

## CHAPTER V

### CONCLUSIONS AND SUGGESTIONS

In this chapter, the conclusions and recommendations regarding the finding of the study is presented. The analysis in the previous chapter is concluded and finally the author will attempt to suggest some important matters concerning to the discussion of this final project. These suggestions are considered to be important for everyone especially the students who are going to conduct the final project in the same field.

#### 5.1 Conclusions

Based on the result of the observation and discussion conducted in previous chapter, it can be concluded as follows:

1. An informative, interactive and virtual maintenance manual based on Web3D technologies has been successfully produced from 3D CAD models. It was created based on an actual, reliable and informative product support information obtained from a manufacturing company. Thus, a large number of 3D CAD models which have been produced in the design stage can be optimally used for other purposes in product life cycle, especially in producing this virtual 3D maintenance manual. Its interactive information interface also provides users with standard navigational tools which enable them to view 3D CAD models from any viewing angles. As a further matter, it facilitates users in different geographical locations to speed up their understanding in learning and solving maintenance cases. The reliability and availability of the enhanced maintenance support information in the required infrastructures such as personal computer, tablet and handphone result in significant cost savings. It is extremely cost-effective as the devices exist almost everywhere and even right in the palm of the users' hands.
2. An on-demand maintenance manual, which allows users and other third parties to collaborate by sharing maintenance procedures information needed, has been effectively produced. The users who are engaged in a

collaborative environment can rapidly find reliable information they need and communicate complex maintenance procedural problems they face with each other at any time and from any place. As a further matter, the manual can be accessed offline, which can be a solution in case the internet connection is down or the users are in remote and out of coverage area.

3. Three-dimensional CAD data conversion process from Inventor assembly file format (.iam) to CATIA assembly file format (.CATproduct) is done by using Inventor software from Autodesk. The file format used in this final project is CATIA assembly CAD data, which is the product of Dassault Systèmes.
4. The process of enhancing 3D CAD models visualisation like giving effect, colour, animation, scene, motion simulations and 3D procedures as well as converting the project into VRML are carried out by using Cortona3D RapidManual application.
5. Based on the result of the test conducted on virtual 3D maintenance manual, it recommends that the virtual 3D maintenance manual is run in popular Web browsers such as Internet Explorer, Google Chrome and Mozilla Firefox, because their configuration settings for plug-ins are highly customizable.
6. The result of effectivity and efficiency assessment conducted on two users who were given distinctive treatments in term of the maintenance manuals used shows that the user facilitated with virtual 3D maintenance manual could demonstrate conscious and thorough understanding of the information acquired from that type of manual compared to the users who used conventional 2D maintenance manual. Thus, it can be inferred that virtual 3D maintenance manual is practically proven as a more effective and efficient maintenance process information.

## 5.2 Suggestions

The work carried out in this final project has revealed many promising areas of further research in the design optimisation of maintenance manual using an advanced 3D technology. Hence, it suggests that the 3D CAD data used in the

project is the existing 3D CAD data obtained directly from a manufacturing company or other sources, so that it no longer entails data redesign and regeneration. And it will save a lot more time for visualisation enhancement and animation modification. Furthermore, ensure that the acquired data or product support information is in a detailed set of data, which at least includes component specifications, manuals, downtime problem reports, maintenance procedures for frequently damaged components. Before it proceeds to further process, make sure you have basic understanding in using all required software such as Inventor, CATIA and RapidManual. Also, it is expected that the visualisation and 3D procedural animations enhancement concerns more on the attractiveness and on the quality and completeness of the information delivered on the virtual 3D maintenance manual.

