

**PRODUCT DESIGN EVALUATION OF
LUCAS HULL DFMA METHOD**

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**A report submitted in partial fulfillment of the requirement for the award of the
degree of Bachelor of Mechanical Engineering
(Design and Innovation)**

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I hereby declare that I have read this thesis and in my opinion this report is sufficient in terms of scope and quality for the award of the Bachelor of Mechanical Engineering (Design and Innovation)

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I declare that this report entitle “ PRODUCT DESIGN EVALUATION OF LUCAS HULL DFMA METHOD” is the result of my own research except as cited in the references. The report has not been accepted of any degree and is not concurrently submitted in candidature of any other degree.

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ABSTRACT

Product Design Evaluation of Lucas Hull DFMA Method represents the action of evaluate and analyze on every part of product by using the analysis method i.e. functional analysis, handling or also called feeding analysis, fitting analysis, and manufacturing analysis. The main purpose of Design For Manufacturing and Assembly (DFMA) method in design process is to reduce part count for product and make the assembly process easier. It will gives a lots of benefit, among others, reduce the assembly cycle time, cost and Time To Market (TTM). The Lucas DFMA uses two types of analysis application, manual application and software application. The TeamSET software and the Visio Standard software are use for software application. The TeamSET software, version 3.1 is use to analyze every single part in a product. Meanwhile, the Visio Standard software is use to edit and print the result from TeamSET software. This project also includes sample case study, which is to show on how the application of Lucas DFMA can be applied on part count reduction.

ABSTRAK

‘Product Design Evaluation Lucas Hull DFMA Method’ mewakili tindakan menilai dan menganalisis setiap bahagian produk dengan menggunakan cara menganalisis seperti analisis fungsian, analisis pengendalian atau juga dipanggil analisis penyusunan, analisis sesuai, dan analisis pembuatan. Tujuan utama menggunakan kaedah reka bentuk untuk pembuatan dan pemasangan (DFMA) dalam proses reka bentuk adalah untuk mengurangkan kiraan bahagian dan memudahkan proses pemasangan produk. Ia memberi banyak kebaikan, antaranya mengurangkan masa kitar pemasangan, kos dan Masa Untuk Pasaran (TTM). Lucas DFMA menggunakan dua kaedah aplikasi, aplikasi manual dan aplikasi perisian. Perisian TeamSET dan perisian Visio Standard digunakan untuk aplikasi perisian. Perisian TeamSET, versi 3.1 digunakan untuk menganalisis setiap bahagian produk. Manakala, perisian Visio Standard digunakan untuk menyunting dan mencetak hasil daripada perisian TeamSET. Projek ini juga mengandungi kes kajian sampel untuk menunjukkan bagaimana aplikasi Lucas DFMA boleh digunakan terhadap pengurangan bilangan bahagian produk.

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NOMENCLATURE

ASF	Assembly Sequence Flow Chart
CAD	Computer Aided Design
CSD	Cordless Screwdriver
DFA	Design For Assembly
DFM	Design For Manufacture
DFMA	Design For Assembly and Manufacturing
PLC	Product Life Cycle
PSM	‘Projek Sarjana Muda’
TTM	Time To Market

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CHAPTER 1

INTRODUCTION

1.0 BACKGROUND

The project divided into three categories, design project, technical/ concept/ method analysis and case study. The first category is design project should be base on certain design, method and finally could end with new product or design that have new good features, part reduction and follow all the specification. The second category is technical and concept analysis that need to do by the students on their own with advice from the supervisor and the final category is the case study project is more on research related to the topics and product case study. All these three categories will be used until the project is done.

By the end of this project, student will comes with the solution of the problem and come out with the new design of product. This final year project title is 'Product Design Evaluation of Lucas Hull DFMA Method'. Therefore, by the end of this project, the project must come out with new product with less part, low manufacturing cost and new product design should be simple with high quality and reliability.

This project contains two case study. The first sample case study will be used as an example for the Lucas Hull DFMA analysis and the second case study will be used as project's case study.

1.1 PROBLEM STATEMENTS

Before the Design for Manufacturing and Assembly (DFMA) exists, the design engineer uses the traditional design method to develop the new product. A few problems occur and this problem is the factor to use DFMA method in design process especially Lucas Hull DFMA method as stated below:

- There are no methodologies in design process that can support the designer to generate feedback on the consequence of design decision and product assembly.
- Design engineer also do not have specific method to design the product, which aims to produce an efficient and economics design.
- By using the traditional design method, quality and reliability of the design will not achieve the targeted level. It also does not ensure that the transition from the design phase to production phase will be smooth.
- Traditional design method also involves a lot of money because they do not use the specific method to evaluate the design. The evaluation of the design will come from feedback from the prototype. If the feedback is not good, they will redesign the product, make the new prototype and evaluate the prototype again to get the other feedback. This activity also involve a lot of time.

The entire factor list above gives many disadvantages for the design process, assembly process and the product quality and reliability such as:

- The product has too many parts.
- The product cost increase.

- Time To Market (TTM) increase.
- Assembly cycle time for the product increase.
- Increasing in product handling difficulties.

1.2 TITLE OF PROJECT

Product Design Evaluation of Lucas Hull DFMA Method.

1.3 OBJECTIVE OF PROJECT

To analyze the use of Lucas Hull DFMA method and to address the part count reduction.

1.4 SCOPES OF PROJECT

The scopes for this project has been classified and stated as below:

- To study other DFMA methodologies.
- To study the Lucas Hull DFMA method.
- To present product case study on how the application of Lucas Hull DFMA using TeamSet V3.1 software.
- To generate conceptual design and detail design using CAD software.

1.5 SUMMARY

Chapter one focus on the main purpose of PSM. Introduction of the project, problem statement, title of the project, objectives and scopes of the project are included. To full fill the project objective, student needs to undergone literature review, data analysis and product design development.

CHAPTER 2

LITERATURE REVIEW

2.0 INTRODUCTION

Now days, the design process use a specific method like Boothroyd Dewhurst, Lucas Hull and many more. All this method guides the design engineer through the analysis by using the assessment chart. Design engineer use these method to make sure the new develop product will be the best according to the criteria.

The criteria mention above is lower assembly cost, shorter assembly time, increase reliability and shorter total time to market. All this criteria is the main factor design engineer used this method is design and manufacture process.

This chapter will cover assembly definition, assembly history, assembly problem, DFMA, other DFMA method, conceptual design, detail design, and other literature review that related to the project.

All information relate to the project is very important to make sure the objective can be successfully achieve. Design for manufacturing and assembly combine the both main things in product design development and it can be the best guideline to reduce the part count but maintain the functionality. Every method has their own criteria that need to be achieved and these criteria will be covered in this chapter.