is a JavaScript framework for writing native mobile application code for iOS and Android [6]. This framework is based on React, Facebook's JavaScript library for building user interfaces. But besides being targeted at browsers, this framework is targeted at mobile platforms. Here, we used React Native for our app.

Node.js is software that allows JavaScript to run on a server, regardless of the browser environment, and allows JavaScript frameworks (such as Express) to be used [7].

MongoDB is a strong, flexible, and scalable database [8]. This database combines the ability to scale with features such as secondary indexes, range queries, sorting, aggregation, and geospatial indexes. MongoDB is not a relational database, but a document-oriented database.

According to Allan Dennis [9], UML or Unified Modeling Language aims to provide a very complete modeling language so that it can be used for modeling various kinds of system development projects from analysis to implementation.

Prototyping is a method of software development that aims to produce the product as quickly as possible, starting with a minimum featured version of it in the first cycle [9].

Usability testing is a method of testing or researching the user experience of an application. Tasks are given to the users to use the application, while the researchers record all the user feedback. In this research, we use the concurrent think-aloud method for usability testing [10].

Black box testing is a testing technique in which the tester doesn’t have to focus on the system’s detailed mechanism [11].

3. Method

In this Megawe mobile app development, we begin our prototyping methodology (Fig.2) with the planning phase. This phase is the fundamental process for understanding why the application was built and determining how the team will build it.

This planning is also repeated in each iteration of the prototyping methodology. This process is carried out again to understand the feedback that has been received in the previous iteration to re-describe the second, third prototype, and so on. This process continues in a cycle until stakeholders agree that the prototype provides sufficient functionality to accept [12].

The analysis begins with requirement gathering by carrying out field research, among others, interviews, observations, and literature studies. Then the research continued with system analysis using the prototyping method to analyze the needs of users and companies. Furthermore, the design of the application prototype was carried out.

System development for the mobile application is conducted using React Native. After the system development has been completed, a system evaluation is carried out using usability testing and black-box testing.

Feedback from the evaluation will play an important role in the model prototyping process. Feedback will provide input before the next iteration begins. Finally, when the results of the evaluation that have been carried out are accepted, the iteration can be ended, and the mobile application prototype has been completed. For this research we are limiting the scope of implementation to job seeker side features only.

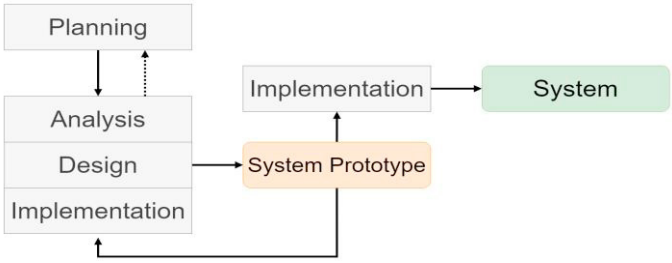

Fig. 2. Methodology used in this app development. [9]

4. Result and Discussion

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We divide the discussion into three parts, the technologies used, requirement gatherings, and the analysis, design to implementation phases.

A. Technologies

We use some recent technologies to develop the application. Below is the list of those technologies.

Table 2. Technology list.

No.	Name	Description
1	NativeBase	Provide flexibility for the UI layer.
2	Expo	Provide robust development tools and libraries.
3	Node.js	Provide a lightweight server-side backend layer.
4	Mongo DB	Provide a robust and flexible database for the application.

NativeBase is a library of components in React Native that is free to use and is devoted to developing mobile applications for both the iOS and Android platforms. The components are built on the pure React Native platform along with JavaScript functionality with a variety of customizable properties [13].

Expo is a framework and platform for universal React applications. Expo is a collection of React Native tools and services that helps us develop, build, deploy, and quickly iterate on iOS, Android, and web applications from the same JavaScript. It is also one of the advantages given by hybrid mobile application development [14].

The options chosen on hybrid technology here should be taken with some consideration that it probably has user experience, testability, implementation, and performance issues that might raise along the implementation cycles [15].

In this research, Node.js is used to build the backend layer of the application. Programs written using JavaScript handle the logic of how data is stored in the database on the remote server. This allows the application to communicate with the server to present data properly in the application.

In the application's backend layer development, we use a framework, namely Express. A framework that helps code server JavaScript to create routes to answer requests from clients and send them as responses. To retrieve dependency Express, the project will take advantage of a utility that Node.js has in the form of a node package manager

(npm).

MongoDB is a NoSQL database that was created to respond to the limitations of relational databases. NoSQL does not use a defined table schema with Structured Query Language but instead uses a flexible document-oriented format. The flexibility of this data modeling can add development dynamics compared to the relational model, especially in the development with the prototyping methodology. Another important aspect of MongoDB is its overall query execution speed that relatively fast compared to other databases. [8]

In this research, MongoDB is used in combination with Node.js. To make the MongoDB and Node.js stacks work, Express makes use of the Mongoose library. Mongoose provides MongoDB modeling solutions including built-in type casting, validation, and data query.

B. Requirement Gathering

Interviews for the needs of job providers were conducted with two small and medium business actors and one member of the human resource department. For users of the application, interviews were conducted with six workers who graduated from elementary school (Sekolah Dasar), junior high school (Sekolah Menengah Pertama), senior high school (Sekolah Menengah Atas), and the equivalent with details:

Table 3. The number of interviewees based on their education level.

No.	Education Level	Number of Interviewees
1	Elementary school	2
2	Junior high school	1
3	Senior high school	3

Table 4. The number of interviewees based on their role.

No.	User	Number of Interviewees
1	Job seeker	6
2	Job provider	3

The characteristics of users who will use this application are non-college graduate users. Users do not have to have special skills and up-to-date devices to use this application, just use an Android phone.

According to the results of the interview, the platform used by all the speakers was Android. In addition, according to Statcounter, the market share of cell phone users in Indonesia to April 2021 was 91,7% dominated by the Android operating system [16]. Referring to that data, this research will focus on developing Android applications only.

Based on the results of interviews with several interviewees who have worked as laborers, shop employees, waiters, and who have registered as migrant workers, many feel lacking the ability to compete because they cannot prove their expertise. For those who register as migrant workers, there must be several stages, namely a written test from the institution which, if completed, will receive a certificate of completion and a certificate of language proficiency in the destination country.

Then from the results of an interview conducted with the first job provider executive, in recruiting labor, the most important thing is the candidate's performance. The candidate's performance can be seen from the interview result and written tests to show tidiness, honesty, and diligence. Certifications from related institutions are good added value for prospective employees.

By understanding some of the interview results above, it can be concluded that a mechanism in the form of features is needed to help job seekers show their expertise. This feature must also be supported with an option to display job seeker certifications because certification is a form of evidence of a recognized skill set.

Next are the results of interviews aimed at employees who work as waiters in shops/cafes/restaurants. To get information about job vacancies, most of them get information from social media platforms. Generally, the recruitment process is carried out by conducting interviews with the owner or manager of the business concerned.

Looking at the explanations, it is better if each stage of the job application process is informed in the mobile

application. We put a feature to see detailed information on job vacancies and the stages in the process of applying for them.

According to the results of an interview conducted with the second job provider, in conducting the search for employees who are non-tertiary graduates, emphasize more on trust in prospective employees. By looking at the country of Indonesia where criminal cases can occur anywhere, this is an important thing to pay attention to. Therefore, a mechanism is needed to upload certain files such as ID and family card if the company needs them and add contacts from the prospective employee's family to be contacted in addition to the prospective employee's number.

Like company trust in prospective employees, fraud from individuals claiming to be companies also often occurs in society, such as fraud from individuals who ask for bail so that their applications are processed. To deal with this, a mechanism is needed to report suspicious vacancies for prospective employees.

The third job provider, a small entrepreneur in the textile industry, has never used any application or platform. In conducting employee searches, the owner looks for employees who live nearby and who have high motivation to find work. This can be implemented in the form of a mechanism to filter locations on the list of prospective employees on the dashboard.

Based on the explanation of the interviews and observations result made to several interested parties and some potential solutions to be implemented in the application above, there are several mechanisms that need to be highlighted to become supporting features, namely: profile and certification, view job information, view application process, files upload, and report vacancies.

C. Analysis, Design, and Implementation of The Solution

After we get the requirements and spot the essential points, we set the features needed to be implemented in the application. Below is the list of primary features (Table 5).

Table 5. Feature list.

No.	Feature	Priority
1	Apply for a job	Mandatory
2	Manage Applications	Mandatory
3	Upload files	Mandatory
4	Set profile	Mandatory
5	Report vacancies	Desirable
6	Create a portfolio	Mandatory
7	Email notification	Optional
8	Push notification	Optional

Next step we develop the use cases, from the use case diagrams (Fig.3) to the use case description. The use case description shown here is the one for the “Apply Job” use case (Table VI).

After all the use case diagrams and use case descriptions are done, we move into the activity diagram. An activity diagram is built for each use case. The activity diagram here describes the business process executed in each use case. An example of an activity diagram for the “Apply Job” use case is shown in Fig. 4. For each activity diagram, we build an input-process-output table to detail the input requirements of the process, give a brief description of the process, and define the outputs of the process.

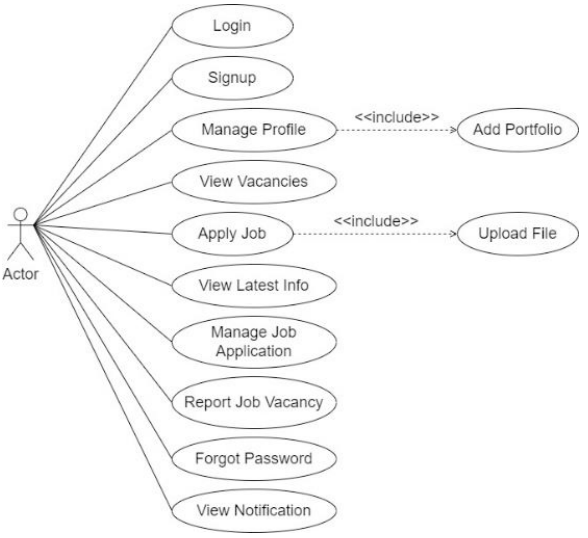

Fig. 3. The use case diagram.

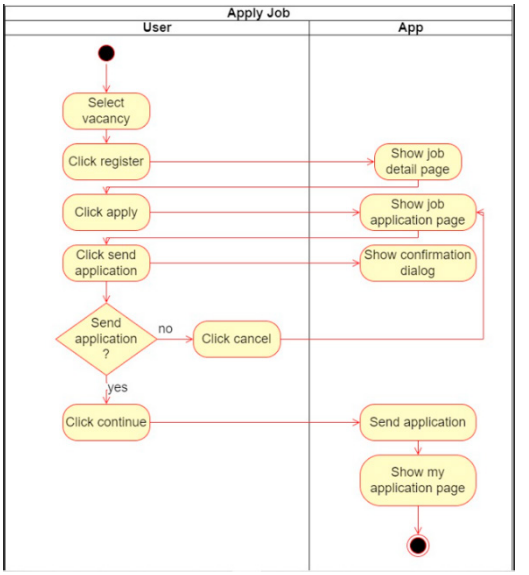

Fig. 4. Activity diagram of apply job process.

Table 6. Use case: Apply Job.

Use Case Name	Apply Job	
Actor	Job Seeker	
Description	In the Apply Job use case, users can apply for the selected job.	
Preconditions	The vacancy provider has already posted the job.	
The typical course of events	***Actors Action***	***System Response***
	Stage 1: The user accesses the main page in the Job List section.	Stage 2: The application displays a list of available vacancies.
	Stage 3: The user presses the *View Details* button.	Stage 4: The application will redirect the user to the related job detail page.
	Stage 5: The user can read job details on the detail page. When the user decides to apply for the related job, the user can press the *Apply for Job* button.	
	Stage 5: The user fills in all the application needs, such as updating the profile by pressing the *Change Now* button and uploading additional files, then pressing the Send application button.	Stage 6: The system will send job seekers' applications to the Job Provider.
Postconditions	The user has registered for the related vacancies.	

Table 7. Input-process-output table of Apply Job.

No.	Input	Process	Output
1	The user presses the Register button of the selected job vacancy.	The application sends application information to the server.	The application displays job information on the Job Details page where the user selects the job.
2	The user presses the Apply for Job button to apply for a job.		The application displays a Job Application page to which the user applies.
3	The user presses the Upload Image button to attach the file.		The application displays a Confirmation dialog when applied by the user.

No.	Input	Process	Output
4	The user presses the Continue button to send the attachment or Cancel to cancel the application.		The application will redirect to the My Application page after sending the application.

The next step is the development of the class diagram. The overall class diagram of the system is shown in Fig. 6.

The UI design is created as follows. It begins with the login process. Login is intended to allow users to be authorized and use all the features of the application to the fullest. There are several steps that must be skipped when logging in. To register a new user, the application takes the value of each field (full name, email, and password) on the "Sign Up" page, then sends it via an HTTP request to the Megawe backbone application.

Manage profile is a feature provided for users to fill in or change user profile information. User profile information stored in the Megawe system is information that can be seen by job providers when users apply for job vacancies. This information consists of personal information, a profile photo, and a portfolio.

Users can change the profile photo by selecting an existing photo on the phone. In the personal information section, users can change their mobile number, address, and city information. Meanwhile, in the portfolio section, you can add or subtract work experience, certificates, and education.

To submit a job application, users can select a photo from the file to be sent as a job application requirement (Fig. 5). Then the application will upload the photo files along with the job id information to the Megawe backbone application.

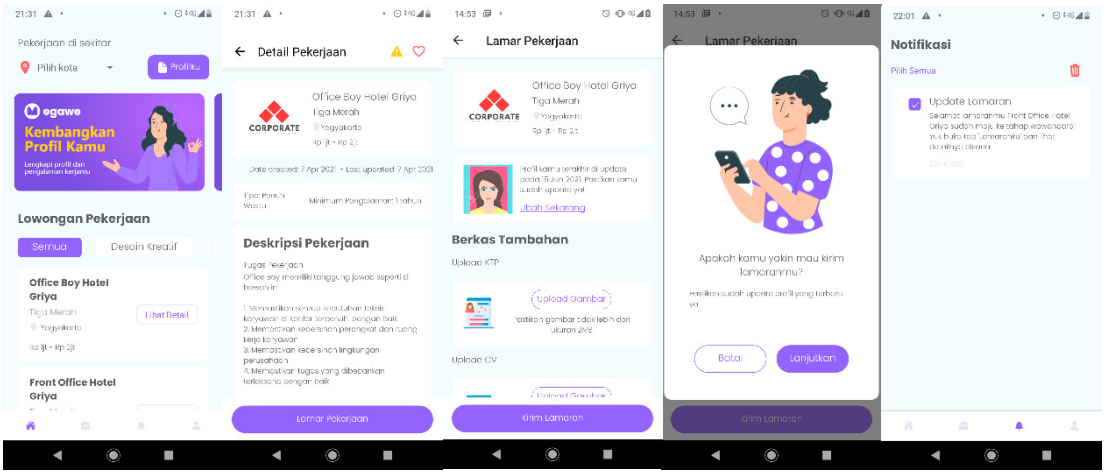

Fig. 5. The UI flow of applying for a job. (1) Choose the vacancy, (2) View vacancy detail, (3) Send the job application, (4) Confirmation pop-up (continue or cancel), (5) View job application status.

D. Analysis, Design, and Implementation of The Solution

In this study, black-box testing was carried out manually by the team who is responsible as a tester before the application is tested by the user. This test is conducted following the test cases that have been defined for each feature. The order of testing is determined according to the risk priority number value for each feature to be tested. Based on all the experimental test cases that have been determined, all functionality in the application has run as expected and is ready to proceed to the next test, namely think-aloud method usability testing [17]. All the observations, chat, and discussion notes are recorded along with the questionnaires and feedback [18].

From the results of the first usability test, several improvements were made to the application and the addition of notification features. There are two feedbacks from users, namely the addition of a search feature to the city selection and changes to the latest info feature so that it can be more easily found. Overall, we did it in two testing cycles.

The first and second post-usability improvements took approximately one week, starting with making changes to the design, then proceeding with coding and the second usability testing. All the tests mentioned above are conducted via real devices to represent the real production situation [19].

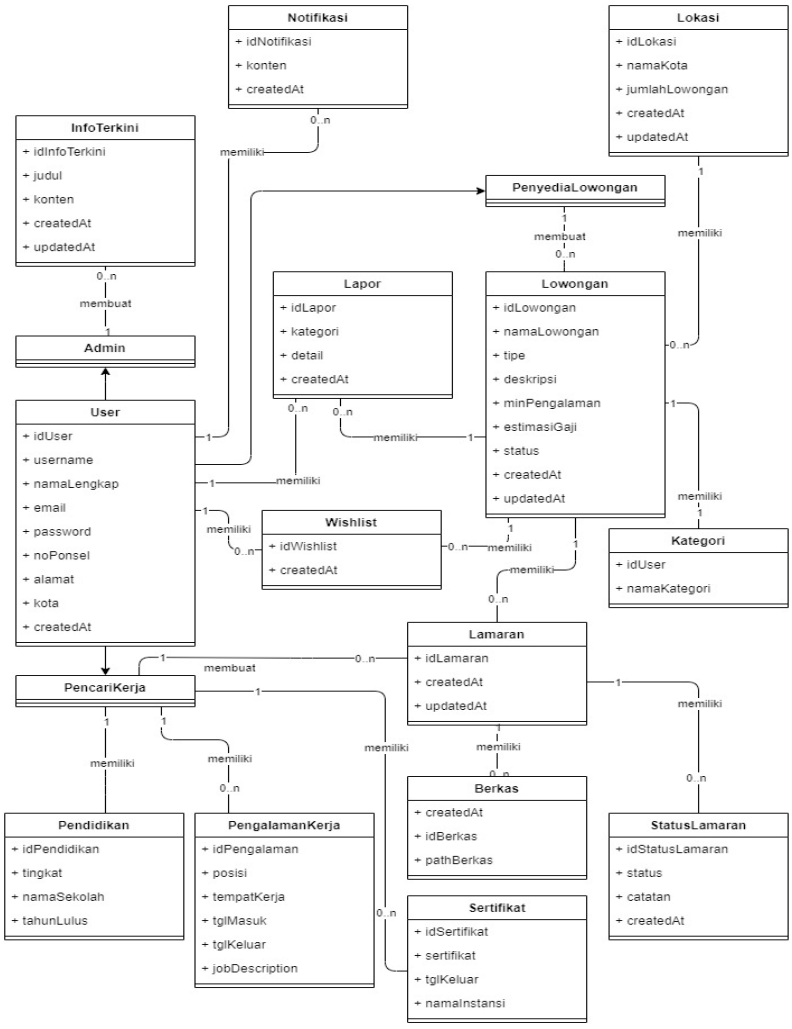

Fig. 6. Class diagram of the application.

5. Conclusion

Based on the discussion that has been carried out in the previous chapter, some important conclusions can be drawn as follows.

From the results of usability testing, it is proven that the Megawe application can offer important features needed by users. This is reflected in user feedback which shows acceptance after several test cycles. Based on usability testing activities carried out for users, the Megawe application has been adjusted for functionality according to the feedback received and adjusted to the planned development time limit.

In accordance with the research objectives, the Megawe application can become a platform for job seekers who are not particularly college graduates to find and apply for jobs. This can be seen from the results of usability testing that already matched with users' feedback that has backgrounds according to the target application.

References

[1] Azzahra, Rizka. (2021) "Pengangguran Di Tengah Puncak Bonus Demografi Pada Era Pandemi Covid-19", *IJAcc* **2** (**1**): 74-81.

[2] Syahrial. (2020) "Dampak Covid-19 Terhadap Tenaga Kerja di Indonesia". *Jurnal NERS* **4** (**2**): 21-29.

[3] Badan Pusat Statistik, (2021) "Keadaan Ketenagakerjaan Indonesia Februari 2021." Feb-2021. [Online]. Available: https://www.bps.go.id/pressrelease/2021/05/05/1815/februari-2021--tingkat-pengangguran-terbuka--tpt--sebesar-6-26-persen.html. [Accessed: 25-Apr-2021].

[4] Alam, Syamsul Alam. (2016) "Tingkat Pendidikan dan Pengangguran Di Indonesia (Telaah Serapan Tenaga Kerja SMA/SMK dan Sarjana)". *Jurnal Ilmiah Bongaya* **29**: 250-257.

[5] Purwandoko, Pradeka B., Seminar, Kudang B., Sutrisno, Sugiyanta. (2019) "Development of a Smart Traceability System for the Rice Agroindustry Supply Chain in Indonesia." *Information* **10** (**10**): 288.

[6] Eisenman, Bonnie. (2018) "Learning react native: building native mobile apps with JavaScript", 2nd ed. Beijing: O'Reilly.

[7] Shah, Hezbullah, Soomro, Tariq R. (2017) "Node.js Challenges in Implementation". *Global Journal of Computer Science and Technology* **17** (**2**): 72-83.

[8] Tavares, Olivia M. I., Rangkoly, Sartje M., Bawan, Sarah S. D., Utami, Ema, Mustafa, Muhammad S. (2020) "Analisis Perbandingan Performansi Waktu Respons Kueri Antara Mysql Php 7.2.27 Dan NoSQL MongoDB". *Jurnal Teknologi Informasi* **4** (**2**): 303-313.

[9] Dennis, Allan, Wixom, Barbara H., Tegarden, David. (2015) "An Object-Oriented Approach With UML." Wiley.

[10] Alhadreti, Obead, Mayhew, Pam. (2018) "Rethinking Thinking Aloud: A Comparison of Three Think-Aloud Protocols". *CHI Conference on Human Factors in Computing Systems*.

[11] Black, Rex. (2019) "Managing the Testing Process: Practical Tools and Techniques for Managing Hardware and Software Testing." Wiley.

[12] Leonardo. (2019) "Analisis dan Perancangan Prototype E-Business Startup Micro Job Indonesia". *Undergraduate thesis, Universitas Bina Nusantara*.

[13] Gu, Yifan, Xu, Chaohui, Zheng, Mao. (2017) "Using React Native in an Android App." *Conference Proceedings of Midwest Instruction and Computing Symposium*.

[14] Palliyaguru, H. T., Weerathunga, L. I. E. P., Ekanayake, E. A. L. R., Wijesuriya, S. P., Gamagee, M. P. A. W.. (2016) "An Approach To Hybrid Technology For Mobile Application Development". *Asia Pacific Journal of Contemporary Education and Communication Technology* **2** (**2**): 162-172.

[15] Majchrzak, Tim A., Biørn-Hansen, Andreas, Grønli, Tor-Morten. (2017) "Comprehensive Analysis of Innovative Cross-Platform App Development Frameworks". *Hawaiian International Conference on System Sciences*.

[16] StatCounter, (2021) "Mobile Operating System Market Share Indonesia," *StatCounter Global Stats*. [Online]. Available: https://gs.statcounter.com/os-market-share/mobile/indonesia. [Accessed: 28-May-2021].

[17] McDonald, Sharon, Edwards, Helen M., Zhao, Tingting. (2012) "Exploring Think-Alouds in Usability Testing: An International Survey". *IEEE Transactions on Professional Communication* **55** (**1**): 2-19.

[18] Kokil, U., Scott, Sandra. (2017) "Usability Testing of a School Website Using Qualitative Approach." *SCITEPRESS Science and Technology Publications*: 55-64.

[19] Sethi, I. P S., Agarwal, V., Shukla, S. (2018) "Mobile App Testing: Challenges, Strategy and Approaches". *International Journal of Computer Applications* **179** (**43**): 16-22.