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Automatic Portal Access Application Using Static Qr Code Reading

Suhartono[1], Nurhani[2], Satria Gunawan Zain[3]
[1,2,3] Informatics & Computer Engineering, Makassar State University, Makassar, Indonesia
[1]suhartono@unm.ac.id, [2]nurhaniana99@gmail.com, [3]sg.zain@gmail.com

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***Abstract*— This study is a study that aims to determine the results of the automatic portal access application using a static QR Code reading based on the results of the ISO 25010 testing standard and to find out the results of using an automatic portal access application using a QR Code reading. The development model used in this research is the Rapid Application Development (RAD) model and the application quality test is based on the ISO 25010 quality standard. Data were collected using documentation and observation techniques. The instrument and system were validated by two system experts. Data were analyzed using descriptive statistical analysis techniques. Based on the test results using the ISO 25010 quality standard, the automatic parking application using QR Code reading has met the standards where: a) testing the functionality suitability aspect Testing the application is carried out by involving 2 (two) expert validators who are experienced in the field of application programming, the percentage is obtained in the category Very Good and has met the functionality suitability aspect; b) testing the performance efficiency aspect of the application can run well without experiencing a memory leak which results in a force close and launch fail so that the application is said to be successful and has met the performance efficiency aspect; c) Testing the maintainability aspect From the test results on the maintainability aspect, it shows that the maintainability aspect test has met three aspects of the test, including instrumentation, consistency, and simplicity, so the results of the maintainability aspect test can be said to meet the maintainability standard.**

***Index Terms*— Application; Development; QR Code**.

I. INTRODUCTION

The development of technology is currently growing very rapidly, so technology has become a necessity at this time. Many needs in today's era can be met through mobile phones. One of the requirements needed is access to the parking area for motorists. Often the need for a parking area for motorists is still lacking in service.

These are some of the things that encourage thinking about building an automatic portal access application using a mobile, fast, effective and efficient QR Code reading. Android and QR Code are used in this study because Android is a very popular and widely used mobile OS (Operating System) and QR Code is a medium used to deliver information quickly and get a fast Response without inputting manually by typing.

Android is an operating system for Linux-based mobile devices that includes an operating system, middleware and applications. Zafaat (2015).

According to Supardi (2017) Android is a Linux-based mobile device operating system that includes an operating system, middleware, and applications.

Hilmawan et al (2019) Parking is a temporary state of immobility of a vehicle because it is abandoned by the driver. By law it is forbidden to park the vehicle in the middle of the highway, but parking on the side of the road is generally allowed. Parking facilities are built together with most buildings, to facilitate vehicles using the building.

Quick Response Code or commonly referred to as QR Code is a two-dimensional barcode introduced by the Japanese Company Denso Wave in 1994. This type of barcode was originally used for data collection of vehicle parts production inventory and is now used in various fields of business services and services for marketing and promotional activities. Basically, the QR Code was developed as a code that allows its contents to be translated at high speed Rouillard (2008).

The use of QR Codes is currently widely used in the business and industrial world, such as in Japan, China and Korea. QR Code is an evolution of barcodes from 1 dimension to 2 dimensions developed by Denso Wave. Along with the development of information technology, parking security structuring activities are also increasing according to the complexity of the existing work, the presence of android technology that can be used as a data processor is quite interesting for several conditions to use it, one of which is the problem of parking. The connection in this research is how to design a parking system concept that provides security and comfort for Android-based motorists that can be accessed directly through an Android smartphone. The design of an android-based application that is installed on the driver's smartphone contains user data which is input when the driver parks.

QR code is a type of matrix code or two-dimensional barcode developed by Denso Wave, a

division of Denso Corporation which is a Japanese company and published in 1994 with the main functionality that it can be easily read by a scanner QR Code stands for quick Response or rapid Response, which is in line with the goal is to convey information quickly and get a fast Response as well.

II. Research Method

This type of research is a Research & Development (R&D) research which aims to develop automatic portal access software using a static QR Code reading, which is an application that can be used to manage automatic parking in the Department of Informatics and Computer Engineering. To produce results that are in accordance with user needs, in its development using the Rapid Application Development (RAD) software development model. Suhartono & Susilawatizahraen (2022).

The model used in this development is the Rapid Application Development (RAD) development method which has 3 phases, namely Requirements Planning, RAD Design Workshop, and Implementation. Rapid Application Development (RAD) is a strategy aimed at providing much faster development and obtaining better quality results than results achieved through traditional cycles McLeod (2002).

The instrument in this study is used to assist in analyzing the quality of the software developed using ISO 25010 which is a development of the previous model, namely ISO 9126. In this ISO 25010 model there are eight criteria.

There are 3 aspects of testing mobile devices in ISO 25010 covering Functional suitability, performance efficiency, and maintainability. Therefore, in this research the software testing phase uses 4 of the 8 characteristics in ISO 25010.

Data analysis techniques used in this study are as follows: 1). Functional Suitability, Analysis Functionality testing by experts is determined from the results of calculating the percentage score for each instrument. On the answer sheet for each question item using the Guttman scale. This study uses an instrument in the form of a checklist and with yes-no answer choices. The Respondent's answer with the highest score (yes) is worth 1 and the lowest score (no) is 0. 2). Performance Efficiency Analysis testing, the performance efficiency aspect of the ISO/IEC 25010 standard using GT Metrix software/tools, which aims to measure and determine the performance efficiency aspect. 3). Usability Analysis, the usability aspect analysis test is done by analyzing user responses. Usability testing was carried out on 30 respondents, using a Likert scale with 5 scale options. Likert scale is a type of scale used to measure attitudes, opinions, and perceptions of a person or group. The reason for using respondents is that at this time the portal access application and system are still in the trial phase so 30 respondents are deemed sufficient, after the trial is declared successful, the application and system will be fully implemented.

III. Results and Discussion

A. Research Results

1) Application Development Results

The results of this study resulted in an automatic portal access application using a static QR Code reading. This application was created using the Android Studio software. Application database management using Firebase Realtime Database.

This study aims to produce an automatic portal access information system using a static QR Code reading. This application is made with features that make it easier for vehicle users when they want to enter the parking area and have a high capacity in coding data or in information storage. The following is a description of the stages of making an automatic portal access application using a static QR Code reading based on the selected development model.

A) System Evaluation Results

At this stage it is carried out by the user to find out whether the application that has been built is in accordance with the needs or not. If it is appropriate, it will proceed to the application coding stage, if not, the application will be repeated from Steps 1, 2, then 3. Based on the evaluation of the application by the user, the application design can be continued to the application coding stage.

B) System Coding Results

At the coding stage, the approved application is made using the appropriate programming language. The programming language used is the Kotlin programming language, with Arduino Studio IDE software. The database management system uses the Firebase Real time Database.

Fig. 1. Initial Appearance of the Application

The Initial screen when the automatic portal access application is opened for the first time, in this initial view the application opens by displaying the application icon and the loading bar of the application at the bottom of the device screen.

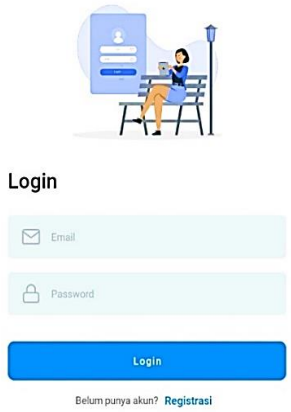

Fig. 2. Login Form

Login form is the display of the main page of the application that was built. This form contains the login and registration buttons. The login button is used to access the next page by entering the email and password data entered by the user, while the registration button will direct the user to a page containing the data entry form to register as a parking member.

Fig. 3. Registration Form

Registration Form is a registration form display on the application that was built. In this form there is a register button and a login list. The register button is used to register an account as a parking member by entering the name first then the NIP/NIM for the Lecturer or Student then entering the email then the mobile number then the password then re-entering the password. After completing the registration form, you will be directed return to the login page. The login button is used to access the next page according to the email and password data entered by the user.

Fig. 4. User Dashboard Form

The User Dashboard Form is a display from the user dashboard, this page contains a profile photo editing menu that contains data for the account user name, as well as the number registered in the application, also contains the mobile number of the account owner, as well as data on entry and exit times recorded in the system. In this display there is also a QR Code display that will be scanned by the reader system on the portal used to enter and exit.

C) System Test Results

1) QR Code System Response and Entry Time Barrier

Testing the Response of the QR Code and Barrier system which was carried out to determine the duration of time required when scanning to open the entrance portal. In the first experiment, the required scan time is 5.35 seconds, while the required Barrier Response time is 1.05 seconds, for more details, see the table below.

TABLE I. QR CODE RESPONSE AND ENTRY BARRIER TIME

No.	Scan Time	Barrier Response Time
1	5.35 Second	1.05 Second
2	6.07 Second	1.25 Second
3	3.04 Second	1. 42 Second
4	3.37 Second	1.12 Second
5	7.87 Second	1.90 Second
6	5.65 Second	2.00 Second
7	5.78 Second	1.34 Second
8	4.32 Second	2.00 Second
9	8.14 Second	1.95 Second
10	10.01 Second	1.30 Second
11	7.14 Second	1.83 Second
12	5.31 Second	1.74 Second
13	5.73 Second	1.35 Second
14	6.52 Second	1.92 Second
15	8.31 Second	1.74 Second
16	4.58 Second	1.56 Second
17	3.57 Second	1.42 Second
18	7.13 Second	1.67 Second
19	4.42 Second	1.81 Second
20	5.41 Second	1.48 Second
Average Scan Time 5.89 Second		Average Barrier Response Time 1.59 Second
Minimum Scan Time 3.04 Second		Minimum Barrier Response Time 1.05 Second

Maximum Scan Time 10.01 Second	Maximum Barrier Response Time1.95 Second

2) QR Code System Response and Barrier Time Out

Testing the Response of the QR Code and Barrier system which is carried out to determine the duration of the exit time required when scanning to open an exit portal. In the first experiment, the required scan time is 2.90 seconds, while the Barrier Response time is 1.98 seconds. For more details, see the table below.

TABLE II. QR CODE SYSTEM RESPONSE AND BARRIER TIME OUT

No.	Scan Time	Barrier Response Time
1	2.90 Second	1.98 Second
2	5.96 Second	1.45 Second
3	4.78 Second	1.23 Second
4	3.98 Second	2.00 Second
5	3.00 Second	1.76 Second
6	5.97 Second	1.87 Second
7	6.67 Second	1.24 Second
8	3.65 Second	1.47 Second
9	6.34 Second	1.68 Second
10	2.08 Second	1.47 Second
11	5.95 Second	1.54 Second
12	4.10 Second	1.59 Second
13	6.74 Second	1.56 Second
14	7.93 Second	1.47 Second
15	5.32 Second	1.40 Second
16	3.87 Second	1.37 Second
17	2.56 Second	1.52 Second
18	7.92 Second	1.57 Second
19	5.82 Second	1.35 Second
20	2.78 Second	1.09 Second
Average Scan Time 4.92 Second		Barrier Average Response Time 1.53 Second
Minimum Time 2.08 Second		Barrier Minimum Response Time 1.09 Second
Maximum Time 7.92 Second		Barrier Maximum Response Time 2.00 Second

3) Distance Scan QR Code and Barrier

The test is carried out to determine the distance from the QR Code scan process on the portal, and the time required by the system and the barrier in responding to the application. In the tests that have been carried out, it was found that various responses were found, as in the first experiment at a distance of 10 cm with a system response of 0.68 seconds and a response barrier of 1.00 seconds, for more details, see the table below.

TABLE III. DISTANCE TO SCAN QR CODE AND BARRIER

No	Scan Distance	System Response (Second)	Barrier Response (Second)
1	10 cm	0.68	1.00
2	10 cm	0.92	1.00
3	10 cm	0.74	1.00
4	10 cm	0.93	1.00
5	10 cm	0.78	1.00
6	15 cm	1.25	1.00
7	15 cm	1.02	1.00
8	15 cm	0.76	1.00
9	15 cm	0.98	1.00
10	15 cm	1.05	1.00
11	20 cm	1.75	1.00
12	20 cm	1.92	1.00
13	20 cm	1.68	1.00
14	20 cm	1.79	1.00
15	25 cm	1.90	1.00
16	25 cm	1.87	1.00
17	25 cm	1.96	1.00
18	25 cm	1.89	1.00
19	25 cm	1.92	1.00
20	25 cm	1.72	1.00

4) Test the Access Speed of Providers and Various Network Services

This test is carried out to test the speed of provider access from various network services, the effect of connectivity on the speed at which the scan data is sent to the system. In the first experiment, Telkomsel network service required 1.25 Second Response Time, for more details, see the table below.

TABLE IV. ACCESS SPEED TEST

No	System Response Time			
	TELKOMSEL	XL	SMART FREN	INDOSAT /TRI 3
1	1.25 Second	0.56 Second	1.27 Second	0.80 Second
2	0.87 Second	0.82 Second	1.31 Second	1.02 Second
3	1.76 Second	1.21 Second	0.47 Second	1.48 Second
4	1.45 Second	1.46 Second	0.85 Second	1.20 Second
5	1.37 Second	1.25 Second	0.92 Second	1.08 Second
Average	1.34 Second	1.06 Second	0.96 Second	1.12 Second

5) Test Results From Making Applications Based on Software Testing Standards ISO/IEC 25010

a) Application Test Results (Functional Suitability)

Application testing is carried out by involving 2 (two) expert validators who are experienced in the field of application programming. The validator tests the system directly by trying all the functions contained in the system, then fills out the test scores in the questionnaire table which has previously been validated by 2 (two) instrument validator experts by checking the options that are considered correct and providing input related to the development of the system being tested. . The results of the examiner's questionnaire from the 2 (two) experts are listed in the following table:

TABLE V. APPLICATION TESTING DATA PROCESSING RESULTS

Answer	Validator Score	
	Validator 1	Validator 2
Yes	7	7
No	-	-

The score result will then be calculated by the formula of the feature completeness matrix where in this formula the functional suitability result is the result

of the number of features that have been successfully implemented divided by the total designed features. Based on the formula, it is obtained.

$$Functional\ suitability\ (X) = \frac{7}{7} = 1 \qquad (1)$$

Based on the above, which is then calculated using the feature completeness formula, a Score of 1 is obtained, from the score it can be concluded that the quality of the software in the form of applications in this study is stated to be good and fulfills the functional suitability aspect. The description of the functional suitability aspect test data can be seen in the appendix.

b) Application Test Results (Functional Suitability)

Aspects of testing include the use of the Central Processing Unit (CPU), memory, memory, thread counts, and Frames Per Second (FPS). Testing is done using a desktop application called Apptim. The following are the results of testing the performance efficiency aspect with Apptim in Figure 5.

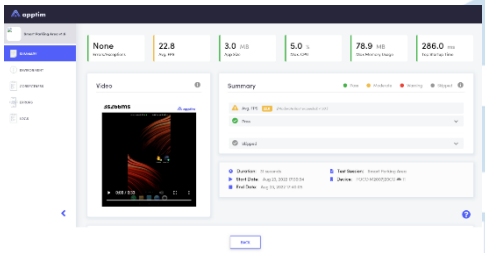

Fig. 5. Performance Efficiency Testing

Performance efficiency testing that has been carried out shows that the automatic parking application using a static QR code reading can be described in Table 6 as follows.

TABLE VI. PERFORMANCE EFFICIENCY ASPECT TEST RESULTS

No.	Category	Average	Maximum Score	Result
1.	CPU Use	0,9%	5%	Low Limit
2.	Memory Use	82,1 MB	114,2 MB	Low Limit

Based on the table above, the test results on the performance efficiency aspect of the Automatic Portal Access Application Using Static QR Code Reading using Apptim software show Average CPU usage is 0.9% with Maximum 5 percent (low limit), and Average memory usage is 82.1 MB with Maximum 114.2 (low limit). During ongoing testing the application runs well without experiencing a memory leak or application damage that results in a force close or launch fail, the test scores are also at a low limit, no test is above the maximum user limit, therefore it can be concluded that the test results on Performance efficiency aspects of Automatic Portal Access applications Using Static QR Code Reading have met ISO 25010 software quality testing standards on performance efficiency aspects.

c) Application Test Results (Functional Suitability)

Maintainability testing is carried out operationally in the field using three aspects of testing, including instrumentation, consistency, and simplicity by involving 2 (two) experienced experts in this field. The expert tested the system directly by trying 3 (three) aspects of testing in the system, then filling in the test scores in the questionnaire table. The results of the tester's questionnaire from the 2 (two) experts are listed in the following table:

TABLE VII. MAINTANABILITY DATA PROCESSING RESULTS

Answer	Validator Score	
	Validator 1	Validator 2
Yes	3	3
No	-	-

The quality of maintainability testing on a software is carried out according to the Land testing instrument contained in Table 7. From the test results of the maintainability aspect as in Table 7 above, it shows that the maintainability aspect test has met three aspects of the test, including instrumentation, consistency, and simplicity, so the results of the maintainability aspect test can be said to meet the maintainability standard.

B. Discussion

The automatic portal access application using a static QR Code reading is an application designed to provide convenience in parking services. Development of automatic portal access application using static QR Code reading using Research & Development (R&D) research type. The stages of application planning are starting from needs analysis, this stage uses data collection techniques in the form of interviews using irregular question instruments. The results of the interview then proceed to the application creation stage, in the design process a system design is made which consists of database design, business process design, user interface design, and system architecture design. The application that has been designed is then evaluated by the user to determine whether the system design can be continued or not, if it is appropriate then the process can be continued to the system coding process, if not, the application will be designed from scratch. The results of the evaluation of applications that have been carried out by developers with users, namely development can proceed to the system coding stage. The coding of the system uses the Kotlin programming language with the Arduino Studio IDE software. The database is managed using the Firebase Realtime Database. Based on the results of the research, an automatic portal access application was produced using a valid, practical, and effective static QR Code reading for use in parking managers.

Testing automatic parking applications using static QR Code readings is carried out through several stages, namely testing using expert validation. Validation of

experts (expert) that is asking for feedback and suggestions from 2 system experts, the validator is in charge of providing an assessment of whether the developed application is good and feasible to be implemented or not. The system expert provides an assessment of the system by filling out a questionnaire sheet that was made and has been previously validated by 2 instrument experts. Testing the system using the ISO/IEC 25010 testing standard which takes 3 aspects of testing, namely functional suitability is a test carried out to test all functional requirements of the system and then calculates the percentage of system success, performance efficiency is a test carried out to measure how fast in accessing applications, requests and responses. data, maintainability is a test conducted to determine the ability of application maintenance.

The results of application testing from the functional suitability aspect based on the test table can be concluded that the quality of the software in the form of applications in this study is stated to be good and fulfills the functional suitability aspect. The results of performance efficiency testing that have been carried out show that the automatic portal access application using a static QR Code reading can run well without experiencing a memory leak or application damage resulting in a force close or launch fail, the automatic portal access application using a static QR Code reading has met the testing standards. software quality in terms of performance efficiency. The results of testing the maintainability aspect based on the test table, showed that it had met three aspects of the test, including instrumentation, consistency, and simplicity, so the results of testing the maintainability aspect could be said to meet the maintainability standard.

Based on the results of the research on designing an automatic portal access application using a static QR Code reading after being validated and tested using the ISO/IEC 25010 software testing standard using aspects of functional suitability, performance efficiency, maintainability, it can be concluded that this application is suitable for use by end users.

IV. CONCLUSIONS

Based on the results of the research conducted, the following conclusions were obtained:

1. This study resulted in an automatic portal access application using a static QR Code reading, in testing the application it has a Time Response scan and a Time Response barrier with an Average Time Response scan of 5.89 Second, while the Average Time Response barrier of 1.59 Second is quite practical in using the application and has been feasible to use based on the results of the application's feasibility test.
2. The automatic portal access application using a static QR Code reading shows that this application has met the ISO/25010 standard in 3 aspects of testing, namely the functional suitability aspect with the test results being well received, performance efficiency with the test results running very well without experiencing memory leak or application damage, and maintainability can be said to meet the standard.

REFERENCES

[1] Siregar, H. F., & Siregar, Y. H. (2018). Perancangan aplikasi komik hadist berbasis multimedia. 2(2), 113–121.

[2] Supardi, I. Y. (2017). Semua bisa menjadi programer android. Elex Media Komputindo.

[3] Hilmawan, N., Akhmadali, & Sumiyattinah. (2019). Analisa kebutuhan parkir pada pasar flamboyan sekadau. 1–4.

[4] Suhartono, & Susilawatizahraen, R. (2022). Development of e-document information system in information and computer engineering department using quick Response code. 1–9.

[5] M. I. Perkasa and E. B. Setiawan, "Pembangunan Web Service Data Masyarakat Menggunakan REST API dengan Access Token,"J. Ultim. Comput., vol. 10, no. 1, app. 19-26, 2018, doi: 10.319337/sk.v10i1.838.

[6] A. Pulungan and A. Saleh, "Perancangan Aplikasi Absensi Menggunakan QR Code Berbasis Android," J. Mhs. Fak. Tek. Dan Ilmu Komput., vol. 1, no. 1, pp. 1063-1074.

[7] R. H. D. A. M. N. H. Khosa, Aplikasi Inventory barang menggunakan QR code. Bandung: Kreatif Industri Nusantara, 2020.

[8] Sugiyono, Metode Penelitian kuantitatif, Kualitatif dan R&D. B: Alfabeta Cv, 2017.

[9] K. B. Dsouza, S. Mohammed and Y. Hussain, "Smart parking-An integrated solution for an urban setting," 2017 2nd Internasional Conference for Convergence in Technology (12CT), 2017, pp. 174-177, doi: 10.1109/12CT.2017.8226115.

[10] K. Jing Yong and Muataz H. Salih. "Design and Implementation of Embedded Auto Car Parking System Using FPGA for Emergency Conditions". Indonesia Journal of Electrical Engineering and Computer Science, 2019, Vol. 13, No. 3, pp. 876-883.

[11] Huang, P. C., Chang, C. C., Li, Y. H., and Liu, Y., "Efficient access control system based on aesthetic QR code," Personal and Ubiquitous Computing, vol. 22, pp. 81-91, 2018.

[12] K. Peng, H. Sanabria, D. Wu, and C. Zhu, "Security overview of QR codes," Student project in the MIT course, vol. 6, pp. 1–20, 2014.

[13] S. Tiwari, "An introduction to QR code technology," in 2016 International Conference on Information Technology (ICIT), Dec. 2016, pp. 39-44, doi: 10.1109/ICIT.2016.021

[14] Denso Wave Inc. "QR code essentials." Denso Wave, vol. 900, 2011.

[15] A. Somani, S. Periwal, K. Patel, and P. Gaikwad, "Cross Platform Smart Reservation Based Parking System," 2018 International Conference on Smart City and Emerging Technology(ICSCET), pp. 1-5, 2018.

[16] T. S. Gunawan, A. Mutholib, and M. Kartiwi, "Design of automatic number plate recognition on android smart-phone platform," Indonesia Journal of Electrical Engineering and Computer Science, vol. 5, no. 1,, pp. 99-108, 2017.

[17] Sri Hastuti, Raditya A.R, S.T., M.T, Slamet Indriyanto, S.T.,M.T. Rancang Bangun Sistem Informasi Lokasi Meja Pada Food Court Menggunakan Rfid (Radio Frequency Identification) Berbasis Aplikasi Android". Jurnal EECCIS Vol 14, No 3 (2020) pp. 101-107.

[18] Noor H, dkk. Sistem Informasi Perpustakaan. Berbasis Web Menggunakan Barcode Pada SMP Negeri 11 Banjarmasin. Technologia. 2020.

[19] Tri Haryanti. "Sistem Informasi Perpustakaan Menggunakan Barcode". Smart Comp Vol. 11 No. 1, 2022.

[20] Abdul B, dkk. Smart Door Lock Berbasis QR Code. Smart Comp Vol. 11 No. 1, 2022.