# DEVELOPMENT OF CVT VISUALIZATION MEDIA INFORMATION BIKE MATIC YAMAHA

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**ABSTRACT**

CVT (Continuous Variable Transmission) engine is a very important component in a scooter type motor which serves to channel or forward the power produced by the engine and then channeled to the rear wheels. Damage to CVT engine components occurs because the user does not know the cause of the damage resulting in an untreated CVT component which causes more severe damage because motorbike users do not repair or replace CVT components. The absence of media to find out the damage to the CVT engine, motorbike users have to disassemble and bring it to work to find out the cause of the damage to the CVT engine. So from that the author built an information media for visualizing CVT Yamaha Yamaha motorbike which aims to enable motorbike users to get information about CVT engines on scooter types. The purpose of this study is to provide information about the CVT component to users of motorized types, as well as provide information about the causes of damage that occurred in the CVT engine and its maintenance.

**Keywords**: Automotive, Information Media, Visualization, Matic Yamaha Motorbike CVT**.**

## 1. INTRODUCTION

Indonesia's population growth from year to year has increased. According to data obtained from the Central Statistics Agency (BPS) in 2000-2015 it reached around 134 (souls / km2). As the population increases, the needs of the community also increase. The most important community needs are transportation, because transportation facilities are very supportive in community activities.

Motorbikes have become a favorite choice as a means of transportation for people in Indonesia because of their easy use, effective travel time, economical operating costs that can help with their daily needs. Based on data obtained from the Association Industri Sepeda Motor Indonesia (AISI) penjualan sepeda motor pada akhir tahun 2018 mencapai 6.383.111 unit motor [1].

Dari beberapa kelebihan sepeda motor tipe skutik tentunya ada kekurangan dan permasalahan yang terdapat pada kendaraan jenis skutik diantaranya adalah mesin, kelistrikan dan komponen lainnya yang on scooter motorbike vehicles. Damage that often occurs is in CVT engine components. CVT (Continuous Variable Transmission) is an important engine part that is on a motorbike that serves to forward the rotation or power from the engine to the rear wheels through components on the CVT [2]. Damage to CVT engine components occurs because the user does not know the cause of the damage which causes the CVT component to be neglected and cause more damage.

The absence of media to determine the damage to the CVT engine, the user must disassemble and bring it to work to find out the cause of the damage to the CVT engine.

Based on the problems that have been described, to help motorbike users, an application is needed regarding the CVT motorbike Yamaha mobile based CVT engine. By using mobile android, it is expected that motorcycle users can easily get information in a concise manner, where this application contains information such as CVT components, CVT maintenance, how CVT works and the causes of CVT damage by being visualized in 3D (three dimensions). By using a 3D (three-dimensional) form, users can view CVT engine component objects from different angles. Based on the background described, the authors are interested in conducting a study entitled "DEVELOPMENT OF MATIC YAMAHA MOTORCYCLE CVT VISUALIZATION MEDIA INFORMATION"

Therefore the objectives of this study are:

a. Provides information to users about components on a CVT engine.

b. Provides information about damage and maintenance on a CVT engine.

### 1.1 Media

Media is a means of communicating in print or audio-visual form that can reduce thoughts, attention, feelings and can be used as learning tools for [3].

### 1.2 Information

Information is a set of data that has been processed in various forms that can produce a good, precise and meaningful information for users [4].

### 1.3 Visualization

Visualization is a way to give ideas or ideas to other people, both listeners and the general public in the form of understandable media images. In the world of architecture, visualization is often referred to as presentation technique [5].

### 1.4 CVT

CVT (Continuous Variable Transmission) is an important engine part that is on a matic motorbike that serves to continue the rotation or power from the engine to the rear of the wheel through components on the CVT [2].

### 1.6. Multimedia

Multimedia adalah penggunaan komputer untuk menyajikan dan menggabungkan teks, suara, gambar, animasi dan video dengan alat bantu dan koneksi (link) sehingga pengguna dapat bernavigasi, berinteraksi, berkarya dan berkomunikasi. Multimedia sering digunakan dalam dunia hiburan. Selain dari dunia hiburan, Multimedia juga diadopsi oleh dunia game. Multimedia juga dapat diartikan sebagai penggunaan beberapa media yang berbeda dalam menyampaikan informasi berbentuk teks, grafik, audio, animasi, dan video (Suyanto, 2008) [11].

### 1.5 Unity 3D

Unity 3D is a tool for developing videos, visualizing architectures, games, and interactive media installations used on Mac, Plastation 3, iPad, iPhone and Android platforms. Unity can also produce browser games that use the Unity web player plugin, can be used in Windows and Mac [6].

### 1.7. Luther Sutopo

According to Luther (1994), the multimedia development methodology consists of six stages, namely concept (design), design (design), collecting materials (material collection), assembly (making), testing (testing), and distribution (distribution). In this stage it can be randomized which will be made, but the concept stage must be the first thing. Sutopo (2003) adopted the Luther methodology by modifying it, as shown below.

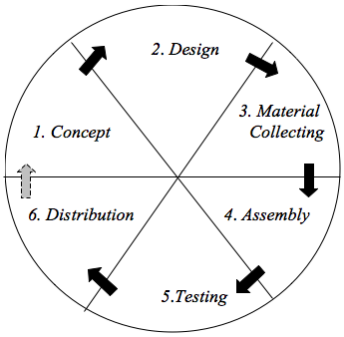


**Figure 1 Stages of Multimedia Development [7].** (Source: Iwan binanto. Basic Theory Digital Multimedia + Development)

Next is the explanation:

**1. Concept**

Stage concept (conceptualization) is where the stage to determine a goal and who uses the program (audience identification). The goal and end-user of the program affect the nuances of multimedia as a reflection of the identity of the organization that wants information to end users.

**2. Design**

Design or design is a sequence for making specifications about program architecture, style, appearance, and material / material requirements for the program. The specifications are as detailed as possible so that in the next stage, namely collecting and assembly materials, new decision making is no longer needed. In this section a storyboard is created to describe the description of each scene.

**3. Collecting material**

Collecting material is the stage to collect the materials needed to work. The materials used are photos, videos, animations and clip art images. This stage is done in parallel with the Assembly stage.

**4. Assembly**

Assembly stage is the stage of making all multimedia objects or materials, making applications based on the design stage, such as storyboards, flow parts, and / or navigation structures. This stage usually uses authoring software such as macromedia director, macromedia flash or other free open source products.

**5. Testing**

After the assembly stage is done, then the next step is testing or testing that is done after finishing by running the application / program to find out the problems that occur**.**

**6. Distribution**

In the distribution phase, the finished application will be saved into a storage media. If there is not enough storage media to hold the application. Compression of the application will be done. This stage is also called the evaluation stage for the development of products that have become better.

### 1.6 Object Oriented Programming

Object-oriented programming (object oriented programming) is a way of designing and encoding programs. OOP is very different from traditional programming because it requires a new way of thinking about the structure of programming. Instead of displaying the program as a sequence of instructions to be processed, OOP displays the program as a collection of data structures that have both data elements and program instructions. Another way to understand the difference between traditional

programming and OOP is that traditional programming is organized around the first and second logic of data, while OOP is organized around the data as the first and the second logic [8].

### 1.7 Unified Modeling Language (UML)

Unifed Modeling Language (UML) is a technique for developing systems with graphic language as a tool for documenting and carrying out specifications on the system. Booch and OMT, then Ivar Jacobson, who created Object Orinted Software Engineering (OOSE) joined in. The UML standard is managed by the Object Management Group (OMG) [9].

### 1.8 Use Case Model

Use Case Model is a collection of diagrams that are used to describe the system into graphical notation. Use Case Model is more focused on describing the purpose of a system. The Use Case Model consists of three notations:

1. Use Case diagram

Use Case diagrams are diagrams used to describe the relationship between systems and actors. Actors are users or other systems that are interconnected with systems that will be from outside the information system. In usecase only uses a few elements.

2. Use Case Narrative

Use Case Narrative is a description of the description of the use case diagram so that UML users can find out the details of the process in the use case diagram.

3. Use Case Scenario

Use Case Scenario is a diagram that describes the logic - logic (possible scenario) of a use case narrative [10].

### 1.9 Activity Diagram

Activity Diagram is a diagram that is used to describe workflow (activity) in use cases (processes), logic, business processes and relationships between actors and use case workflows [10].

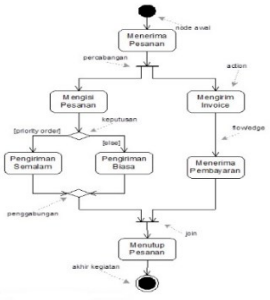


**Figure 2 Activity Diagram [10].**

### 1.10 Sequence Diagram

Squence Diagram is what describes the action of an object. Squence Diagrams specifically describe the behavior of a single scenario. This diagram shows some of these objects through in a use case [7].

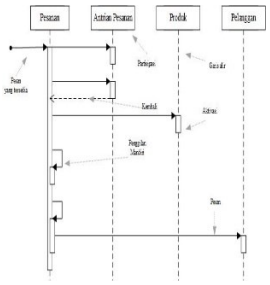


**Figure 3 Sequence Diagram [10]**

### 1.11 Class Diagram

Class Diagram is a diagram that is used to present the class, the components of the class and the relationship between each class. In addition, the class diagram describes several types of objects in the system and various kinds of static relationships that exist between them. Class diagrams also show the properties and operations of a class as well as the limitations contained in the relationships of these objects [10].

## 2. RESEARCH CONTENTS

### 2.1 Analysis of System Architecture

The system architecture that will be built consists of users, android smartphones The architecture in the development of media information is in Figure 4

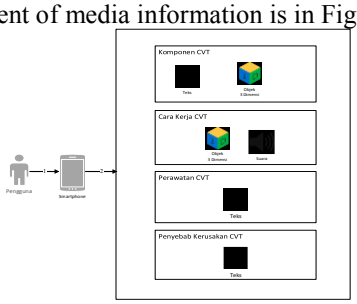


**Figure 4 Arsitektur Sistem**

Following is a description of Figure 3.2 architecture getting information:

1. Users access the Android smartphone
2. Smartphones access apk that has been installed by the user. On the apk there are 4 menu features, namely CVT Components, How CVT Works, CVT Maintenance and Causes of CVT Damage. On the CVT component menu will display information about the components on the CVT engine with 3D objects (3 dimensions) and text. The cvt work menu displays how to work cvt with 3D objects (3 Dimensions). The CVT treatment menu displays information on how to maintain text. The menu that causes CVT damage displays information on the cause of CVT damage in the form of text.

### 2.3 Specifications of Software Requirements

The specification of software requirements is the result of the analysis process carried out in software development. Analysis of software requirements specifications that will be explained is a specification analysis of functional requirements and non-functional requirements specifications. Following is the functional requirements analysis table in table 1

**Tabel 1 Spesifikasi Kebutuhan Fungsional**

| SKPL-F | Software Requirements Specifications |
|---|---|
| 001 | The system displays the main menu |
| 002 | The system displays a CVT component menu |
| 003 | The system can rotate the CVT component |
| 004 | The system displays the CVT maintenance menu |
| 005 | The system displays a menu of how CVT works |
| 006 | The system displays a menu of causes of CVT damage |
| 007 | The system displays an exit menu |

The following is a table of non-functional software requirements specifications in table 2

**Table 2 Specifications for Non-functional Requirements**

| **SKFL-NF** | Software Requirements Specifications |
|---|---|
| 001 | Hardware requirements specifications |
| 002 | Software requirements specifications |
| 003 | Specifications of user requirements |

### 2.4 Analysis of Non-Functional Needs

Non-functional requirements analysis is the analysis needed to be able to determine the specifications of the system requirements which include elements or devices for the system to be built or until the system can be implemented. This need analysis can determine the detailed input needed by the system for the expected output.

### 2.5 Analysis of Hardware requirements

Analysis of hardware requirements is the decomposition of non-functional requirements related to hardware specifications. Minimum hardware requirements for Android needs to run the software in table 3.

**Table 3 Specifications for smartphone hardware requirements**

| **No** | Type of Specifications | Type of Specifications |
|---|---|---|
| 1 | Dimension of 3.5 inches screen | Dimension of 3.5 inches screen |
| 2 | 2 GB RAM | 2 GB RAM |
| 3 | 2 GB of memory | 2 GB of memory |
| 4 | Resolution of 480 x 800 pixels | Resolution of 480 x 800 pixels |
| 5 | 1.2 Ghz quad-core processor | 1.2 Ghz quad-core processor |

Next is the minimum requirement for hardware to run the application of information media, CVT visualization, yamatic engine, in Table 4.

**Table 4 Smartphone smartphone Minimum Requirements Specifications for running applications**

| **No** | Type of Specifications | Type of Specifications |
|---|---|---|
| 1 | Dimension of 3.5 inches screen | Dimension of 3.5 inches screen |
| 2 | 512 GB RAM | 512 GB RAM |
| 3 | 2 GB of memory | 2 GB of memory |
| 4 | Resolution of 480 x 800 pixels | Resolution of 480 x 800 pixels |
| 5 | 1.2 Ghz quad-core processor | 1.2 Ghz quad-core processor |

### 2.6 Software Requirements Analysis

Software needed to build information media applications for visualization of CVT Yamaha Motorbike.

**Table Table 5 Software for Building Applications**

| **Komputer** | | |
|---|---|---|
| **No** | Software | |
| 1 | Microsoft Windows 10 Operating System | Microsoft Windows 10 Operating System |
| 2 | Unity 3D Modeling Program 5.5.5fi | Unity 3D Modeling Program 5.5.5fi |
| 3 | 3D Blender Object Making Program | 3D Blender Object Making Program |
| 4 | UML Microsoft Visio modeling program | UML Microsoft Visio modeling program |
| 5 | Microsoft Visio BPMN Modeling program | Microsoft Visio BPMN Modeling program |

The following are the devices used to run the application.

**Table 6 Software to run the application**

| **Smartphone** | | |
|---|---|---|
| No | **Software** | |
| 1 | Android Operating System Version 4.1 Jelly Bean | Android Operating System Version 4.1 Jelly Bean |

### 2.7 User Analysis

A system that works to find out who will use or run a system that can know the size of user knowledge. The following are users based on the current procedure:

**Table 7 User Analysis**

| **No** | Characteristic Access Rights Users | Characteristic Access Rights Users | Characteristic Access Rights Users |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | System admin a. Can manage data and systems | System admin a. Can manage data and systems | a. System admin a. Can manage data and systems |
| 2 | a. Can operate an Android smartphone | a. a. Can operate an Android smartphone | a. Can operate an Android smartphone |

### 2.8 Analysis of functional

Analysis of functional requirements is done using UML tools, in using UML there are several stages, namely: Use Case Diagram, Use Case Scenario, Activity Diagram, and Class Diagram.

### 2.9 Use Case

Use case diagram is one diagram to model the behavioral aspects of the system. The following is a use case diagram that can be seen in the picture

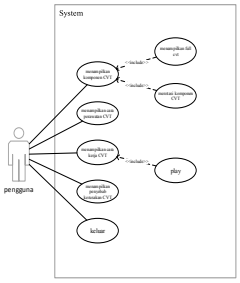


**Figure 5 Use Case Diagram**

### 2.10 System planning

Designing is a part of a software development methodology that is carried out after the analysis stage to provide a detailed description. To be able to design the system, several steps are taken, namely as follows:

a. Designing Menu Structure
b. Making Storyboard
c. Interface Design
d. Sematic Network

### 2.11 Designing Menu Structure

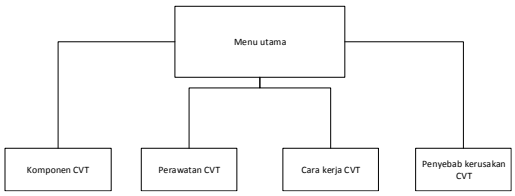


**Figure 6 Designing Menu Structure**

### 2.8 Interface Implementation

1. Display of the Main Menu


**Figure 7 Display the main menu**

2. CVT Component Display

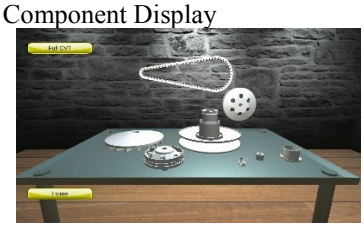

**Figure 8 CVT Component Display**

3. Display Component Rotation

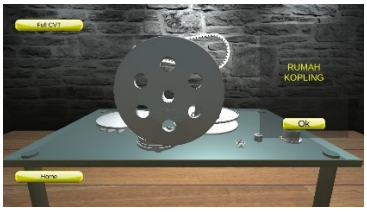


**Figure 9 Display of Component Rotation**

4. Display How CVT Works

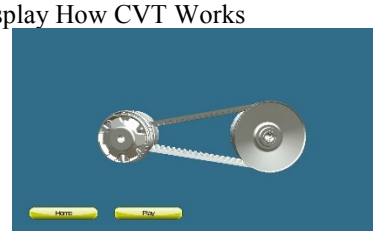


**Figure 10 Display of How CVT Works**

5. CVT Care Display

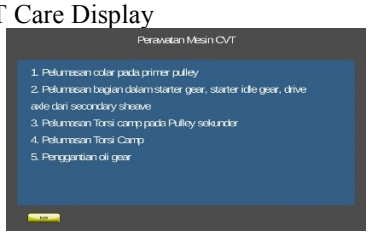


**Figure 11 Display of CVT care**

6. Display the cause of CVT damage

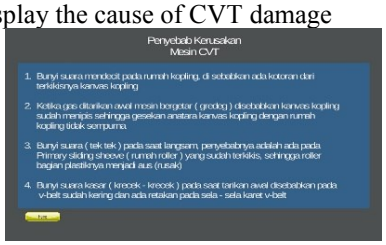


**Figure 12 Display the causes of CVT damage**

## 2.12 System Testing

Testing is done to find out what is still in the system that has been tested. This test aims to determine whether the system that has been made meets the design. Tests used by Black Box testing and Beta testing.

## 2.13 Testing Scenario

Tests are done repeatedly to find out errors to be corrected. After repairing it will be tried again so get the desired results. The table below is a test scenario of the system being built.

**Table 8 testing scenarios**

| No | Components tested | Type | | Type | Type Enter Action |
|---|---|---|---|---|---|
| | | Enter Action | Enter Action | | |
| 1 | Main course | | *Press button* | Pressing the CVT component button | Blackbox |
| | | | | Pressing the button How to work CVT | Blackbox |
| | | | | Pressing the CVT maintenance button | Blackbox |
| | | | | Pressing the CVT damage button | Blackbox |
| 2 | CVT Component Menu | | Press button | Pressing the CVT component | Blackbox |
| | | | | Press the Full CVT button | Blackbox |
| | | | | Rotating CVT components | Blackbox |
| | | | | Press the home button | Blackbox |
| 3 | Menu of how CVT works | | Press button | Putting the button on how CVT works | Blackbox |
| | | | | Press the Play button | Blackbox |
| | | | | Press the home button | Blackbox |
| 4 | CVT care menu | | Press tutton | Pressing the CVT Maintenance button | Blackbox |
| | | | | Press the home button | Blackbox |
| 5 | Menu causes CVT damage | | Press button | Pressing the button causes CVT damage | Blackbox |
| | | | | Press the home button | Blackbox |
| 6 | Out menu | | Press button | Press the exit button | Blackbox |

## 2.14 Black Box Test Results

The test results display the results of the tests that have been carried out in accordance with the testing scenario.

1. Testing the main menu

Following is the main menu testing table in the table 9.

**Table 9 tests the main menu**

| No | Input | Expected results | Test result | Conclusion |
|---|---|---|---|---|
| 1 | CVT component button | Display the CVT component | Successfully displayed the CVT component | [√] is ccepted [...] rejected |
| 2 | Keys to how CVT components work | Showing how CVT works | Successfully displayed how CVT works | [√] is ccepted [...] rejected |
| 3 | CVT Maintenance Button | Display information on how to treat CVT | Successfully display information on how to treat CVT | [√] is ccepted [...] rejected |
| 4 | Button causes CVT damage | Display information on the cause of CVT damage | Successfully display information about the cause of CVT damage | [√] is ccepted [...] rejected |
| 5 | Exit button | Exit the application | Successfully exited the application | [√] is ccepted [...] rejected |

2. Testing the CVT component menu

Following is the menu table of CVT components in table 10.

**Table 10 CVT component menu**

| No | Input | Expected results | Test result | Conclusion |
|---|---|---|---|---|
| 1 | Pressing object | Displays popup objects and displays object information | Successfully displays popup objects and displays object information | [√] is accepted [...] rejected |
| 2 | Object rotation | Rotating objects | Successfully rotates the object | [√] is accepted [...] rejected |
| 3 | FullCVT button | Display full CVT components | Successfully displaying full CVT components | [√] is accepted [...] rejected |
| 4 | Back button | Return to the CVT component menu | Successfully returned to the CVT compoen menu | [√] is accepted [...] rejected |
| 5 | Home button | Return to the main menu | [√] is accepted | [√] is accepted [...] rejected |

2. Testing the menu How CVT works

Following is the menu table for how CVT works in table 11.

**Table 11 Menu of How CVT Works**

| No | Input | Expected results | Test result | Conclusion |
|---|---|---|---|---|
| 1 | Play button | Run the object to move | Successfully run the object to move | [√] is accepted [...] rejected |
| 2 | Stop button | The object stops moving | Successfully stopped moving | [√] is accepted [...] rejected |
| 2 | Home button | Return to the main menu | Successfully returns to the main menu | [√] is accepted [...] rejected |

2. Testing the CVT Treatment menu

The following is a table of CVT maintenance menu tests can be seen in table 12

**Tabel 12 Menu CVT Care**

| No | Input | Expected results | Test result | Conclusion |
|---|---|---|---|---|
| 1 | CVT maintenance button | Display CVT maintenance information | Successfully display CVT maintenance information | [√] is accepted [...] rejected |
| 2 | Home button | Return to the main menu | Successfully returns to the main menu | [√] is accepted [...] rejected |

3. Testing the menu causes CVT damage

Following is the table testing the menu for the cause of the damage.

**Table 13 menu causes of CVT damage**

| No | Input | Expected results | Test result | Conclusion |
|---|---|---|---|---|
| 1 | Broken button CVT damage | Display information on the cause of CVT damage | Successfully display information about the cause of CVT damage | [√] is accepted [...] rejected |
| 2 | Home button | Return to the main menu | Successfully returns to the main menu | [√] is accepted [...] rejected |

### 1.15 Beta Testing Scenarios

Beta testing is done objectively to find out whether the application is built according to the purpose or not by giving questions directly to the user. Here is a beta testing scenario by asking questions to users with questions like the following:

1. Can this application provide information about components or parts of a CVT engine?
2. With this application you can find out how the CVT engine works?
3. Can this application provide instructions or information about damage to CVT components?
4. Can you find out about the cause of the damage to the CVT engine with this application?
5. Can this application help you to find out which components need to be replaced when a CVT engine is damaged?
6. Can you find out how to treat CVT components with this application?

To calculate the results of this questionnaire answer use a scale with different weights. The following is a table of questionnaire answers found in 14.

**Table 14 Answer Questionnaire Categories**

| Weight | Information |
|---|---|
| 1 | Strongly disagree |
| 2 | Disagree |
| 3 | Neutral |
| 4 | Agree |
| 5 | Strongly agree |

To find intervals from each answer, a Likert scale is used. The formula is:$P = \frac{s}{skorideal}\ x\ 100\%$

Information:

P = percentage value sought.

S = Number of frequency answers multiplied by the answer scale.

skorideal = The highest scale of the answer multiplied by the number of samples.

From these results the conclusions can be drawn. The interval from the results of the questionnaire answers in table 15.

**Table 15 Questionnaire Interval Results**

| Category | Interval |
|---|---|
| Strongly disagree | 0 – 20% |
| Disagree | 20 – 40% |
| Doubtful | 40 – 60% |
| Agree | 60 – 80 % |
| Strongly agree | 80 – 100% |

### 2.16 Conclusion of Beta Testing

Based on the results of testing that has been carried out on the Construction of Matic Yamaha Motorbike CVT Visualization Information Media along with the table 16.

**Table 16 User Profile Conclusions**

| No | Questions for users | Hasil Interval |
|---|---|---|
| 1 | Can this application provide information about the components or parts of a CVT engine? | 2,67% |
| 2 | With this application you can find out how the CVT engine works? | 2,87% |
| 3 | Can this application provide instructions or information about damage to CVT components? | 2,73% |
| 4 | With this application, you can find out about the cause of the damage to the CVT engine? | 2,77% |
| 5 | Does this application help you to find out which components need to be replaced when a CVT engine is damaged? | 2,77% |
| 6 | Can you find out how to treat CVT components with this application? | 2,70% |

From the results of the questionnaire that was given to the users stated that it was enough to provide information on the development of the CVT visualization media for Yamaha motorcycle.

### 2.17 Distributed

The distribution phase is the stage that is carried out after the test is completed with the results that are in accordance with the designed, expected, and needed. Distribution is carried out on the construction of the Yamaha CVT motorbike visualization information media by uploading the .apk file to the playstore for download by users.

# 1. CONCLUSION

### 3.1 Conclusions

Based on the results of the research in the preparation of the final assignment it can be concluded as follows:

1. Construction of Information Media Matic Yamaha CVT Visualization Yamaha can provide information about CVT engine components.

Development of Information Media Matic Yamaha Motorbike CVT Visualization can provide information about maintenance and causes of damage to CVT engines.

**3.2 Suggestions**

After the development of this software, there are still many shortcomings in the application. For this reason, the author gives several suggestions to develop so that the application can be better than before, there are suggestions as follows:

1. Repairing 3D objects that are still not perfect
2. Add animation to make it more attractive when the application is used.

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