CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

“Optimization” is the key word for production engineer and plant operators to meet success. According to Steve Jobs, when he is making a design for his new Apple product, “less is more” is the key to make his product distinctive. A great industrial design should be clean and simple. Similar concept goes to Design for Assembly (DFA). According to Boothroyd, DFA is a methodology for evaluating part designs and the overall design of an assembly. It is a structured way to identify unnecessary parts in an assembly and to determine assembly times and achieve cost optimization. It is a support method that encourages product development in teams, in order to maximize productivity. If a design is easier to produce and assemble, it can be done in less time, so it is less expensive. Hence, in this whole report, there are techniques, methods and guidance of DFA to show how to achieve the target. In this chapter, problem statement, objectives, scopes, expected result as well as report arrangement are clearly stated.

1.1 PROJECT BACKGROUND

The dilemma faced by some companies was the inability to have return of investment after investing in product development. The possible cause might be errors that are caused by human, machines, parts delivery not delivered on time and also poor design. As a result, these factors had influenced the manufacturing and assembly cost. Regardless
what kind of production they have, these companies definitely need immediate changes to reverse the current situation or they will face continuously deficit. Some companies gain profit while producing products but the others did not gain as much profit when producing similar products. This problem is due to the assembly and manufacturing process cost majority of the investment capital.

Traditionally, the designers only take care in designing the product without considering how the product can be made or the difficulties in making the product. This attitude is termed as “over-the-wall-approach” where the designer is sitting on one side of the wall and throwing design over the wall to the manufacturing engineer, who has to deal with manufacturing difficulties. To cope with this situation, the designer team must throw away the “over-the-wall-approach” and work together with manufacture engineer at the designing stage. This teamwork is called concurrent engineering team where team members consists of design engineers, manufacturing engineers, cost accountants and marketing and sales professionals. With these multi-disciplinary team members, plenty of problems regarding manufacturing difficulties can be solved at designing stage with the help of analysis tool – the DFA. The DFA is important in that it potentially can reduce the estimated 15-70 % of manufacturing cost that is attributable to assembly. Besides the reduction in cost, DFA promises additional benefits in increased quality, increased reliability, and shorter manufacturing time (Wu, T. and O'Grady, P. 1999).

1.2 PROBLEM STATEMENT

Bicycle is considered as one type of transportation modes. It helps the usage in every aspect of the daily requirement. Besides as a transportation mode, a bicycle can also be used as an exercise equipment. According to Barnes and Krizek (2005) and Massachusetts Statewide Bicycle Transportation Plan on year 1990, bicycle demand keeps increasing. The assembly of bicycles needs to be competent to cope with the growing industry. On the other hand, the cost of producing a bicycle worth to be studied in order to let consumer to enjoy a lower cost product but in the same time maintaining the bicycle quality.
1.3 OBJECTIVES

The objectives of this study are:

i. To evaluate the design efficiency for existing product.

ii. To reduce the part count of the existing product.

iii. To propose a new design with improve in design efficiency of the product.

1.4 SCOPES OF STUDY

The chosen product is a mountain bike which named Predator the Millenium edition assembled by Probike. Only major assemblies are considered and the sub-assembly of which minor parts area assumed to come as ready in the major assembly line. The bicycle used is in Figure 1.1. There are many listed DFA techniques in the field. For this research, the DFA technique used is Boothroyd-Dewhurst design for assembly (DFA) and Hitachi Assemblability Evaluation Method (AEM). In this study, only the assembly cost of the bicycle is consider although there are many elements that sums up the total cost of product.

Apart of that, to visualize the components to be improved in 3-dimensional, the engineering drawing software, Solid Works is used. With the aid of Solid Works, a clearer understanding of components in the product can be obtained. The finite element analysis using Autodesk Algor simulation software is used to identify weak points of redesign parts so that the new design for product is proven practical.