# BORANG PENGESAHAN STATUS TESIS

JUDUL: DATA LIBRARY IN MANUFACTURING (CUTTING TOOL) SYSTEM

SESI PENGAJIAN: 2007/2008

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# DATA LIBRARY IN MANUFACTURING (CUTTING TOOL) SYSTEM

## HAFIZAH BINTI HAMZAH

This report is submitted in partial fulfillment of the requirements for the
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FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
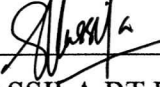UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2008

# DECLARATION

I hereby declare that this project report entitled

**DATA LIBRARY IN MANUFACTURING (CUTTING TOOL) SYSTEM**

is written by me and is my own effort and that no part has been plagiarized
without citations.

STUDENT: _____ Date: 30/04/08

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SUPERVISOR: _____ Date: 30/04/08.

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# ABSTRACT

Data Library in Manufacturing (Cutting Tool) system or DLIMS is a standalone application. The system allow user to access information and help user to make decision on cutting tool selection. The purpose this system is designed is to overcome the problems on cutting tool selection faced by user in manufacturing sectors such as technician, practitioners and also students. With this system, hopefully it will help users to retrieve information on cutting tools easier and also to make wiser decision on cutting tool selection. DLIMS will be developed on Visual Basic.Net platform with Microsoft SQL Server as the database. The advantages using Visual Basic.Net is that it can be use to develop both standalone and web based system and the interface can be design and modify easily.

# ABSTRAK

*Data Library and Manufacturing (Cutting Tool) system* adalah sebuah aplikasi sistem yang dibangunkan secara *'standalone'*. Sistem ini dapat memberi maklumat mengenai *'cutting tool'* kepada pengguna dan membantu pengguna untuk membuat keputusan dalam pemilihan *'cutting tool'* yang bersesuaian untuk proses-proses tertentu. Sistem ini direka untuk membantu pengguna untuk mendapatkan maklumat berkenaan dengan *'cutting tool'* dan juga dalam penyelesaian masalah ketika proses pemilihan *'cutting too'l*. Dengan adanya sistem ini, diharapkan agar dapat membantu pengguna dalam pencarian maklumat dan juga dalam pemilihan *'cutting tool'* yang bersesuaian sekaligus dapat menyelesaikan masalah yang dihadapi pengguna dan sekaligus menjimatkan masa pengguna. Sistem ini dibangunkan menggunakan Visual Basic.Net dan Microsoft SQL Server sebagai pangkalan datanya. Kelebihan Visual Basic.Net adalah ia dapat digunakan untuk membangunkan sistem secara *'standalone'* mahupun secara beasaskan web. Selain itu, antaramuka sistem juga dapat direka dan diubahsuai dengan mudah.

# CHAPTER I

# INTRODUCTION

## 1.1    Project Background

Manufacturing is the application of tools and a processing medium to the transformation of raw materials into finished goods for sale (Kalpakjian & Schmid, 2006). This to-be system will be used in manufacturing industry to help the user to select the best cutting tools that can be used to perform the desire operation based on input given by users. It also will provide user with information on cutting tools that can be used in manufacturing their products. It also can act as an advisor to user by suggesting them the best cutting tools that can be used. This to-be system can be a good source for technicians, practitioners and manufacturing students to get information and also for those who tends to get help on choosing suitable tools.

## 1.2    Problem statement(s)

Based on some observations and research done, currently there is no system used by the manufacturing sectors on choosing suitable cutting tools. Manufacturers normally select the cutting tools that will be used for the cutting operation manually. Besides, the information of cutting tools can only be found in form of catalogue, handbook, journals and papers. This factors will leads them to take longer time to make decision on selecting the most suitable cutting tools to cut the material or also known as workpiece because all the sources required user to scan the information by themselves (Arslan, Catay & Budak, 2004). It also might raise the cost of manufacturing a product if the wrong cutting tools are selected for the cutting process (Arslan, Catay & Budak, 2004). Other than that, the quantity of the sources available might be very limited. Therefore, if a person is using the catalogue or handbook, other person has to wait before they can use the source. This to-be system that will be developed will solve all of the problems stated above and to provide information on cutting tools. With this to-be system, all information on cutting tools will be store in the data library to ease data retrieval and to help user on finding information and making decisions accurately and faster.

## 1.3    Objective

The objective(s) this to-be system is developed are:
  i)   To develop a system which will provide users with information on cutting tools for manufacturing a product.
       - System will provide user with cutting tools information such as tool name, type, size, description etc.

  ii)  To define the best cutting tools that can be use to cut a material.

- System will give suggestion to user on what type of cutting tool can be use together with some other details on the cutting tool based on some details input by user.

iii) To help user to minimize searching time for cutting tools selection
- Minimize the time when searching for the correct cutting tools that should be use for cutting the material or workpiece.

## 1.4 Scope

Scopes of the project are as follows:

i) Common type of operation for cutting a material or workpiece.
- Provide information on cutting tools for several types of operations.
- Provide selection of tools.

ii) The help user discover the best decision in cutting tools selection
- The system will provide suggestion to user on the most suitable cutting tools can be used by the user based on user input. This will help user to make the best decision.

iii) User
- Student
- Practitioner
- Technician

## 1.5    Project significance

The significance of this project is to ease user in choosing the correct cutting tools. On the other hand, it will help to reduce the potential of selecting the wrong tools or unsuitable tools for a cutting process which might leads user to expense more cost on making the products. Besides, with this to-be system, it helps user to minimize time on searching for the correct tools. Meaning user do not have to go through cutting tools catalogues, handbooks, journals or papers just to find out which tools is the most suitable to be used for the cutting process. Besides, this to-be system can help user; students on getting information about cutting tools. This to-be system will be developed as a standalone software system where user can easily install it directly to their computer.

## 1.6    Expected Output

This system is expected to be delivered as software system. The system should be able to produce accurate information about cutting tools. It also should be able to provide user with list of cutting tools type that can be used by user based on data that will be input by user. The system also should be able to come out with a suggestion to user about the best selection of cutting tools rely on the factors involve in selection.

## 1.7 Conclusion

As a conclusion, when the new system is fully implemented it will definitely help the potential user to make the best decision on selecting the best and the most suitable cutting tools for the cutting processes. Each cutting tools list out by the system are based on the details entered by user and it will come along with a suggestion. Therefore, with this system user can find the right cutting tools together with its information in minimum time and in an easier way.

The next chapter would be focusing on the literature review and project methodology that will be used to develop this project.

# CHAPTER II

# LITERATURE REVIEW AND PROJECT METHODOLOGY

## 2.1    Introduction

This chapter will focuses on literature review and project methodology. The literature review is focused on the domain background of the system, some information on existing system and also research on the new system.

The domain of this system is manufacturing. Manufacturing is the application of tools and a processing medium to the transformation of raw materials into finished goods for sale. According to Cagdas, Bulent and Erhan (2004), the cutting tools selection is an important decision making process in any manufacturing companies. To manufacture a product, many different cutting tools are involved, from deep hole drills to the smallest ball nose mills (Cakir, Irfan & Cavdar, 2004).

In addition, according to Cakir, Irfan & Cavdar (2004), previous effort on CAD/CAM systems in manufacturing was focused on the geometric aspect of tools path generation and there is no such information like type of cutting tools can be determined by CAD/CAM systems or no cutting tools can be selected by

these system either. The only source to get this kind of information is the years of experience in manufacturing.

Therefore, a computerized system is developed to solve problems regarding to cutting tools selection for manufacturing. Data library in manufacturing (cutting tools) will guide user through selection of cutting tools process besides giving user information on cutting tools for manufacturing a product.

## 2.2    Facts and findings

### 2.2.1   Domain

The domain background of this project is manufacturing and specific to cutting tools. Before selecting a cutting tool, there are a few factors need to be consider by a user.

Among the factors need to be consider and study by user are about what kind of process they wish to do, what type of material they want to use, type of operations user want to perform and others.

To get precise information about all this factors, an interview with manufacturing person/expert will be conducted. Other than that, the types of cutting operation and types of cutting tool also needed to be study deeply.

## 2.2.2  Existing System

i. **Decision Support System for machine tool selection**

According to Arslan, Catay & Budak (2004), a machine tool selection is an important decision-making process for many manufacturing companies. Improperly selected machines can negatively affect the overall performance of a production system. One of the major challenges in machine selection process is the lack of a standard format in the machine catalogues. Therefore, a knowledge-based system is developed to overcome machine tool selection problems. This system will guide the selection process and help a decision maker solve the selection problem.

ii. **Decision Support System for machining center selection**

- This system is a user-friendly and object-oriented decision support software system for the decision making process involved in machining center selection. This decision support system was built in Microsoft Excel file and Visual Basic. The system was built because of the continuous difficulties with respect to machine tool specifications and associated pricing for customers of a machine tools sale organization (Gopalakrishnan, Yoshii & Dappili, 2004). The system included several aspects for machining center selection. User are requires to enter some input based on several criteria and the system will come out with a suggestion.

iii. **Expert System for die and mold making operation**

- The purpose this expert system was developed is for guiding the die or mold makers and to give optimum solutions in selecting the tool type, workholding method, machining method and etc (Cakir, Irfan & Cavdar, 2004). This expert system provide information on the available tool type that can be use to machine the surface type chosen

by user, miscellaneous information about the recommended tool, workholding method, direction of feed, method of machining, depth of cut and offset values and also miscellaneous information about machining operations.

Based on the system found from journals and research papers, there is no cutting tools software systems exist in manufacturing sectors that can help users with cutting tools selection. Most of the system found focused on the various aspects of machine tools only. This to-be system, data library in manufacturing (cutting tools) is similar to the three systems describe above, only it focused on the cutting tool selection.

## 2.2.3  Technique

The methodology that will be use for developing this system is Structured System Analysis and Design (SSADM) using the waterfall model. The reason SSADM is chosen for the project methodology is because SSADM use the Data Flow Diagram (DFD) to model the logical information flow of the system, determination of physical system requirements, simplicity of notation and establishment of manual an automated systems requirements.

The advantages of DFD are early understanding of system technical implications, establishment of inter-relatedness between business and systems, user involvement with system development determine if data and processes have been defined properly.

There is also other methodology and approach that is suitable to develop this system such as Object-Oriented Analysis Design (OOAD) using the Unified Modeling Language (UML). One of the different between SSADM and OOAD is, SSADM use DFD to model the system while OOAD use the UML diagrams

such as use case, sequence diagram and etc. OOAD is more suitable for a web-based system.

## 2.3    Project Methodology

A methodology is a collection of procedures, techniques, tools and documentation aid which help system developers in developing a new information system. (Maddison, 1983), define methodology as a collection of philosophy, phases, procedures, rules and techniques. According to Maddison's definition, a methodology has number of components which specify (Maddison, 1983):

- How a project is to be broken down into stage
- What task is to be carried out at each stage
- What constraints are to be applied and what support tools may be utilized

### 2.3.1    Structured Systems Analysis and Design (SSADM)

SSADM also provides with range of techniques which can be used to model, describe and develop existing and required systems. The technique is as follows:

- Data flow modeling - represent flows of information through a system
- Entity event modeling - describe effect of events which changes data in a system
- Requirement definition - identify requirements which meet the needs of the users and the business.

Because of SSADM's structural integrity it is regarded as one of the effective methodology for developing a system from complete scratch (Lejk, Meldrum & Guy, 1993)

## 2.3.2    Benefit using SSADM

The advantages of SSADM:

- The planning is easier with SSADM structured framework
- Well documented procedures and methods is widely practiced elsewhere
- Improves the quality of the systems accurately identifying user needs
- Documentation produced is clear and understandable
- By providing standard framework, it is useful for trainees and experienced analysts
- Stages can be break down which is useful for team work
- Suitable for medium and large sized projects
- Quality assurance is provided by the documentation standards, clear and detailed guidelines.

(Meldrum, 1993) (Linecar, 1994) (Donald & Tony, 2004)

## 2.3.3    SSADM with traditional SDLC

SSADM puts emphasis on the analysis and design stages of the terms in Software Development Life Cycle or SDLC is a conceptual model used in project management that describes the stages involved in an information system development project. SDLC consist of six stages as per shown on figure below. It is modeled using the waterfall model.

The relationship of each stage to the others can be roughly described as a

waterfall, where the outputs from a specific stage serve as the initial inputs for the following stage. During each stage, additional information is gathered or developed, combined with the inputs, and used to produce the stage deliverables.
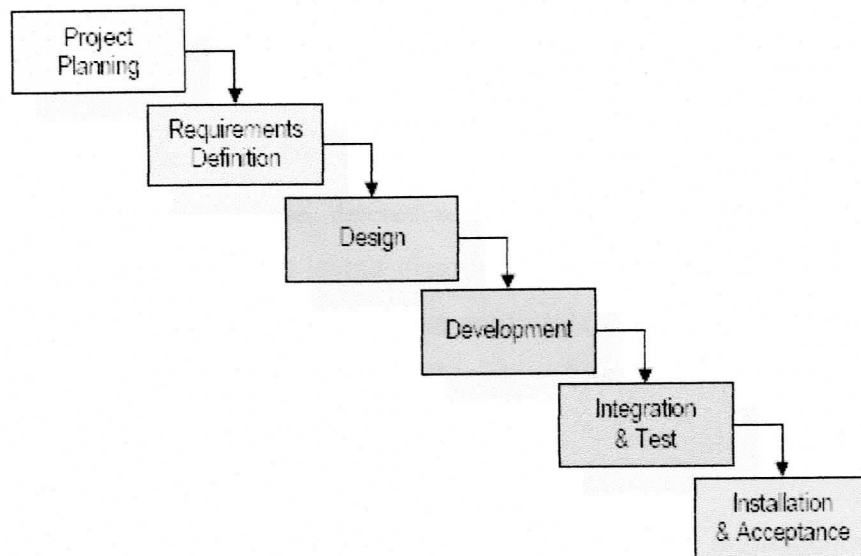


**Figure 2.1: Software Development Life Cycle**

**Project planning phase**
- The planning stage establishes a bird's eye view of the intended software product, and uses this to establish the basic project structure, evaluate feasibility and risks associated with the project, and describe appropriate management and technical approaches.
- At this planning phase, research on cutting tools is done. The objectives, scopes as well as the software and hardware requirements are defined. Milestone and project schedule is produced as a guide through the project development.

**Requirements Definition phase**
- The requirements gathering process takes as its input the goals identified in the high-level requirements section of the project plan. These requirements define the major functions of the intended

application, define operational data areas and reference data areas, and define the initial data entities.

- During this phase, the system requirement is analyzed. The major function of the system is to provide user with information about cutting tools and suggestion on cutting tool selection.

**Design Phase**

- During design phase, desired software features in detail; system data flow diagrams, screen layout diagrams, tables of business rules, business process diagrams and a complete entity-relationship diagram with a full data dictionary of this system will be described.

**Development Phase**

- During the development phase, the system will be implemented/coded on the Visual Basic.Net platform and Microsoft Sql Server as the database platform.

**Integration and Test Phase**

- At this point, all test cases are run to verify the correctness and completeness of the software. Successful execution of the test suite confirms a robust and complete migration capability.

**Installation and Acceptance Phase**

- During this phase, the system will be installed at user environment. After the end user has verified that the initial production data load is correct and the test suite has been executed with satisfactory results, the user will formally accepts the delivery of the system.

## 2.4 Project Requirements

### 2.4.1 Software requirement

This system will be develops using:
  i.    Visual Basic.net – as the software platform
  ii.   Microsoft SQL Server – used the create database and store all data
  iii.  Microsoft Project – used to create project gantt chart/schedule
  iv.   Microsoft Visio– used to model all the system diagrams
  v.    Microsoft Word – for project documentation

### 2.4.2 Hardware requirement

The project will be carried out using a computer with below requirements:

**Table 2.1: Hardware Requirement**

| | |
|---|---|
| **Random Access Memory** | Minimum 256MB |
| **Processor** | 2.4GHz |
| **Hard Disk** | Minimum 40GB |
| **Monitor** | Maximum resolution |

### 2.4.3 Other requirements

- Keyboard
- Mouse
- Printer

## 2.5 Project Schedule and Milestones

Refer to Appendix A for the project Gantt Chart.

## 2.6 Conclusion

As a conclusion, this chapter has covers the literature review and project methodology. The methodology that will be used in developing the system is Structured Systems Analysis and Design (SSADM) with waterfall model. The benefits of the selected methodology and task description for every stages in the waterfall model has been discussed in this chapter. The next chapter will explain about the analysis phase of the system development.

# CHAPTER III

# ANALYSIS

## 3.1    Introduction

In this chapter, it will focus on the system analysis. After doing the literature review and define the project methodology for project requirement, analysis is the most important chapter in this report. This chapter will start by describing the problem analysis. It will discuss and also identify the user requirement in current system and propose system to solve the problems. Through this analysis chapter, it can help to determine the user problems. The requirement analysis will explained about the flow and process to develop this system. The flow of this system will be diagram using the Data Flow Diagram.
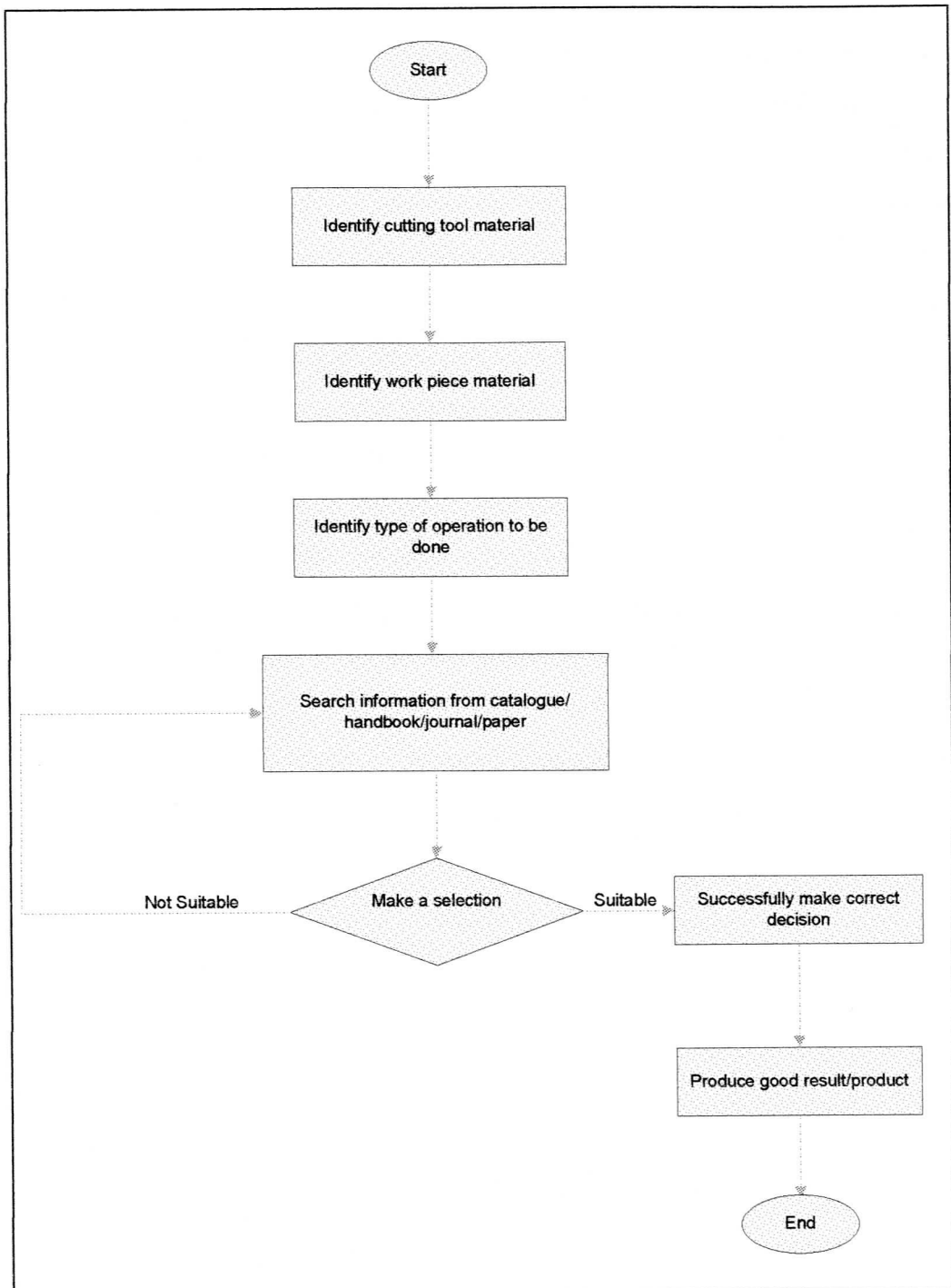
## 3.2    Problem analysis



**Figure 3.1: Current system business flow for cutting tool selection**

The business flow in figure 3.1 shows the current system flow for cutting tool selection. Firstly, user will have to identify what kind of cutting tool material they are using. Then, user must identify the workpiece or material and the type of operation they wish to perform for example drilling, face milling, end milling, finishing or roughing. From all the information user has gathered, they will have to find a suitable cutting tool in order to perform the cutting process. Information of cutting tool can be found in form of catalogues, handbooks, journals and papers. After going through the sources, user then will come out with a decision on which cutting tool they wanted to use to cut the material. For the experienced user, cutting tool selection may be easier and accurate because of the experience the gain from the field. But the selection process could be very difficult for the beginners like practitioners and students. This kind of user is normally lack of experience and knowledge on cutting tool selection. Therefore, they might make mistake by choosing the unsuitable cutting tool for the cutting process. If the user has made the correct decision, they will end up by producing a good product/result. But if the unsuitable cutting tool is selected, user will have to refer back to the cutting tool sources and make another decision. This process may cause waste of time because user will take long time to go through books and catalogues in order to find the right cutting tool. Furthermore, if the unsuitable cutting tool is used for the cutting process, it may cause user to produce lower quality of product or might rise up the cost of producing the product and also may lead to scrapped product.