INVENTORY INFORMATION SYSTEM FOR FACULTY OF ENGINEERING

By

Ms. Pajaree Suphatharawisal

Final Report of the Three - Credit Course
CS 6998 System Development Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer Information Systems
Assumption University

November, 1998

Inventory Information System for Faculty of Engineering

by
Ms. Pajaree Suphatharawisal

Final Report of the Three-Credit Course
CS 6998 System Development Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer Information Systems
Assumption University

November 1998

Project Title	:	Inventory Information System for Faculty of Engineering *The tittle has been changed according to the final approval the committees.
Name	:	Ms.Pajaree Suphatharawisal
Project Advisor	:	Dr.Sudhiporn Patumtaewabal
Academic Year	:	1998

The Graduate School of Assumption University had approved this final report of the three-credits course, **CS 6998** System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information Systems.

Approval Committee :

(Dr.Sudhiporn Patumtaewapibal)
Member and Advisor

(Prof.Dr.Srisakdi Charmonman)
Chairman

(Air Marshal Dr.Chulit Meesajjee)
Dean and Co-Advisor

(Assoc.Prof.Somchai Thayarnyong)
MUA Representative

November 1998

ABSTRACT

This project was written to submit for the CS 6998 System development project that addresses the Inventory Information System. This project is separated into three parts are the system analysis, system design and system implementation.

The system analysis is in chapter two that analyzed the business functions and current problems in order to identify the areas of improvement. The system design is in the chapter three that identifies the user requirements and then design the proposed system such as hardware and software requirements including the security and control of the proposed system. Before moving to the system implementation, we determined the cost /benefit first which helps to determine the investment of the proposed system. In chapter four illustrates the testing, conversion and implementation of the new system.

We hope that the reader can use the benefits from this project to apply in their requirements.

ACKNOWLEDGEMENTS

The writer desires to express her most sincere appreciation and thanks to Dr.Sudhiporn Patumtaewapibal who is the dean of the faculty of engineering - for his encouragement and advice through out the course of this study and for his help in the preparation and writing of this project.

My thanks go to A.Roongsri Waungwittawut who is the secretary of the engineering faculty, and to the staff of the engineering laboratories at Assumption University supplying the source of information for this work.

The writer is grateful to her parents for their support of this study.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

The growth of computer and information technology continues unabated. In fact, the rate of growth is accelerating. Information technology is bringing changes in organization even more dependent than in the past on the knowledge, learning, and decision making. Although these technologies affect nearly all aspects of human endeavor, the emphasis of this project is on the use of these technologies to manage and operate enterprises.

The latter field is now called *Information Systems* that combined informations about the technologies, people, processes, and organizational mechanisms within the organization and its environment for the purpose of improving organizational performances.

In general, there is a much greater need to plan for the overall information architecture of the organization. The kinds of systems built today are more important for the overall performance of the organization, especially in today's highly globalized and information-based economy; technologies have become more powerful and more difficult to implement; and new applications require intense information between professional technical experts and general management.

1.1 Background of the Project

The topic of this project is called *Inventory Information System for Faculty of Engineering*. This project is a part of CS 6998 System Development Project subject. It is used to describe the information systems of inventory systems for faculty of engineering.

An information system is an organizational and management solution, based on information technology, to a challenge posed by the environment. Designing and using information systems effectively requires an understanding of the organization, management, and information technology shaping the systems.

Thus, using information systems in the inventory system development will help the firm get better performance both in the management of the executives and in the operation of the staffs.

1.2 Objectives

The objectives of this project focus on inventory system of engineering faculty's laboratory in the following :

- To study and analyze the problems of the original inventory system.
- To understand problems and requirements of the users.
- To design the new appropriate system in order to serve the specific requirements.
- To control and allocate the proper budget for an expenditure of the engineering laboratory in each time.
- To produce reports for the decision making by the management.
- To implement the new application for the most efficiency and effectiveness.

1.3 Scope

The scope of this project covers the major parts of the inventory system in the following:

- To edit and update the equipment record of each laboratory.
- To summarize the total costs, the total quantities, and the total name lists of equipment in each year.
- To categorize the list of the depreciation equipments and of the office supply equipments.
- To categorize the list of the new equipments and of the replacement equipments.
- To do the damaged equipment items in each year includes equipments that are sent to repair.
- To do the list of the office supply equipments that is provided for routine in each month.
- To do the new equipment items for name lists, classes, brands, quantities, and prices.
- To summarize an expenditure item and the total budgets for each year.
- To do the forms and the reports, and print them out to the administrative office and the executive of engineering faculty.

A principle objective of the Faculty of Engineering is to develop engineers who have academic and hands on experience in the most recent technologies.

1. Dynamic, pedagogical experienced and research oriented international staff.
2. Laboratories equipped with the most advanced technologies.
3. Emphasis on English skills as the medium of instruction.
4. International collaborations and opportunities.
5. Quality controlled education.

Each level of management in the Faculty of Engineering will be shown in the organization chart (Figure A.1.).

The Faculty of Engineering of Assumption University consists of the many lab facilities that will provide the necessary practical experience and a unique overview of the most recent technologies and managerial skills. The details of each laboratory are as follows:

Broadband Telecommunication Lab

BTL focuses on the modeling and design of optical and microwave communication systems, electromagnetic modeling, IC technology and network modeling and design. It contains quite a lot of software packages (Pspice, Opnet, Matlab, C++, Labview, web server, Java, etc.) and measurement equipment (network analyzer with S-parameter test set, spectrum analyzer, RF generator, digitizing oscilloscope, optical spectrum analyzer, optical equipment like lenses, light sources, detectors and fibers, microwave link, etc.). The staff is very research oriented and there are lots of project possibilities.

Communication Lab

Basic communication circuits like digital FSK, ASK and PSK modulators, phase locked loops, active filters, analog AM, FM and PM modulators, wire antennas, encoding, internet technology, and etc. are being studied. More advanced systems like microwave systems and network modeling software (OPNET) are also being included in the labs.

Computer Lab

Nowadays software and Internet knowledge are seen as basic skills for an engineer. In the Computer Lab students learn how to program in C++ and Assembly Language, how to develop a web site and how to configure the personal computer or workstation.

Digital Lab

Communication systems and personal computers contain quite a lot of digital hardware. In this lab students are made familiar with the most common digital components and with more advanced components like micro-controllers and microprocessors.

Electronics Lab

The basic active circuits like BJT and FET amplifier circuits, rectifiers, opamp circuits, active filters, and etc., are thoroughly studied in numerous electronic labs. These labs are also used to gain practical experience with telecommunication circuits. Software modeling (SPICE) of the circuits will become an integral part of the labs and will enhance the insight and knowledge of the students.

High Speed Communication Network Lab

This lab consists of a high speed ATM-switch (155 Mb/s or OC-1), network management software, network analyzer or sniffer and network modeling software (OPNET). This network will be used and configured for realistic traffic conditions so that the students will have hands on experience in the control, design and measurement of the most recent data transfer technology.

Power Electronics Lab

This lab is equipped with the latest state of the art technology. It includes Siemens Power Electronics and Drive Technology consisting of uncontrolled rectifiers, controlled power converters, microprocessor controlled 4 quadrant drives, DC drive, AC drives with pulse width modulator and frequency converter with interface, single phase mosfet transistor bridge inverters, microcomputer controlled motors, switching mode regulators and switched mode power converters. It has software such as Labview, Pspice, Matlab and Simulink. Some more advanced Power Electronics training systems including chopped drives, thyristor controlled power factor improvement systems, and converters for wind and solar energy are also being acquired.

2.2 Existing Business Functions

As mentioned, the Faculty of Engineering at Assumption University is divided into many laboratories. Each laboratory is a place to do the experiments of students in each class and to keep much equipments for the experiments both the depreciation and the office supply equipments. In general, each laboratory has one staff, but some staff may control two laboratories. The staff serves the functions of lecturer's assistant in each class, inspects the equipment, maintains the equipment, prepares the equipment, and others.

Engineering laboratories are interrelated with the administrative office, the purchasing department, the supplier, and the student. As shown in Context Diagram (Figure A.2.).

The inventory systems of the engineering laboratories consist of eight processes in the following:

- Process 1 : Verify Outline
- Process 2 : Check Equipment
- Process 3 : Prepare Equipment
- Process 4 : Repair Equipment
- Process 5 : Purchase Equipment
- Process 6 : Request Equipment
- Process 7 : Inspect to hold Equipment
- Process 8 : Print Equipment Report

The details in the processing of the inventory system in the engineering laboratory are shown in Data Flow Diagram Level 0 (Figure A.3.).

Firstly, the staff verifies an outline experiment to list the names of equipment that is used in that experiment. After that he will verify the inventory to check the equipment and prepare it for the students in each class. After that, if the staff finds that there is damaged equipment, and if he can repair it by himself, he will do it. The repaired equipment will be kept in the laboratory. But if he cannot repair it, he will ask for permission to repair from the administrative office by using the purchase requisition form. And he will take the signed form and the damaged equipment to the purchasing department.

But if the staff finds that the equipment is not sufficient for that experiment. He asks for permission from the administrative office to purchase the equipment. In case that the staff goes to buy equipment by himself since the equipment is not expensive, he submits the voucher form to the administrative office in order to ask for permission. After permission, the staff will take money to purchase the equipment from the supplier. Then he will take the receipt to the administrative office. If the equipment is expensive, the staff will submit the purchase requisition form to the administrative office. When the executives permit, the staff takes the signed form to request the purchasing at the purchasing department.

After the supplier delivered both the new equipment and the repaired equipment, the purchasing department will call the staff to go and receive that equipment. The staff who got the equipment will always inspect the equipment. And then the staff keeps all the equipments in the laboratory and enters only the new depreciation equipment record into the equipment file.

Every semester, the staff prints the report of the existing quantity and the expected quantity of the depreciation equipment out to the administrative office.

2.3 Current Problems and Areas for Improvements

There are a number of problems that occur within any organization. The problems may be top-down (from upper management) or bottom-up (from people who use the system in the conduct of their day-to-day activities), the same as the inventory system at the engineering laboratory.

Seeing that most existing system is controlled by the manual system, there are many current problems. In the engineering laboratory, the inventory system is not good

enough to collect various data. No good system causes the delay and errors in the process. The staff who controls the laboratory keeps only the names and quantities of the depreciation equipment that is used in the present time and that is expected in a later year. Thus, the executives and staff do not exactly know the details of data. For example, the management does not know the following:

- When the staff gets the new equipment
- Whether the suppliers deliver the equipment or not
- What the staff buys in each year
- How many staff purchases the equipment
- How much the equipment cost
- How many each laboratory has the damaged equipment each year
- When the staff purchases the new equipment
- When the staff buys to replace the damaged equipment
- What the staff buys in routine
- Which brand the staff buys

In addition, some equipments purchased for laboratory is not used in any experiments. So each laboratory has over stocks that cause to loss in cost.

As mentioned about the current problems, it is appropriate that the inventory system of the engineering laboratory should be developed into a good computerized system. And the system must be analyzed and designed to meet the expectations and the requirements of the executives and staff. The improved area will help the executives and staff to obtain the following:

- The summary list of the total costs of equipments in each year
- The summary list of the total quantities of equipment in each year

- The summary list of the total names list of equipment in each year
- The list of the new equipments and of the replacement equipments
- The item of the damaged equipments each year
- The item of the damaged equipments that sent to repair each semester
- The summary items of an expenditure and the total budgets each year
- Many forms and reports that involved the engineering laboratory

That good system will help the staff to save the time and get accurate information in the process. Furthermore, many forms and reports that are related to the engineering laboratory will help the executives make the decision effectively. Then the improvements for the problem areas are very important.

2.4 Existing Computer Systems

Currently, the existing system of the engineering laboratory is not a fully computerized system. Namely, the staffs use Microsoft Excel to collect data for basis equipments only. The staff uses this application to process that information and produce the report for the administrative office in each semester. In that report, there are only the names and quantities of the depreciated equipments that are used in a present time and that is expected at a later year.

The software specification in the engineering laboratory is as follows:

- MS-Dos version 6.0
- Microsoft Windows 95 Thai Edition
- Microsoft Office 97 for Windows 95

For the hardware specification in the engineering laboratory in the following:

- Computer 1

  Pentium 100

  HardDisk 3.2 GB

  Ram 16 MB

  DiskDrive 1.44 MB

  Monitor 14 inches

  Keyboard 104 keys

  Mouse

- Computer 2

  80486SX

  HardDisk 1.7 GB

  Ram 16 MB

  DiskDrive 1.44 MB

  Monitor 14 inches

  Keyboard 104 keys

  Mouse

- Printer

  Hewlett Packard LaserJet 4P

III. PROPOSED SYSTEM

After the existing business functions are analyzed and the current problems are identified, then the proposed system can be designed to meet the user requirements. In order to define what the new system is able to do, all the data collected during the study of the existing system should be reviewed.

3.1 User Requirement (System Specifications)

The object of defining the new system requirements is to assemble an overall picture of the inputs, outputs, operations, and resources required by the system to meet the present and future needs of the organization.

The user requirements are derived from the executives and staff by interviewing and from the existing system evaluation. Those requirements are defined as follows:

- The system should be easy to use (user friendly).
- The system should give accurate information.
- The system should be reliable and consistent.
- The system should save the time in processing work.
- The system should give the result on time when users need.
- The system should be easy-to-search information.
- The system should have better performance in processing in each job.
- The system should produce many reports to support decision-making.

3.2 Systems Design

Now this project moves forward into the system design process (how the system will do it). Systems design is concerned mainly with the coordination of activities, job procedures, and equipment utilization in order to achieve organizational objectives.

The objectives of the systems design are to convert the user requirements into a computerized system to improve operations, planning, controls, and decision making in the inventory system of the engineering laboratory.

The context diagram, data flow diagram, and current problems of the existing system and the user requirements are used as the main for the proposed system development. The proposed system is in the context diagram (Figure B.1.) and the data flow diagrams (Figure B.2. to B.7.).

The inventory systems of the engineering laboratories consist of nine processes as follows:

- Process 1 : Check Equipment

  Staff takes the equipments list that will be used in each experiment to check with equipment that is in the laboratory.

- Process 2 : Prepare Equipment

  After staff checks equipment, he will prepare it for the students in each class.

- Process 3 : Repair Equipment

  If staff finds that there is a damaged equipment and if he can repair, he will do it.

- Process 4 : Purchase Equipment

  In case of insufficient office supply equipment and staff does not want much, staff will submit the voucher form to ask for permission from the administrative office, and he will take cash to buy the office supply equipment from the supplier by himself.

- Process 5 : Request Equipment

  In case of insufficient depreciation and office supply equipments and staff wants it very much and the damaged equipments which staff cannot repair, he will submit the purchase requisition to request purchasing or repairing from the administrative office.

- Process 6 : Inspect to hold Equipment

  Staff will inspect to hold equipment every time he receives equipment from the supplier and the purchasing department. And he will sign on the receipt requisition to confirm the receipt.

- Process 7 : Add New Equipment Record

  After staff received new equipment, he will list the names of new equipment. Then staff will add new depreciation equipment record into the depreciation equipment file, and add new office supply equipment records into the office supply equipment file.

- Process 8 : Update Equipment Record

  After staff received repaired equipment and replacement equipment, he will list the name of equipment. Then he will update the repaired equipments record and the replacement depreciation equipments record into the depreciation equipment file. And staff will update the replacement office supply equipment record into the office supply equipment file.

- Process 9 : Produce Management Reports

  Staff produces many reports to follow the period of time for the management.

3.2.1 Database Design

The database design of the proposed system should be designed for the need of users and for the goals of database design are as follows:

- A database should provide for the efficient storage, update, and retrieval of data.
- A database should be reliable. The stored data should have high integrity to promote users trust in that data.
- A database should be adaptable and scalable to new and unforeseen requirements and applications.

To meet the goal of database design, we use the relational database in this project. We determined files and database requirements. In this step, we usually provided E-R diagrams and files and database considerations have been carefully thought through. The next step is to specify specific file relations and records, to make file protections, and to determine the impact of the design on file storage devices.

3.2.2 Input Design

Following the completion of the preliminary design (including its review for technical and functional accuracy), the system analyst should design input design of the proposed system by following the user requirement. In addition, input requirements may have been defined during systems analysis. A good starting point for input design is the design unit data flow diagram (DFDs) for the new system.

After the system analyst gets the users requirements from the users then the system analyst start designing input screen, and system analyst should consider the rules as follows:

- Inputs should be as simple as possible and designed to reduce the possibility of incorrect data being entered. Furthermore, the needs of data entry checks must also be considered. With this in mind, system analyst should understand human factor that should be evaluated during input design.

- Input controls ensure that the data input to the computer is accurate and that the system is protected against accidental and intentional errors and abuse, including fraud.

- When designing input screen for an application that will contain a GUI appearance, the system analyst must be careful to select the proper control object for each control attribute.

Finally, the system analyst should select the most appropriate input medium. With the proposed system, the data entry operation uses a keyboard and computer terminal to enter data. See the input screens in Appendix F.

3.2.3 Output Design

The outputs of the proposed system present information to system users. So the system analyst should define output needs and requirements of the users. And another issue is that we apply to output design as follows:

1. Computer outputs should be simple to read and interpret. These guidelines may enhance readability.
   - Every report or output screen should have a tittle.
   - Reports and screens should section heading to segment large amounts of information.
   - Information columns should have column heading.
   - Reports should include legends to interpret those headings.
   - Computer jargon and error messages should be omitted from outputs.

2. The timing of computer outputs is important. Their recipients must receive outputs while the information is pertinent to transaction or decision.

3. The distribution of computer output must be sufficient to assist all relevant system users.

4. The computer outputs must be acceptable to the system users who will receive them. An output design may contain the required information and may still not be acceptable to the system users. To avoid this problem, the system analyst must understand how the recipient plans to use the outputs.

For the best output, the system analyst should do as above to meet the user requirements and expectations that users want to use the outputs both in output screens and output reports. See reports in Appendix G.

3.3 Hardware and Software Requirements

3.3.1 Hardware Requirements

The proposed system uses the same hardware as the existing system to save cost. Hardware resource is enough for the proposed system; namely, there are 2 computers, and a printer (Page 12). In addition, there should be the hardware configuration of the proposed system (Figure 3.1.).

3.3.2 Software Requirements

Since the existing system has software specifications (Page 11) that is necessary, the proposed system should have the application software that helps the users in the processing system. Then the proposed system requires new software that is called " Inventory Information System programs ".

3.4 Security and Controls

The security and controls of the proposed system are separated into system security and system control. And the details of both types can be illustrated as follows:

For system security of the proposed system, we must make sure that the system security can protect the failure and mis working. So we must consider the details below to make the completion of the system security.

- Only authorized persons can access to the system.
- Data entry, modification and correction must be made by only authorized persons.
- A copy of the programs and data files must be kept in the secondary storage medium in case the program has failure or loss of data.

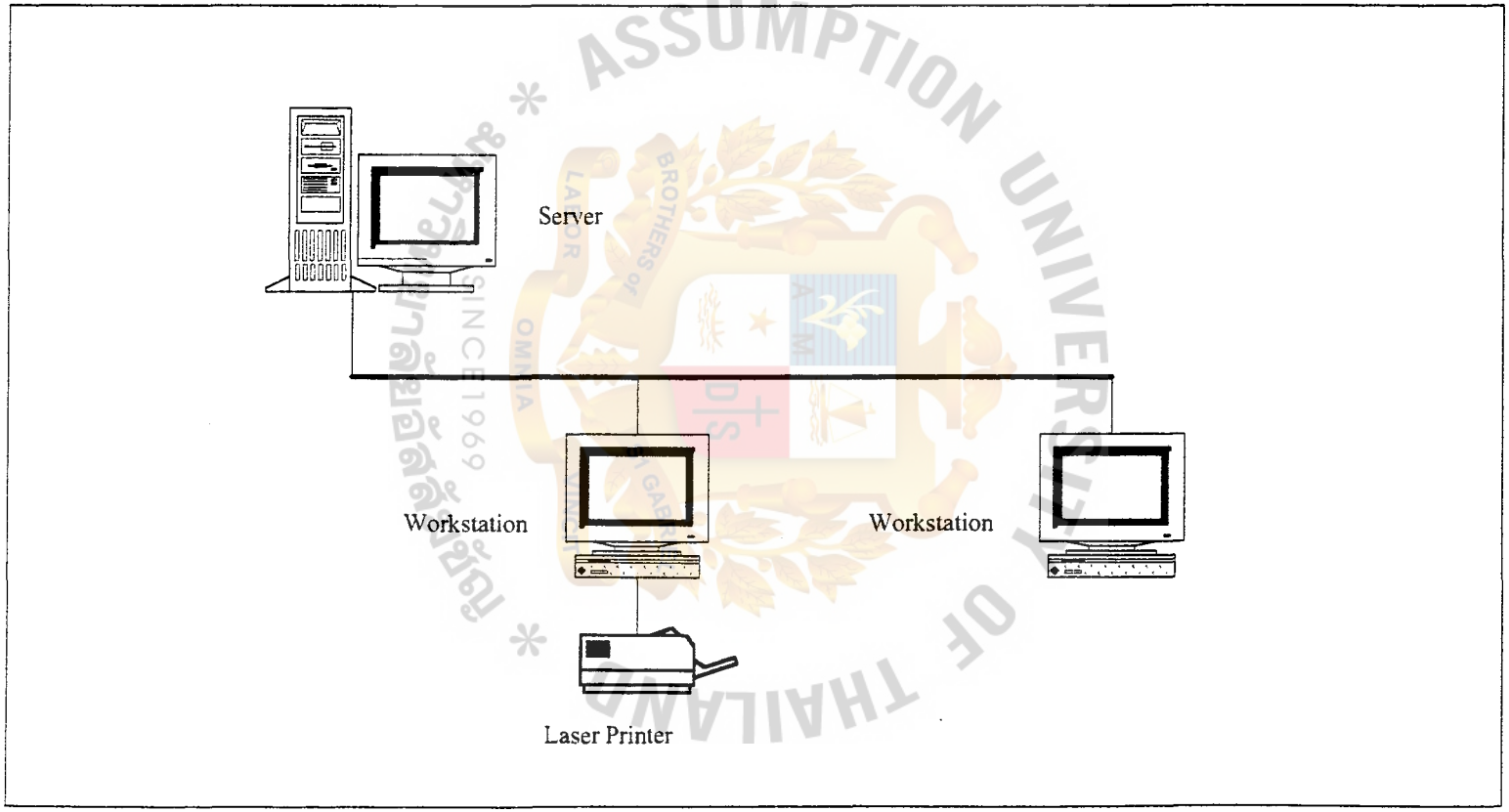

Figure 3.1. Hardware Configuration of the Proposed System

- Filling of processed forms-procedures for filling source documents after they have been used is a step many designers miss, often to their later embarrassment.

2. ***Input controls.*** Input controls are designed to verify that data keyed or read to processing from files are received by the computer. Most input controls are built into computer hardware devices, such as computer terminals.

3. ***Output controls.*** Output controls are designed to verify that all data have been sent from processing (that is, printed, displayed, or written to output files) and unauthorized persons cannot obtain output materials. Typical output control measures include assigning authorized personnel account codes and passwords. Unless users remember their codes and passwords, they are not allowed access to processing.

4. ***Computer program controls.*** Computer program controls validate the accuracy of programmed procedures. Most program controls deal with verifying the accuracy of input data, because of the importance of data validation procedures. A second type of program control involves the setting of flag to indicate errors or unusual conditions. End-of-data, end-of-file, out-of-range, and so forth are examples of program control specified by flags. Still another type of program control consists of messages that warn users of some impending danger. For example, the messages DISK FILE 90 PERCENT FULL warns the users to either remove data from the disk or to stop adding data to the disk.

A successful new system in today's sophisticated, rapidly changing organization environment must be built upon a solid framework of operational controls. To emphasize

the need for controls, organizations increasingly have become dependent upon computer hardware, software, and data processing personnel.

Merely having controls does no good unless they are used properly. People using controls must be convinced of the need for security. Of course, no control is effective unless it is used. Therefore, controls must be used to be effective. They must be efficient, easy to use, and appropriate; in terms of time, memory space, human activity, or other resources used.

3.5 Cost/Benefit Analysis

The systems must be compared for costs and benefits of system resources and evaluated in terms of probable effect on the quality of the organization. The usual practice in a simplistic cost/benefit analysis is first to identify the benefits and second to identify the costs. Benefits and costs can be thought of as either tangible or intangible.

3.5.1 Benefit Analysis

The benefits of Inventory Information System for Faculty of Engineering are both tangible benefits and intangible benefits.

Tangible benefits:

Tangible benefits are advantages measurable in terms of dollars, resources, or time saved that accrue to the organization through use of the information system. For this project, tangible benefits are an increase in speed of processing, access to information on a more timely basis than was possible before, the advantage of the computer's superior calculating power, and decreases in the amount of users time needed to complete specific tasks.

Intangible benefits:

Intangible benefits are difficult to measure but are important. For this project, intangible benefits are improving the decision-making process, enhancing accuracy, and increasing job satisfaction for users by eliminating tedious tasks.

While intangible benefits of an information system are important factors in deciding whether to proceed with a system, a system built solely for its intangible benefits will not be successful. Then presenting both tangible and intangible benefits will allow decision-makers in the business to make a well-informed decision about the proposed system.

3.5.2 Cost Analysis

The concepts of tangible and intangible costs present a conceptual parallel to the tangible and intangible benefits discussed already.

Tangible costs:

Tangible costs are the cost of equipment such as computers and terminals, cost of systems analysts' time, cost of programmers' time, and other users' salaries.

Intangible Costs:

Intangible costs are difficult to estimate and may not be known. An example of intangible costs is ineffective decision making due to untimely or inaccessible information. In order to aid decision-makers who want to weigh the proposed system and all of its implications, intangible costs must be included, even though intangible costs are not quantifiable.

3.5.3 Cost / Benefit Economic Comparison

In this project, the writer chooses the Payback Analysis to identify cost / benefit economic comparison. The payback analysis technique is a simple and popular method for determining how much time will lapse before accrued benefits overtake accrued and continuing costs. This method is used to judge the profitability of a system. It is defined as the number of years required accumulating earning sufficient to cover its cost.

Table 3.1. Comparison between Costs and Benefits

Cash flow description	Year 0	Year 1	Year 2	Year 3	Year 4
Development cost:	10,000				
Operation & maintenance cost:		95,000	104,500	114,950	126,445
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636
Present value of annual costs:	10,000	84,835	83,287	81,844	80,419
Cumulative costs:	10,000	94,835	178,122	259,966	340,385
Benefits derived from operation:	0	110,000	121,000	133,100	146,410
Discount factors for 12%:	1.000	0.893	0.797	0.712	0.636
Present value of annual benefits:	0	98,230	96,437	94,767	93,117
Cumulative benefits:	0	98,230	194,667	289,434	382,551

In Table 3.1, an information system will be developed at a cost of 10,000 Baht. The estimated net operating costs for each of the next four years are also recorded in the table. The estimated net benefits over the same four operating years are also shown.

Look at the cumulative lifetime costs and benefits. The lifetime costs are gradually increasing over the four-year period because operating costs are being incurred. But also the lifetime benefits are accruing at a much faster pace. Lifetime benefits will overtake the lifetime costs between years 0 and 1.

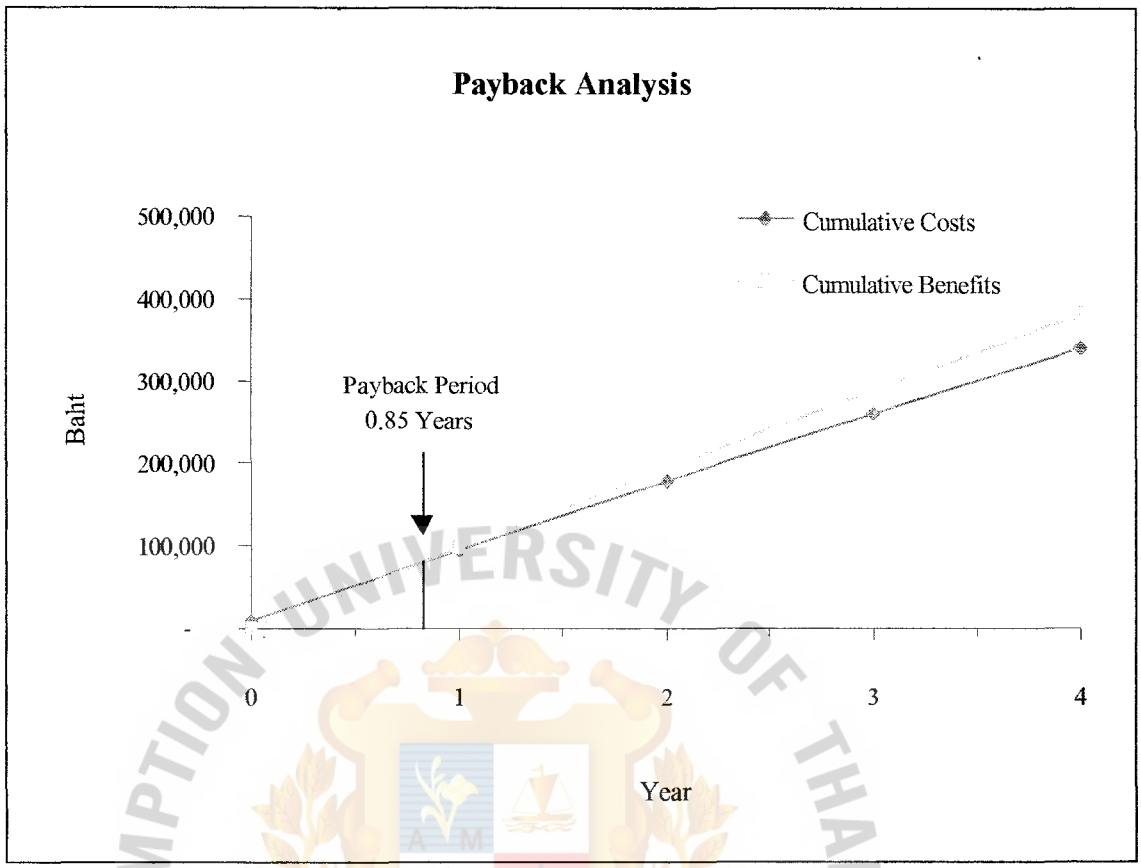

Figure 3.2. Payback Analysis for Inventory Information System

The cumulative lifetime costs and the cumulative lifetime benefits in Figure 3.2, we can estimate that the break-even point (when costs + benefits = 0) will occur approximately 0.85 years after the system begins operating. It is a good investment.

IV. PROJECT IMPLEMENTATION

After we complete the system design and all controls such as input, output, files, and processing to be built into the new system, the next step is to move from system design to system implementation.

System implementation consists of three components: programming, testing, and conversion. And the details of the system implementation are illustrated below:

Programming

The work of translating design specifications into computer code is better known as programming. The purpose of the programming can be separated into:

- Making program easy to read.

  Readability is a major factor in the design of computer programs. Generally, if a program is easy-to-read, it will be easier to follow logically. However, readability is very important to the person who must review the program and perhaps correct its mistakes.

- Designing programs using standard constructs.

  Central to the concept of improved readability is the concept of structured programming. With structured programming, individuals can write efficient, relatively easy-to-read computer programs which be divides the tasks to perform into well-defined units modules. Programs developed in this way tend to minimize the complexity of program flow, especially the transfer of control.

- Designing programs following a top-down design.

Besides restricting program code to standard program constructs, we are well advised to follow a procedure known as top-down program development. With this procedure, the uppermost levels of a structured design are implemented first, followed by lower-level modules.

- Documenting computer code.

Besides writing code to be processed by the computer, we must carefully document computer programs to identify and explain to others the steps important to processing. Careful documentation of programs also improves their readability. Consider three rules of documenting computer code. First, each procedure should begin with a program identification section. Second, documentation should be added to indicate when a procedure begins and ends. Finally, documentation should be added within the procedure to clarify important flags, decisions, special assignments, and loops.

- Testing computer code.

Thoroughly testing computer code is also essential in the design of computer programs. As an initial test, programmers should determine whether each codes procedure is easy to read, uses structured constructs, follows a top-down organization, and is well documented. If this is the case, unit testing and program testing can begin, followed by system testing.

After completing the programming, we must do the program testing. Testing is a multistep process with a designated purpose to uncover errors and flaws in coded design. Testing typically begins with unit testing, followed by program testing. When we do the unit testing, we conduct to remove syntax and logic errors from a single module or unit of a computer program.

System Testing

Following the completion of program testing, system testing begins. One way to minimize user resistance to a new system is by providing a software product that is easy--to-use and free from errors.

The objective of system testing is to ensure that the software is of high quality and promised user requirements. So we must consider the areas for testing as follows:

- Peak load testing helps determine whether the system performs properly when operating at the upper limit of its capacity during periods of high demand for computer execution.
- Performance testing determines the length of time required for certain system operations. This test often involves examining transaction data processing.
- Recovery testing examines the ability of the system to recover from a failure. This failure can take many forms: data loss because of a disk head crash, equipment destruction because of fire that changes important data values.
- Storage testing determines the ability of the system to store a maximum amount of data.
- Procedure testing provides a basic test of both system and user documentation. System documentation provides directions in a procedure manual for both operations.
- User procedure testing mainly involves testing the user manual, which guides users in initiating system execution or accessing on-line help facilities.
- User testing determines how the system is actually used. Factors to consider are clarity of documentation, and ease of use.

After completing all the tests above, we can ensure that the proposed system can operate free from errors. But it is not enough, we must do the acceptance testing to get the acceptance from the users. The acceptance testing is separated into two kinds. We must test both kinds; that is software acceptance criteria and manual procedure acceptance criteria.

Software acceptance criteria include factors such as the following: processing speed, response time, error rate, completeness of the system, completeness of documentation. Manual procedure acceptance criteria which is equally important are manual procedure acceptance criteria. These criteria measures the degree to which user work procedures are acceptable in light of the new system.

System Conversion

During the later stages of system implementation, the process of system conversion begins. Conversion consists of installing the system software and making it fully operation. The difficult with this activity lies in making the transition from the old to the new. Since the new system replaces something that existed before.

Two activities occur simultaneously during conversion: making new software operational (and replacing the existing system) and helping users use the new software. And we must do the following conversion to complete the system conversions that are:

- Database creation.

  New file must be built, tested, and made operation before the new system is installed. If the number of files is high, or records to be stored are extensive, database creation can take considerable time.

- Completion of system documentation

Closely tied to the writing of work procedures is the completion of the system documentation. While most of the system design documentations at this point is near the final of final form, two additional types of documentation typically needs further attention. These are the operator's guides (operations documentation) and the users guide (user documentation).

The operator's guide includes step-by-step instructions for setting up, operating, and distributing the result of processing. It may specify several diagnostic tests to perform if problems in processing are encountered. These instructions and tests are needed by data center operations, which is responsible for making the software operational on a day-to-day basic.

The user's guide includes step-by-step instructions for telling users how to execute the software.

- User training

User training (and operation training) is one of the final and most important parts of conversion. It is designed to provide users with hands-on experience with the new system.

Successful training programs are carefully planned and organized. Let's consider the five steps important to such programs:

= Identify the objectives of the program. The objectives of training are usually tied to the performance of users following a training period.

= Identify the users who require training and trainers. Users and their supervisors are most often the people who require training, while project managers, led analyst, and designers are typically designated as trainers.

= Design a comprehensive, progressive training program. In the actual design of the training program, all system functions (enter a record, update a record, print/display a record) must be covered.

= Select the most appropriate method of presentation on-the-terminal training, self-paced instruction, classroom training, videotape instruction are all workable methods of presenting new system material.

= Determine whether users meet or exceed program objectives. Tests conducted at the end of training sessions are advised to determine whether users can perform as specified in advance.

In the proposed system, we must train the staff who are responsible for each laboratory to clearly understand the inventory information system software. The inventory information system software will help users work efficiently and effectively. In addition, this software will help users operate the work correctly and rapidly. For the Microsoft Windows 95 Thai Edition and the Microsoft Office 97 for Windows, it is unnecessary that users are trained for skill and exact understanding of the operations.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The proposed system is the Inventory Information System of the Faculty of Engineering at Assumption University. This system is designed to serve the specific requirements of the end users.

The activities of this project start from studying and analyzing the existing business functions which includes current problems and areas for improvement. The next step is designing the proposed system to serve the user needs, hardware and software requirements, security and controls, and cost/benefit analysis. The last step is the implementation.

This proposed system is a computerized system that will help end users get better performance in the operations. In addition, this system can save time, reduce paper work, and support decision-making.

5.2 Recommendations

It is difficult to improve all parts in the system to complete in only one time. Hence, the recommendations for the inventory information system in the future are as follows:

The system should have the bar code system in order to enter data easier. Staff can check the inventory by using bar code that helps staff operate faster and get accuracy information.

Making a requisition for articles or equipments by the computerized system is expected in the future. Staff must always update the inventory system when he makes a requisition for equipment. This system will help users save more time and reduce errors in the operations.

In addition, the borrowing and return equipment system, and the system of fines by using computer is also expected. When the student borrows equipment, staff will update the inventory the same as the return equipment. After the student returns equipment, if the equipment is damaged, staff will update information and levies a fine. This system will help users work conveniently.

BIBLIOGRAPHY

1. Fitzgerald J., Fitzgerald A. Fundamentals of Systems Analysis : Using Structured Analysis and Design Techniques, 3rd Edition. John Wiley & Sons, 1987.

2. Alan L. Eliason. Systems Development : Analysis, Design, and Implementation, 1987.

3. Yourdon E. Modern Structured Analysis. Prentice-Hall, 1989.

4. Kendall K.E., Kendall J.E. Systems Analysis and Design, 2nd Edition. Prentice-Hall, 1995.

5. Whitten J., Bentley L. Systems Analysis and Design Methods, 4th Edition. McGrawHill, 1998.

APPENDIX A

EXISTING SYSTEM

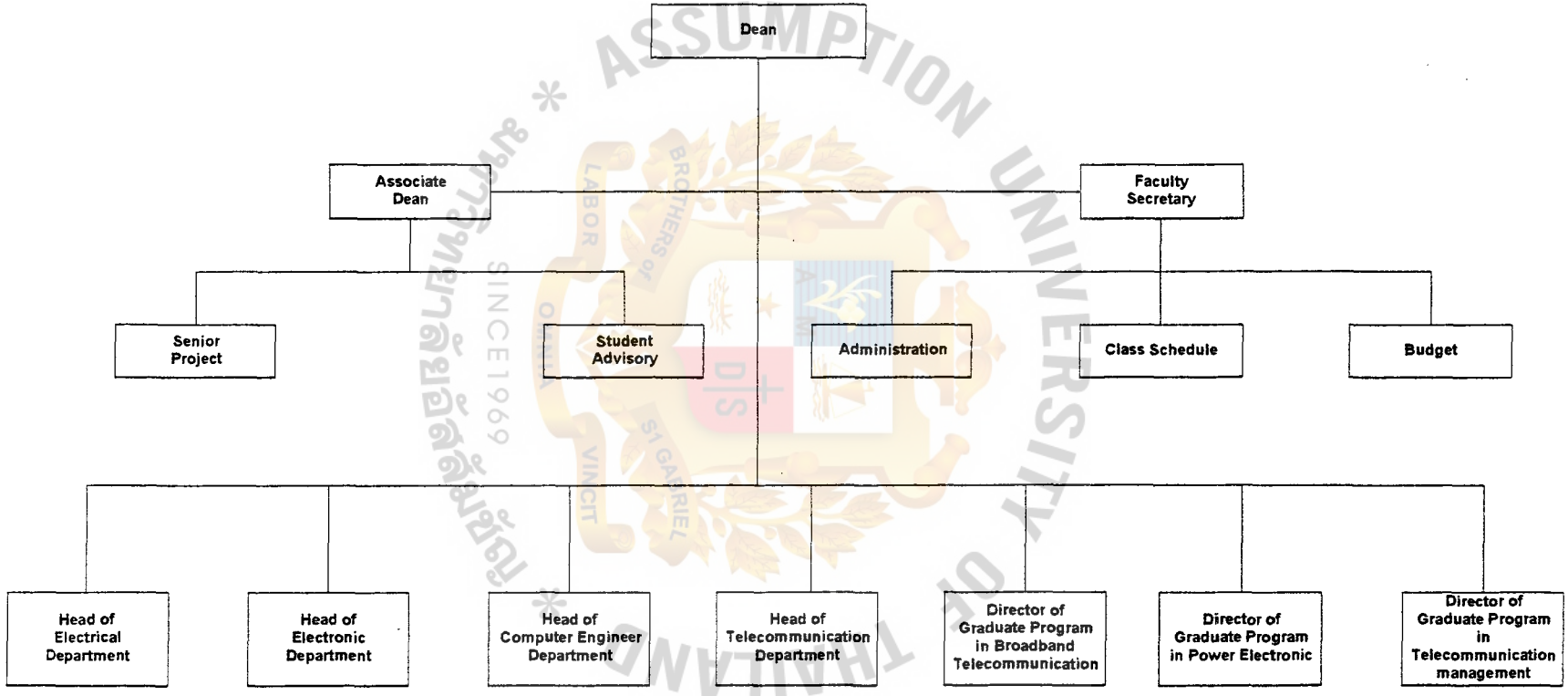

Figure A.1. Organization Chart of the Faculty of Engineering

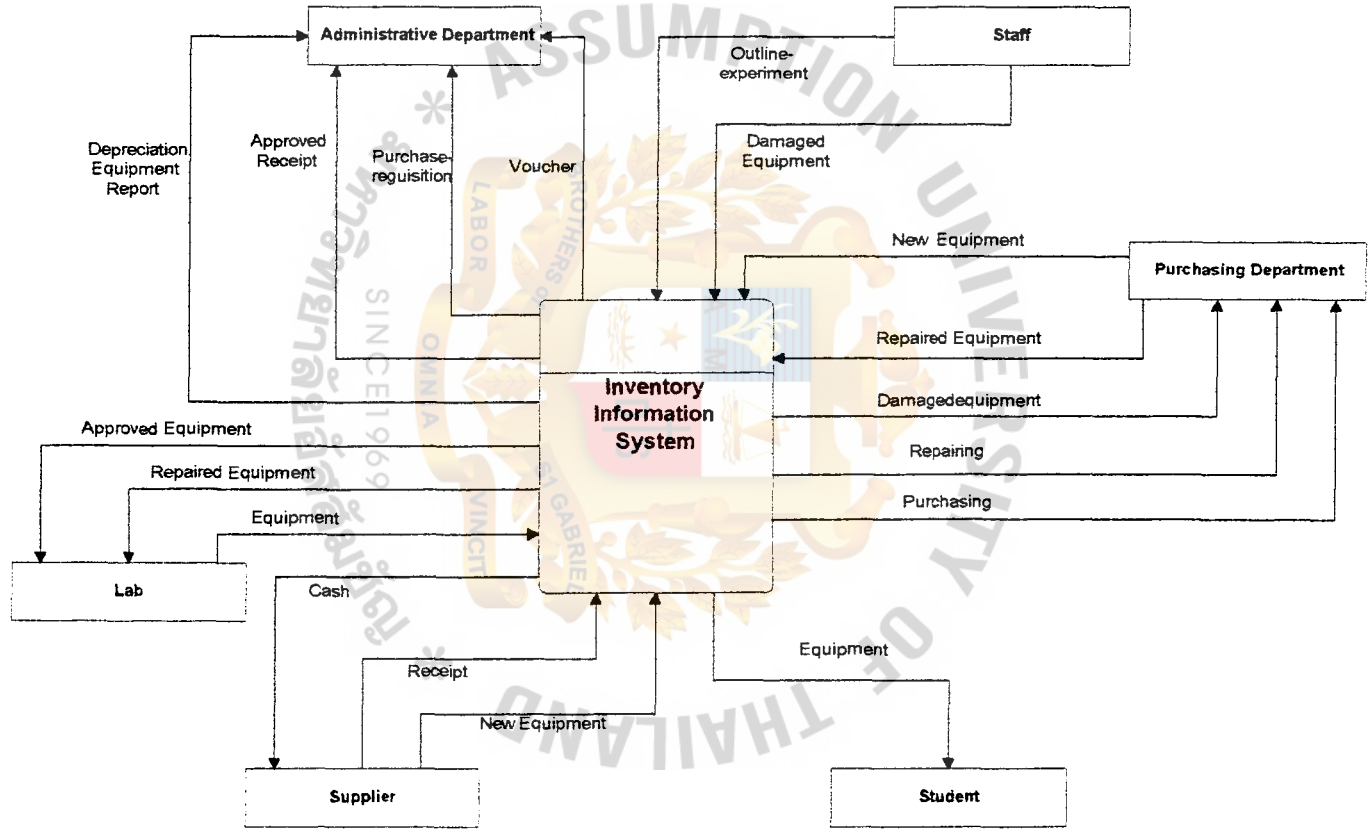

Figure A.2. Context Diagram of the Existing System

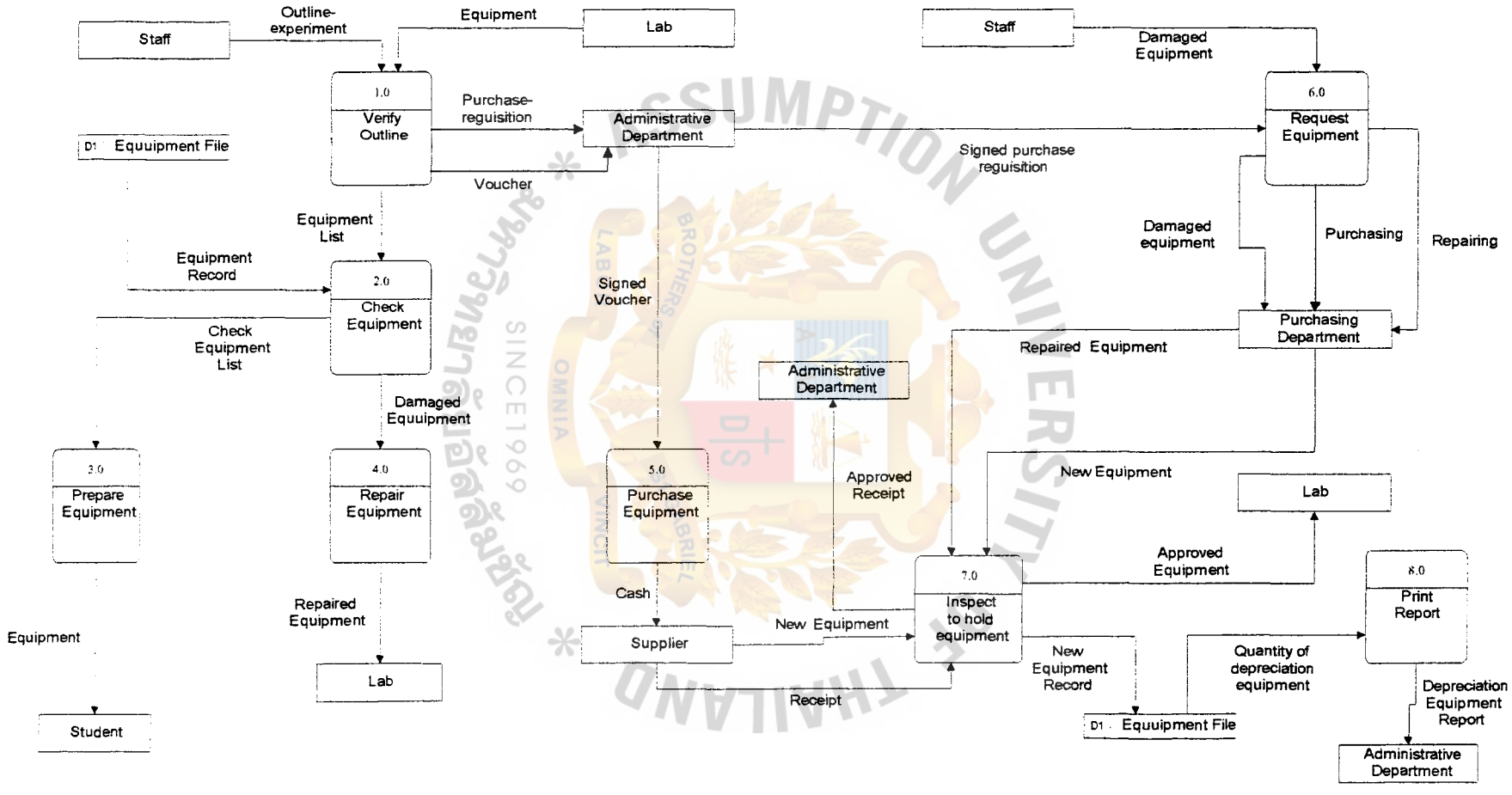

Figure A.3. Data Flow Diagram of the Existing System

APPENDIX B

PROPOSED SYSTEM

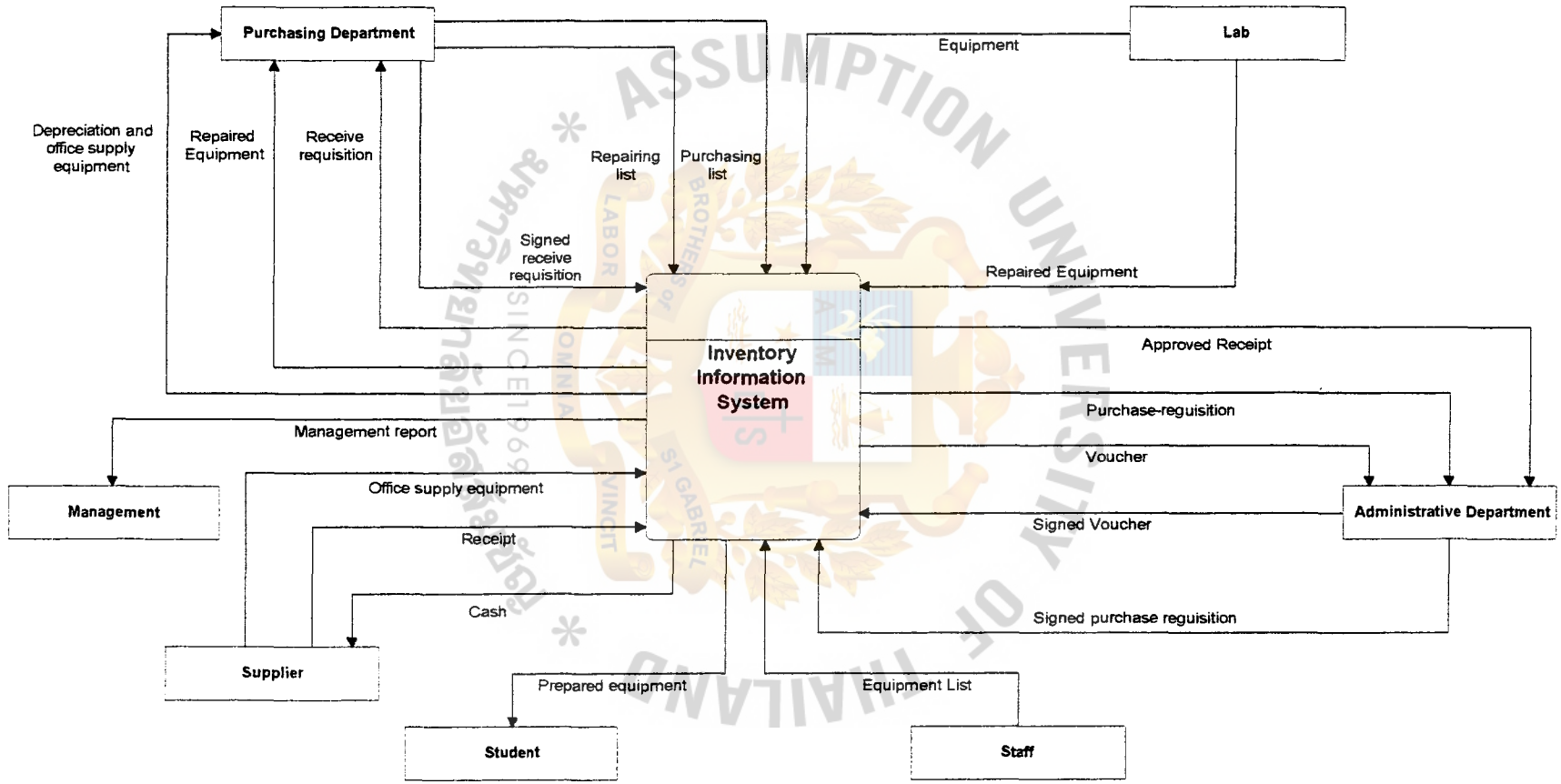

Figure B.1. Context Diagram of the Proposed System

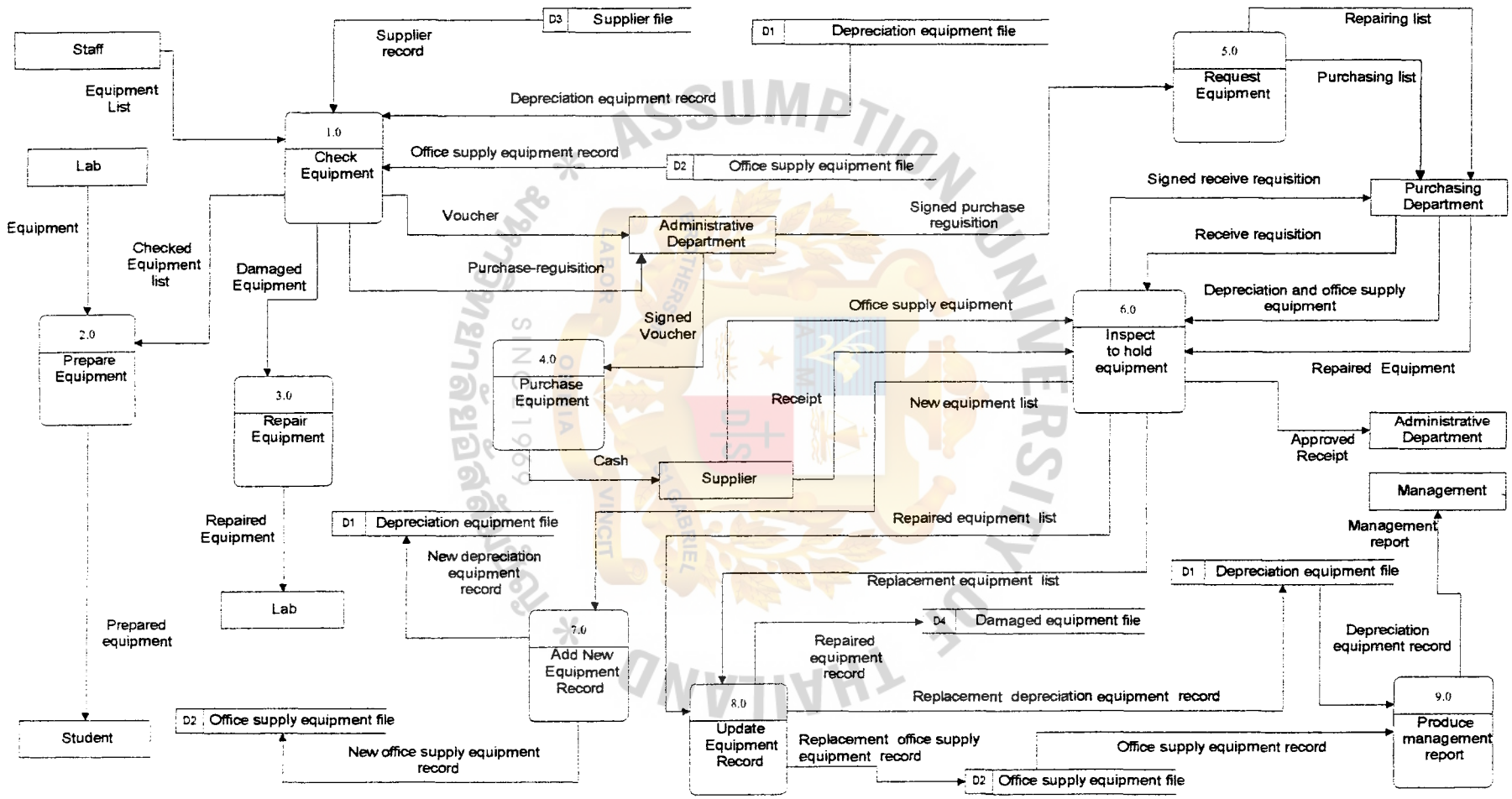

Figure B.2. Data Flow Diagram Level 0 of the Proposed System

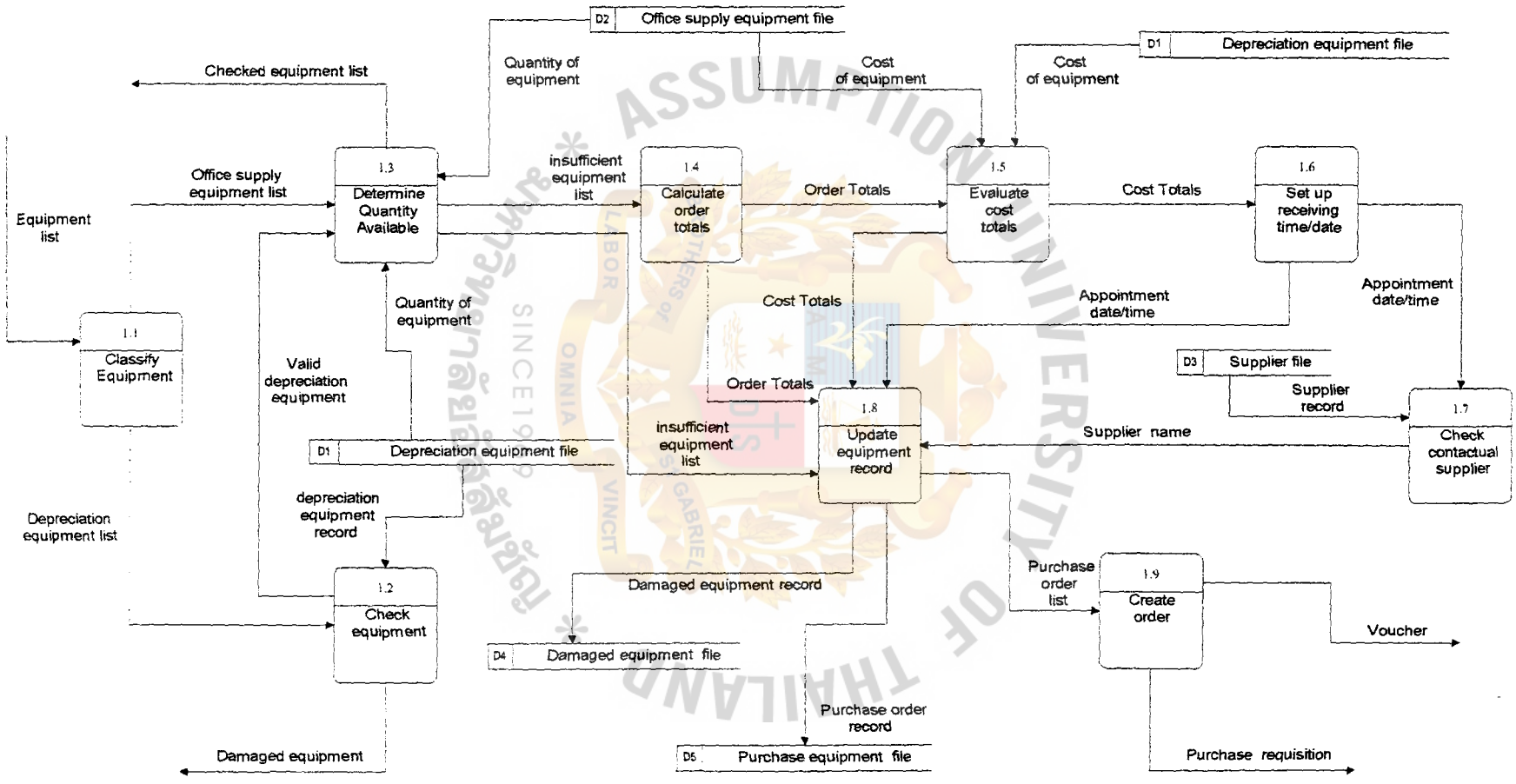

Figure B.3. Level 1 Data Flow Diagram from the Process 1.0

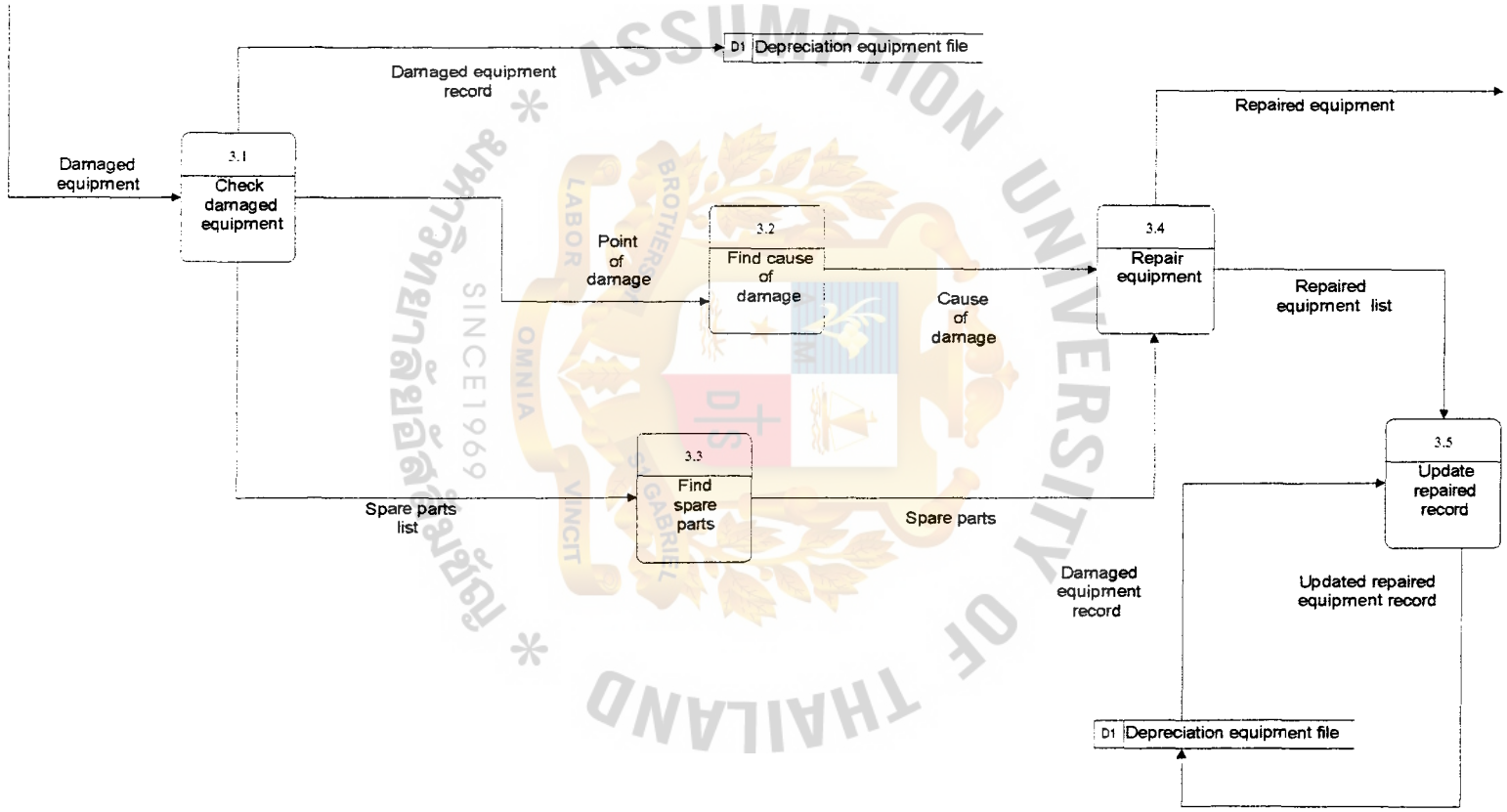

Figure B.4. Level 1 Data Flow Diagram from the Process 3.0

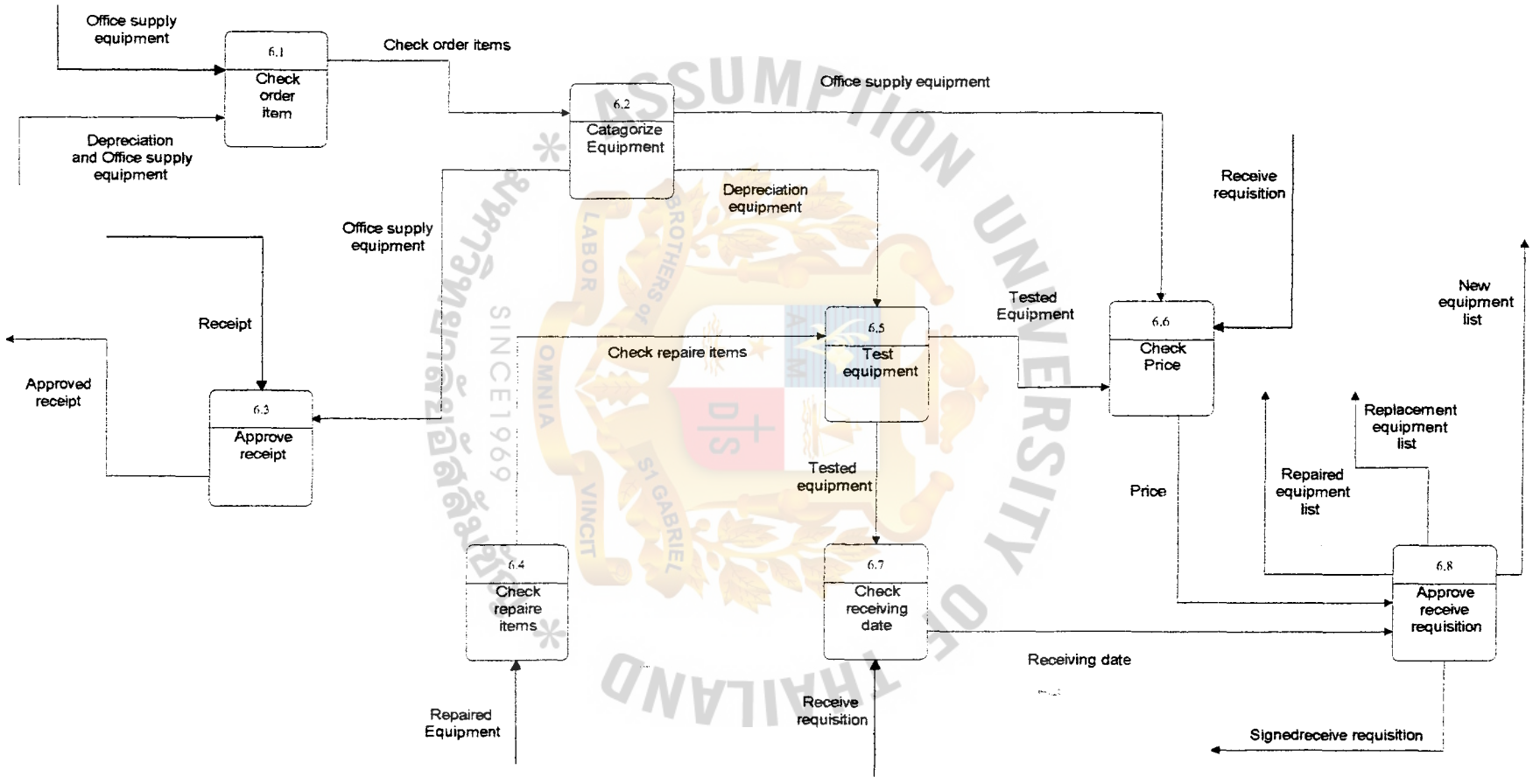

Figure B.5. Level 1 Data Flow Diagram from the Process 6.0

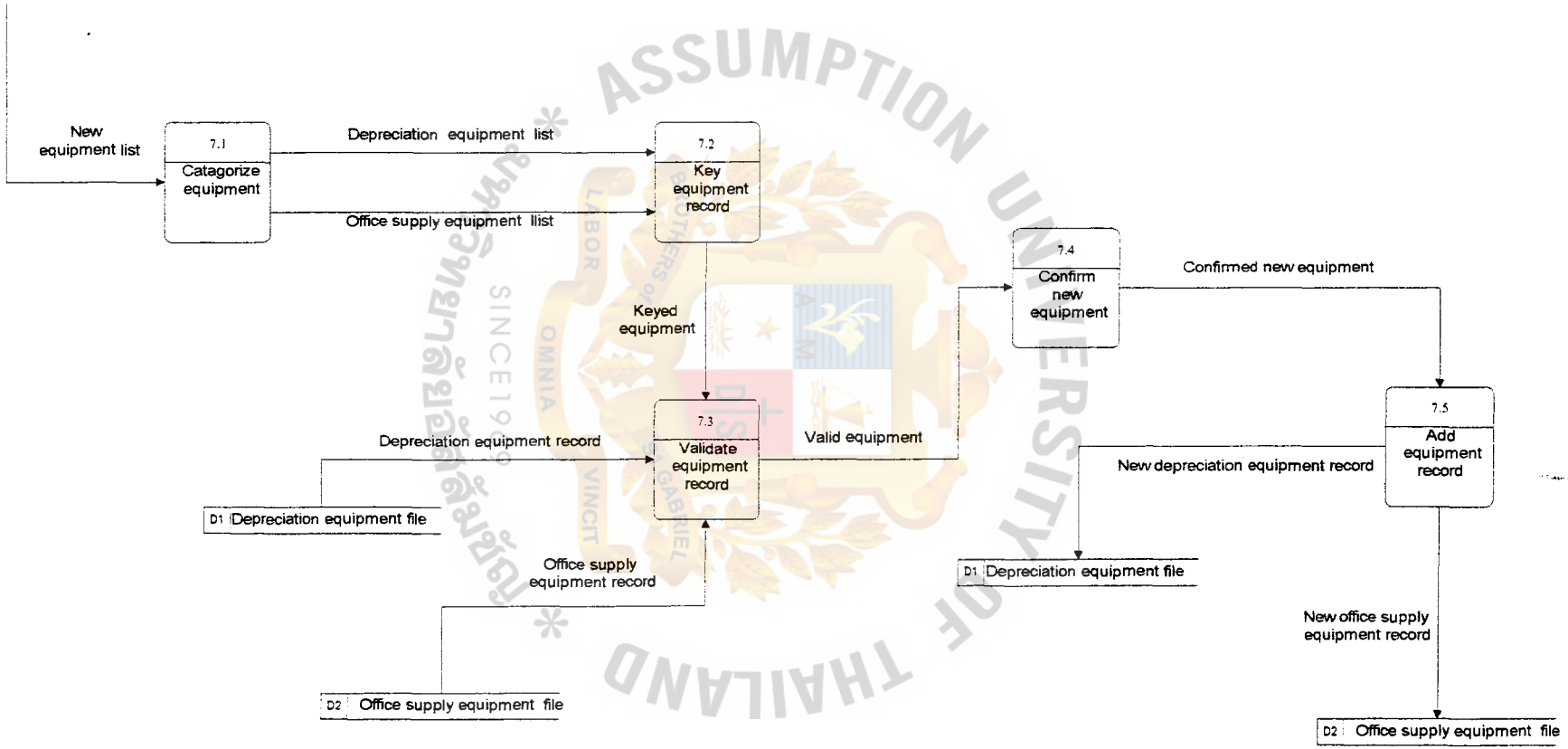

Figure B.6. Level 1 Data Flow Diagram from the Process 7.0

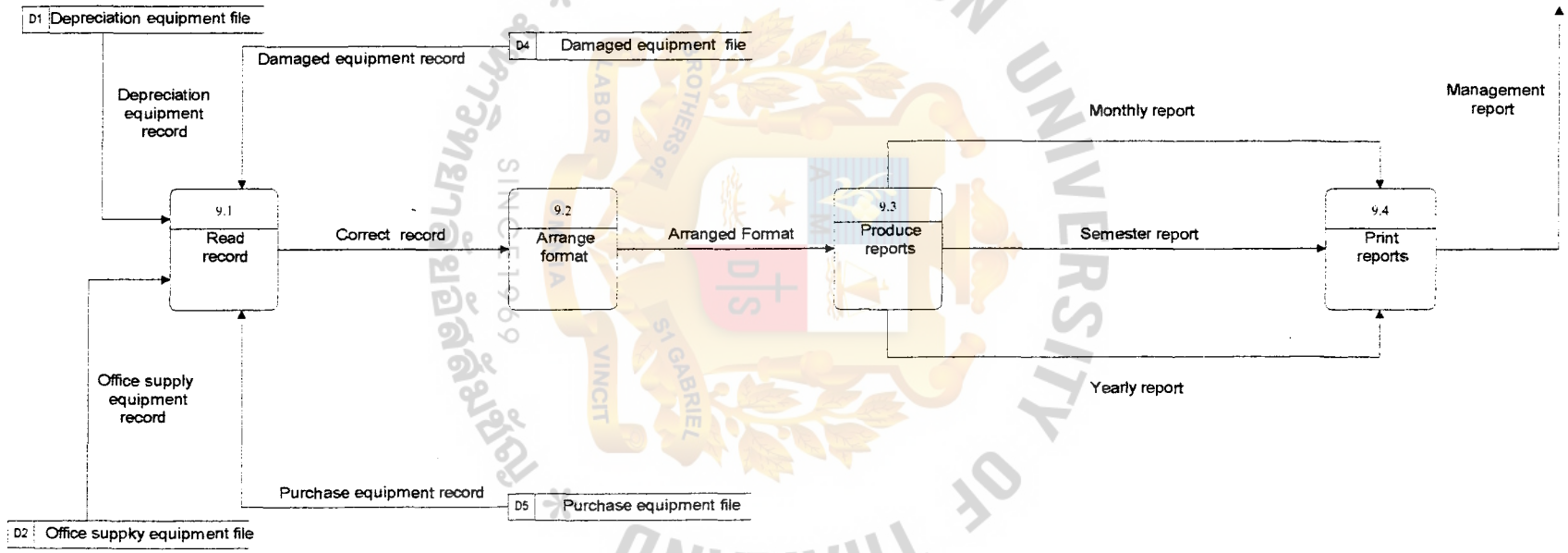

Figure B.7. Level 1 Data Flow Diagram from the Process 9.0

APPENDIX C

DATA DICTIONARY

DATA DICTIONARY

Equipment list = Equipment name +
Equipment amount

Supplier record = Supplier number +
Supplier name +
Supplier address +
Supplier telephone

Depreciation equipment record = Depreciation equipment number +
Depreciation equipment name +
Equipment brand +
Quantity on hand +
Unit price +
Beginning date of use +
Lifetime +
Supplier name

Office supply equipment record = Office supply number +
Office supply name +
Equipment brand +
Quantity on hand +
Unit price +
Supplier name

Checked equipment list	= Depreciation equipment name +
	Depreciation equipment amount +
	Office supply equipment name +
	Office supply equipment amount
Damaged equipment	= Depreciation equipment name +
	Point of damage +
	Cause of damage +
	Spare parts
Voucher	= Office supply equipment name +
	Quantity to be order +
	Unit price +
	Total price
Purchase requisition	= Depreciation equipment name +
	Office supply equipment name +
	Quantity on hand +
	Quantity to be order +
	Unit price +
	Amount +
	Supplier name +
	Credit days +
	Requirement date
Repairing list	= Depreciation equipment name +
	Quantity to be repair +
	Supplier name

Purchasing list	= Depreciation equipment name +
	Office supply equipment name +
	Quantity to be order +
	Unit price +
	Amount +
	Supplier name +
	Requirement date
Receive requisition	= Depreciation equipment name +
	Office supply equipment name +
	Equipment brand +
	Quantity to be order +
	Unit price +
	Total price +
	Supplier name +
	Staff name +
	Receiving date
New equipment list	= New depreciation equipment name +
	New office supply equipment name +
	Equipment brand +
	Quantity to be add +
	Unit price +
	Supplier name +
	Receiving date

New depreciation equipment record = Depreciation equipment number +
Depreciation equipment name +
Equipment brand +
Lifetime +
Quantity to be add +
Unit price +
Supplier name

New office supply equipment record = Office supply equipment number +
Office supply equipment name +
Equipment brand +
Quantity to be add +
Unit price +
Supplier name

Repaired equipment list = Depreciation equipment name +
Quantity to be repair +
Cause of damage +
Repairment expense +
Supplier name +
Staff name +
Receiving date

Replacement equipment list	= Replacement depreciation equipment name +
	Replacement office supply equipment name +
	Equipment brand +
	Quantity to be replace +
	Unit price +
	Supplier name +
	Receiving date
Repaired equipment record	= Depreciation equipment number +
	Depreciation equipment name +
	Quantity to be repair +
	Cause of damage +
	Repairment expense +
	Supplier name +
	Staff name
Replacement depreciation equipment record	= Depreciation equipment number +
	Depreciation equipment name +
	Equipment brand +
	Lifetime +
	Quantity to be replace +
	Unit price +
	Supplier name

Replacement office supply equipment record	= Office supply equipment number + Office supply equipment name + Equipment brand + Quantity to be replace + Unit price + Supplier name

APPENDIX D

PROCESS SPECIFICATIONS

PROCESS SPECIFICATIONS

Process 1.0 : Check Equipment

Process No.	:	**1.1**
Process Name	:	Classify equipment
Description	:	Classify the equipment to be the depreciation and office supply equipment
Input	:	Equipment list from staff
Output	:	Depreciation equipment list
	:	Office supply equipment list
Process	:	- Get equipment list from the staff and classify the equipment - Bring the depreciation equipment list to do the process 1.2 - Bring the office supply equipment list to do the process 1.3
Process No.	:	**1.2**
Process Name	:	Check equipment
Description	:	Check the validation of the depreciation equipment
Input	:	Depreciation equipment list
	:	Depreciation equipment record
Output	:	Valid depreciation equipment
	:	Damaged equipment
Process	:	- Get the depreciation equipment list from the process 1.1 - Read data from the depreciation equipment file - Check the validation of equipment from the depreciation equipment record and send to do the process 1.3 - Send the damaged equipment to do the process 3.0

Process No.	:	**1.3**
Process Name	:	Determine quantity available
Description	:	Determine the available quantity of equipment from file
Input	:	Office supply equipment list
	:	Valid depreciation equipment
	:	Quantity of equipment
Output	:	Checked equipment list
	:	Insufficient equipment list
Process	:	- Get office supply equipment list from the process 1.1
		- Read quantities from the office supply equipment file
		- Determine the available quantity of the office supply equipment
		- Get valid depreciation equipment from the process 1.2
		- Read quantity from the depreciation equipment file
		- Determine the available quantity of the depreciation equipment
		- Send insufficient equipment list to do the process 1.4 and 1.8
		- Send the checked equipment list to do the process 2.0
Process No.	:	**1.4**
Process Name	:	Calculate order totals
Description	:	Calculate order totals for purchasing
Input	:	Insufficient equipment
Output	:	Order totals
Process	:	- Get insufficient equipment from the process 1.3
		- Calculate order totals
		- Send order totals to do the process 1.5 and 1.8

Process No.	:	**1.5**
Process Name	:	Evaluate cost totals
Description	:	Evaluate cost totals from existing price in file for the purchase requisition
Input	:	Order totals
	:	Cost of equipment
Output	:	Cost totals
Process	:	- Get order totals from the process 1.4 - Read existing cost from the office supply equipment file - Evaluate cost totals of the office supply equipment - Read existing cost from the depreciation equipment file - Evaluate cost totals of the depreciation equipment - Send cost totals to do the process 1.6 and 1.8

Process No.	:	**1.6**
Process Name	:	Set up receiving date / time
Description	:	Set up date and time to receive the equipment for the purchase Requisition from the purchasing department
Input	:	Cost totals
Output	:	Appointment date / time
Process	:	- Get cost totals from the process 1.5 (In case that staff requests to buy the depreciation and office supply equipment to the purchasing department) - Set up the receiving date and time - Send an appointed date / time to do the process 1.7 and 1.8

Process No.	:	**1.7**
Process Name	:	Check contactual supplier
Description	:	Check supplier that contacts for purchasing
Input	:	Appointment date / time
	:	Supplier record
Output	:	Supplier name
Process	:	- Get appointment date and time from the process 1.6
		- Read supplier record that has a contact from the supplier file
		- Send the supplier name to do the process 1.8

Process No.	:	**1.8**
Process Name	:	Update equipment record
Description	:	Update equipment record that changes into file
Input	:	Insufficient equipment list
	:	Order totals
	:	Cost totals
	:	Appointment date / time
	:	Supplier name
Output	:	Purchase order list
	:	Purchase order record
	:	Damaged equipment record
Process	:	- Get the insufficient equipment list from the process 1.3
		- Get order totals from process 1.4 and cost totals from process 1.5
		- Get an appointment date and time from the process 1.6
		- Get the supplier name from the process 1.7
		- Update the record of damaged equipment into file
		- Update the record of purchase order into file
		- Send purchase order list to do the process 1.9

Process No.	:	**1.9**
Process Name	:	Create order
Description	:	Create order for purchasing
Input	:	Purchase order list
Output	:	Voucher
	:	Purchase requisition
Process	:	- Get purchase order list from the process 1.8 - Bring data to create voucher (In case that staff buys office supply equipment by himself) - Bring data to create the purchase requisition (In case that staff requests to buy the depreciation and office supply equipment to the purchasing department)

Process 3.0 : Repair equipment

Process No.	:	**3.1**
Process Name	:	Check damaged equipment
Description	:	Check damaged equipment for updating into file and repairing
Input	:	Damaged equipment
Output	:	Damaged equipment record
	:	Point of damage
	:	Spare parts list
Process	:	- Get damaged equipment from the process 1.0
		- Update damaged equipment record into the depreciation equipment file
		- Send point of damage to do the process 3.2
		- List the name of spare parts and send it to do the process 3.3

Process No.	:	**3.2**
Process Name	:	Find cause of damage
Description	:	Find cause of damage of equipment for repairing
Input	:	Point of damage
Output	:	Cause of damage
Process	:	- Get point of damage from the process 3.1
		- Find cause of damage equipment
		- Send cause of damage to do the process 3.4

Process No.	:	**3.3**
Process Name	:	Find spare parts
Description	:	Find spare parts to repair the equipment
Input	:	Spare parts list
Output	:	Spare parts
Process	:	- Get the spare parts list from the process 3.1
		- Find the spare parts for that damaged equipment
		- Send spare parts to do the process 3.4

Process No.	:	**3.4**
Process Name	:	Repair equipment
Description	:	Repair damaged equipment
Input	:	Cause of damage
	:	Spare parts
Output	:	Repaired equipment list
	:	Repaired equipment
Process	:	- Get cause of damage of equipment from the process 3.2
		- Get spare parts from the process 3.3
		- Repair equipment that damages
		- Send repaired equipment list to do the process 3.5
		- Send repaired equipment into the laboratory

Process No.	**:**	**3.5**
Process Name	:	Update repaired equipment record
Description	:	Update the record of repaired equipment into file
Input	:	Repaired equipment list
	:	Damaged equipment record
Output	:	Updated repaired equipment record
Process	:	- Get the repaired equipment list from the process 3.4 - Read the damaged equipment record from the depreciation equipment file - Update the record of repaired equipment into file - Send the updated repaired equipment record into the depreciation equipment file

Process 6.0 : Inspect to hold equipment

Process No.	:	**6.1**
Process Name	:	Check order item
Description	:	Check order item to know about details of equipment
Input	:	Office supply equipment
	:	Depreciation and office supply equipment
Output	:	Checked order item
Process	:	- Get the office supply equipment from the supplier - Get the depreciation and office supply equipment from the purchasing department - Check order item to know about quantity, size and brand of equipment - Send the checked order item to do the process 6.2
Process No.	:	**6.2**
Process Name	:	Categorize equipment
Description	:	Categorize into the depreciation and the office supply equipment
Input	:	Checked order item
Output	:	Office supply equipment
	:	Depreciation equipment
Process	:	- Get checked order item about quantity, size and brand from the process 6.1 - Categorize equipment into the depreciation and the office supply equipment - Send the office supply equipment to do the process 6.3 - Send the depreciation equipment to do the process 6.5 - Send the office supply equipment to do the process 6.6

Process No.	:	**6.3**
Process Name	:	Approve receipt
Description	:	Approve the receipt
Input	:	Office supply equipment
	:	Receipt
Output	:	Approved receipt
Process	:	- Get the office supply equipment from the process 6.2
		- Get the receipt from the supplier
		- Approve the receipt
		- Send the approved receipt to the administrative office

Process No.	:	**6.4**
Process Name	:	Check repair items
Description	:	Check repair item to know about details of repaired equipment
Input	:	Repaired equipment
Output	:	Checked repair items
Process	:	- Get the repaired equipment from the purchasing department
		- Check repair item to know about details of repaired equipment
		- Send the checked repair item to do the process 6.5

Process No.	:	**6.5**
Process Name	:	Test equipment
Description	:	Test equipment to ready for working
Input	:	Depreciation equipment
	:	Checked repair items
Output	:	Tested equipment
Process	:	- Get the depreciation equipment from the process 6.2 - Get the checked repair items from the process 6.4 - Test the depreciation and the repaired equipment to ready for working - Send the tested equipment to do the process 6.6 and 6.7

Process No.	:	**6.6**
Process Name	:	Check price
Description	:	Check price of equipment from the receive requisition form
Input	:	Office supply equipment
	:	Tested equipment
	:	Receive requisition
Output	:	Price
Process	:	- Get the office supply equipment from the process 6.2 - Get the tested equipment (the depreciation and the repaired equipment) from the process 6.5 - Get the receive requisition form from the purchasing department - Check price of equipment from the receive requisition form - Send price to do the process 6.8

Process No.	:	**6.7**
Process Name	:	Check receiving date
Description	:	Check date in receiving equipment
Input	:	Tested equipment
	:	Receive requisition
Output	:	Receiving date
Process	:	- Get the tested equipment (the depreciation and the repaired equipment) from the process 6.5 - Get the receive requisition form from the purchasing department - Check date in receiving equipment from the receive requisition - Send receiving date to do the process 6.8

Process No.	:	**6.8**
Process Name	:	Approve receive requisition
Description	:	Approve the receive requisition form
Input	:	Price
	:	Receiving date
Output	:	Signed receive requisition
	:	New equipment list
	:	Repaired equipment list
	:	Replacement equipment list
Process	:	- Get price from the process 6.6 - Get receiving date from the process 6.7 - Approve the receive requisition form - Send signed receive requisition to the purchasing department - Send new equipment list to do the process 7.0 - Send repaired equipment list to do the process 8.0 - Send replacement equipment list to do the process 8.0

Process 7.0 : Add new equipment record

Process No.	:	**7.1**
Process Name	:	Categorize equipment
Description	:	Categorize equipment and list into the depreciation equipment list and the office supply equipment list
Input	:	New equipment list
Output	:	Depreciation equipment list
	:	Office supply equipment list
Process	:	- Get new equipment list from the process 6.0 - Categorize equipment and list into the depreciation equipment list and the office supply equipment list - Send the depreciation equipment list and the office supply equipment list to do the process 7.2
Process No.	:	**7.2**
Process Name	:	Key equipment record
Description	:	Key equipment record from the depreciation equipment list and the office supply equipment list
Input	:	Depreciation equipment list
	:	Office supply equipment list
Output	:	Keyed equipment
Process	:	- Get both the depreciation equipment list and the office supply equipment list from the process 1.0 - Key equipment record from the depreciation equipment list and the office supply equipment list - Send keyed equipment to do the process 7.3

Process No.	:	**7.3**
Process Name	:	Validate equipment record
Description	:	Validate the equipment record from file
Input	:	Keyed equipment
	:	Depreciation equipment record
	:	Office supply equipment record
Output	:	Valid equipment
Process	:	- Get keyed equipment from the process 7.2
		- Read the record from the depreciation equipment file
		- Read the record from the office supply equipment file
		- Validate the equipment record from file
		- Send the valid equipment to do the process 7.4

Process No.	:	**7.4**
Process Name	:	Confirm new equipment
Description	:	Confirm the new equipment to show that record is correct
Input	:	Valid equipment
Output	:	Confirmed new equipment
Process	:	- Get valid equipment from the process 7.3
		- Confirm the new equipment to show that record is correct
		- Send confirmed new equipment to do the process 7.5

Process No.	**:**	**7.5**
Process Name	:	Add equipment record
Description	:	Add the equipment record into file
Input	:	Confirmed new equipment
Output	:	New depreciation equipment record
	:	New office supply equipment record
Process	:	- Get confirmed new equipment from the process 7.4
		- Add the new depreciation equipment record into the depreciation equipment file
		- Add the office supply equipment record into the office supply equipment file

Process 9.0 : Produce management report

Process No.	:	**9.1**
Process Name	:	Read record
Description	:	Read the record from file to produce many reports
Input	:	Depreciation equipment record
	:	Office supply equipment record
	:	Damaged equipment record
	:	Purchase equipment record
Output	:	Correct record
Process	:	- Read the depreciation equipment record from the depreciation equipment file - Read the office supply equipment record from the office supply equipment file - Read the damaged equipment record from the damaged equipment file - Read the purchase equipment record from the purchase equipment file - Send the correct record to do the process 9.2

Process No.	:	**9.2**
Process Name	:	Arrange format
Description	:	Arrange the format of record
Input	:	Correct record
Output	:	Arranged format
Process	:	- Get the correct record from the process 9.1 - Arrange the format of record - Send the arranged format to do the process 9.3

Process No.	:	**9.3**
Process Name	:	Produce reports
Description	:	Produce many reports
Input	:	Arranged format
Output	:	Monthly report
	:	Semester report
	:	Yearly report
Process	:	- Get arranged format from the process 9.2
		- Produce many monthly reports and send to the process 9.4
		- Produce many semester reports and send to the process 9.4
		- Produce many yearly reports and send to the process 9.4

Process No.	:	**9.4**
Process Name	:	Print reports
Description	:	Print many reports
Input	:	Monthly report
	:	Semester report
	:	Yearly report
Output	:	Management report
Process	:	- Get the monthly report from the process 9.3
		- Get the semester report from the process 9.3
		- Get the yearly report from the process 9.3
		- Print many semester reports and yearly reports (the management report)
		- Send the management reports to the management

APPENDIX E

STRUCTURE CHARTS

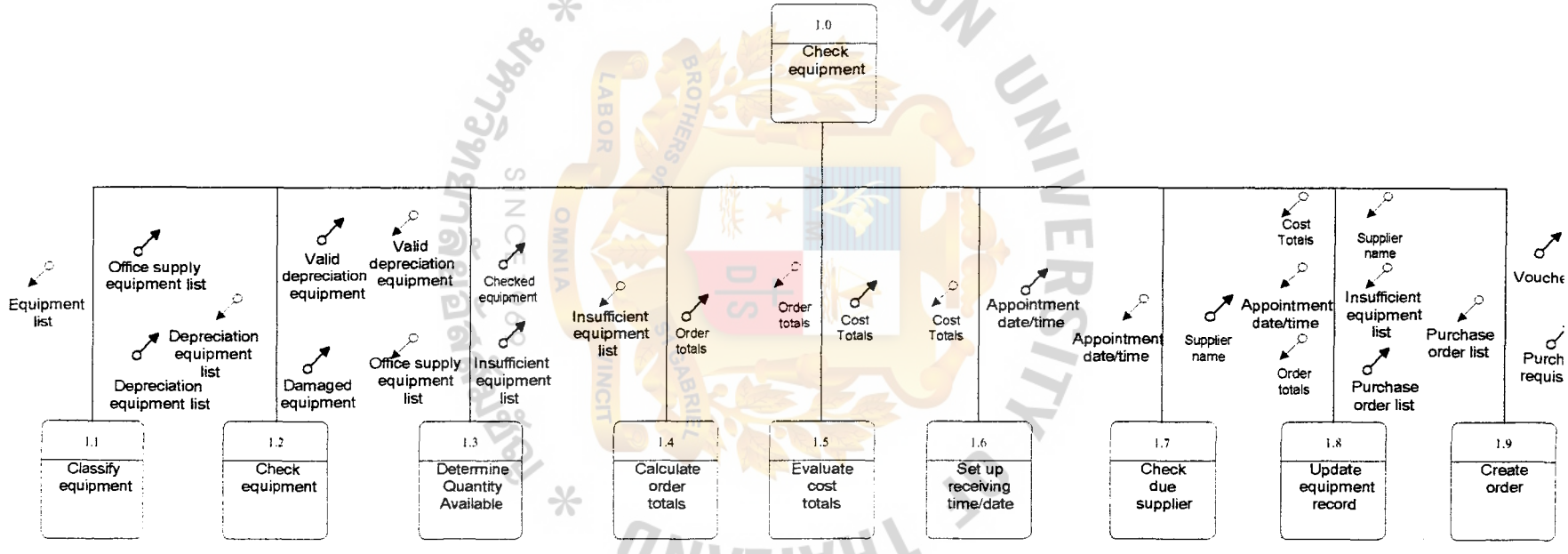

Figure E.1. Structure Chart derived from the Process 1.0

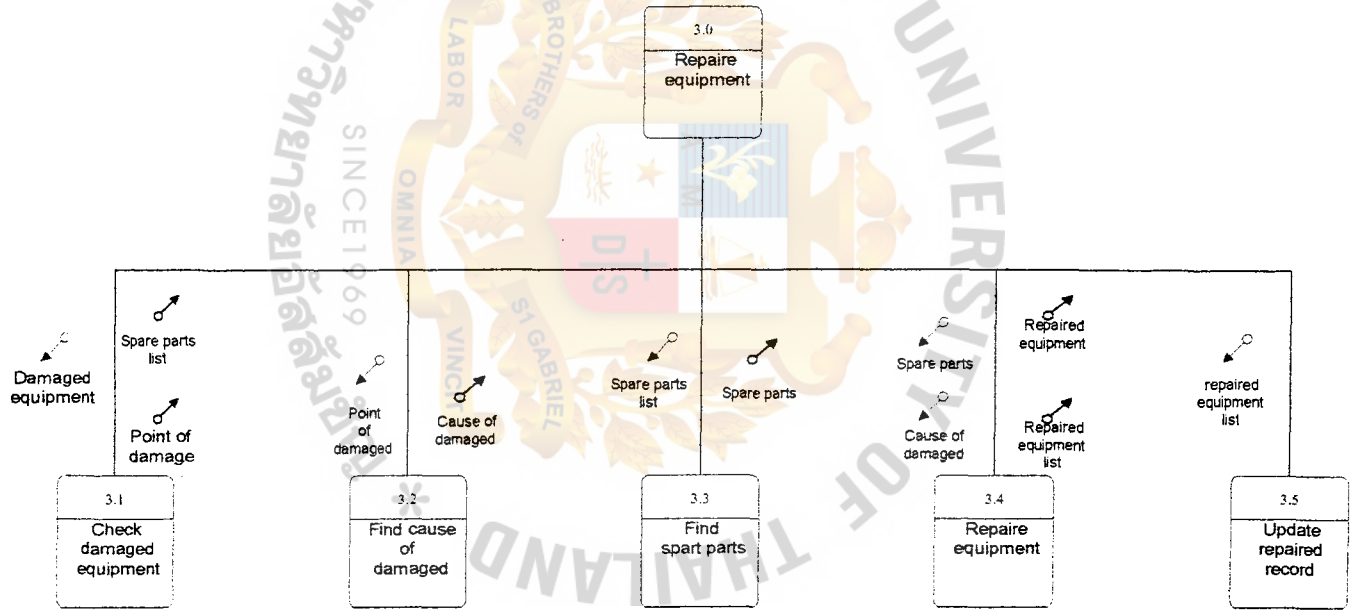

Figure E.2. Structure Chart derived from the Process 3.0

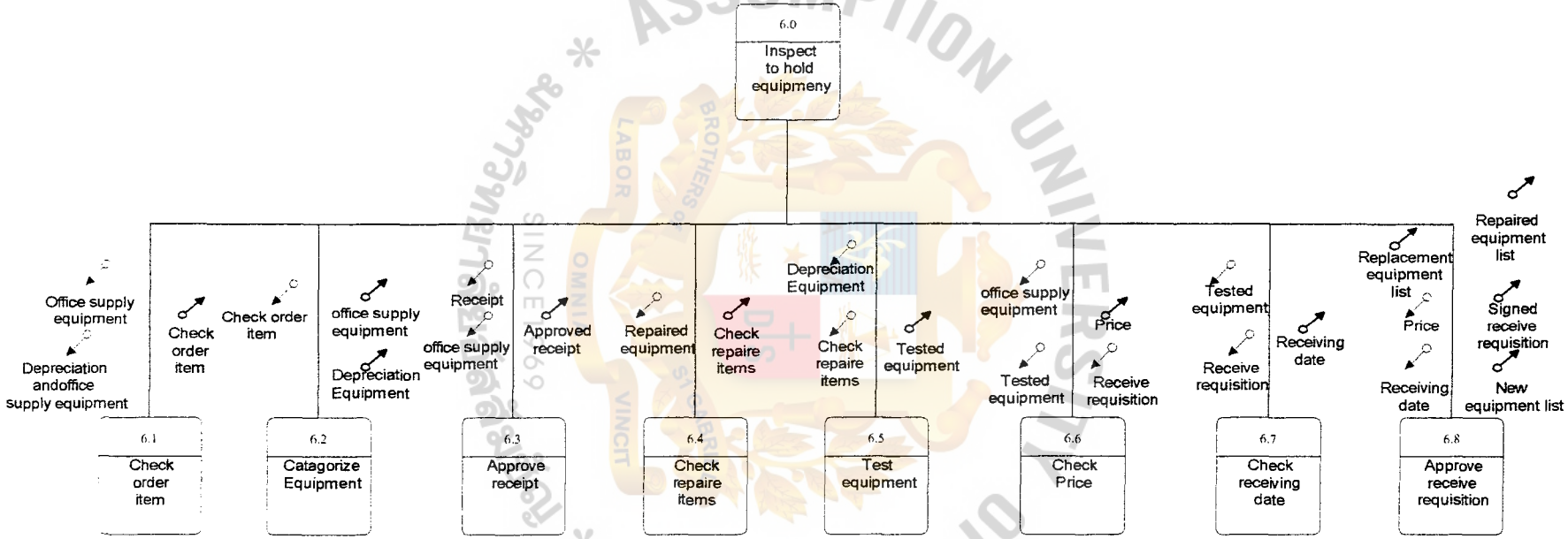

Figure E.3. Structure Chart derived from the Process 6.0

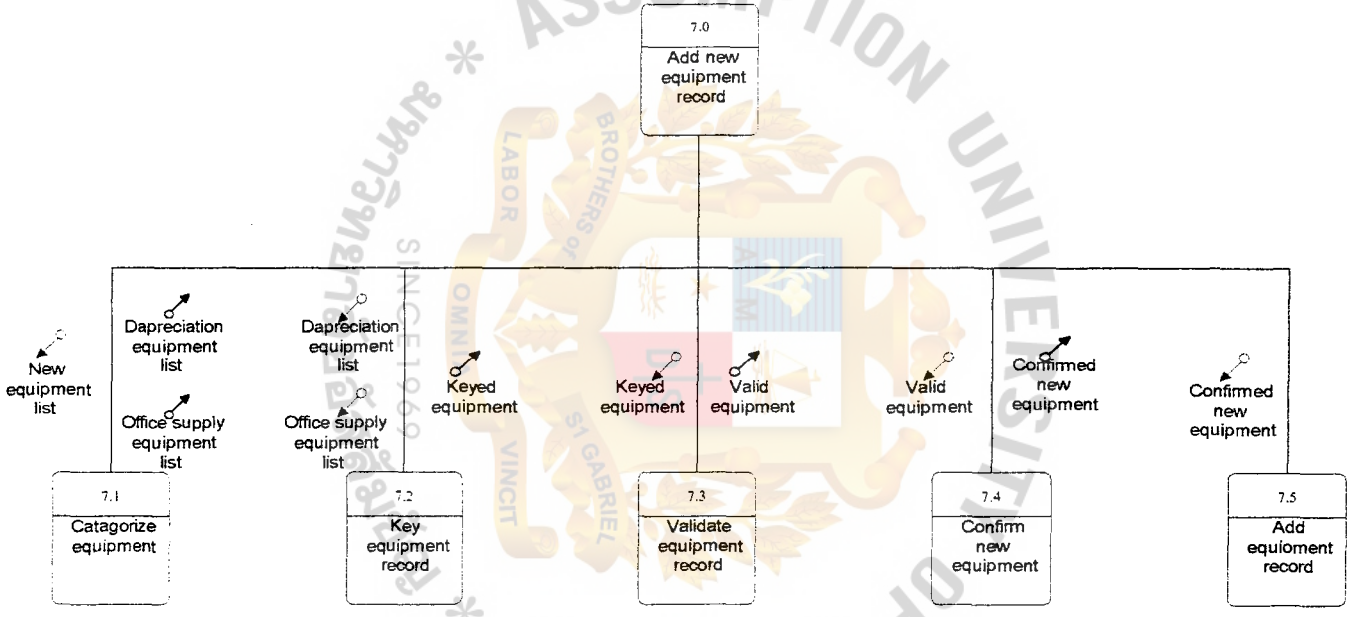

Figure E.4. Structure Chart derived from the Process 7.0

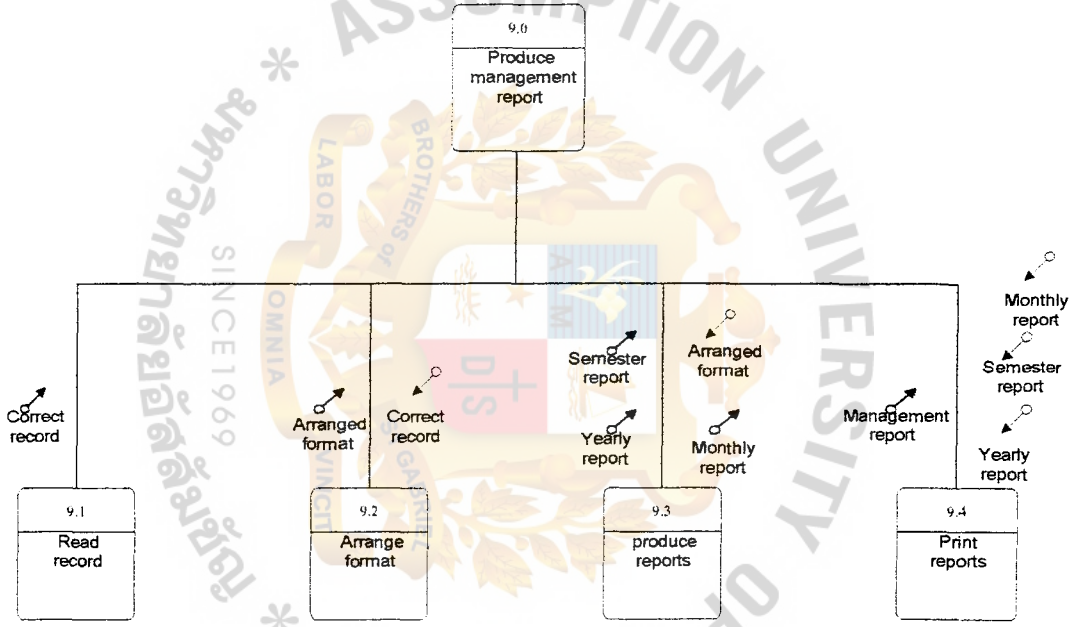

Figure E.5. Structure Chart derived from the Process 9.0

APPENDIX F

INPUT SCREENS

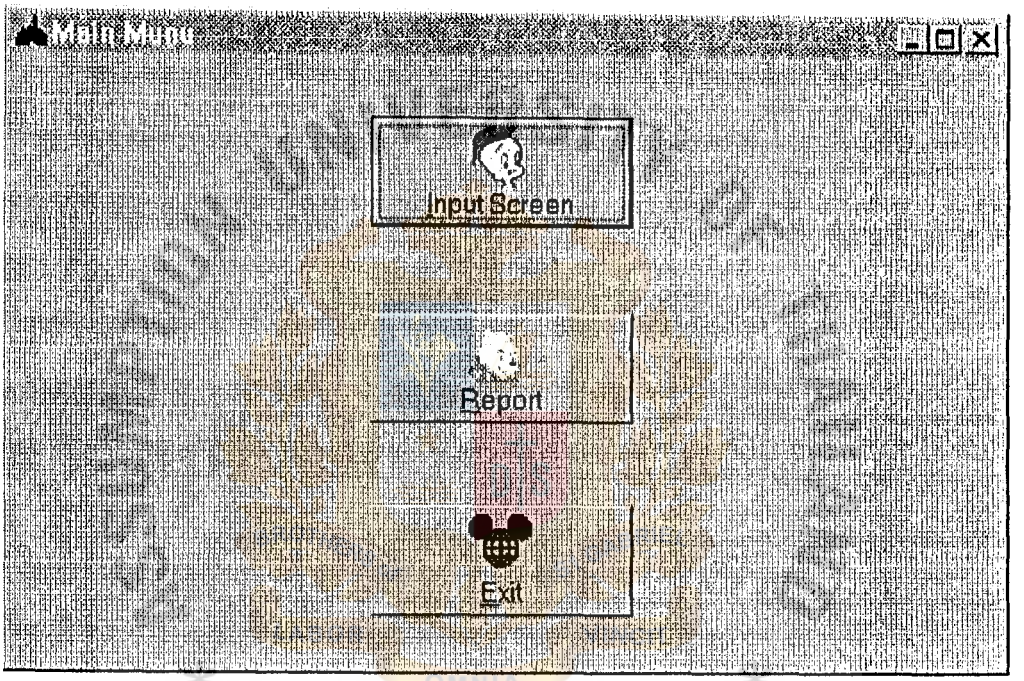

Figure F.1. Main Menu Screen

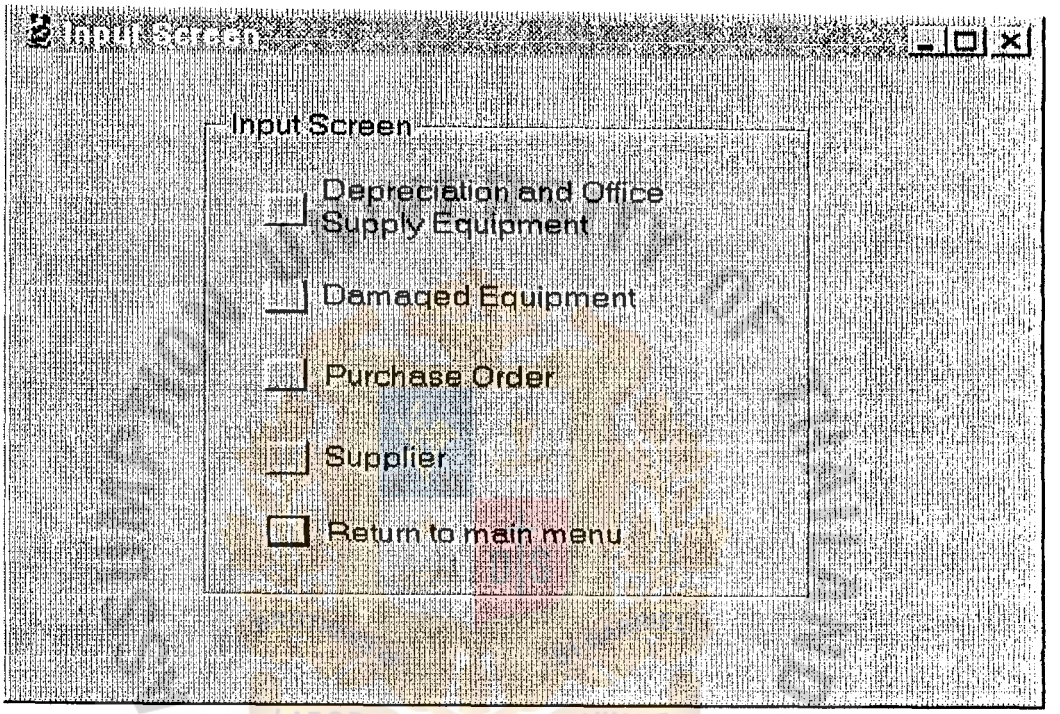

Figure F.2. Input Screen Menu

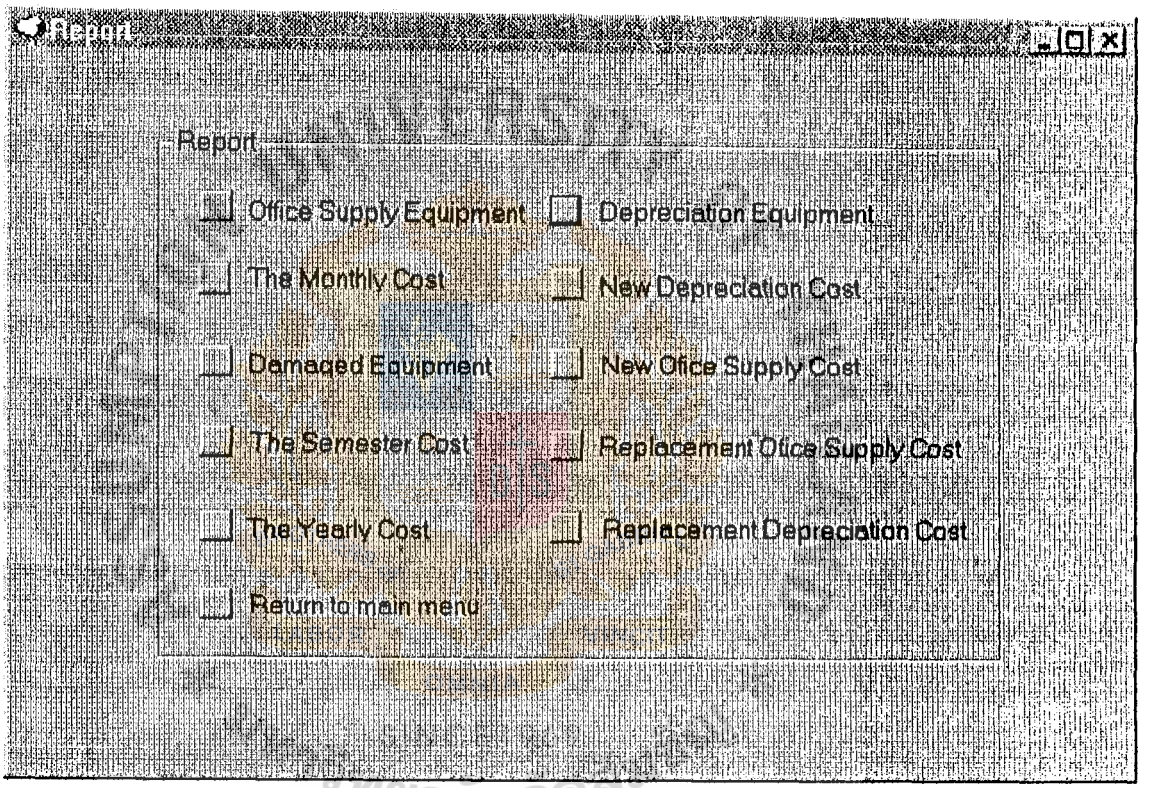

Figure F.3. Report Menu Screen

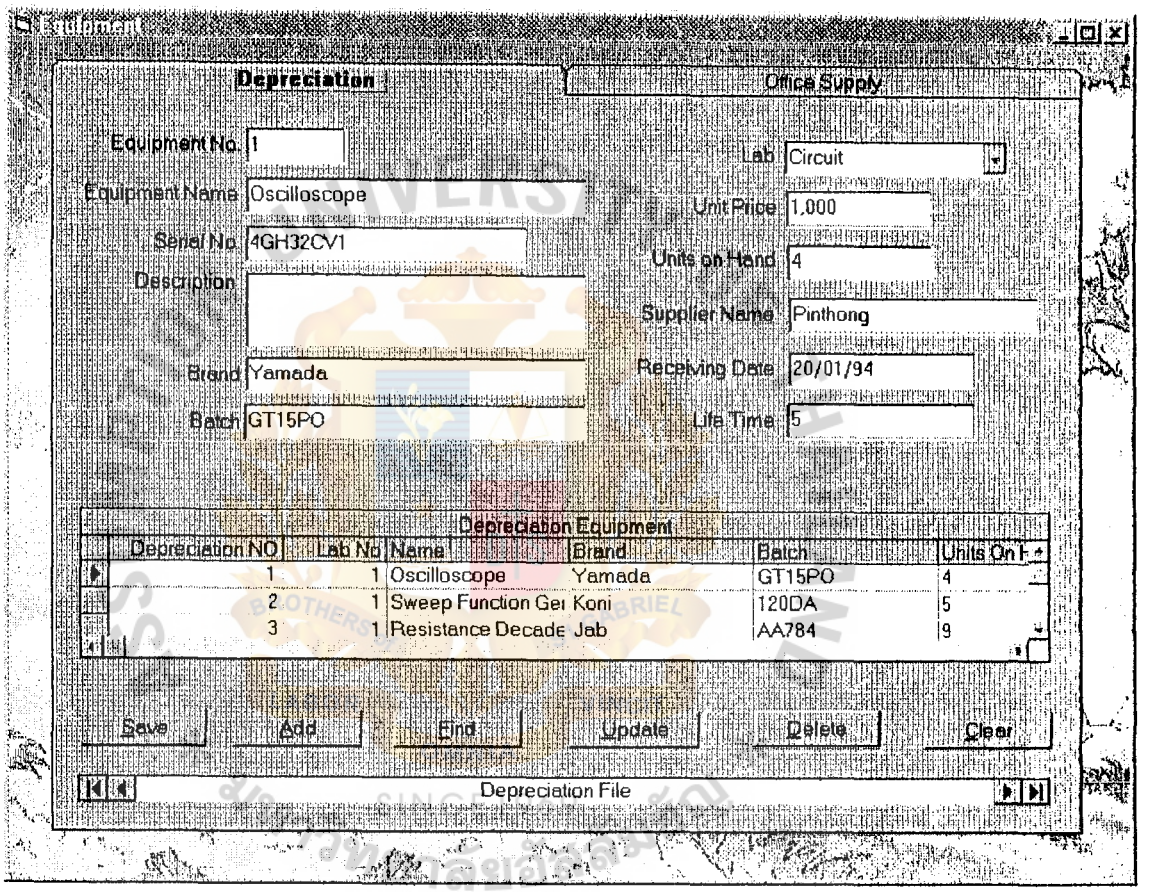

Figure F.4. Depreciation Equipment Screen

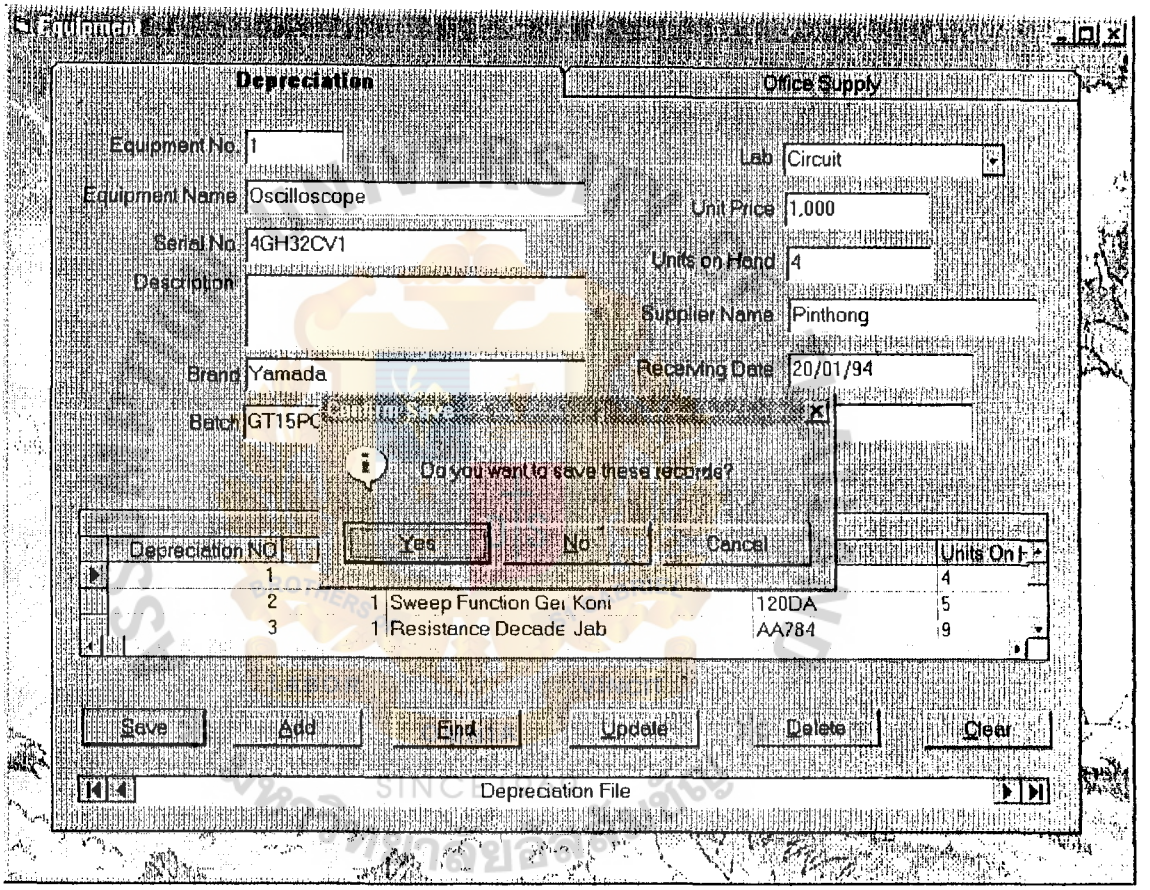

Figure F.5. Confirm Save Screen

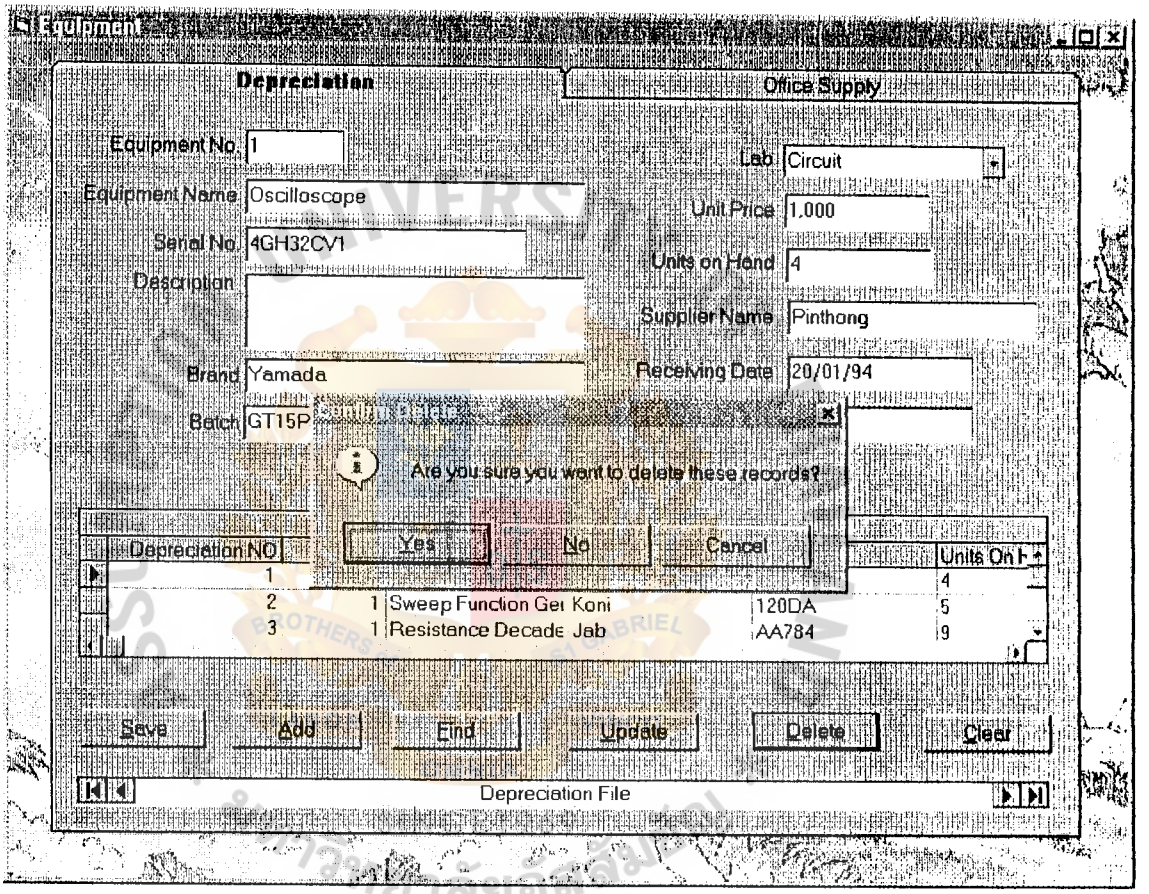

Figure F.6. Confirm Delete Screen

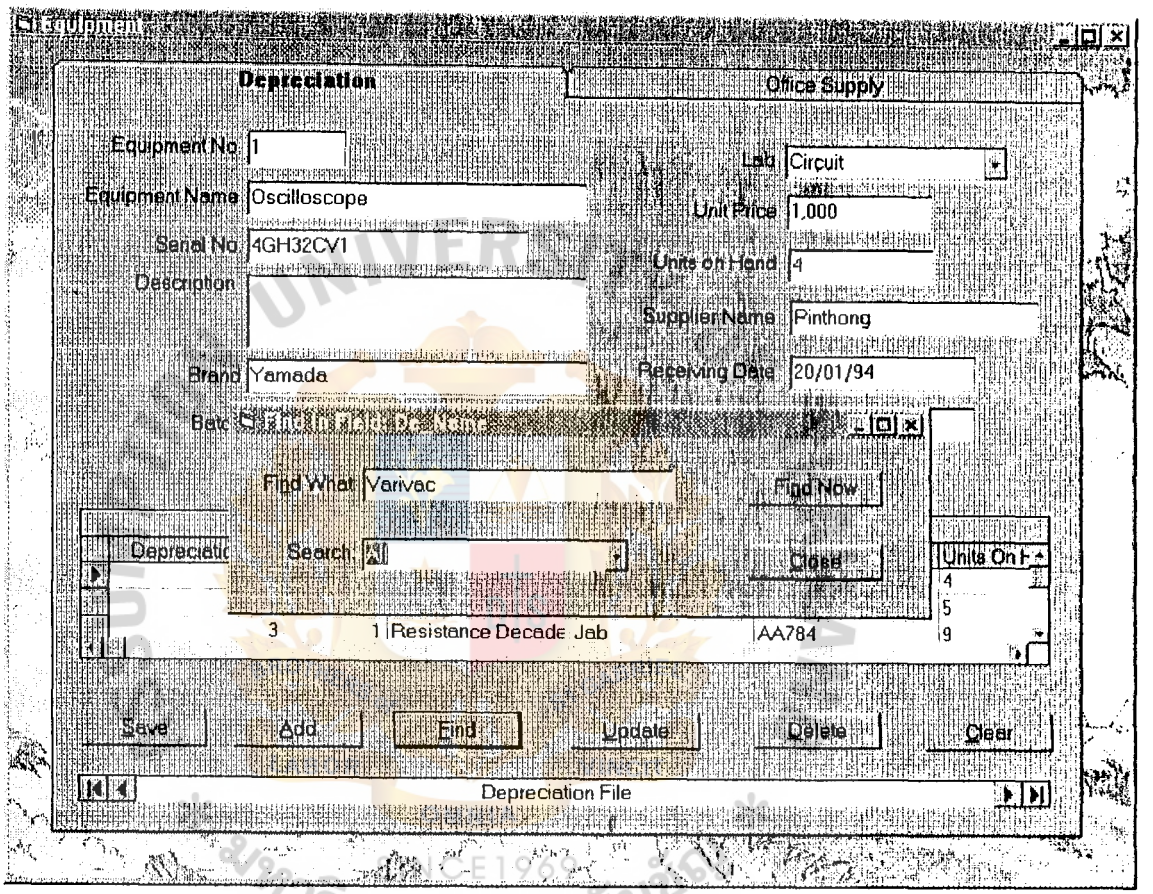

Figure F.7. Find Screen

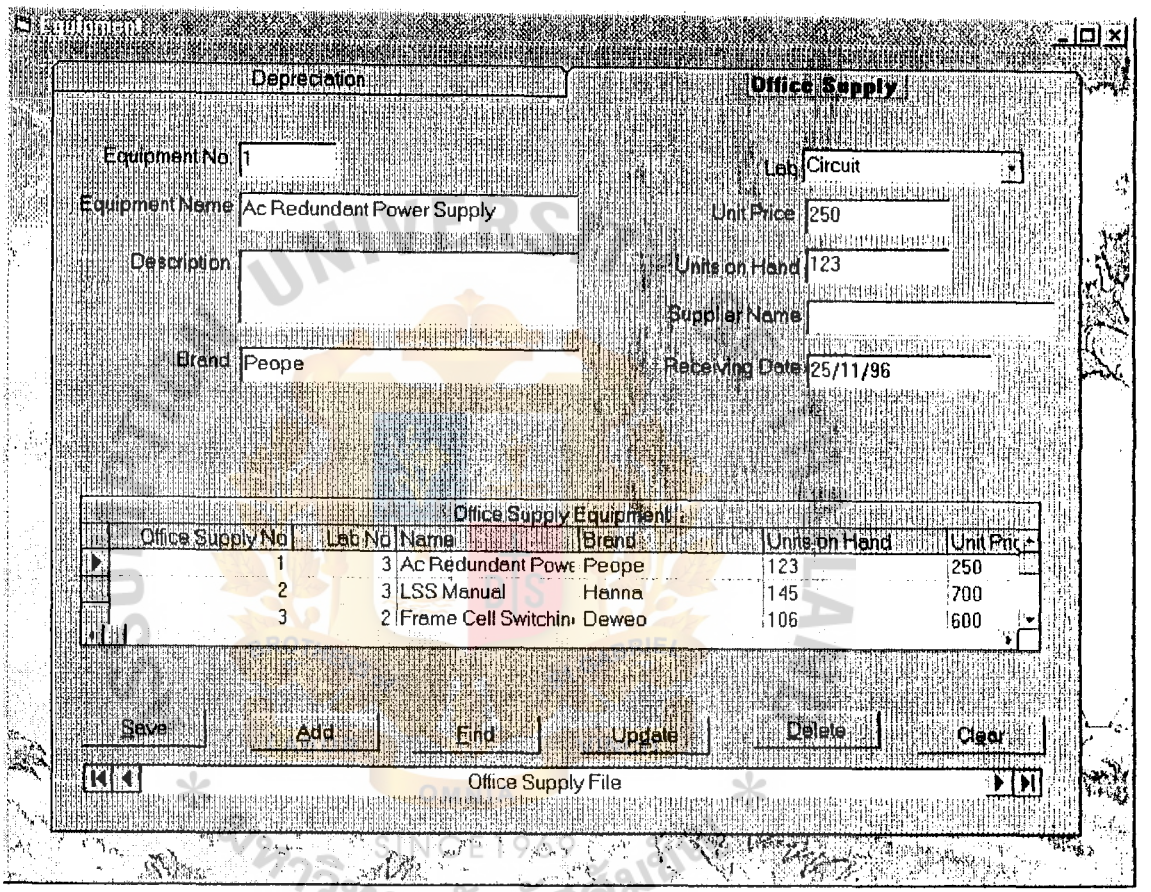

Figure F.8. Office Supply Equipment Screen

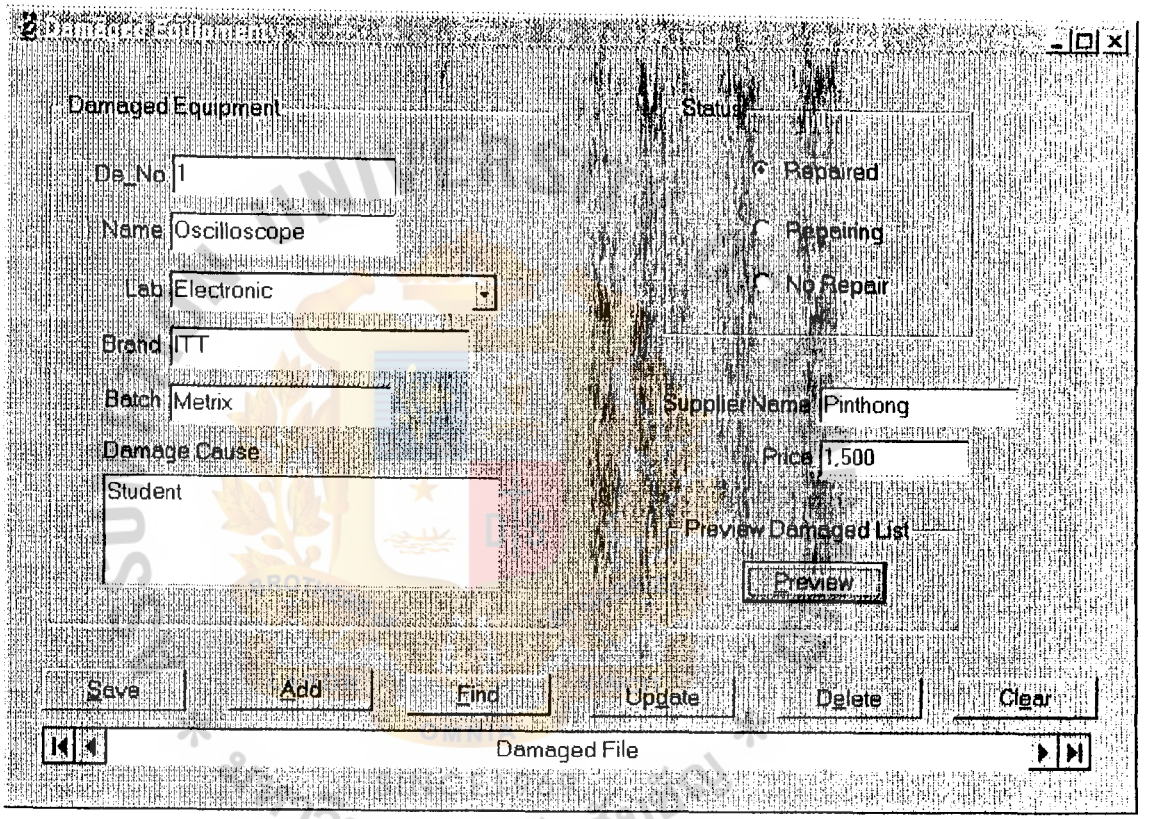

Figure F.9. Damaged Equipment Screen

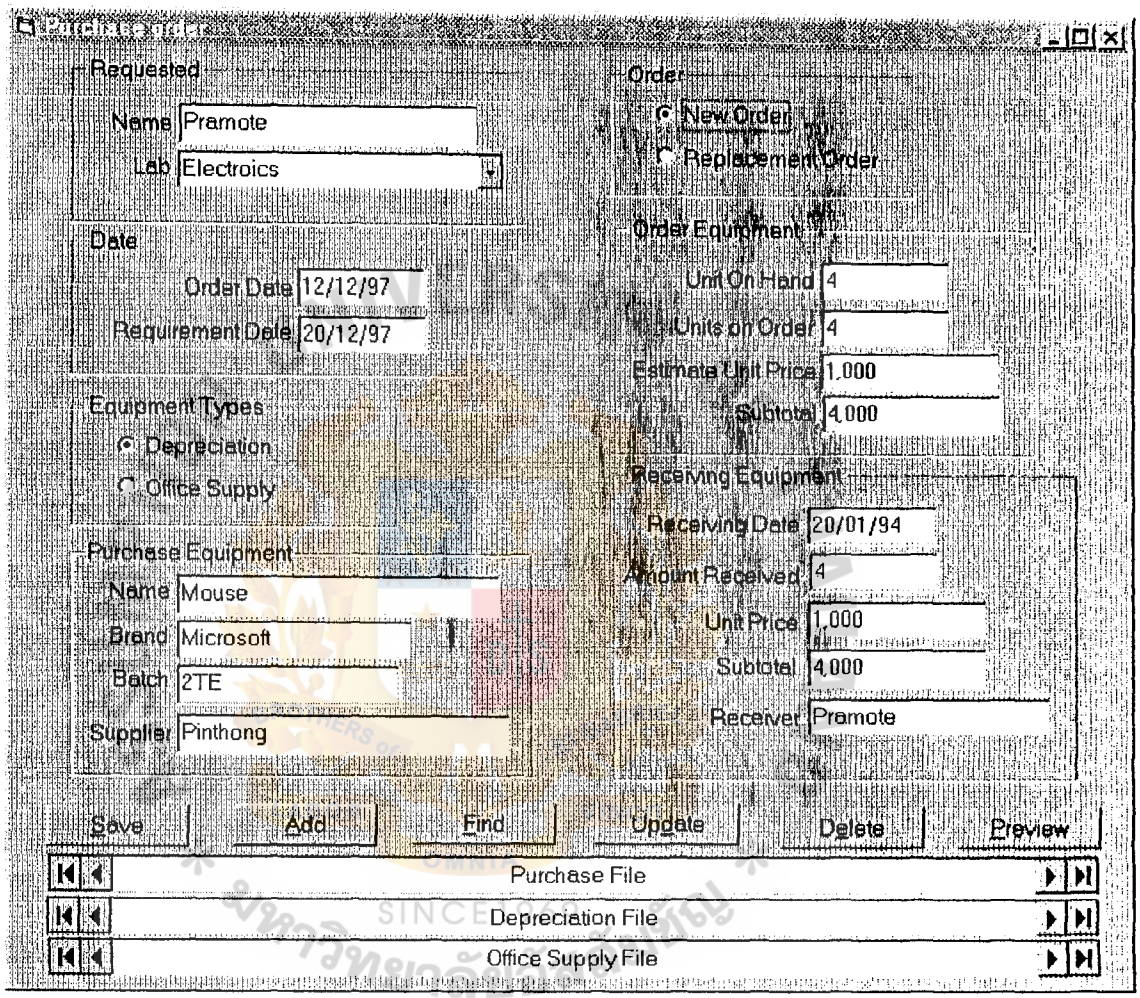

Figure F.10. Purchase Order Screen

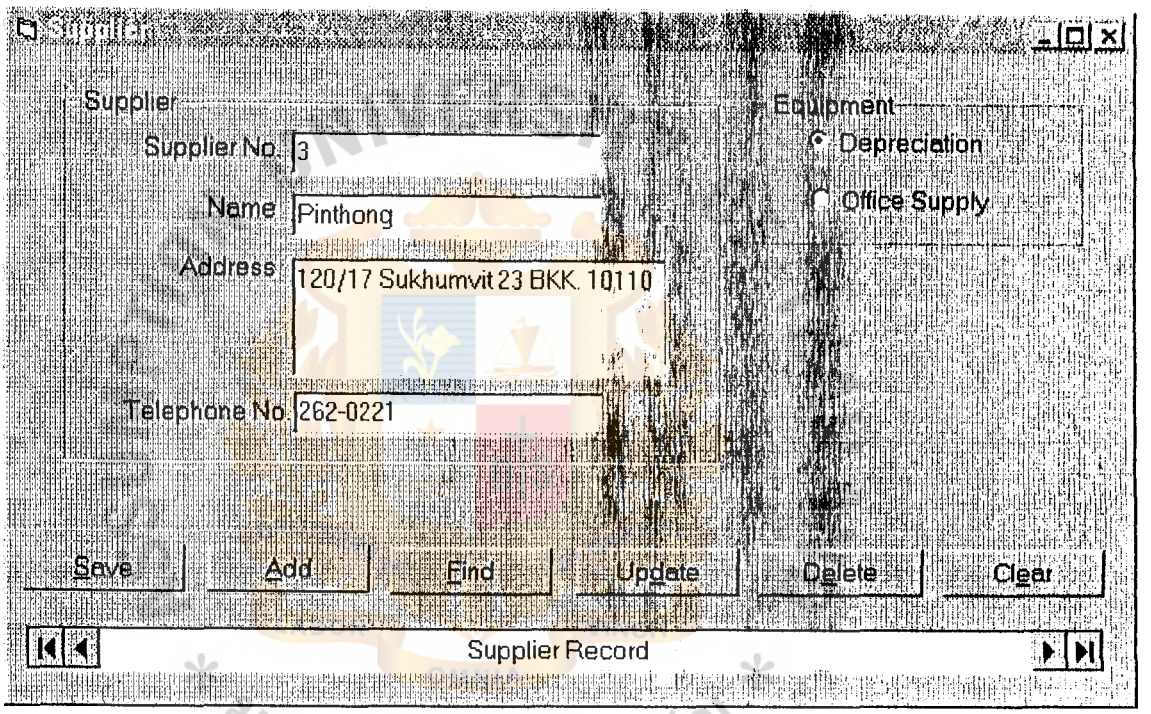

Figure F.11. Supplier Screen

APPENDIX G

REPORTS

New Depreciation Equipment

Print Date 10/12/98 **Semester 1/97 (Jun-Sep 97)**

Order Date	Equip_Name	Brand	Batch	Units on Order	Unit Price	Amount
13/06/97	Audio Generator	Doplphin	21Fd	6	3,000	18,000
20/06/97	Audio Generator	Koss	Hd-3D	6	3,000	18,000
25/07/97	Color Monitor	TVM	Ennery	4	2,500	10,000
22/08/97	Color Monitor	Ginus	Power p	4	2,500	10,000
21/09/97	Frequency Counter	Mile	FD54	5	4,000	22,000
18/07/97	Frequency Counter	Mal	KM-69S	5	4,000	20,000
20/07/97	KeyBoard	Sahara	AD21e	4	500	2,000
21/07/97	Mouse	Ginust	Rs32	4	1,000	4,000
13/07/97	Mouse	Microsoft	2TE	3	1,000	3,000
15/06/97	Spectrum Analyzer	Advantest	R3261B	25	1,000	25,000
					Total Amount	**130,000**

Figure G.1. New Depreciation Equipment Report

New Office Supply Equipment

Print Date 10/12/98 **Semester 1/97 (Jun-Sep 97)**

Order Date	Lab_No	Equip_Name	Brand	Batch	Supplier No	On Order	Unit Price	Amount
23/08/97	4	Fuse	Advantest	SD-96-sa	1	700	5	3,500
22/08/97	4	IC	Kena	AS18	4	300	5	1,500
18/07/97	3	IC	Mtrix	FDS12	1	498	5	2,490
13/06/97	3	Magic	GN	BGV21	1	90	14	1,260
14/06/97	3	Paper	Hameg	RT002	4	100	200	20,000
22/07/97	4	Print Cartridge	HP	516A29	4	5	1,250	6,250
							Total Amount	**35,000**

Figure G.2. New Office Supply Equipment Report

Replacement Depreciation Equipment Cost

Print Date10/12/98 **Semester 1/97 (Jun-Sep 97)**

Order Date	Lab_No	Equip_Name	Brand	Batch	Supplier No	Units on Order	Unit Price	Amount
13/07/97	2	Ampmeter	ITT	MX-0095	2	5	2,000	10,000
14/07/97	1	Cabinet Caster	Mile	321TH	3	10	5,000	50,000
16/06/97	3	Multimeter	ESCORT	Edm-83B	4	4	3,500	14,000
14/09/97	1	Multimeter	Yafe	SS-7802	5	5	1,000	5,000
13/07/97	1	Osciloscope	Iwaisu	SS-5720	2	10	2,000	20,000
25/07/97	1	Transmission Tester	Tekelec	TE541	4	3	5,000	15,000

Total Amount **136,500**

Figure G.3. Replacement Depreciation Equipment Report

Replacement Office Supply Equipment Cost

Print Date 10/12/98 **Semester 1/97 (Jun-Sep97)**

Order Date	Lab_No	Equip_Name	Brand	Batch	Supplier No	On Order	Unit Price	Amount
15/06/97	5	Fiel	Advantest	R3261B	2	2500	10	25,000
18/07/97	3	Fiel	Mal	KM-69S	3	500	40	20,000
20/07/97	3	Fiel	Sahara	AD21e	2	400	5	2,000
20/06/97	4	IC	KossT	Hd-3D	1	600	30	18,000
21/09/97	3	IC.	Mile	FD54	2	500	44	22,000
21/07/97	2	Paper	Ginust	Rs32	1	40	100	4,000
22/08/97	1	Paper	Ginust	Power p	1	40	250	10,000
25/07/97	1	Print Cartridge	HP	Ennery	1	4	2,500	10,000
13/06/97	4	Stationary	Doplphin	21Fd	1	6	3,000	18,000

Figure G.4. Replacement Office Supply Equipment Report

Print Date 10/12/98 **Semester 1/97 (Jun-Sep97)**

Order Date	Lab_No	Equip_Name	Brand	Batch	Supplier No	On Order	Unit Price	Amount
13/07/97	2	Stationary	Micro	2TE	1	3	1,000	3,000
							Total Amount	**130,000**

The Depreciation Equipment

Print Date 10/12/98 **Semester 1/98 (Jun-Sep 98)**

De_ NO	Lab No	Name	Brand	Batch	On Hand	Unit Price	Order Date	Receiving Date	Begining of Use	LifeTime
6	1	Audio Generator. GW.	Tanu	720D	65	4,000	01/02/94	18/04/94	06/06/94	11
26	2	Basefame for Motor-Gener	Koni	124HT	16	6,000	01/02/94	18/04/94	06/06/94	5
15	2	Cabinet Caster Set	Tanu	JY369	8	2,000	20/11/94	12/12/94	15/06/95	9
4	1	Capacitance Decatde Box	Ymada	DA21	5	8,500	01/02/94	18/04/94	06/06/94	9
25	2	Controller for the Dc. Moto	Ymada	DT85	2	3,000	03/11/94	19/01/95	15/06/95	14
7	1	DC Regulated Power Suppl	laoe	QWD5601	21	1,200	03/11/94	19/01/95	15/06/95	13
10	1	DC Regulated Power Suppl	Ymada	Y3	54	900	03/11/94	19/01/95	15/06/95	8
12	1	Digital Analog Training Sy	Kied	DTH61	9	2,000	01/02/94	18/04/94	06/06/94	13
11	1	Digital Design Learning Sy	Koni	RY69	2	14,000	20/11/94	12/12/94	15/06/95	7
13	1	Digital Multimeter	Ymada	JJFFY632	3	3,500	03/11/94	19/01/95	15/06/95	15
22	2	Diodes For Use As Require	Koni	SSSRE96	17	1,600	01/02/94	18/04/94	06/06/94	9
9	1	Electronnics Fet. Vom. San	Oihf	TJ3-3	21	400	01/02/94	18/04/94	06/06/94	6
14	1	Frequency Counnter	Kied	FYJ5	74	900	01/02/94	18/04/94	06/06/94	10
23	2	Load Resistor 5	Kied	HGF6+	16	650	20/11/94	12/12/94	15/06/95	8
17	2	Moulded Inset	Tanu	DHHT964	12	1,500	01/02/94	18/04/94	06/06/94	8
29	2	MultiZet A	Tanu	SSRR11	17	3,000	20/11/94	12/12/94	15/06/95	7
1	1	Oscilloscope	Yamada	4DE2F	4	1,000	02/01/94	20/01/94	06/06/94	5
8	1	Oscilloscope Iwatsu	Kied	WDF9	21	1,000	01/02/94	18/04/94	06/06/94	17
3	1	Resistance Decade Box	Jab	AA784	9	14,000	20/11/94	12/12/94	15/06/95	10

Figure G.5. Depreciation Equipment Report

Print Date 10/12/98 **Semester 1/98 (Jun-Sep 98)**

De_NO	Lab No	Name	Brand	Batch	On Hand	Unit Price	Order Date	Receiving Date	Begining of Use	LifeTime
19	2	Reversing Switch 3 Pole	Jab	TU56	14	5,000	20/11/94	12/12/94	15/06/95	7
24	2	Rotor Controller	Jab	45DG	10	10,000	01/02/94	18/04/94	06/06/94	6
27	2	Single-Coil Resister	Kied	SR85	19	1,500	03/11/94	19/01/95	15/06/95	12
2	1	Sweep Function Gen.	Koni	120DA	5	35,000	11/03/94	05/05/94	21/06/94	13
16	2	Three Incandescent Lamp S	Kied	DYT258	9	3,500	03/11/94	19/01/95	15/06/95	6
21	2	Three Push button SW.	Koni	JDD666	16	1,600	20/11/94	12/12/94	15/06/95	12
28	2	Three-phase Transformer	Jab	15SR	15	2,000	01/02/94	18/04/94	06/06/94	6
30	2	Thyritor Set	Ymada	RR96	15	8,000	01/02/94	18/04/94	06/06/94	14
18	2	Triple-Pole On-Off Switch	Jab	D6HD3	15	3,000	03/11/94	19/01/95	15/06/95	9
20	2	Two Push button SW.	Ymada	SSYT6	10	3,600	03/11/94	19/01/95	15/06/95	13
5	1	Varivac	Pop	690C	21	5,000	03/11/94	19/01/95	15/06/95	8

Damaged Equipment

Print Date10/12/98 **Semester 2/97 (Nov-Mar98)**

De_No	Lab_No	Name	Brand	Batch	Cause	Supplier No	Request Date	Receiving Date	Repairment Expense
13	1	Digital Multimeter	Escort	EDM-93E	Crush	5	15/10/97		
1	1	Oscilloscope	ITT	Metrix	Student	4	13/11/97	13/12/97	900
27	2	Single-Coil Resister	Iwatsu	SS-7820	Student	2	13/01/98	15/02/98	1,500
21	2	Three Push button SV	Goodwill	GFG-8017	Student	5	15/10/97		
30	2	Thyritor Set	Sanwa	YX-361TF	Crush	7	13/01/98	15/02/98	1,000
5	1	Varivac	Pop	690C	Crush	7	13/11/97	30/11/97	500
								Total Amount	**3,900**

Figure G.6. Damaged Equipment Report

Yearly Depreciation Equipment

Print Date 10/12/98 **Semester 1/97 (Jun-Sep97) and Semester 2/97 (Nov-Mar98)**

Order Date	Lab_No	Equip_Name	Brand	Batch	Units on Order	Unit Price	Amount
18/03/98	5	LSS Manual	JVC	95Lop	50	850	42,500
31/01/98	5	Voltac	Amina	32Ko	100	1,000	10,000
14/12/97	1	Multimeter	Yafe	SS-7802	4	1,000	4,000
15/05/98	1	Voltac	Mac	32-Asz	12	1,000	12,000
23/06/97	3	Ampmeter	Hana	654POL	25	1,000	25,000
14/08/97	1	Cabinet Caster	Mile	321TH	10	5,000	50,000
13/04/98	1	Osciloscope	Iwaisu	SS-5720	10	2,000	20,000
23/07/97	5	Multimeter	Sanwa	YX-361 TR	25	300	7,500
14/04/98	6	Osciloscope	Yamada	Nu458	25	1,800	45,000
13/08/97	7	Ampmeter	PAC	LK457	15	2,000	30,000
24/10/97	3	Sweep Function Gen.	Lion	Fy54Sd	20	3,000	60,000

Figure G.7. Yearly Depreciation Equipment Report

Print Date 10/12/98

Semester 1/97 (Jun-Sep97) and Semester 2/97 (Nov-Mar98)

Order Date	Lab_No	Equip_Name	Brand	Batch	Units on Order	Unit Price	Amount
13/09/97	2	Ampmeter	ITT	MX-0095	5	2,000	10,000
16/08/97	3	Multimeter	ESCORT	Edm-83B	4	3,500	14,000
						Total Amount	**330,000**

Yearly Office Supply Equipment

Print Date 10/12/98

Semester 1/97 (Jun-Sep97) and Semester 2/97 (Nov-Mar98)

Order Date	Lab_No	Equip_Name	Brand	Batch	Units on Order	Unit Price	Amount
21/07/97	2	Paper	Ginust	Rs32	40	130	5,200
20/11/97	3	Fiel	Sahara	AD21e	400	5	2,000
25/07/97	1	Print Cartridge	HP	Ennery	1	2,500	2,500
13/06/97	4	Stationary	Doplphin	21Fd	30	300	9,000
21/02/98	3	IC.	Mile	FD54	5000	4	20,000
15/09/97	5	Fiel	Advantest	R3261B	2,400	5	12,000
13/12/97	2	Stationary	Micro	2TE	30	300	9,000
18/01/98	3	Fiel	Mal	KM-69S	500	5	2,500
22/08/97	4	IC	Kena	AS18	300	5	1,500
23/02/98	4	Fiel	Advantest	SD-96-sa	700	5	3,500
18/11/97	3	IC	Mtrix	FDS12	150	5	750
14/06/98	3	Paper	Hameg	RT002	20	120	2,400
22/08/97	4	Print Cartridge	HP	516A29	5	1,250	6,250
20/09/97	4	IC	KossT	Hd-3D	600	4	2,400
						Total Amount	**79,000**

Figure G.8. Yearly Office Supply Equipment Report

Expenditure of the Engineering Laboratory

Print Date 10/12/98 **Semester 1/97 (Jun-Sep 97)**

Descriptions	Semester 1/1997	Semester 2/1997	Yearly Cost
Depreciation Equipment	130,000		
Office Supply Equipment	35,000		
Repaired Equipment	5,500		
Total Amount	170,500		

Figure G.9. Semester Expenditure Report

Expenditure of the Engineering Laboratory

Print Date 10/12/98 **Semester 1/97 (Jun-Sep 97) and Semester 2/97 (Nov-Mar 98)**

Descriptions	Semester 1/1997	Semester 2/1997	Yearly Cost
Depreciation Equipment	130,000	200,000	330,000
Office Supply Equipment	35,000	44,000	79,000
Repaired Equipment	5,500	3,900	9,400
Total Amount	170,500	247,900	503,000

Figure G.10. Yearly Expenditure Report