Media Introduction to Aircraft Engine Collections Using QR Code at Nurtanio Laboratory ITD Adisutjipto

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ABSTRACT

The Public Relations and New Student Admissions Center of the Adisutjipto Dirgantara Technology Institute often collaborates with high schools and vocational schools both from Java and outside Java in terms of campus visits and has a program called Campus Tour. In carrying out campus tour activities, there are several problems that often arise. Therefore, an application called Education for Aero Engineering Adisutjipto (TORERO) was created with a 360° virtual reality tour and voice over which was able to provide information about aircraft engines at the Nurtanio Laboratory using a QR Code. This application is expected to be able to help Public Relations and the New Student Admission Center at the Adisutjipto Aerospace Technology Institute. Application testing uses the Black Box method for system testing, and is carried out on several browsers with the results obtained that all browsers support the use of the TORERO application. User test results using the Likert scale method, obtained results with a success rate of 86.23% with a statement of strongly agree.
Keywords: TORERO ITDA, Virtual Tour Reality 360, Nurtanio Laboratory, Aircraft Engine.

1. INTRODUCTION

Adisutjipto Institute of Aerospace Technology or commonly known as ITD Adisutjipto is a Private University (PTS) with an aerospace concept under the Adi Upaya Air Force Organization (YASAU). The Adisutjipto Institute of Aerospace Technology Admissions and Public Relations Center often partners with high schools and vocational schools in Java and beyond on campus visits. One of the cooperative activity programs related to campus tours is the campus tour, in which students from a high school or vocational school conduct activities around the campus area. school to experience the facilities of the Adisutjipto Institute of Aerospace Technology campus. One of the facilities often used as a sightseeing object for these activities is the Nurtanio Laboratory.

Nurtanio Laboratory is a learning place or facility for students of the Adisutjipto Institute of Aerospace Technology to carry out practical activities. The Nurtanio Laboratory itself contains tools to support practical work and in addition aircraft engines such as piston engines, jet engines and turboshaft engines.

Media comes from Latin, is the plural form of the word 'medius' which literally means middle or intermediary. In Arabic, it is called 'wasail', the plural form of 'wasilah', which is a synonym for al-wast, which also means middle. The word middle itself means being between two sides, so it is called an intermediary (wasilah) (Munadi. Y. 2019). Media is anything that can be used to channel messages and can stimulate the mind, can arouse students' enthusiasm, attention and will so that it can encourage the learning process in students (Fatria, F. 2017).

When doing campus tours, students from SMA or SMK are guided by one of the students from the Adisutjipto Institute of Aerospace Technology. Students will then explain information about the engine in the Nurtanio lab. In this activity, there are many problems such as female students often ignoring the information conveyed by male instructors when visiting the campus, chatting with their friends, and not hearing the information because the tour guide conveys, information conveyed by the student or the student as a tour guide. On campus, the visits are short, unclear, even different, etc.

Along with campus tours, issues always revolve around what has already been mentioned. Using an application as an information system that supports QR codes is one solution. Developments in the use of

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this information system application will include the areas of introductory information materials, Voice Overs with engine information, as well as a 360° virtual reality tour of the area from the Room Nurtanio experiment. Thanks to that, high school or vocational school students can get more information about Nurtanio Laboratory's aircraft engines by scanning the QR code with their personal mobile phones.

Quick response code (QR code) is the evolution of barcodes that were previously one-dimensional codes into two-dimensional codes with greater data storage capacity than barcodes, using QR codes data can be stored in the form of numbers, letters, binary codes and kanji, this code has been applied to many different fields (Dedy Irawan, J., & Adriantantri, E. 2018).

Based on the above description, the purpose of this study is to help high school or vocational school students as well as students of the Adisutjipto Institute of Aerospace Technology deepen their knowledge of aerospace engines with a the application is designed on the website platform with the title Media About Aircraft Engine Collection using QR The code and name of the application can be called Adisutjipto Aeronautical Technical Education (TORERO).

2. LITERATURE REVIEW

In previous research (GA Manu. 2019) entitled Scan QR Codes to Recognize Historical Objects in Museums, it was explained that QR Codes are a development or change in the form of bar codes from one dimension to two dimensions, with the ability to store larger data than codes. bar or barCode. QR Codes can store data in the form of numbers, letters and symbols. So QR Codes can be used to store the URL of a site's page. The site can contain information about teaching materials that teachers can use in the classroom learning process.

In research (Franciscus, 2020) entitled Strategy and Feasibility Analysis of Mro Development and Engine Maintenance in Indonesia, it is explained that the aircraft maintenance business in Indonesia is still very attractive in line with the growth in the number of aircraft owned by domestic airlines. Around 65% of the portion of aircraft maintenance costs owned by domestic airlines has not been absorbed by Mro Indonesia.

Virtual Tour Reality 360°
A virtual tour or often called a panoramic tour is a simulation that describes the condition of a location, which consists of several collections of panoramic photos, hyperlinked videos or collections of images, as well as virtual models of the location. There are other media elements such as sound effects, music, narration and writing that can also be used to support virtual tours (Syani, M., & Rahman, F. 2019). Through 360° a more realistic interaction is achieved with immersive environment and the effect of "feeling like being it actually exists in cyberspace" (Argyriou, L., et a 2020). 360° video can provide immersive educational experiences in otherwise inaccessible real-world environments (Pirker, J., & Dengel, A. 2021).

Voice Over
Voice over is an additional sound or narrative media in the form of a human voice reading a story or narrative related to the video or image being displayed (Nugroho, A. P. (2017). The term voice over is used in translation studies, Díaz Cintas and Orero (2006: 477) define as 'a technique where the voice offering a translation in a particular target language is heard simultaneously over the voice of the source language (Ranzato, I., & Zanotti, S. 2019).

Quick Response Code (QR code)
Quick Response Code (QR code) is a development of the Bar Code which was previously a one-dimensional code into a two-dimensional code with the ability to store larger data compared to a Bar Code, by using a QR code the data that can be stored can be in the form of numbers, letters, binary codes and kanji letters

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(Fatria, F. (2017). QR codes are matrix barcodes that store data most common are URLs, text, vCards, or photos to be quickly accessed by QR readers, available in all smart phone. QR codes have been widely used as marketing tools to efficiently guide consumers directly to an online product or site (Brodie, K., et al. 2020).

3. METHOD

Quick response code (QR code) is the evolution of barcodes that were previously one-dimensional codes into two-dimensional codes with greater data storage capacity than barcodes, using QR codes data can be stored in the form of numbers, letters, binary codes and kanji (Dedy Irawan, J., & Adriantantri, E. 2018). The QR code for this application can be seen in Fig.1.

Fig.1 Application QR Code

Population, Sample and Sample Determination Method.
The population in this study were high school/vocational school students who visited the Nurtanio laboratory. The sample in this research was a collection of aircraft engines in the Nurtanio laboratory. The sampling method is in the form of a random sample from a collection of aircraft engines.

How to make and Number of tests
The object that will be tested in this research is the aircraft engine in the Nurtanio laboratory using a QR Code, then hosted on a website to provide information about the history and specifications of the aircraft engine. The information provided is in the form of text and voice.

Research Line of Thought
    a. Requirement Analysis and Definition
    At this stage in application development, a needs analysis is carried out to determine the system requirements specifications. The required specifications include aircraft engine elements or components in the Nurtanio laboratory using the QR Code required for application development. The final result of this stage is the specification of hardware and software requirements.
    b. System Design
    At this stage of system and software design or system design, it is carried out by designing the results of the requirements analysis and definition stage which are transformed into software architecture.
    c. Implementation
    At this stage, coding of the software program is carried out.
    d. Integration and Testing
    After the software has been implemented, testing is carried out on each component of the software to check for errors or failures in the software.

During the first data collection phase of this study, observations and documentation were carried out at the research site, specifically the Nurtanio Laboratory, to create 360° virtual reality, as well as to know the

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engines available at Nurtanio Laboratories. Below are the results of the Nurtanio Laboratory floor plan map. The laboratory layout can be seen in Fig.2 and the aircraft engine data can be seen in Table 1.

Fig.2 is a floor plan of the Nurtanio laboratory which is a research location, which is designed for floor mapping to create 360° virtual reality and to identify aircraft engines in the Nurtanio Laboratory.

Table 1 is data on the types of aircraft engines available at the Nurtanio Laboratory for 14 aircraft engines.
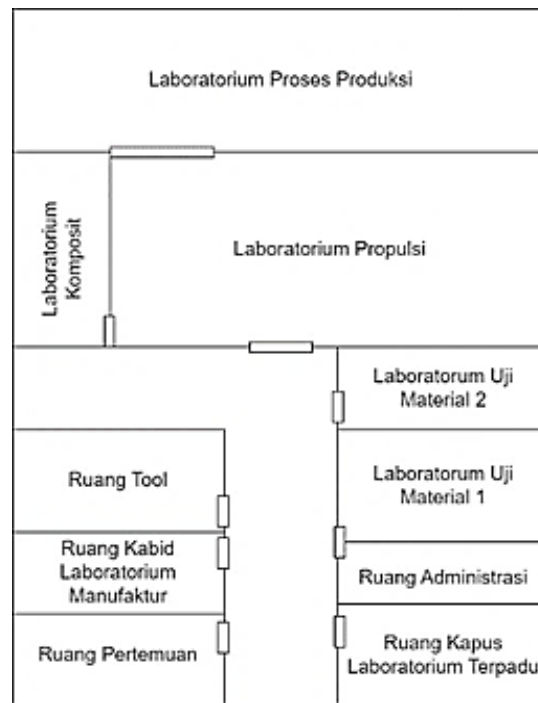

Fig.2 Nurtanio Laboratory Plan

Table 1. Engine List

No	Engine Name	QTY
1.	The generic Electric 47 Turbojet	1
2.	A65/O-170	1
3.	Pratt & Whitney's JT8D	1
4.	Garrett GTC 85	1
5.	Tumansky RD-9B	1
6.	Lycoming O-540	9

Unified Modeling Language or UML is a framework, technique, and diagram for modeling and designing programs and for object-oriented applications (Kroenke, D. M., et al. 2018). Fig.3 explains the use case diagram of this application, explaining which flows or processes can be executed or accessed by administrators and users. Administrators can use 10 functions and users can use 4 functions.
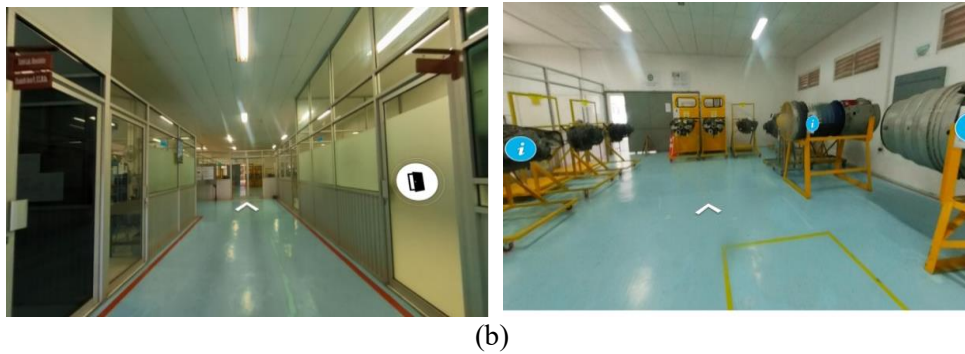
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Fig 3. Use Case Diagram

4. RESULT

Implementation of 360° Virtual Reality

The implementation of 360° virtual reality in the media application for introducing aircraft engine collections using QR Code or TORERO is an important component of this application. The aim of implementing 360° virtual reality is so that users can more easily realize a picture of the surrounding environment, especially at the Nurtanio Laboratory. Fig. 4 (a), (b), (c) dan (d) are several images from the implementation of 360° virtual reality from the Nurtanio Laboratory.

(b)

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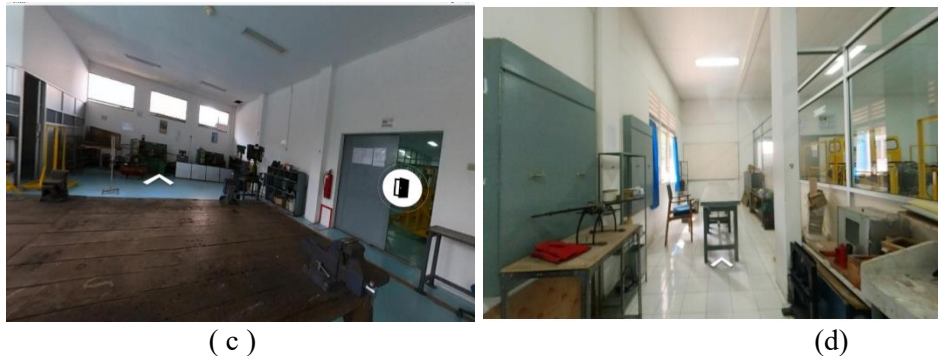
(c)   (d)

Fig.4 Virtual reality 360° - (a) Lobi, (b) Laboratorium Propulsi
(c) Laboratorium Proses Produksi, (d) Laboratorium Komposit

At this stage, the results of testing on the application or system created to find out whether the application or system is functioning well or not as expected, the results of QR code testing, the results of testing on the browser and the results of testing using a Likert scale are discussed.

Scan Distance Testing
In this experiment, the author tested the maximum and minimum distance limits when scanning a QR Code supported by a smartphone scanning application. In this distance test, it starts at a distance of 10 cm to 100 cm. The test results are shown in Table 2.

Table 2. QR Code Scan Distance Test Results

No	Scan Distance	Results
1.	10 cm	Succeed
2.	20 cm	Succeed
3.	30 cm	Succeed
4.	40 cm	Succeed
5.	50 cm	Succeed
6.	60 cm	Succeed
7.	70 cm	Succeed
8.	80 cm	Succeed
9.	90 cm	Succeed
10.	100 cm	Succeed

Line Testing
The author performed the test by checking the integrity of the QR Code form. The purpose of this test is to check whether the QR Code is still scannable after drawing the QR Code with a randomly drawn line of

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black ink. This form test starts from 0 rows or no rows up to a maximum of 5 rows. The test results are shown in Table 3.

Table 3. Test Results for Number of Lines

No	Number of Folds	Results
1.	2 Folds	Succeed
2.	4 Folds	Succeed
3.	8 Folds	Succeed
4.	16 Folds	Succeed

Testing Applications in Browsers
The tests were conducted with the purpose of determining whether the browser application can be used or supports the use of the TORERO application. Test results using the TORERO application on multiple browsers can be seen in Table 5. To test Google Chrome, Firefox, Opera Browser and Microsoft Edge using a laptop. Then test Safari using your iPhone smartphone.

Table 5. Browser Test

No	Browser Name	Accsess	Audio	Visual	Navigation
1.	Google Chrome	Succeed	Succeed	Succeed	Succeed
2.	Safari	Succeed	Succeed	Succeed	Succeed
3.	Firefox	Succeed	Succeed	Succeed	Succeed
4.	Opera Browser	Succeed	Succeed	Succeed	Succeed
5.	Microsoft Edge	Succeed	Succeed	Succeed	Succeed

User Testing
The Likert scale is a scale used to measure the attitudes, opinions, and perceptions of a person or a group of people toward social phenomena (Prathivi, R. 2019). For user tests on the TORERO application, tests are conducted using a questionnaire supported by Google Form with the url address: https://forms.gle/DeEAgDp7y7xpnBth7, includes 10 questions and has 5 indicators or answers in the tests.

a. Determining the number of respondents based on answers:
T (total number of respondents) = Pn (choice of score numbers from the Likert scale), the results of this calculation can be seen in Table 4.

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Table 4. Test Score

No	Indicators / Answers	Total Answers	Score	Total Score
1.	Very Disagree	0	1	0
2.	Disagree	1	2	2
3.	Neutral	24	3	72
4.	Agree	155	4	620
5.	Very Agree	120	5	600
Total Score				1294

b. Determination of interpretation is carried out to determine the results of the highest and lowest scores in the Likert scale assessment results:
Y (Highest Score) = highest Likert scale score x number of respondents
          = 5 x 30 = 150

X (Lowest Value) = lowest score on the Likert scale x number of respondents
          = 1 x 30 = 30

c. Interval determination is carried out to determine the distance between assessments on a Likert scale:
I (Interval) = 100 / total Likert scores
        = 100 / 5
        = 20
Based on the results of the calculations above, it can be seen that the interval distance of the Likert scale is 20% and can be seen in Table 5.

Table 5. Likert Scale Interval Distance

No	Percentage	Information
1.	0% - 19.99%	Very Disagree
2.	20% - 39.99%	Disagree
3.	40% - 59.99%	Neutral
4.	60% - 79.99%	Agree
5.	80% - 100%	Very Agree

d. Likert scale completion:
Index (%) = Total Score / Y x 100
        = 1294 / 150 x 100
        = 86,23%

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The results of testing the TORERO application using the black box method are used for each menu function and page function for users and administrators to implement according to the application design. The final result of the Likert scale was 86.23%, indicating that the number is between 80% and 100% with a strongly agree statement.

5. CONCLUSION

The TORERO application was successfully created through several research stages. With this application, by implementing a QR Code which includes information via voice over as well as a 360° virtual reality tour, it really helps high school or vocational school students or visitors to get clearer information about aircraft engines in the Nurtanio Laboratory by scanning the QR Code. using a cell phone. This can be seen through user responses with a Likert scale calculation of 86.23%, which shows a figure between 80% and 100% with a statement of strongly agree. The results of testing the TORERO application using several browsers, especially: Google Chrome, Safari, Firefox, Opera Browser and Microsoft Edge, it is known that all browsers support it. Suggestions for developing the TORERO application better are as follows: Improvements in the User Interface and User Experience of the application can be further developed and images taken for virtual reality should be displayed in several corners of the room so that they are presented more clearly.

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