

COST ANALYSIS SOFTWARE DEVELOPMENT FOR INJECTION
MOULDING IN THE CONCURRENT ENGINEERING ENVIRONMENT

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Dedicated to my parent
Zamrah B. Yusoff and Che Som Bt Daud,
to my wife Rafidah Bt Hassan,
to my son Uthman Affan Zamrah Al-Firdausi,
to my daughters Ummi Athirah and Ummu Alisha.

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In the Name of Allah. Most Gracious, Most Merciful

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ABSTRACT

To establish sound part is essential in product designing. The delay to introduce the product into the market, will affect the overall development plan, production and marketing plan. To produce product at the right cost, designer must has a tool or system that could determine the part cost in real-time. Failure to achieve the targeted cost will result in part re-design that eventually will delay the development schedule and increase the total investment cost in term of die modification cost. Based on this requirement a simple prototype software to calculate part cost being introduced.

In developing the software, the approached that the program developer took are involving the identification of cost influence factors, arithmetical cost modeling establishment, user interface layout and design development,

VB6 software calculation programming, post-programming result validation and software calculation accuracy.

Post-programming case study results recommended the calculation accuracy are consistent with cost target, but to further additional improvement to increase cost accuracy, which include real-time material cost update, die amortization cost, various overhead expenses calculations, secondary process cost requirement, and transportation packaging cost calculations.

ABSTRAK

Sesuai produk itu mestilah mempunyai rekabentuk yang bagus yang memungkinkan ianya berjaya di pasaran. Kelewatan memperkenalkan produk tersebut di pasaran memberi kesan keatas keseluruhan jadual pembangunan dan pemasarannya. Ini memberi impak yang besar dari segi kos pembangunan secara keseluruhan. Bagi membina produk yang bagus didalam lingkungan peruntukan yang diberi, seseorang jurureka mestilah mempunyai kaedah atau alat pemudah cara dimana ianya dapat menentukan kos sesuatu produk itu secara langsung. Seandainya kos ini tidak dapat ditentukan seawal mungkin, kos-kos pembetulan terpaksa ditanggung jika berlaku kesilapan rekabentuk atau rekabentuk produk tersebut melebihi peruntukan yang ada. Ini dapat dielakkan dengan adanya satu perisian yang dapat mengira kos produk dengan tepat dan cepat.

Satu perisian computer telah dibangunkan disini dengan mengambil kira factor-faktor yang mempengaruhi kos produk, penetapan nilai aritmatik perisian, membentuk papancara perisian yang mudah difahami menggunakan perisian VB6, sistem untuk menilai tahap kecekapan perisian baru ini dan aras ketepatan pengiraan yang dilakukan

Dari penilaian pasca-perisian, didapati perisian baru ini mampu memberi ketepatan bacaan seperti yang ditetapkan. Namun beberap aspek penambah-baikkan telah diberi penekanan dan akan dimasukkan didalam perisian versi yang akan datang.

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CHAPTER 1

INTRODUCTION

1.1 Introduction to the Problem

Product design and geometry are significantly reflected to the manufacturing cost. Based on concurrent engineering concept, product cost analysis is being established at earlier stages. The estimated cost is then used to set the costing foundation for cost negotiation with vendors.

With the widely usage of design for assembly (DFA) and design of manufacturing (DFM) methodology, designer is capable to simplify the product design in-order to reduce assembly time and manufacturing cost. However, the overall product cost is only being estimate after completed design evaluation. By then, if the part cost is above the required target cost, designer has to simplify the product design in-order to meet the target.

What if the designer himself is able to estimate the product cost while he is still designing the part (no need to wait until design complete) in real-time? A type of system is required to assist the designer in promptly and accurately determine the part cost. The system should be able to aid the designer in designing product with more competitive price and designing the product according to target cost, not vice versa.

1.2 Objective of Study

To develop the prototype cost analysis system for plastic injection moulding in the environment of Concurrent Engineering.

1.3 Scope of Study

The scopes of study for this project consist of:

- 1) Costs on part, machine rate, material cost, manpower will be considered.
- Mould calculation is not included by assuming mould cost is on up-front payment based.

- Mould cost is assumed not to be amortized into the part cost.
- The prototype version, only involves limited type of materials

2) Small and Medium Industry (SMI) companies being invited to joint in the project and data gathering. 4 companies that involved in this project are:

- Yato Precision Engineering Sdn Bhd. A Malaysian company based in Kajang, Selangor that involved in precision plastic injection moulding and rubber injection and compression moulding for electronic industries including Canon and Sony-Ericsson.
- Shinko Asia (M) Sdn Bhd. A Japanese company based in Petaling Jaya, Selangor. Their main product is name plate for electronic industries such as for JVC and National Panasonic and automotive emblems for Toyota.
- Takahata Precision (M) Sdn Bhd. A Japanese company based in Cheras, Selangor. Their main product is precision plastic injection moulding for electronic industries including for Toto Electric and Canon.
- CPI (KL) Sdn Bhd. A Malaysian company based in Sri Kembangan, Selangor. Their main product is precision plastic injection moulding for electronic industries such as JVC and

Canon, and for automotive industries including for Perodua and Proton.

3) Use of NX3 Unigrahpic design software for part volume and weight information Software develop will not directly integrate into the NX3 Unigrahpic software due to intellectual properties related issue and different software platform.

4) Use of Visual Basic 6 software for prototype development. Easy to use, object oriented software Easy to use, object oriented, event-driven programming and integrated development environment (IDE) from Microsoft. Easy to learn and use BASIC programming language.

1.4 Project Methodology

This project is being divided into two parts; part one (to be completed in first semester) and part two (schedule to be completed in second semester). Activities for part one consist of project overall schedule preparation, Gantt chart preparation for both semester, literature review on current study in cost estimation technique and review on commercially available cost estimating software. The understanding on Visual Basic 6 and NX3 Unigrahpic software are were established as a preparation for prototype software development in second semester.

Prototype software will be developed and established in second semester, together with its evaluation and system improvement. Project discussion and complete thesis writing will be presented at the end of semester. Appendix 1 shows the overall project schedule while Appendix 2 shows the Gantt chart for both semesters.

1.5 Report Structure

This report consists of 5 chapters. Chapter 1 covers project objectives, scopes and project methodologies. Chapter 2 reviews on the literature reviews which include current study related to the topics and review on existing software. Chapter 3 explains the prototype software development including software mapping and process flow. Arithmetical Cost Modeling also being suggested in this chapter, and finally the user interface layout are being introduced. Chapter 4 presented few case studies consecutively to evaluate the prototype results and calculation accuracy. It is being carried out by comparing few plastic injections moulding part actual cost (from an official quotation) with cost calculated by the prototype software. The cost difference between these two costs should be within the declared accuracy range. Finally, Chapter 5 will suggest future improvement that can be made in order to increase the prototype software function and calculation accuracy.

1.6 Summary

This chapter presented the overall review of the project. This includes the introduction to the problem, objective of study, scope of study, prototype software development, evaluation and future recommendation being elaborated.

The objective of this project is to develop a prototype system that promptly and accurately calculate part cost for plastic injection moulding. In order to do this, firstly need to do various literature reviews that also include preview on existing cost calculation software currently available in market. These reviews will be explained in Chapter 2.