



Real Estate Information System

by
Mr. Guo JunJia

A Final Report of the Three-Credit Course
CS 6998 - CS 6999 System Development Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
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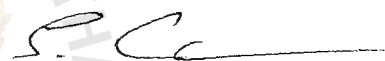
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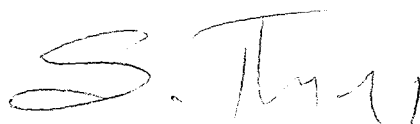
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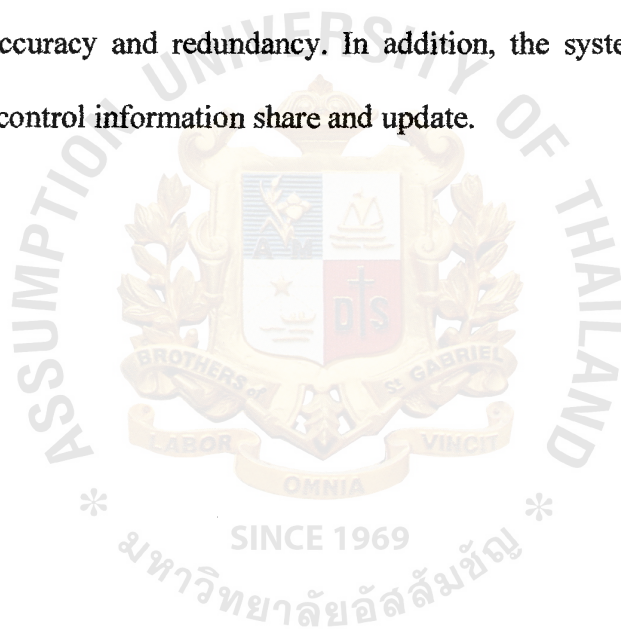
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November 2003

ABSTRACT

This project report presents the study of a project development management and project information management in Real Estate Company. As the existing system is a manual system, the new computerized system is proposed in order to improve business operations and resolve problems in the existing system.

This system development project covers all phases of system analysis and design starting from studying user requirements, analysis, design and implementation of the system. The design system consists of features which reduce information processes time and data inaccuracy and redundancy. In addition, the system is designed with good security and control information share and update.



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I. INTRODUCTION:

1.1 Background of the Project

Real Estate Company operates properties valuation business in the market and the important business is selling houses and buildings. But in fact, it is not only selling building but also covers valuation of land, property, plant, machinery for purpose of a loan, sale, and purchase. Furthermore, property estimate, insurance even the financial services, like capital issues are included.

Real estate company's businesses are based on each project. The projects that are developed under the process are shown in Figure 1.1.

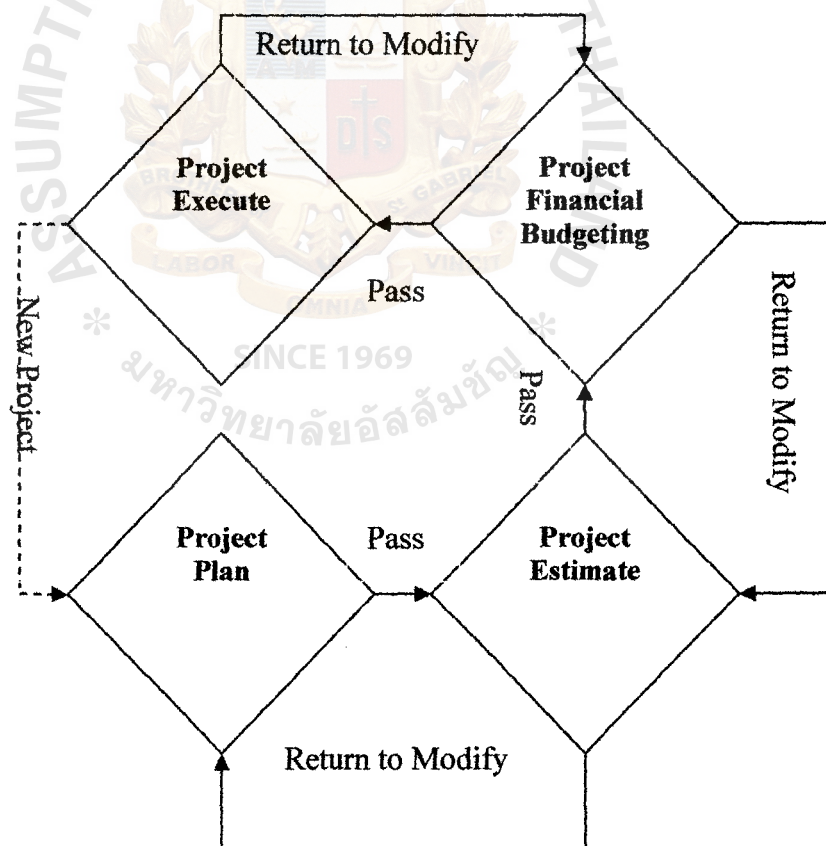


Figure 1.1 Project Developing Process Chart.

From this process, it is seen that the project data will move to many departments and be modified many times. The data are very complex because they are not only financial data but also many technological data. So for the project, Project Development Information System should be set up to solve the data transfer, data modify questions. It is intended that this system is clear and easy to supply data to each user, to save time and management cost.

1.2 OBJECTIVES:

The objectives of this project are as follows:

- (1) To analyze the existing system and design the new system computerized system for more effective work
- (2) To identify user requirement
- (3) To identify task requirement
- (4) To identify information system requirement
- (5) To design and develop a new system based on all requirements
- (6) To improve the efficiency and effectiveness of organization concerning Project Development Information system.
- (7) To provide up-to-date information and reports for management team to analyze, forecast and plan project analysis.
- (8) To minimize company costs and time consumption.
- (9) Reliability of information, fast and efficient searching of all kinds of data that the project needs.
- (11) To provide friendly interface to update data easily and timely.
- (10) Accurate and secure data.

1.3 Scope:

The existing system is studied and analyzed in order to identify user's requirements. Then possible solutions to the problems are identified. This project is designed to reduce errors which usually occur in the existing system and to create online computer-based information system for project information procedures which are adding, updating, deleting, and searching. This system is involved with marketing information, financial information, project information and technological information.

The scope of this project is as follows:

- (1) To analyze, design, implement and provide up-date document of the project development information system.
- (2) To create database of project development information system.
- (3) To provide reports more speedily and accurately for management team in order to analyze, forecast, and plan project analysis.
- (4) To provide reports at regular time and upon request.
- (5) To support transaction from staff who work at project site.

1.4 Deliverables:

In this project, deliverables can be divided into 2 parts. First part focuses on system analysis, and it delivers ER (Entity Relationship) Diagram for Database design, and functional Decomposition with Data Flow Diagram (DFD) for the system design. The second part focuses on system design, and it delivers Physical Entity Relationship Diagram, Physical Data Flow Diagram and System Structure. All analyzed models are used to implement a new system, which consists of both software and hardware solution, and cost/benefit analysis.

1.5 Project Plan:

This project started on 1 July 2003 and finished on 31 October 2003. The project is based on FAST system development methodology. The project schedule of Project Development Information System is given in Figure 1.2.

- (1) Analysis of the Existing System should be done in 1.25 month.
- (2) System design should be done in 0.75 month.
- (3) System Implementation should be done in 2 month.



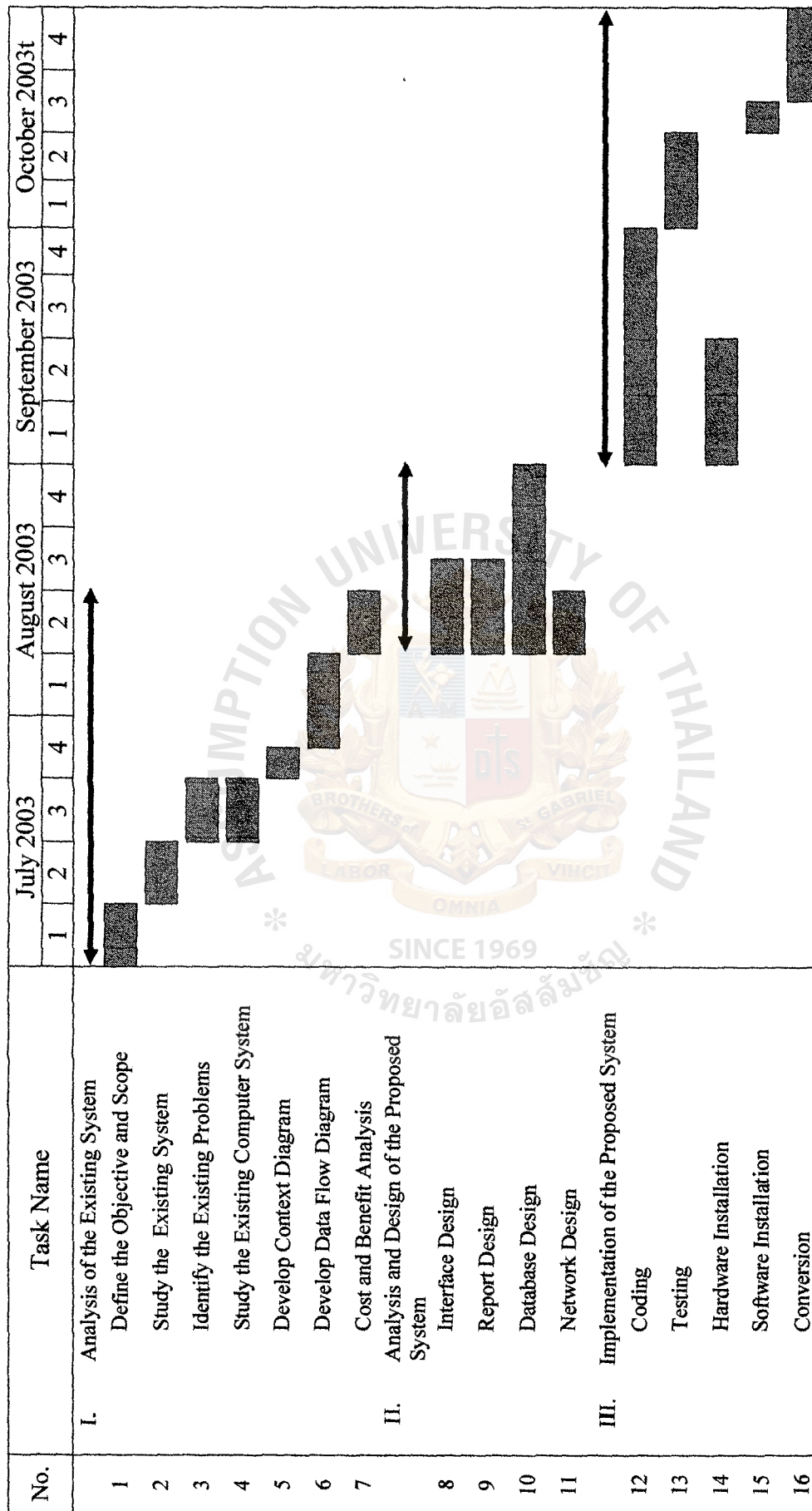


Figure 1.2. Project Plan of Real Estate Company.

II. EXISTING SYSTEM

2.1 Background of the Organization.

Following the economic crisis, many real estate companies and construction companies had failed in their project because the investment cost is higher than the selling income. Why? They have no accurate process to estimate the project. They ignore some factors, like financial risk- inflation, marketing risk- customer demand changing, new technology using reduced material, less labor cost, etc. So, for the project, a system is developed under the project developing process (see Figure 1.1) and based in the company's organization. The company's organization chart is shown in Figure 2.1.

The project development follows 4 processes (see Figure 1.1). They are Project Plan phase, Project Estimate phase, Project Financial phase and Project Execute phase.

(1) Project Plan phase: For this phase, the important work is under marketing information to set up a plan. The plan tries to decide what kind of building that will be built and which kind of product is the best for customer demand.

(2) Project Estimate phase: In this phase technological information is used to calculate how much material and how many labor units are needed and how much is the management cost. After calculating product total cost, it is considered how much time is needed to build the building, because time is very important for the loan interest of the financial budget. It also affects the customer demand because nobody likes to wait for the house to be finished.

(3) Project Financial Budgeting phase: This phase decides how much is needed to pay for each project executing phase and how much loan is needed from the bank.

(4) Project Execute phase: The important work of this phase is help to solve all kinds of problems which happen in operation.

2.2 Existing Business Functions

The existing business functions of Project Development Information System are manual and some are computerized. We can summarize them as follows:

Process 1: Project Plan System

In this process, project requirement from Executive Vice President, and data from marketing are obtained to consider which kind of product customers need in the market. After that data from Technology Support Office is obtained to decide what kind of structure will be used in this kind of building and what and how much materials are needed. Finally, all these information are summarized to form a plan report to the manager and Executive Vice President for approval.

Process 2: Data collection and calculation system

This process is to collect all the data of the approved project, and to calculate all the costs. After that all the data and calculation results are saved in the database. The status and phase of the project will be updated in this process.

Process 3: Project estimate system

This process is to do a feasibility analysis report for the company. First, data is combined with the company financial status to form a project financial budget. And then feasibility analysis is done and if it is approved, the whole

project is saved in the system. Otherwise depending on decision marking, the system goes back to process 1 or 2 for necessary modification.

Process 4: Project execution system

This process has two tasks. One is announcing to execute the project if the project plan is approved by the president. So there is a need to report the formal project to each department for operation. Second is solving the problems that happen during operation. All problem solutions increase the project's cost. So this process reports the problems to the concerned departments and supports accurate data to help them solve the problems.

2.3 Current Problems

The existing system is a manual system, so there are many problems listed as follows:

- (1) All the data are recorded on paper, so it is hard to keep, to protect, to update, etc.
- (2) The project data are very complex and the system is manual. So it is difficult to save and search for the data.
- (3) The data come from different departments, so it is not easy to update on time.
- (4) Because financial data is also recorded on paper, it is not secure.
- (5) It is hard to connect with other departments working together. So the system wastes time and increases management cost.

2.4 Area for Improvement:

- (1) The new Project Development Information System helps the organization reduce human work-hour and paper costs.

- (2) Collection of data is more systematic and fast tracking.
- (3) Reports are more systematic and the system provides more reliable and accurate information.
- (4) The computerized system generates correct calculation.



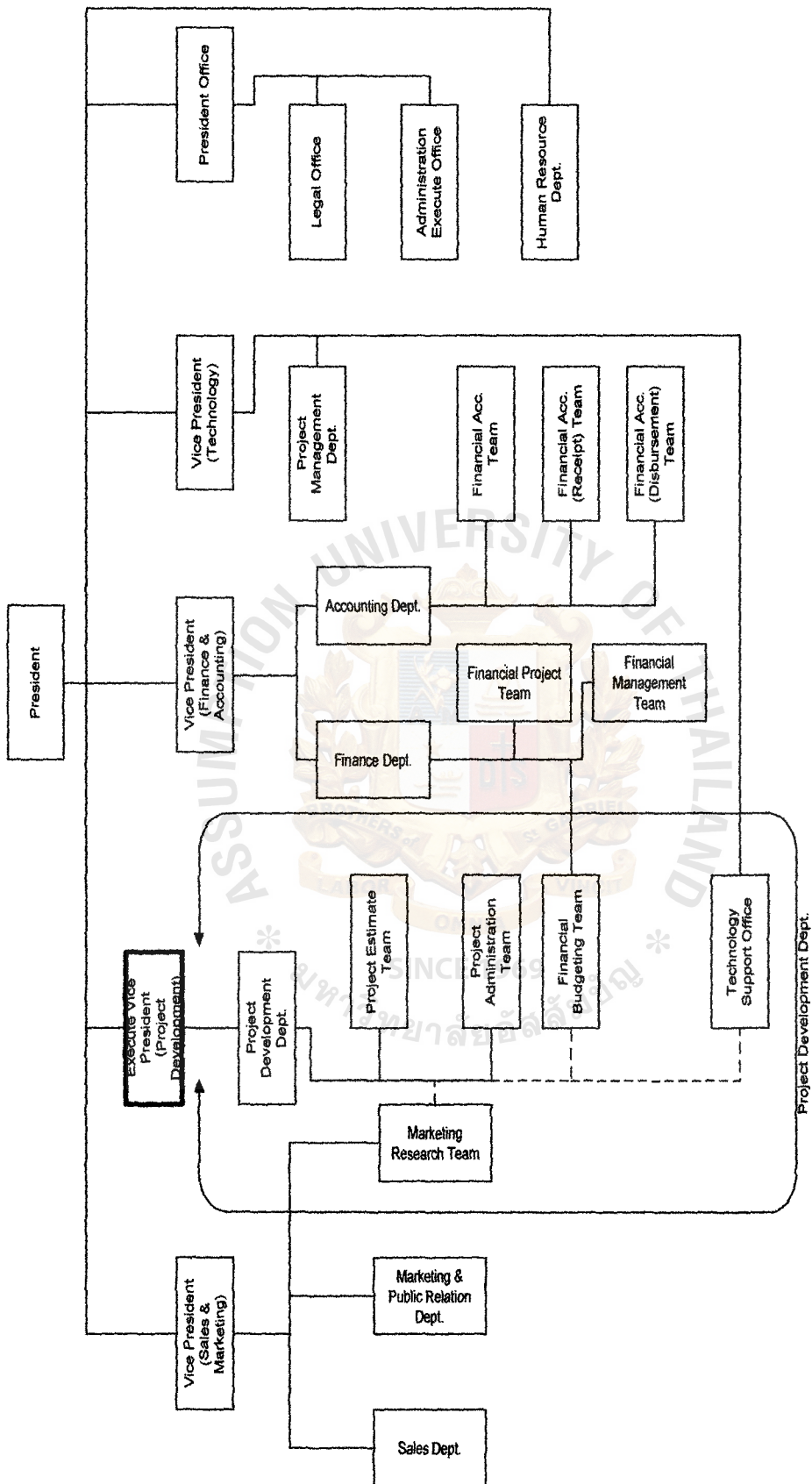


Figure 2.1 Organization Chart of the Real Estate Company.

III. PROPOSED SYSTEM

3.1 Requirements Analysis and System Specification

As mentioned in the previous chapter, the company requires a new project development information system, which can efficiently serve internal users and facilitate the various processes of Project Development Department. From information gathering, fact-finding and analyzing the existing system, user requirements and system specifications are categorized as function and nonfunctional requirements in order to make them more readable, understandable and traceable as follows:

3.1.1 Functional requirements

Functional requirements are a function or feature that must be included in the project developing management to satisfy the business need and be acceptable to the users.

- (1) The system should be able to process project order to form an order detail to each department.
- (2) The system should form a project plan under the project order detail.
- (3) The system should record all the data which the project needs in the system.
- (4) The system should record all the estimated costs, such as investment cost; investment benefit and other financial data.
- (5) The system should record all the project plan information.
- (6) The system should be able to change the project details to fulfill decision making.
- (7) The system should be able to record all the problems and their solutions which happen in the project operating process.

- (8) The system should be able to produce all required reports such as project estimate report, project execute report and other managerial reports.

3.1.2 Nonfunctional requirement

Nonfunctional requirement is a description of the features, attributes, and characteristics of the system as well as any constraints that may limit the boundaries of the proposed solution. In order to accomplish the goal, the new system should have the following components:

- (1) The system should be easy and friendly to use.
- (2) The system should be stable and reliable.
- (3) The system should update all data accurately and timely.
- (4) The system should be accurate to show all the output.
- (5) The system should help the company save costs and time.

3.2 Data Modeling and analysis

Data modeling is a technique for organizing and documenting a system's data and is sometimes called database modeling because a data model is eventually implemented as a database. A simple logical data model is called an entity-relationship diagram or ERD.

Entity Relationship Diagram (ERD) depicts data in items of the entities and relationships described by the data. The first task in data modeling is to discover the fundamental entities in Real Estate Company Project Development Information System that is or might be described by data as shown in Table 3.1.

The next is to construct the data model to establish project scope. Context data model includes fundamental business entities. This is shown in Figure 3.1. The

following task is a Key-based data model. The Key-based data model is to identify the key of each entity, eliminate nonspecific relationship and add associative entities. Figure 3.2 is the key-based data model for the project. Notice that the primary key is specified for each entity. The last task is a fully attributed data model. The fully attributed data model is to identify the remaining data attributes and subset criteria. Figure 3.3 provides the fully attributed data model for the project development information system project.



Table 3.1 Entity Definition Matrix:

Entity Name	Entity Description	Data Requirements
1. Project	This entity keeps major detail of the project ordered by the company and binds to the project plan. Execute vice president gives out the project requirement and under this required detail, project plan is formed. If the plan is approved then the project will be executed.	Project No Project Name Project Type Project Issue Date Project Due Date Project Location Project Budget Project Manager Project Admin
2. Project Plan	Under the project requirement to form a plan to estimate the project and do the feasibility analysis. The plan is control by manager.	Plan NO Plan Name Plan Location Plan Issue Date Plan Due Date
3. Project administrator	Those who are responsible for the project executing help other departments to solve the problems which happen in the executing.	P_adm ID P_adm Name P_adm Address P_adm Telephone P_adm Email address
4. Project Manager	Those who have responsibility to manage and make-decision on the project, also the one who communicate among the terms.	Project-Manager ID PM_Name PM_ADD PM_TEL PM_Email address
5. Project Estimator	Those who are responsible for the plan's estimate.	P_est ID P_est_Name P_est_ADD P_est TEL P_est Email address

Table 3.1 Entity Definition Matrix (Continued)

Entity name	Entity Description	Data Requirements
6.Engineer	Those who are supported the project technologic information.	Eng_ID Eng_Name Eng_ADD Eng_TEL Eng_Email add
7. Marketing Researcher	Those who are responsible for project market research.	MR_ID MR_Name MR_ADD MR_TEL MR_Email Add
8.Fnancial Budgeter	Those who are responsible for the project financial budget.	FB ID FB_Name FB_Add FB_Tel FB_Email add
9. Budget	The amounts of money required for the project.	B_No B_Issue Date B_Due Date B_type
10. Technology status	Support the project technological information.	Ts_No Ts_Issue Date
11. Market status	Support project market information.	Ms_No Ms_Issue Date

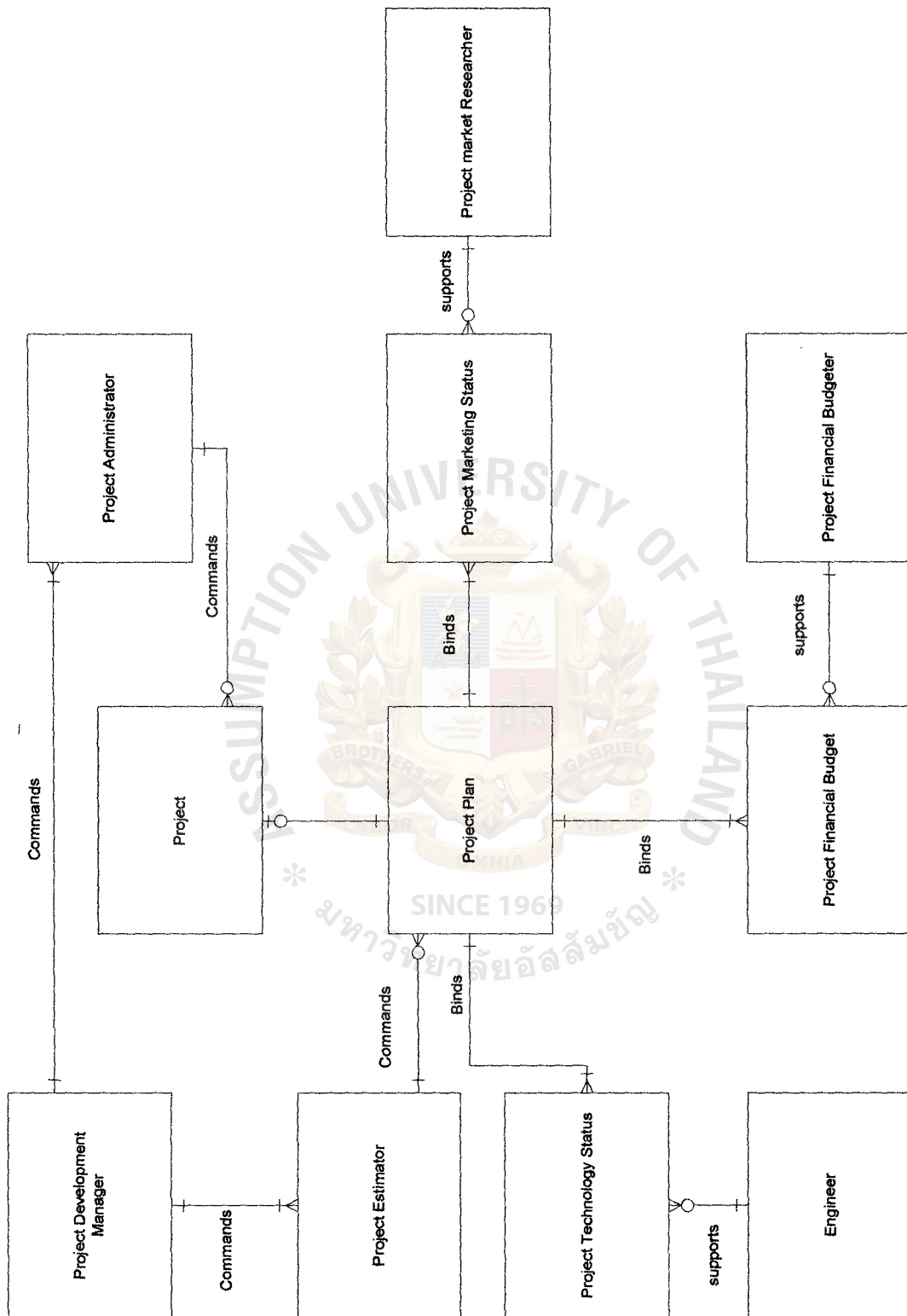


Figure 3.1 Entity Relationship Diagram (Context Data Model).

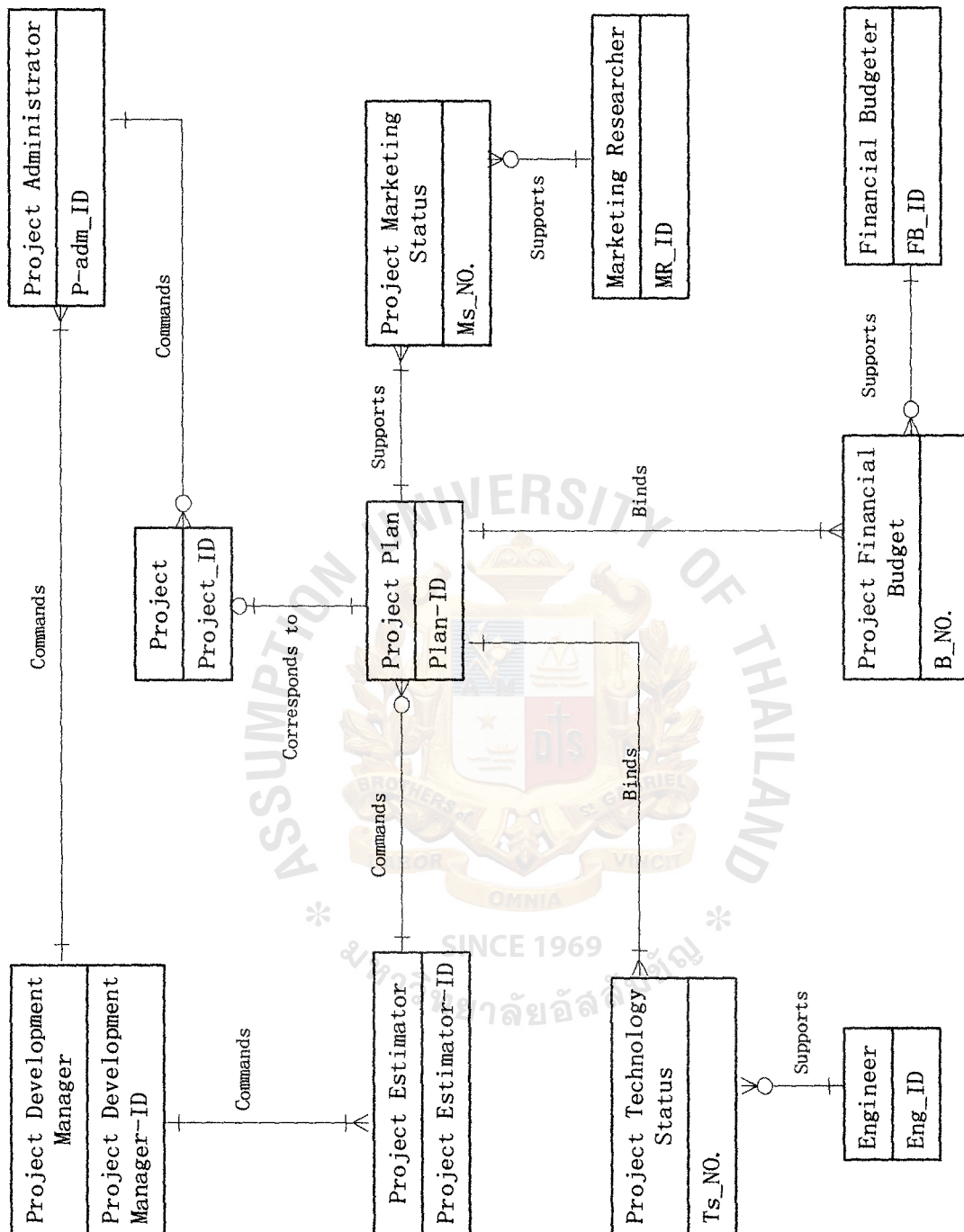


Figure 3.2 Key-Based Data Model

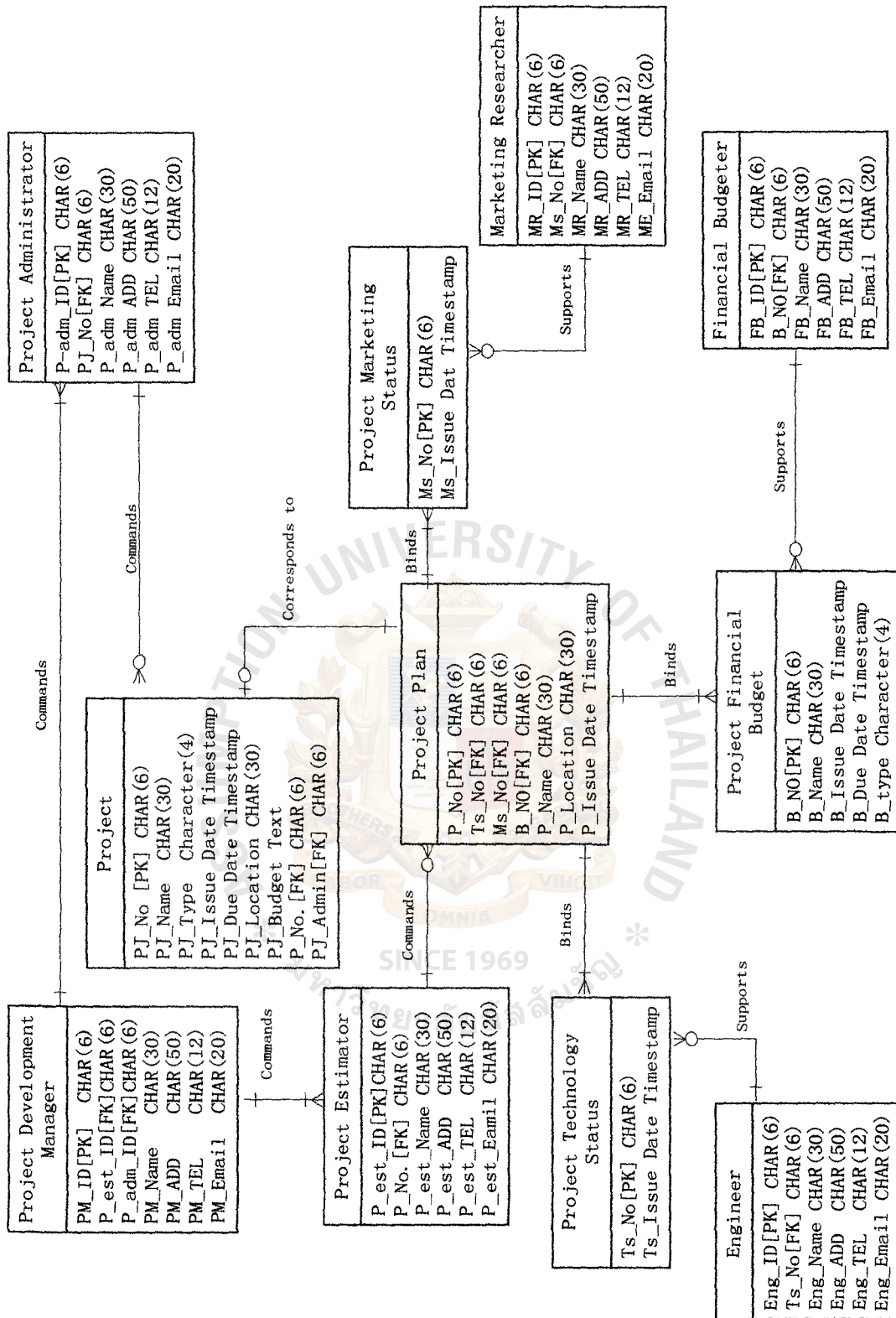


Figure 3.3 Fully Attributed Data Model

3.3 Process Modeling

Process modeling is a technique used for organizing and documenting the structure and flow of data through system processes and/or logic, policy, and procedures to be implemented by the system's processes. The process modeling of project development information system will be shown by the data flow diagram. Data flow diagram (DFD) depicts the flow of data through a system and the work or processing performed by the system.

(1) Context data flow diagram

Before constructing process model, a system context data flow diagram is constructed to establish initial project scope. The context data flow diagram, which is illustrated in Figure 3.4 defines the scope and boundary for the project development information system. Because the scope of the project is always subject to change, the context data flow diagram is also subject to constant change.

(2) Functional decomposition diagram

Decomposition is the act of breaking a system into its component subsystems, processes and sub processes. A decomposition diagram, also called a hierarchy chart, shows the top-down functional decomposition and structure of a system. Figure 3.5 is the functional decomposition diagram for the project development information system.

(3) Event diagram

An event is a logic unit of work that must be completed as a whole. An event is triggered by a discrete input to the project development information system and is completed when the process of project development information system has responded with the appropriate

outputs. Using the decomposition diagram as an outline, we can draw one event diagram or each project development event process. The event diagram shows the inputs, outputs and data store interactions for the event. An event diagram is constructed and validated for each event. Figure 3.6 to 3.15 are the context diagrams for each single event of the project development information system respectively.



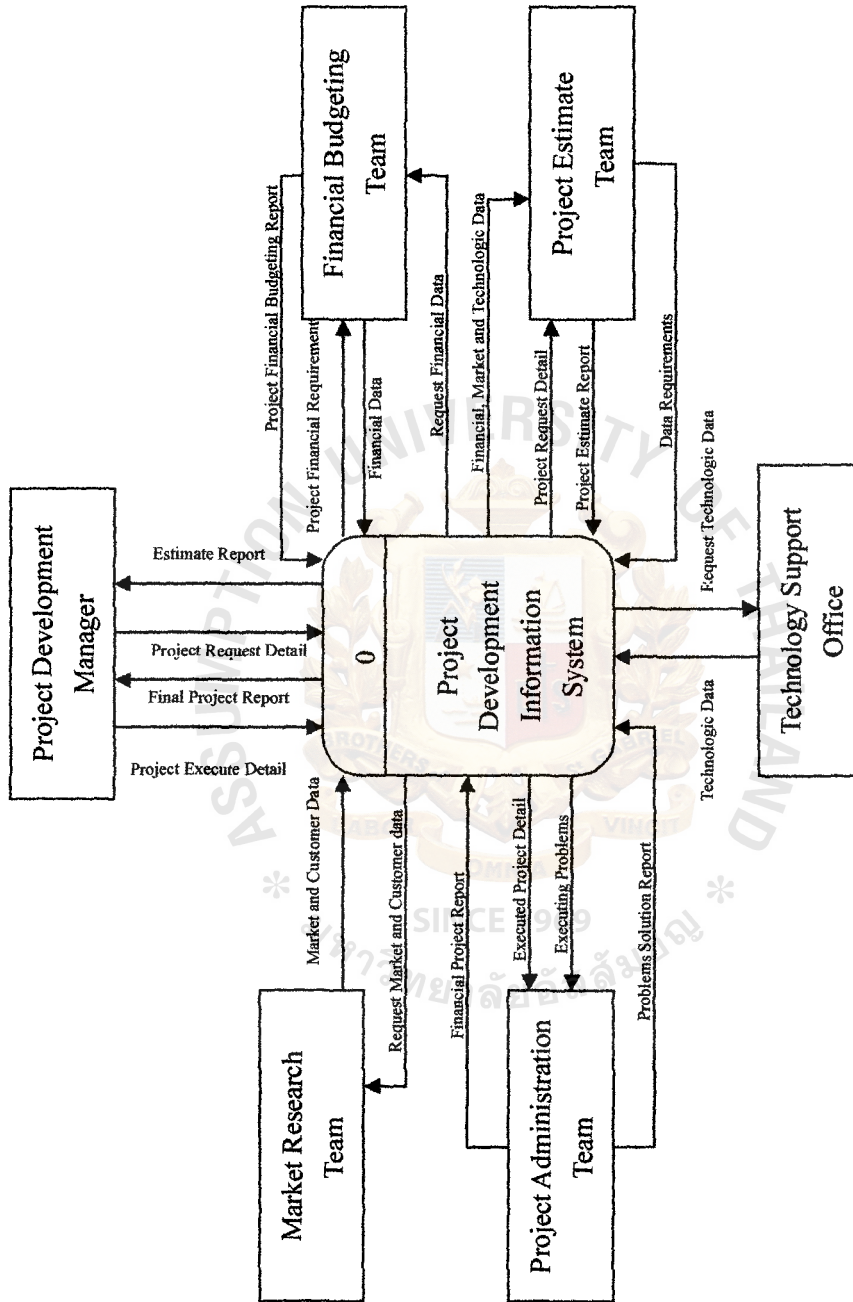


Figure 3.4 Proposed System's Context Data Flow Diagram

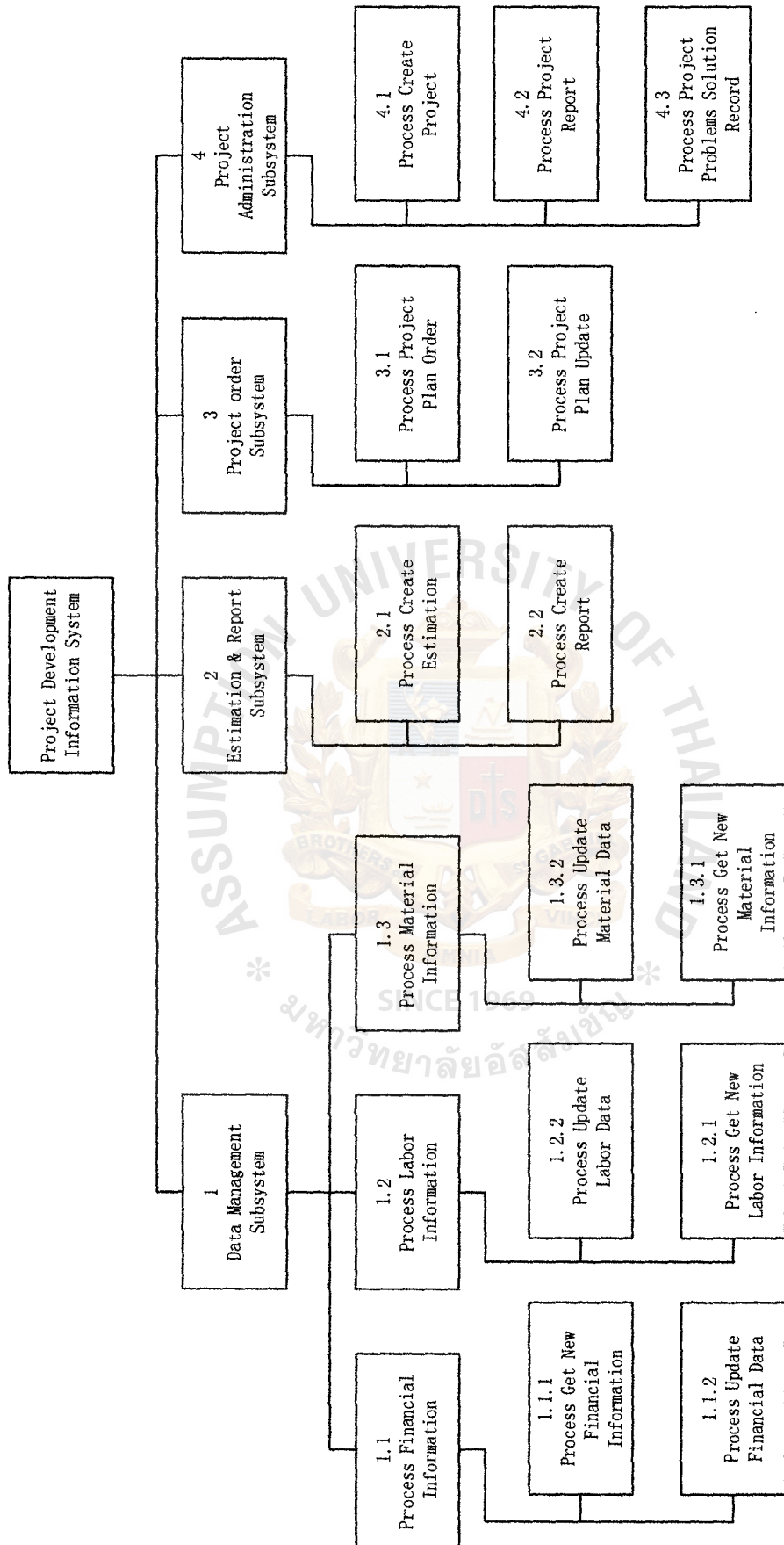


Figure 3.5 Function Decomposition Diagram.

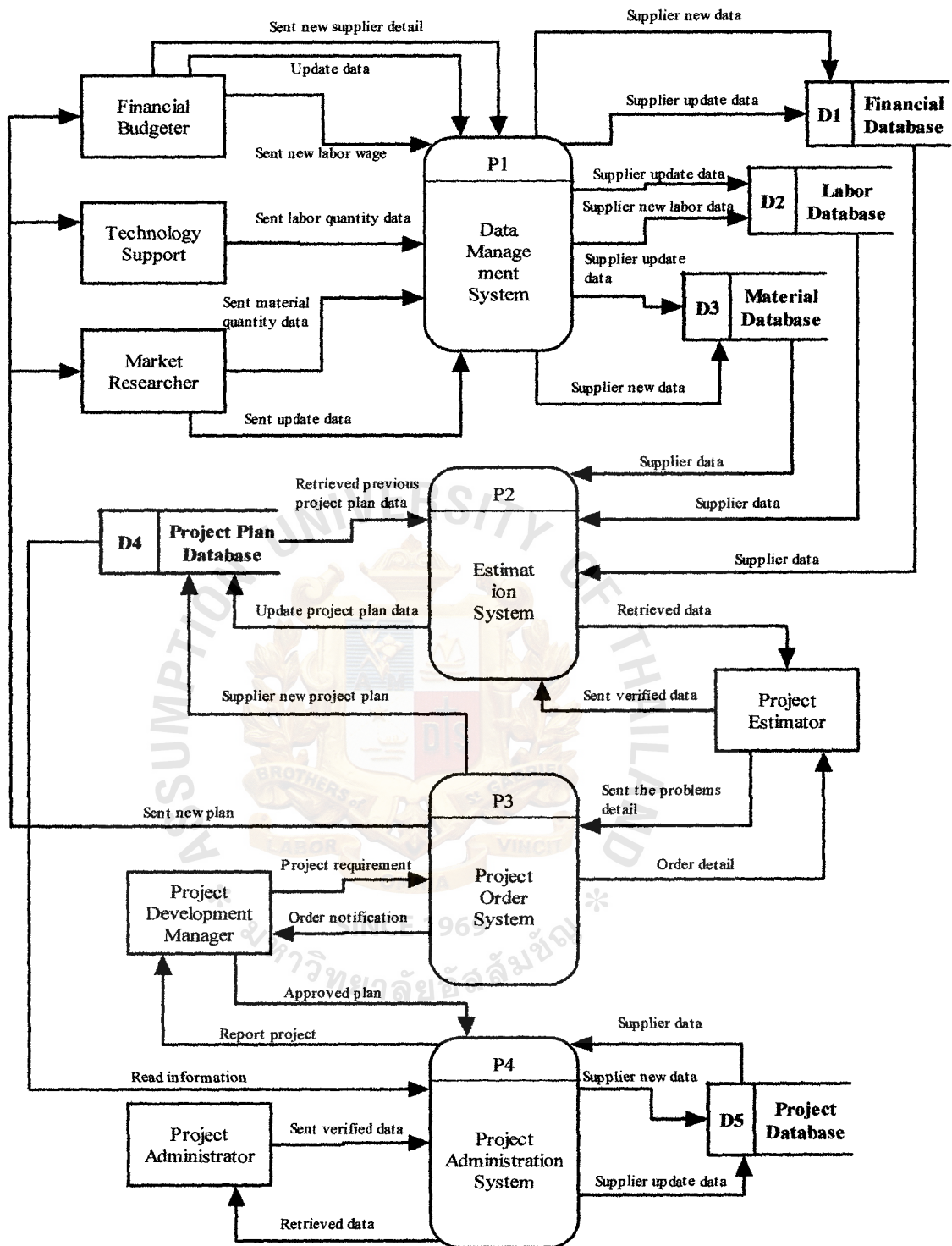


Figure 3.6 Data Flow Diagram Level 0.

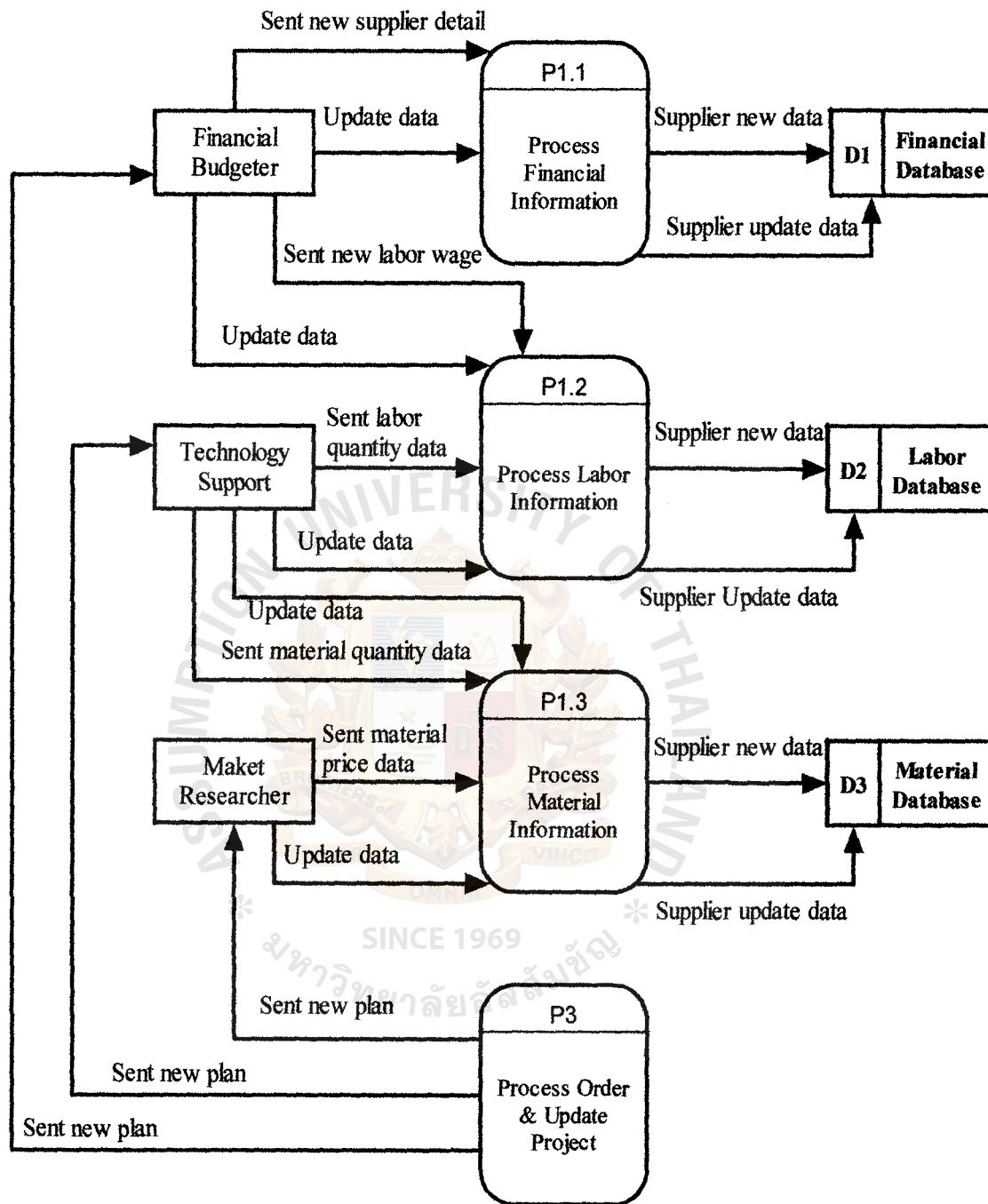


Figure 3.7 Data Flow Diagram Level 1: Process 1.

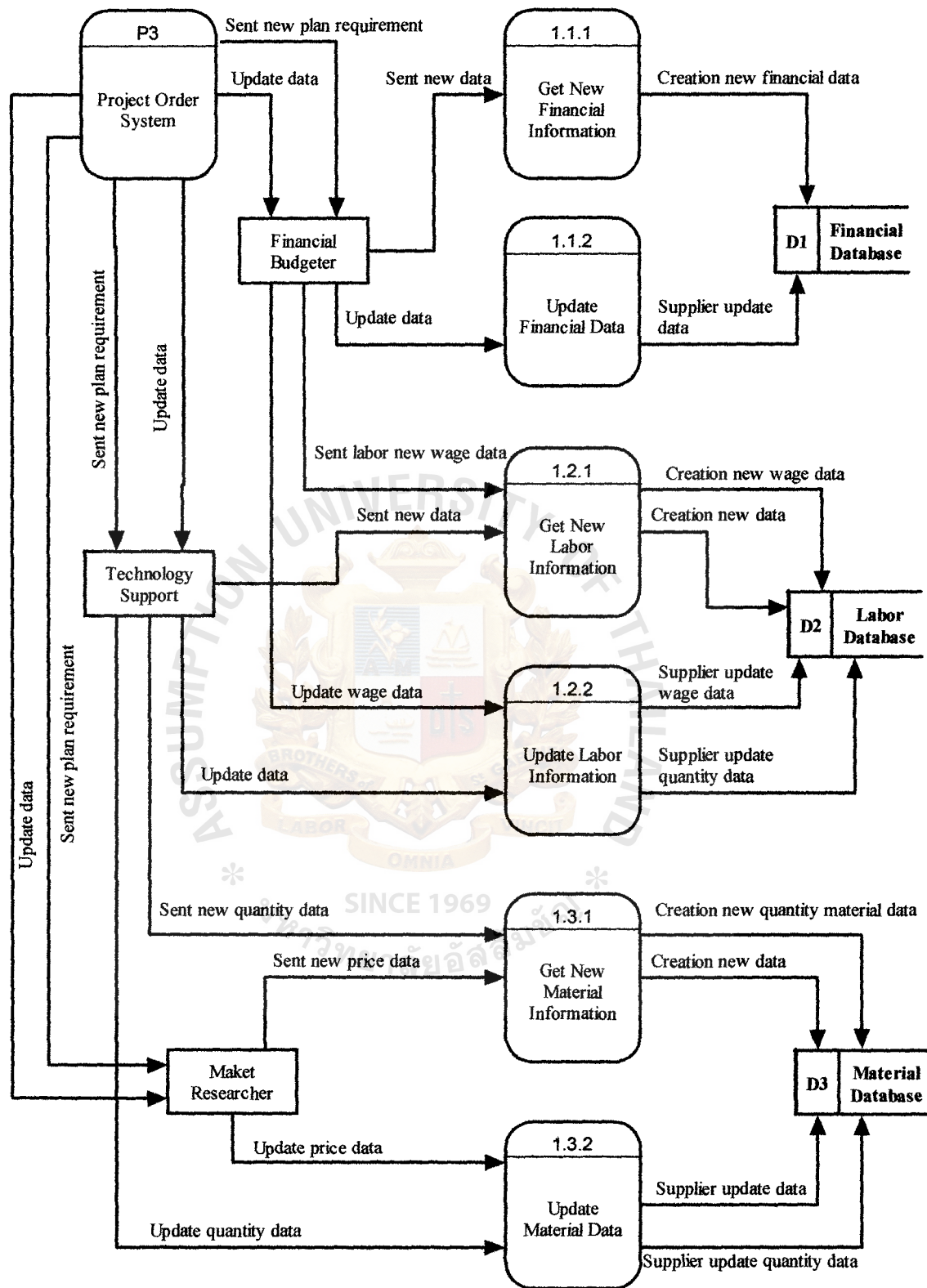


Figure 3.8 Data Flow Diagram Level 2: Process 1.

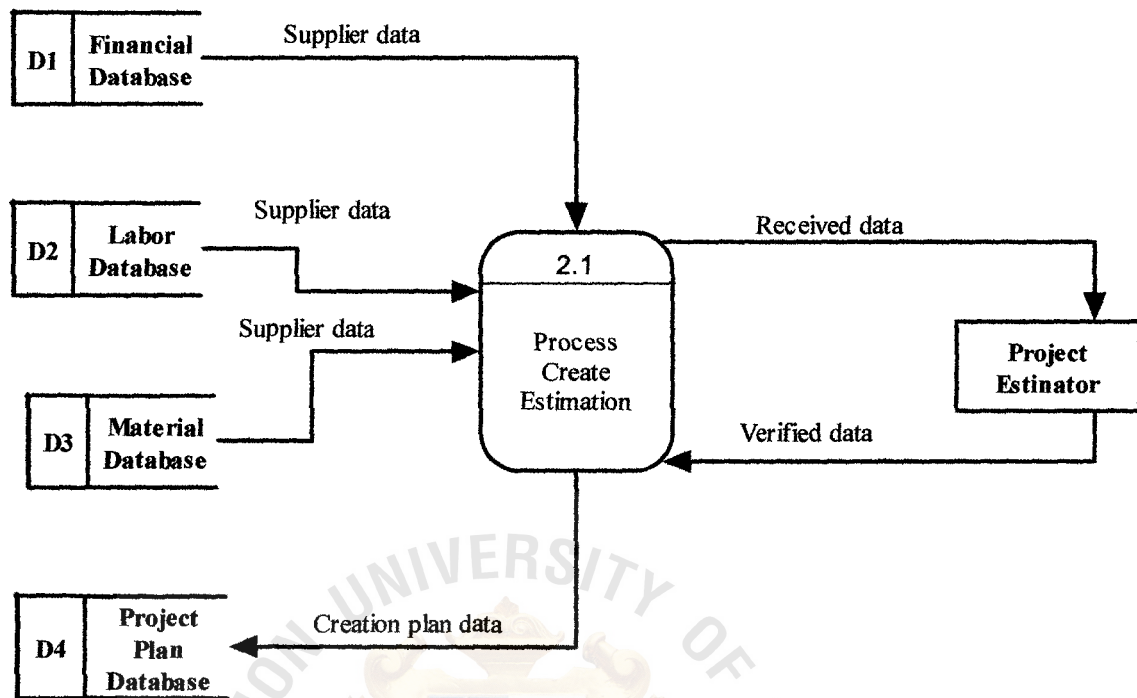


Figure 3.9 Level 1 Data Flow Diagram: Process Create Estimation

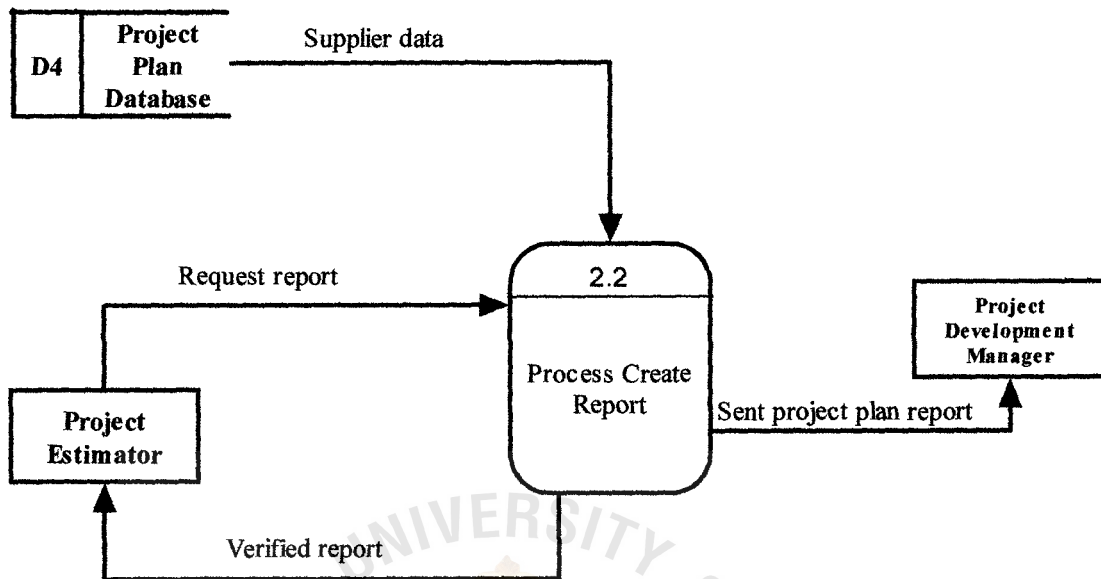


Figure 3.10 Level 1 Data Flow Diagram: Process Create Report.

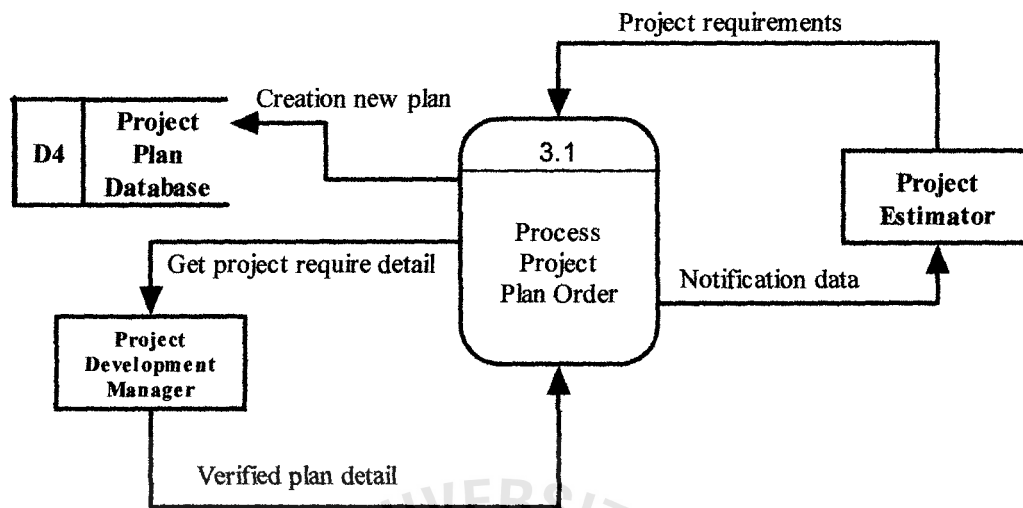


Figure 3.11 Level 1 Data Flow Diagram: Process Project Plan Order.

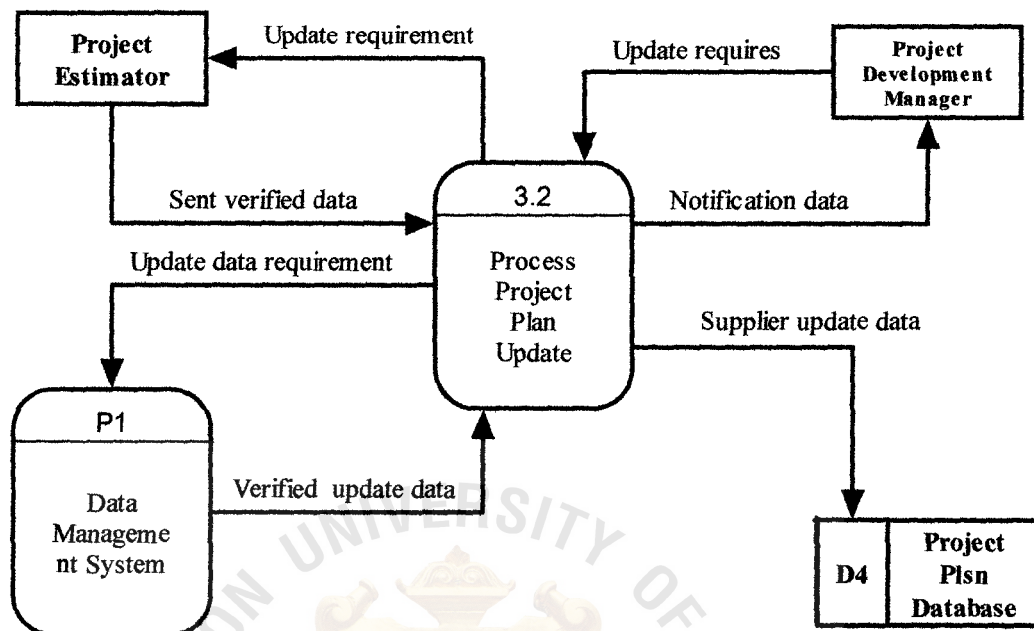


Figure 3.12 Level 1 Data Flow Diagram: Process Project Plan Update.

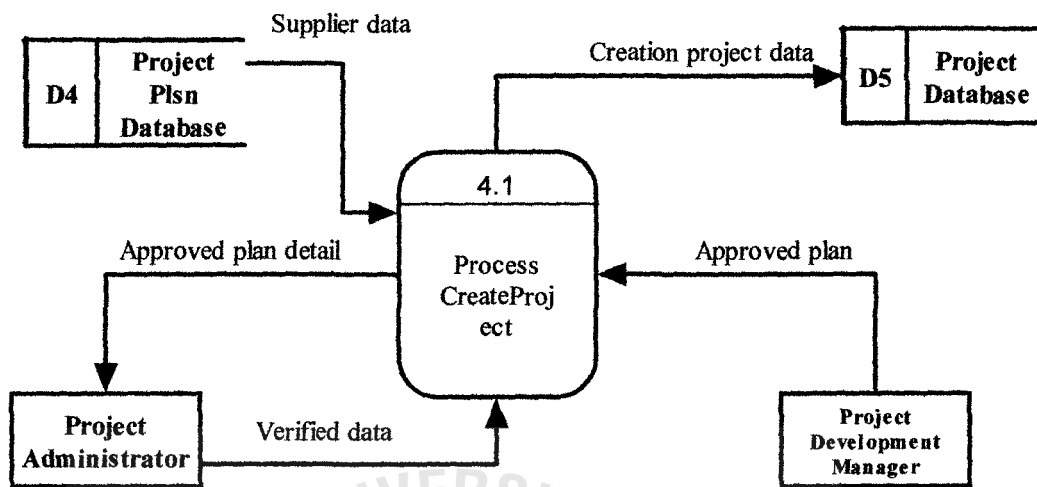


Figure 3.13 Level 1 Data Flow Diagram: Process Create Project.

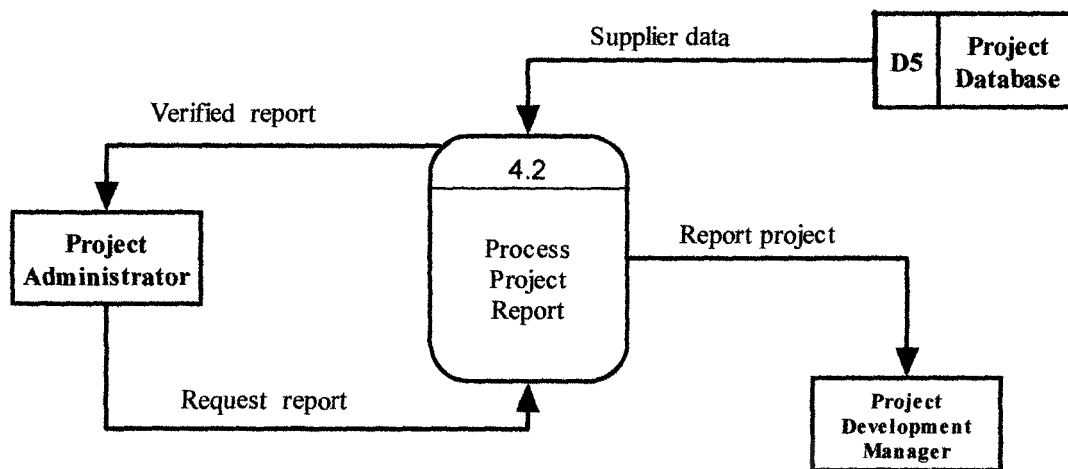


Figure 3.14 Level 1 Data Flow Diagram: Process Project Report.

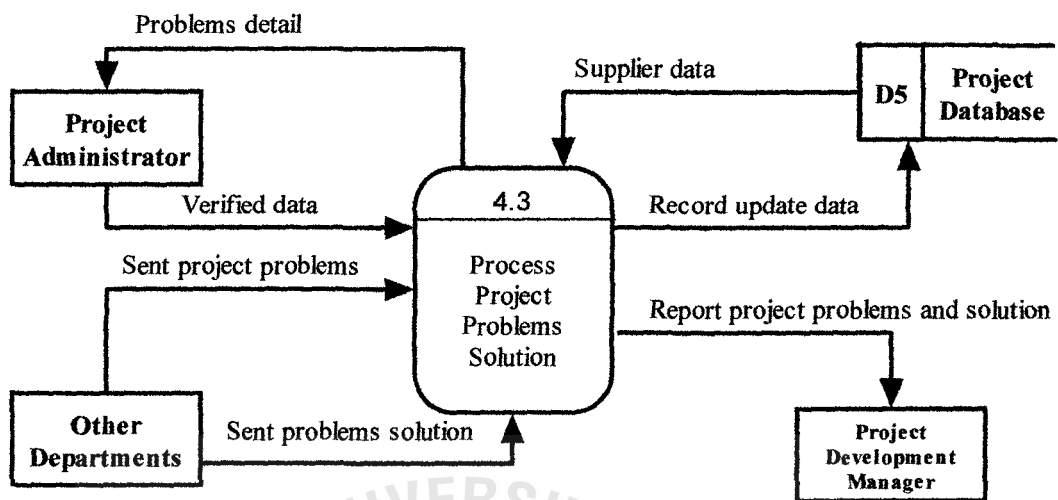


Figure 3.15 Level 1 Data Flow Diagram: Process Project Problems Solution.

3.4 System Design

(1) Database Design

One of the system design tasks is to develop the corresponding database design specifications. Database is the shared resource and a collection of interrelated file. The purpose of this task is to prepare technical design specifications for a database that is adaptable to future requirements and expansion. Database design is the process of translating logic data model, which is the entity relationship diagram (ERD) into physical database schema. Data analysis and normalization are the techniques for removing impurities from a data model as a preface to designing the database. These impurities can make the database unreliable, inflexible and nonscalable. In this paper, the designed database will be constructed up to the third normal form (3NF) by normalizing at the ERD level. The three-steps of normalization are processed as follows:

- (a) An entity is in first normal form (1NF) if it contains no repeating attributes. (That is, attributes that cannot have more than one value of a single instance of the entity).
- (b) An entity is in second normal form (2NF) if it contains no partial dependencies (that is, non-key attribute whose value is dependent only on part of the entity's primary key).
- (c) An entity is in third normal form (3NF) if it contains no derived attributes (that is, calculated or logic-based attributes) or no transitive dependencies (that is, non-key attribute whose value is dependent on another non-key attribute).

A database schema is the physical model for a database based on the chosen database technology. The rules for transforming a logical data model into a physical database schema are as follows:

- (a) Each entity becomes a table.
- (b) Each attribute becomes a field (column in the table).
- (c) Each primary and secondary key becomes an index into the table.
- (d) Each foreign key implements a possible relationship between instances to the table.

The entity relationship diagram (ERD) in a fully attributed data model that has already been depicted in Figure 3.3.

(2) Structure Design

Structure design is a process-oriented technique for breaking up a large program into a hierarchy of modules that result in a computer program that is easier to implement and maintain. The concept is to design a program as a top-down hierarchy of modules. A module is a group of instructions, block, subprogram, or sub routine. The top-down structure of these modules is developed according to design rules and guidelines.

Structured design emphasizes on the process building blocks in information system, especially software process. Structured design seeks to factor a program into the top-down hierarchy of modules. Figure 3.16 depicts the structure chart for project development information system program.

(3) User Interface Design

For user interface or dialogue design, the design considered such factors as terminal familiarity, possible errors and misunderstandings that

the end-user may have or may encounter. We will follow the human engineering guidelines.

- (a) The screen should be formatted so that the various types of information, instructions, and message always appear in the same general display area.
- (b) The system user should always be aware of what to do next.
- (c) Message, instructions, or information should be displayed long enough to allow the system user to read them.
- (d) Use display attributes sparingly.
- (e) Default values for fields and answers to be entered by the user should be specified.
- (f) Anticipate the errors user might make.
- (g) With respect to errors, a user should not be allowed to proceed without correcting an error.

(4) Input Design

Because inputs originate with system user, human factors play a significant role in input design. Input should be as simple as possible and designed to reduce the possibility of incorrect data being entered. The needs of system user must be considered. With this in mind, several human factors should be evaluated. Following are general principles that are used for designing the input of project development information system.

- (a) Capture only variable data.
- (b) Do not capture data that can be calculated or stored in computer programs.
- (c) Include instructions for completing the form.

- (d) Use code for appropriate attributes.
- (e) Data to be entered (keyed) should be sequenced so it can be easier to read.
- (f) Minimize the amount of handwriting.
- (g) When possible, use designs based on known metaphors.

The input design for project development information system is displayed in Appendix D.

(5) Output Design

In output design, the system has to generate many paper outputs that have to interact with many sections included in outside market data research. Therefore, the format of output will try to cover all processes of project development information system.

Most new applications developed use Graphical User Interface (GUI) and outputs are designed as clear and readable as possible and reduce the possibility of misunderstanding or lack of information. The following general principles are important for output design:

- (a) The outputs should be simple to read and interpret.
- (b) The distribution of outputs must be sufficient to assist all relevant system users.
- (c) The timing of outputs is important.
- (d) The outputs must be acceptable to the system users who will receive and has to operate with them.

The outputs design for project development information system is displayed in Appendix E.

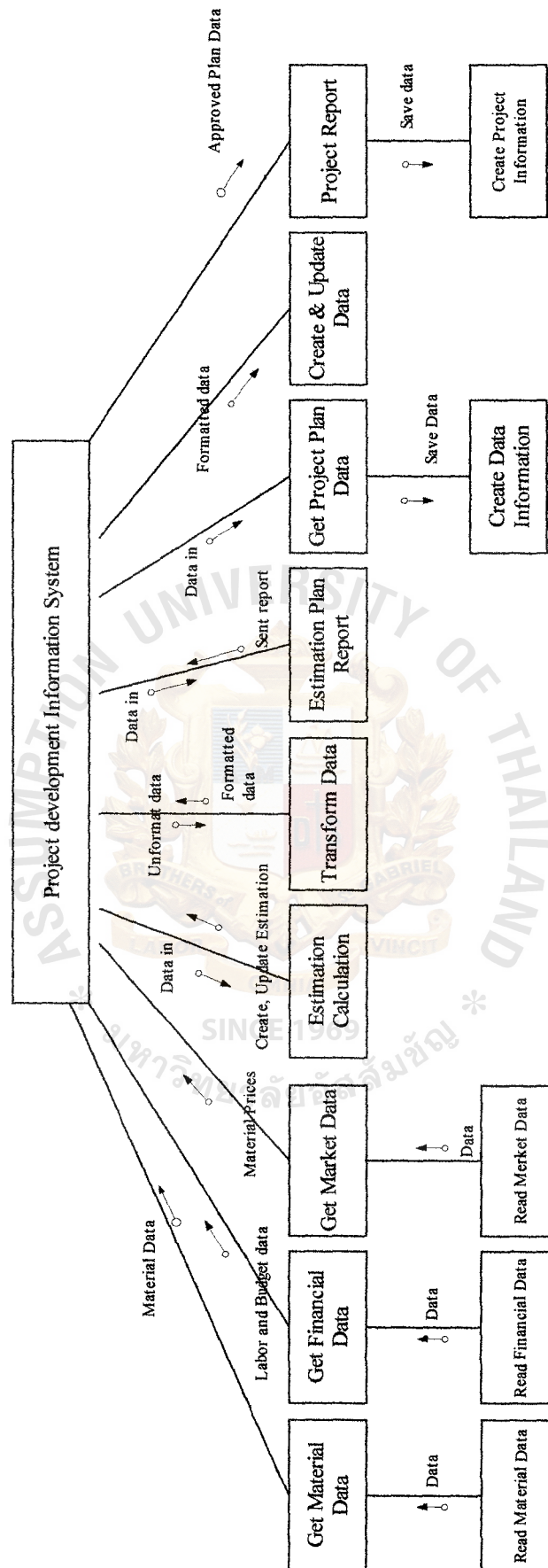


Figure3.16 Structure Chart of Project Development Information System.

3.5 Hardware and Software Requirement

The proposed project development information system will be developed in the form of based. Microsoft office Access XP is the major software tool used to develop the input and output design of the system. The hardware and software specifications for server are shown in Tables 3.2, 3.3 and 3.4 respectively. And the network configuration of the proposed is shown in Figure 3.17.

3.6 Security and Controls

To protect unauthorized persons accessing into data and the hardware threats, management needs security measures to protect the hardware and software. Security measures are divided into categories as follows:

- (1) Password Security, this control exists in the form of logon procedure. A user can gain access to the system by logon password. In addition, the system will disconnect after three invalid logon attempts.
- (2) Software Security, this control exists in the form of a virus-checking program. It will be installed to scan for viruses before the computer system will be infected. The virus-signature will be updated every month.
- (3) Data Security, this method involves in minimizing data destruction risks. Backup data will be done in storage media every week.
- (4) User Security, this method will allow only authorized users access to their data.
- (5) Hardware Security, this control exists in the form of locked cover of personal computer and locking each computer room. This method will prevent the theft of computer peripheral or equipments.

Table 3.2 Hardware Specification for Server:

Hardware	Specification
CPU	Pentium 4 - 2.5GH
Cache	512KB Level1
Memory	128 MB
Hard Disk	80GB
CD-Rom Drive	CD-RW 48X
Network Adapter	Ethernet 10-Base T
Display Adapter	64MB SVGA cards
Display	17" Flat Screen
UPS	1000VA
Printer	Laser Printer
Floppy Drive	1.44MB

Table 3.3 Software Specification for the Server:

Software	Specification
Operating System	Windows XP
Database Server	Microsoft SQL Server
Development Tools	Microsoft Access XP and Visual Basic

Table 3.4 Hardware Specification for Each Client Machine:

Hardware	Specification
CPU	Pentium 4 - 2.0GH
Cache	128KB
Memory	128MB
Hard Disk	20GB
CD-ROM Drive	CD-ROM 50X
Floppy Drive	1.44MB
Network Adapter	Ethernet 10-Base T
Display Adapter	32MB SVGA Cards
Display	15" Flat Screen

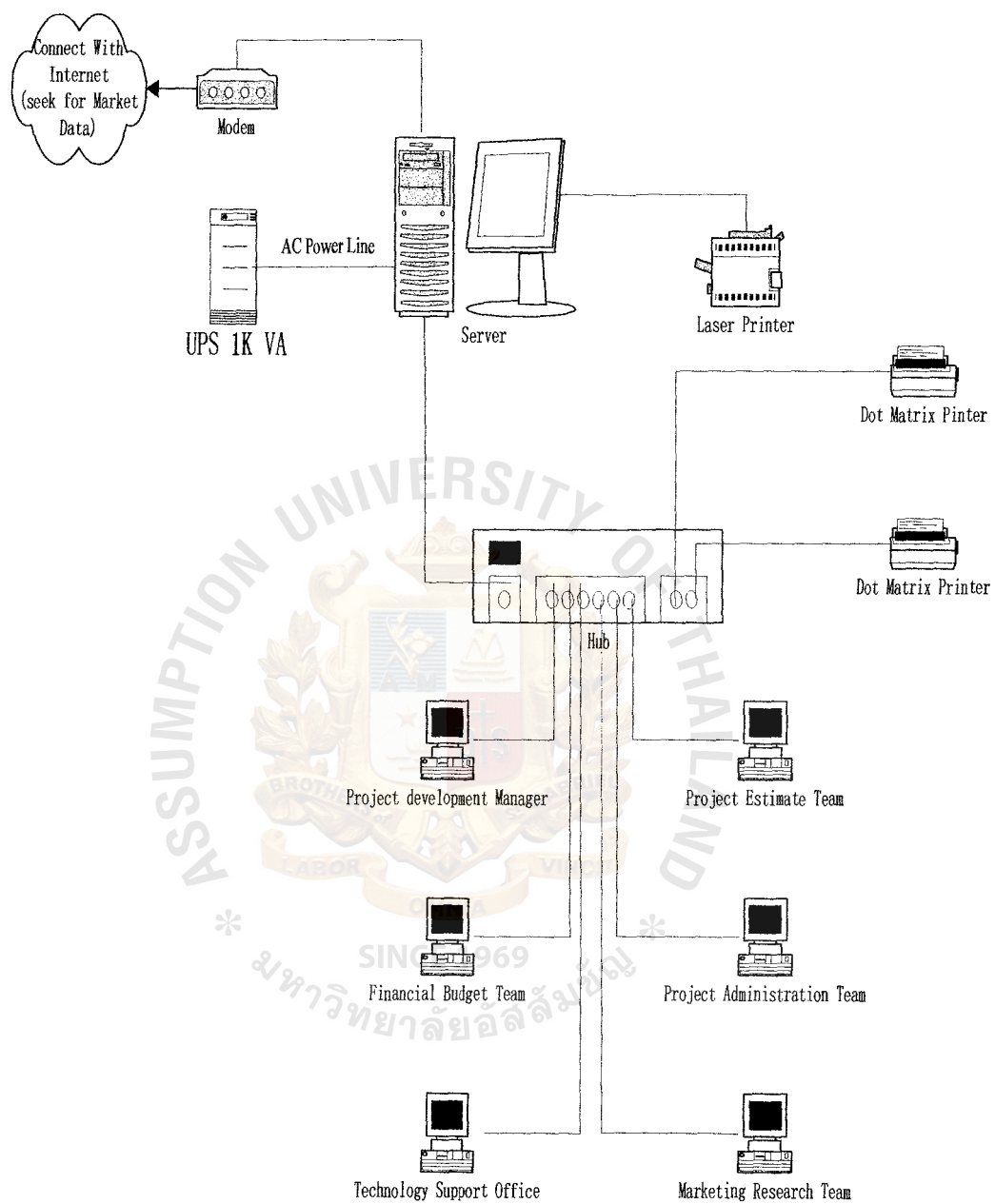


Figure 3.17 Hardware Configuration of the Proposed System.

3.7 Cost and Benefit Analysis

3.7.1 Cost Analysis

(1) Cost of Manual System

The manual system cost analysis is separated into three cost types and they are fixed cost, salary cost, and maintenance and miscellaneous costs as shown in Table 3.5.

(2) Cost of New system

For the new system, there are three candidate systems. Candidate System Matrix is shown in Table 3.6.

The new system cost analysis is separated into two cost types and they are development cost and operating cost as shown in Table C.2 to C.7.

Table 3.5 The Manual System Cost Analysis (Unit: Baht.).

Cost Items	Years				
	1	2	3	4	5
<i><u>Fixed Cost</u></i>					
Computer 2 units @ 25,500	51,000.00	51,000.00	51,000.00	51,000.00	51,000.00
Dot-matrix printer 2 Sets @ 17,600	35,200.00	35,200.00	35,200.00	35,200.00	35,200.00
Total Fixed Cost	86,200.00	86,200.00	86,200.00	86,200.00	86,200.00
<i><u>Salary Cost</u></i>					
Supervisor 8 Persons @ 15,000	120,000.00	126,000.00	132,300.00	138,915.00	145,860.75
Staff 28 Persons @ 8,000	224,000.00	235,200.00	246,960.00	259,308.00	272,273.40
Total monthly Salary Cost	344,000.00	361,200.00	379,260.00	398,223.00	418,134.15
Total Annual Salary Cost	4,128,000.00	4,334,400.00	4,551,120.00	4,778,676.00	5,017,609.80
<i><u>Maintenances & Miscellaneous Cost</u></i>					
Maintenances Per Annum	50,000.00	55,000.00	60,500.00	66,550.00	73,205.00
Miscellaneous Per Annum	10,000.00	11,000.00	12,100.00	13,310.00	14,641.00
Utility Cost Per Annum	10,000.00	11,000.00	12,100.00	13,310.00	14,641.00
Total Maintenances & Miscellaneous Cost	70,000.00	77,000.00	84,700.00	93,170.00	102,487.00
Total Manual System Cost	4,284,200.00	4,497,600.00	4,722,020.00	4,957,046.00	5,206,296.80

Table 3.6 Candidate System Matrix:

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized Brief description of that portion of the system that would be computerized in this candidate.	COTS package for project order, project management, and operation.	Full supports all relevant units that are involved in the system requirement.	Same as candidate 2.
Benefits Brief description of the business benefits that would be realized for this candidate.	This solution can be implemented quickly.	Application development is easy with fast learning time.	Powerful application that perform tasks more efficiently.
Servers and Workstations A description of the servers and workstations needed to support this candidate.	Technically architecture dictates Pentium III.	Technically architecture dictates Pentium IV.	Same as candidate 2.
Software Tools Needed Software tools needed to design and build the candidate (e.g., database management system, emulators, operating systems, languages, etc.) Not generally applicable if application software packages are to be purchased.	MS Office 2000 MS Internet Explorer MS Visual Basic 6.0 ER-studio 5.0 MS windows 2000 for Server & work station MS Access	MS Office XP MS Internet Explorer MS Visual Basic 6.0 Visible Analyst 7.4 MS windows XP for Server & work station MS SQL Server	Unix operating system JDK 1.1 or higher and Javax.server package Informix DBMS

Table 3.6 Candidate System Matrix (Continued):

Characteristics	Candidate 1	Candidate 2	Candidate 3
Application Software A description of the software to be purchased, built, accessed, or some combination of these techniques.	Package Solution.	Custom Solution.	Same as candidate 2.
Method of Data Processing Generally some combinations of on-line, batch, deferred batch, remote batch, and real-time.	Client/Server.	Same as candidate 1.	Same as candidate 1.
Output Devices and Implications A description of output devices that would be used, special output requirements, (e.g., network preprinted forms, etc.), and output considerations (e.g., timing constraints).	Two dot matrix printers. One ink jet..	Two dot matrix printers. One laser printer.	Same as candidate 2.

3.7.2 Benefits Analysis:

(1) Tangible Benefit:

(a) Personnel: Reduce salary cost: 1,512,000 Baht/year.

The manual system has 8 Supervisors and 28 staff whose monthly salaries cost an estimated 344,000 Baht (1 supervisor @ 15,000 Baht/month, 1 staff @ 8,000 Baht/month).

The proposed system can decrease the number of Supervisors from 8 to 6 and the staff from 28 to 16.

(b) Operation:

- Reduce paper usage and office supplies 36,000 Baht / year.

(3,000 Baht / month)

- Reduce telephone fee 48,000 Baht/year. (2,000 Baht / month)

- Reduce waste rate from expiry 36,000 Baht / year (3,000 Baht / month). The new system targets to reduce waste rate from 5% to 4% of total sales amount.

Following tables are the Benefit Analysis for Project Development Information System:

Table 3.7 Benefit Analysis for Project Development Information System

Personnel:

Title	Benefit
Reduction of salary (126,000 Baht / month)	1,512,000

Operation:

Title	Benefit
Reduction of paper usage and office supplies (3,000 Baht / month)	36,000
Reduction of telephone fee (2,000 Baht / month)	48,000
Reduction of waste rate (3,000 Baht / month)	36,000

Total Annual Benefit: 1,632,000 Baht.

(2) **Intangible Benefits:**

Intangible are benefits that accrue in the organization due to the information system that are difficult to measure but important.

The system provides intangible benefits as follows:

- (a) Improve the decision making and planning process.
- (b) Reduce the risk of human errors.
- (c) Reduce the volume of paper work produced and handled.
- (d) Faster information retrieval.
- (e) Smooth operations.
- (f) Provide on time, accurate and efficient operations.
- (g) Improve employee morale.
- (h) Better manpower management.

- (i) Confidential control.
- (j) Better organization image.

3.7.3 Feasibility Analysis:

Feasibility analysis is appropriate to the system analysis but particularly important to the decision analysis. Feasibility is the measure of how beneficial or practical the development of the project development information system is. Feasibility analysis is the process by which feasibility is measured.

Feasibility analysis matrix complements the candidate systems matrix with an analysis and ranking of the candidate system. Feasibility analysis matrix corresponds to the same candidate solution as shown in the candidate system matrix. There are four categories of feasibility tests:

- (1) Operational feasibility is a measure of how well the solution will work in the company. It is also a measure of how people feel about the system.
- (2) Technical feasibility is a measure of the practicality of a specific technical solution and the availability of technical resources and expertise.
- (3) Schedule feasibility is a measure of how reasonable the project development information system project timetable is.
- (4) Economic feasibility is a measure of the cost-effectiveness of the system. This is often called a cost-benefit analysis because it deals with the costs and benefits of the information system.

The candidate feasibility analysis matrix will be shown in Appendix C.1.

3.7.4 Payback Analysis

There are many techniques for comparing the costs and benefits of the proposed system; for this project, payback analysis is suitable.

System development costs are incurred long before benefits begin to accrue so it will take time for the benefit to overtake the costs. The payback period is the number of years required to accumulate earnings sufficient to cover the investment cost. Three candidate payback analysis tables are shown in Table C.2 to C.7. Figure C.1 to C.3. show the candidate's payback period analysis.

Payback period is determined by calculating the number of years required for accumulation of earnings sufficiently to cover the cost of the proposed system. From previous analysis, it is known candidate 2 is the best choice for this case. So calculation of candidate 2's payback period is :

$$\begin{aligned} P &= \text{Investment Costs} / [(1 - \text{Tax Rate}) * (\text{Tangible Benefit} - \text{Operating Costs})] \\ &= 1,345,950 / [(1 - 0.3) * (1,958,400 - 719,000)] \\ &= 1.55 \text{ Years or 1 Years and 6 months.} \end{aligned}$$

3.7.5 Return-on-Investment Analysis (ROI):

Return on Investment Analysis technique compares the lifetime profitability of alternative solution or projects. The ROI for a project is a percentage rate that measures the relationship between the amounts the business gets back from an investment and the amount invested. The ROI for a potential project is calculated by using the data from Table C.6. as follows:

$$\text{ROI} = (\text{Estimated lifetime benefits} - \text{Estimated lifetime costs}) /$$

Estimated lifetime costs

$$= (8,403,852 - 4,443,316) / 4,443,316$$

$$= 0.89 * 100$$

$$= 89\%.$$



IV. PROJECT IMPLEMENTATION

4.1 Project Implementation Plan

Implementation of the new system involves a partial installation. It converts data to computer. System implementation will begin after approval of the new system. System implementation can be the most frustrating time of the project due to the problems that were not discovered during development. The user may have new requirements after using the new system. So the development team should be prepared for these problems and be prepared for modifications of the program.

4.2 Testing

After the system is implemented, the organization will have to review to determine whether the system meets expectations and where improvements are needed, to check whether the proposed system can be compatible and suitable for existing problems or not.

Testing for the new system is an important step. Although it may take a long time to test and prepare data for this, it is necessary to ensure that there is no error in the new system to be implemented. Testing is the best way when user departments are asked to assist in identifying all possible situations that might occur.

(1) Code testing:

Program coding is the first step of implementation. Coding is the process of writing process instructions that can be run on computer hardware. It transforms the modules to the run-able system. This system uses MS Access XP and Microsoft Visual Studio.net to create coding.

(2) Specification testing:

Specification test is performed to test what the program should do or how to perform under various conditions such as Data management testing, Estimate project testing, and performance testing.

(3) Human factor testing:

This is to test human ability or understanding of the new system on how to change their routine work to the new system or how the new system operates. It may require time and training.

4.3 Training

Training must involve the capability to support staffs' familiarization with the new system and general basic tasks system. Staff members must know the method and processes in order to succeed in their work. They must also know the method to solve non – serious problems of operation, malfunctions and how to detect these problems.

Training can be performed one by one. However, group training is generally performed to save time and encourage group learning possibilities. For this case, there are many staff members who work with this new system, so they will be trained one by one for specific tasks later. But group training will be used to train the principle or the basics of how to use the computer such as turn on/off the computer, save information to diskette and so on.

(1) Overview of training

All staff must learn or get some knowledge benefits to cooperate with the use of the system.

(2) Detailed training

Only users of the system must participate to know how to operate the system.

4.4 Conversion

Conversion is the process of changing the old system to the new system and evaluating the project experience and final system. There are four conversion methods of handling system conversion : abrupt cut over, parallel, location and staged conversion. For this case, parallel system method is selected. This method converts the old system to the new system carefully since the company did not have the computer system before.

The existing system of real estate company is a manual operation. Therefore it should be converted step by step to prevent all work stopping immediately due to an unsuitable process. Staff members must be given time to be familiar with the computerized system and for their training. Parallel conversion is used and both the old and the new system are operated for some time. This is done to ensure that all major problems in the new system have been met and solved before the old system is discarded. Parallel conversion minimizes the risk of major flaws in the new system causing irreparable harm to the business. Parallel conversion is suitable for changing from the manual system to a computerized system, although it increases the cost of running the two systems over some period and consumes more time with double workload of staff members. When the staff can run the new system smoothly and all major problems can be solved, the double workload will be reduced.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The important activities of this study are analyzing the existing system and designing the new system for the Real Estate Company. When the existing system was analyzed, problems were found (discussed in Chapter II). All these problems can be classified as data control, project information management, and working cooperation problems. The new system has been designed to solve the existing problems and to try to make the new system more efficient, practical, and flexible.

Table 5.1 shows the performance of each process of the proposed system compared with the existing system. It shows that each process of the proposed system performs in less time than that of the existing system which has to operate many work steps manually. So, it can be concluded that the proposed system is more efficient and effective than the existing system.

Table 5.1 Degree of Achievement of the Proposed System.

Process	Existing System	Proposed System
Project Order Process	2 days	1 days
Project Estimate & Report Process	Once and half weeks	4 days
Data Management Process	One week	4 days
Project Administration Process	Once week	4 days

The description for each process system in the project can be summarized into 4 processes:

- (1) Project Order Process: Create new project plan and update project detail.

- (2) Project Estimate & Report Process: Create estimation and create report.
- (3) Data Management Process: Create the financial, labor and material data and update those data processes.
- (4) Project Administration Process: Create a new project and a project report, Record the project problems and the solutions in project database.

5.2 Recommendations

For changing from the existing system to the new system, there are some factors that the company should for the best performance. The recommendations are as following:

- (1). The company has to provide the computer skills to their staff. Trained staff can easily be familiar with the computer and learn the new application fast. Finally, they can improve the business service and business flow.
- (2). The update and expansion of the system have to be made. To support the future business improvement, we have to check the system performance and provide user questionnaire (for example) to make sure that the system still serves well for the business flow.
- (3). For the project estimating, the cost estimates is not be accurate because some work such as piping, electrical fittings, etc. must be handling with many equipment items. It is hard to estimate the accurate estimate cost.
- (4). The system can be applied to other system in the organization for example, selling information system, project management system. The manager can evaluate real expenses in the business and plan the future business flow.



APPENDIX A
DATA DICTIONARY

Data Dictionary

Table A.1 Data Dictionary:

Field Name	Meaning
ApproveID	Approval by authority to approve the project plan
Budget_NAME	Financial budget name in financial database.
Budget_ID	The attribute in budget table, which identifies a budget title.
Budget_TYPE	The attribute in Budget table, which identifies the type of budget that is classified into 2 types: plan budget and project budget.
Budget_issue Date	The attributed in Budget table, which identifies the budget beginning date.
Budget due_DATE	The attribute in Budget table, which identifies the due – date for budget.
Engineer_Add	The attribute in Engineer table, which identifies the address of the engineer.
Eng_Email add	The attribute in Engineer table , which identifies Email address.
Eng_ID	The attribute in Engineer table, which identifies the engineer.
Eng_NAME	The attribute in Engineer table, which identifies the Engineer's name
Eng_Tel	The attributed in Engineer Table, which identifies the Engineer's telephone number.
Financial Budgeter_ID	The attributed in Budget table, which identifies a Budgeter.
FB_Add	The attributed in Budget table, which identifies budgeter address.
FB_Email	The attributed in Budgeter Table, which identifies the Email address.
FB_Name	The attribute in Budget table, which identifies the name of Budgeter.
FB_Tel	The attributed in Budget table, which identify the telephone number.
Marketing Researcher_ADD	The attribute in Researcher table, which identifies the address of researcher.
MR_Email	The attribute in Researcher table, which identifies the Email of Researcher.

Table A.1 Data Dictionary (Continued):

Field Name	Meaning
MR_ID	The attribute in Researcher table, which identifies ID of the researcher..
MR_Name	Identifies the Researcher name.
MR_TEL	The attribute in Researcher table, which identifies the telephone number of the researcher..
Material Code	The attribute in Material table, which identifies the material name.
M_Name	The attributed in Material table, which identifies the name of material.
M_QTY	The attributed in Material table, which identifies the Quantity of the material..
M_Price	The attributed in Material table, which identifies price of material..
Plan_Due date	The attributed in Plan table, which identifies the end date of the plan..
P_ID	The attributed in Plan table, which identifies the plan.
P_issue Date	The attributed in Plan table, which identifies the plan's beginning date.
P_Location	The attributed in Plan table, which identifies the Plan developing place.
P_Name	The attributed in Plan table, which identifies the Name Of Plan.
M_Issue Date	The attributed in Market information table, which identifies the date of the supplier.
M_No	The attributed in Market Info. table, which identifies market information number..
P_adm_ID	The attributed in Administrator table, which identifies name of administrator..
P_adm_address	The attributed in Administrator table, which identifies the address of administrator..
P_adm_Email	The attributed in Administrator table, which identifies the email of administrator.
P_adm_Name	The attributed in Administrator table, which identifies a name of the administrator.
P_adm_TEL	The attributed in Administrator table, which identifies a telephone number of the administrator.
P_est_ADD	The attributed in Estimator table, which identifies the address of estimator.

Table A.1 Data Dictionary (Continued):

Field Name	Meaning
P_est_Email	The attributed in Estimator table, which identifies Email of the estimator.
P_est_ID	The attributed in Estimator table, which identifies name of the estimator.
P_est_Name	The attributed in Estimator table, which identifies name of the estimator.
P_est_TEL	The attributed in Estimator table, which identifies telephone number of the estimator.
Project_No	The attributed in Project table, which identifies the project name of project..
P_admin	The attributed in Project table, which identifies the administrator of project.
P_budget	The attributed in Project table, which identifies the budget of the project.
P_Due date	The attributed in Project table, which identifies the end date of the project.
P_Issue date	The attributed in Project table, which identifies the beginning date of the project.
P_Location	The attributed in Project table, which identifies the place where the project developing.
P_ID	The attributed in Project table, which identifies name of the project.
P_Name	The attributed in Project table, which identifies the name of the project.
Project manager_add	The attributed in Manager table, which identify the address of manager.
PM_Email	The attributed in Manager table, which identifies the Email of manager.
PM_ID	The attributed in Manager table, which identifies the name of manager.
PM_Name	The attributed in Manager table, which identifies the name of manager.
PM_TEL	The attributed in Manager table, which identifies the telephone number of manager.



APPENDIX B

PROCESS SPECIFICATION

Process Specification

Table B.1 Process Specification 1.1.1

Item	Descriptions
Process Name	Get new Financial Information
Data In	New Supplier Data
Data Out	Supplier Record
Process	(1) Get necessary new supplier data; (2) Record new supplier data into Financial database.
Attachment	(1) Financial Budgeter (2) Data store D1.

Table B.2 Process Specification 1.1.2

Items	Descriptions
Process Name	Get update Financial data
Data In *	Supplier data
Data Out	Supplier record
Process	(1) Retrieve the existing data from supplier database (2) Update the existing supplier data (3) Record the update supplier data into supplier database
Attachment	(1) Financial Budgeter (2) Data store D1.

Table B.3 Process Specification 1.2.2

Items	Descriptions
Process Name	Update Labor Information
Data In	Labor quantity data from Engineer, Labor wage/Price from Financial database.
Data Out	Labor information record
Process	(1) Get update data from Engineer and financial database. (2) Update the existing Labor data (3) Repeat (1) step until all update Labor data has been established.
Attachment	(1) Engineer (2) Financial Database (3) Data store D2.

Table B.4 Process Specification of Process 1.2.1

Items	Descriptions
Process Name	Get new Labor information
Data In	New Labor data
Data Out	Labor Record
Process	(1) Get necessary detail of Labor (2) Get labor price from financial budgeter (3) Record new data into database (4) Repeat step (1) until the new data has been established
Attachment	(1) Engineer (2) Financial Budgeter (3) Data store D2.

Table B.5 Process Specification of Process 1.3.2

Items	Descriptions
Process name	Update Material data
Data In	Material price from market Researcher, quantity come from Engineer
Data Out	Material Record
Process	(1) Get update material data and price from Engineer and Market researcher (2) Update the existing Material data (3) Repeat step (1) until all data has been established
Attachment	(1) Engineer (2) Market Researcher (3) Data store D3

Table B.6 Process Specification of Process 1.3.1

Items	Description
Process Name	Get new Material Information
Data In	New data
Data Out	Material Record
Process	(1) Get necessary detail of material (2) Get Material Price from Market Researcher and material quantity from Engineer (3) Record data to database
Attachment	(1) Engineer (2) Market Researcher (3) Data Store D3.

Table B.7 Process Specification of Process 2.1

Items	Descriptions
Process Name	Process Create Estimation
Data In	(1) Record of Financial Cost (2) Record of Labor Cost (3) Record of Material Cost (4) Verified all the Costs data
Data Out	(1) Data of Material price from market researcher, labor wage from Financial budgeter, and all the quantity data from engineer estimate. (2) Budget of Project Plan (3) Record all the data in Plan database
Process	(1) Get data of Material price from market researcher, labor wage from Financial budgeter, and all the quantity data from engineer estimate. (2) These data will be verified by Project Estimator to find a suitable price of each project. (3) If the value is not suitable, repeat step (1) until the requirement of project has been established. (4) Keep the data and record them into project plan database.
Attachment	(1) Project estimator (2) Data store D1, D2, D3 (3) Create and store D4.

Table B.8 Process Specification of Process 2.2

Items	Descriptions
Process Name	Process Create Report
Data In	(1) Project Plan Data (2) Verified Variation Work Data.
Data Out	(1) Estimated variation data (2) Update Project data (3) Variation report
Process	(1) Record all needed data from plan database (2) Verified data (3) Create project plan report and send to manager
Attachment	(1) Project estimator (2) Data store D4

Table B.9 Process specification of Process 3.1

Items	Descriptions
Process Name	Process Project Plan Order
Data In	Project Requirement from Manager
Data Out	(1) Create a New Plan (2) Save the requirement into new plan
Process	(1) Get the requirement from manager (2) Verify all the requirement (3) Create a new plan to suit the requirement (4) Store all the required details into Plan (5) Send the new plan requirement to all teams
Attachment	(1) Manager (2) Project estimator (3) Data store D4

Table B.10 Process Specification of Process 3.2

Items	Descriptions
Process Name	Process Project Plan Update
Data In	(1) Update required from Manager (2) Record all need data
Data Out	(1) Notification of the required data (2) Send the requirement to other Team (3) Update all data
Process	(1) Get the update required from manager (2) Record update required data and send them to other team. (3) Received all the update data from other teams and verified them. (4) Update the plan date
Attachment	(1) Manager (2) Estimator (3) Other Team (4) Data store D4.

Table B.11 Process Specification of Process 4.1

Items	Descriptions
Process Name	Process Create Project
Data In	(1) Approved Plan (2) Record all the plan data (3) Verified data
Data Out	(1) Create Project Data (2) Store data into Project Database
Process	(1) Get approved Plan from manager (2) Record all the plan data (3) Verified all data (4) Create the project under the approved plan (5) Store the project data
Attachment	(1) Manager (2) Project administrator (3) Store data D5

Table B. 12 Process Specification of Process 4.2

Items	Descriptions
Process Name	Process Project Report
Data In	Get data from project database
Data Out	Create project report
Process	(1) Get the data from D5 (2) Verified all project data (3) Create report and sent to manager and other department.
Attachment	(1) Manager (2) Project Administrator (3) Data store D5.

Table B.13 Process Specification of Process 4.3

Items	Descriptions
Process Name	Process Project Problems solutions
Data In	(1) Project problems (2) Project solution
Data Out	(1) Update project data (2) Record project solutions
Process	(1) Get the project problem from other Dept. (2) Get the solution from other Dept. (3) Update the project data when verified the data (4) Record the problems solution into project database
Attachment	(1) Other department (2) Project administrator (3) Data store D5.



Table C.1 Candidate feasibility analysis matrix

Feasibility Criteria	Wt.	Candidate 1	Candidate 2	Candidate 3
Operational Feasibility Functionality. A description of to what degree the candidate would benefit the organization and how well the system would work. Political. A description of how well received this solution would be from both user management, user, and organization perspective.	30%	Generate the required report. Score:60	Full supports functional requirements in term of both functionality and business process. Score:90	Fully Support functional requirements and nonfunctional requirements. Score: 90
Technical Feasibility Technology. An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate. Expertise. An assessment to the technical expertise needed to develop, operate, and maintain the candidate system.	30%	The COTS package for sales order, project management, and operation management is widely available in the software market. But it need to be modified to meet further requirements in the future. The software company will setup the system and training class for the staff and also create manual to support the sage.	MS Visual Basic is a natural technology and easy to find experienced programmer. MS SQL service is the most popular standard of technology, however, it's expensive. Require hardware specialist to set up an internal network and the application. The system is professional designed. So it requires the training specifiabe process and the knowledge of database.	Programmer is not familiar with Unix operating system therefore this takes a long time in the development process. Unix operation command server. This solution is using Informix DBMS as a tool to manage information.
edEconomic Feasibility Cost to develop: Payback period (discounted): Net present value:	30%	Approximately 920,490 Approximately 1.05 years Approximately 4,450,614 Score: 100	Approximately 1,345,950 Approximately 1.55 years Approximately 3,960,536 Score: 90	Approximately 1,475,950. Approximately 2.41 years. Approximately 2,266,775. Score: 70
Schedule Feasibility An assessment of how long the solution will take to design and implement.	10%	1-2 Months Score: 90	5-6 Months Score: 80	10-12Months Score: 60
Ranking:	100 %	72	86	76.5

Table C.2:

Estimated Costs for Project Development Information System (Candidate 1)

DEVELOPMENT COST:**Personnel:**

Number	Title	Cost
2	Systems Analysts(25 days @ 3,000 Baht)	150,000
2	Programmer/Analysts (20 days @ 2,000 Baht)	80,000
1	Telecommunication Specialist(7 days @ 1,000 Baht)	7,000
1	System Architect(15 days @ 3,000 Baht)	45,000
1	Database Specialist(3 days @ 2,500 Baht)	7,500

Expenses:

Number	Title	Cost
4	Training Registration (@ 8,000 Baht)	32,000

New Hardware & Software:

Number	Title	Cost
1	Intel Pentium III processor 2.53 GHz -1 Server	205,000
1	Operating System (Windows 2000)	20,000
1	COTS package	50,000
1	ER studio 5.0 @ 10,000	10,000
1	MS Visual Basic 6.0	14,500
4	MS Office 2000	32,000
6	Computer set including OS (1 for backup)	220,000
2	Dot matrix printer Epson LQ580 (@ 17,600 Baht)	35,200
1	Ink Jet	7,590
2	Modem (Aztech 56k @ 1,100 Baht)	2,200
	Connecting accessory	2,500

Total Development Costs : 920,490 Baht.

PROJECTED ANNUAL OPERATING COSTS:

Personal:

Number	Title	Cost
1	Programmer & Analysts(7 days @ 2,000 Baht)	14,000
2	Computer Administrator (@ 15,000 Baht / month)	360,000

Expenses:

Number	Title	Cost
1	Maintenance Agreement for Server	30,000
	Prorated overhead (@20,000 Baht / month)	240,000
	Supplies (e.g., paper, floppy disk, etc.) (@ 5,000 Baht / month)	60,000

Total Annual Operating Costs : 704,000 Baht.

TableC.3:

Estimated Costs for Project Development Information System (Candidate 2)

DEVELOPMENT COST:**Personnel:**

Number	Title	Cost
2	Systems Analysts(50 days @ 3,000 Baht)	300,000
2	Programmer/Analysts (40 days @ 2,000 Baht)	160,000
1	Telecommunication Specialist(7 days @ 1,000 Baht)	7,000
1	System Architect(30 days @ 3,000 Baht)	90,000
1	Database Specialist(5 days @ 2,500 Baht)	12,500

Expenses:

Number	Title	Cost
4	Training Registration (@ 8,000 Baht)	32,000

New Hardware & Software:

Number	Title	Cost
1	Intel Pentium IV processor 2.53 GHz -1 Server	301,860
1	Operating System (Windows XP)	20,000
1	DBMS server software (SQL)	48,000
1	Visible Analyst 7.5 @ 10,000	10,000
1	MS Visual Basic 6.0	14,500
4	MS Office XP	64,000
2	CD- writer @ 2,100 Baht	4,200
6	Computer set including OS (1 for backup)	220,000
2	Dot matrix printer Epson LQ580 (@ 17,600 Baht)	35,200
1	Laser Printer (HP Laser 1220)	21,990
2	Modem (Aztech 56k @ 1,100 Baht)	2,200
	Connecting accessory	2,500

Total Development Cost: 1,345,950 Baht.

PROJECTED ANNUAL OPERATING COSTS:

Personal:

Number	Title	Cost
1	Programmer & Analysts(7 days @ 2,000 Baht)	14,000
2	Computer Administrator (@ 15,000 Baht / month)	360,000

Expenses:

Number	Title	Cost
1	Maintenance Agreement for Server	30,000
1	Maintenance Agreement for Server DBMS software	3,000
	Prorated overhead (@ 20,000 Baht / month)	240,000
	Supplies (e.g., paper, floppy disk, CD-R, CD-RW etc.) (@ 6,000 Baht / month)	72,000

Total Annual Operating Cost: 719,000 Baht.

Table C.4:

Estimated Costs for Project Development Information System (Candidate 3)

DEVELOPMENT COST:**Personnel:**

Number	Title	Cost
2	Systems Analysts(50 days @ 3,500 Baht)	350,000
2	Programmer/Analysts (40 days @ 2,500 Baht)	200,000
1	Telecommunication Specialist(7 days @ 1,000 Baht)	7,000
1	System Architect(30 days @ 4,000 Baht)	120,000
1	Database Specialist(5 days @ 3,000 Baht)	15,000

Expenses:

Number	Title	Cost
4	Training Registration (@ 10,000 Baht)	40,000

New Hardware & Software:

Number	Title	Cost
1	Intel Pentium IV processor 2.53 GHz -1 Server	301,860
1	Operating System (Unix System)	20,000
1	DBMS server software	48,000
1	Javax.server Package	24,000
4	JDK 1.1	64,000
2	CD- writer @ 2,100 Baht	4,200
6	Computer set including OS (1 for backup)	220,000
2	Dot matrix printer Epson LQ580 (@ 17,600 Baht)	35,200
1	Laser Printer (HP Laser 1220)	21,990
2	Modem (Aztech 56k @ 1,100 Baht)	2,200
	Connecting accessory	2,500

Total Development Cost: 1,475,950 Baht.

PROJECTED ANNUAL OPERATING COSTS:**Personal:**

Number	Title	Cost
1	Programmer & Analysts(7 days @ 3,000 Baht)	21,000
4	Computer Administrator (@ 15,000 Baht / month)	720,000

Expenses:

Number	Title	Cost
1	Maintenance Agreement for Server	36,000
1	Maintenance Agreement for Server DBMS software	5,000
	Prorated overhead (@20,000 Baht / month)	240,000
	Supplies (e.g. paper, floppy disk, CD-R, CD-RW etc.) (@ 5,000 Baht / month)	60,000

Total Annual Operating Cost: 1,082,000 Baht.

Table C.5 Payback Analysis for Candidate 1.

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost:	-920,490					
Operation (Increase 10% / year) and Maintenance Cost	0	-704,000	-774,400	-851,840	-937,024	-1,030,726
Discount Factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time - Adjusted Cost (Adjusted to present value)	-920,490	-628,672	-617,197	-606,510	-595,947	-584,422
Cumulative Time - Adjusted Cost Over lifetime	-920,490	-1,549,162	-2,166,359	-2,772,869	-3,368,816	-3,953,238

Benefit Derived from Operation of New System (20% Growth Rate)	0	1,632,000	1,958,400	2,350,080	2,820,096	3,384,115
Discount Factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567
Time - Adjusted Benefit (Adjusted to present value)	0	1,457,376	1,560,845	1,673,257	1,793,581	1,918,793
Cumulative Time - Adjusted Benefit Over lifetime	0	1,457,376	3,018,221	4,691,478	6,485,059	8,403,852
	0	1	2	3	4	5
Cumulative Lifetime Time - Adjusted Cost + Benefit	-920,490	-91,786	851,862	1,918,609	3,116,243	4,450,614

Table C.6 Payback Analysis for Candidate 2.

Development Cost:	-1,345,950								
Operation (Increase 10% / year) and Maintenance Cost	0	-719,000	-790,900	-869,990	-956,989	-1,052,688			
Discount Factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567			
Time - Adjusted Cost (Adjusted to present value)	-1,345,950	-642,067	-630,347	-619,433	-608,645	-596,874			
Cumulative Time - Adjusted Cost Over lifetime	-1,345,950	-1,988,017	-2,618,364	-3,237,797	-3,846,442	-4,443,316			
Benefit Derived from Operation of New System (20% Growth Rate)	0	1,632,000	1,958,400	2,350,080	2,820,096	3,384,115			
Discount Factors for 12%	1.000	0.893	0.797	0.712	0.636	0.567			
Time - Adjusted Benefit (Adjusted to present value)	0	1,457,376	1,560,845	1,673,257	1,793,581	1,918,793			
Cumulative Time - Adjusted Benefit Over lifetime	0	1,457,376	3,018,221	4,691,478	6,485,059	8,403,852			
	0	1	2	3	4	5			
Cumulative Lifetime Time - Adjusted Cost + Benefit	-1,345,950	-530,641	399,857	1,453,681	2,638,617	3,960,536			

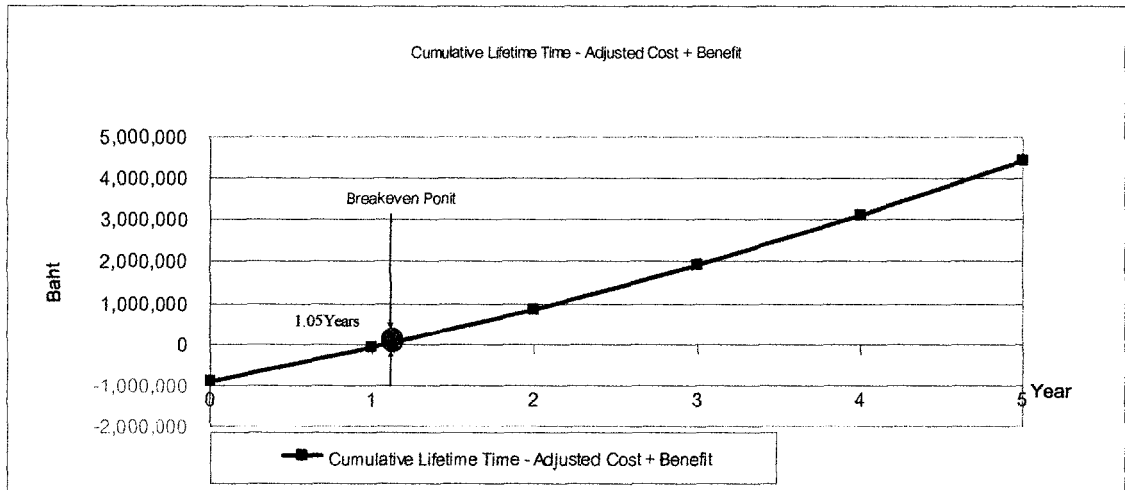


Figure C.1 Payback Analysis for Candidate 1.

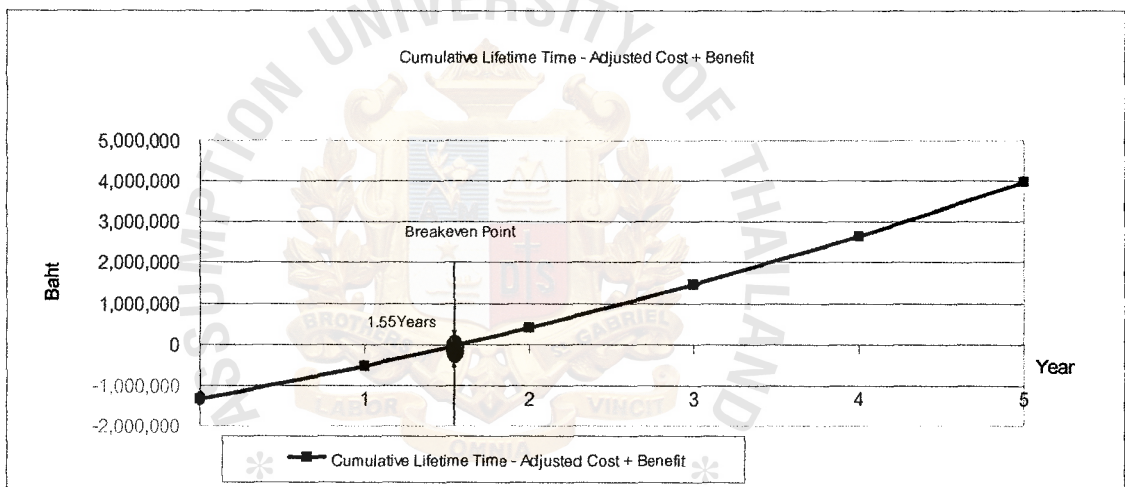


Figure C.2 Payback Analysis for Candidate 2.

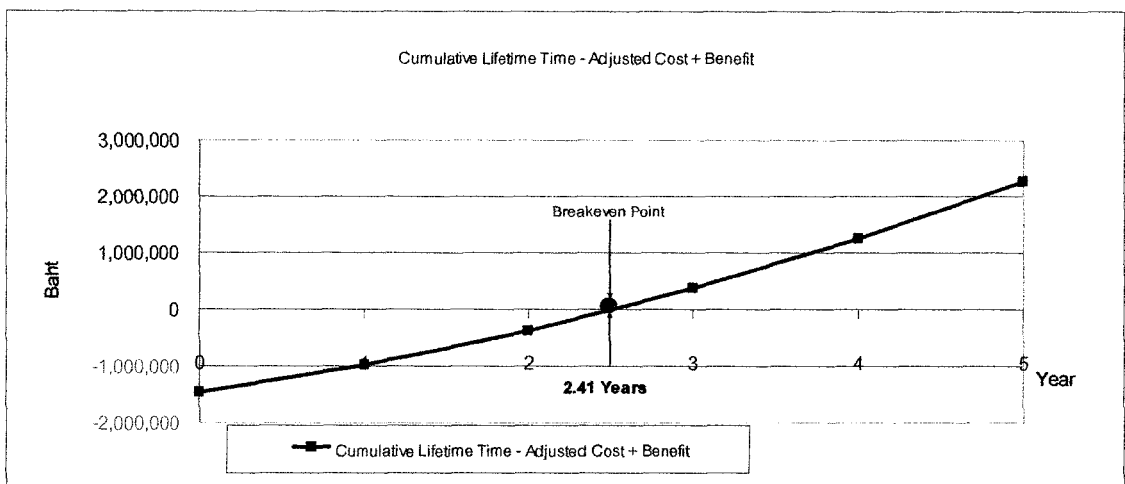


Figure C.3 Payback Analysis for Candidate 3.



Enter Password

Welcome to use The Project Development Information System!

This is a Internal System. Please Login!

Personal ID:

Password:

Enter **Exit**

Figure D.1 Identify Personal ID.

PDIS-(Main Menu)

Main Menu

Click to star

Add New Plan **Add New Project**

Plan Information **Project Information**

Data Management **Generate Report**

ABC Real Estate Company **Exit**

Figure D.2 Main Menu.

SubMenu-Project

Project List:

Project ID	Project Name
<input checked="" type="checkbox"/> P19990112	ABCDEFGH
<input type="checkbox"/> P19990830	HJKLMNO
<input type="checkbox"/> P20000918	MNOPQRST

Input Project ID:

View Delete Exit

Figure D.3 Project Information Main Menu

Project- P19990112

List:

Item	Update Time
<input checked="" type="checkbox"/> Project Description	1999-01-12
<input type="checkbox"/> Financial Data	1999-08-15
<input type="checkbox"/> Material Data	1999-09-27

Project ID: P19990112 Project Name: ABCDEFG

Project Issue Date: 1999-01-12

Project Due Date: 2001-05-15

View Update Exit

Figure D.4 Project Detail Interface

Project- P19990112

Project Description:

Project ID: P1990112 Project Name: ABCDEFG

Project Issue Date: 1999-01-12

Project Due Date: 2001-05-15

Update Exit

Figure D.5 Project Description Interface.

Project- P19990112

Project Materials:

Material Code	Material Name	Unit	Quantity
C002	Cement 50#	Kg	100000
S018	Steel Bar 18mm	Ton	20
P009	Pipe 90mm	M	60

Project ID: P1990112 Project Name: ABCDEFG

Project Issue Date: 1999-01-12

Project Due Date: 2001-05-15

Update Exit

Figure D.6 Project Materials Interface.

Add New Project

Project Plan List:

Plan ID	Plan Name
<input checked="" type="checkbox"/> 20001112	ABCDEFGH
<input type="checkbox"/> 20010830	HJKLMNO
<input type="checkbox"/> 20020918	MNOPQRST

1. Choose Plan ID to be the new Project Data.

2. Create Project ID for that Plan::

Figure D.7 Create New Project Interface.

Create New Plan

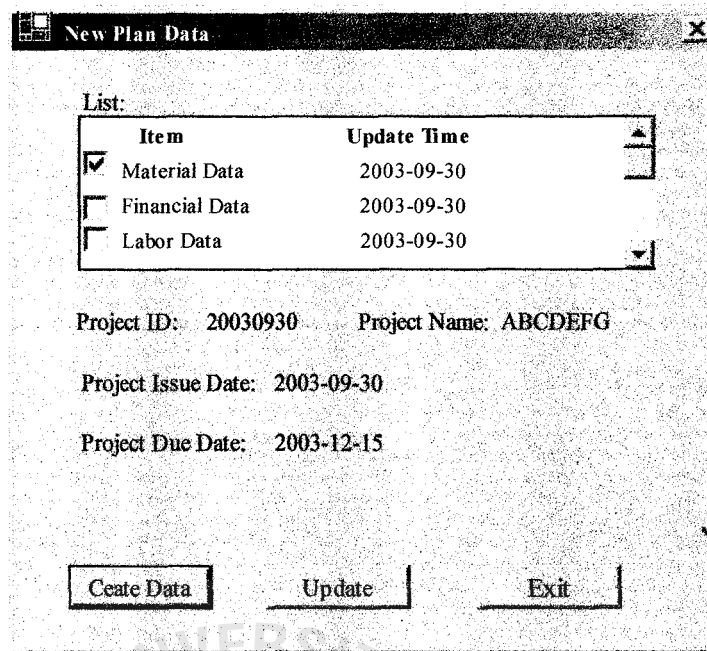
Plan ID: Plan Name:

Plan Location:

Plan Issue Date: Plan Due Date:

New Plan Description:

Figure D.8 Create New Plan Interface.



A screenshot of a software window titled "New Plan Data". It contains a table with two columns: "Item" and "Update Time". The table lists three items: "Material Data", "Financial Data", and "Labor Data", all with an update time of "2003-09-30". The "Material Data" row has a checked checkbox. Below the table, there are fields for "Project ID: 20030930", "Project Name: ABCDEFG", "Project Issue Date: 2003-09-30", and "Project Due Date: 2003-12-15". At the bottom, there are three buttons: "Ceate Data", "Update", and "Exit".

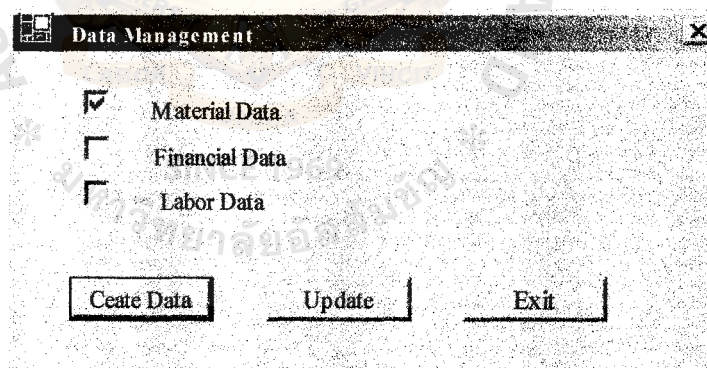
Item	Update Time
<input checked="" type="checkbox"/> Material Data	2003-09-30
<input type="checkbox"/> Financial Data	2003-09-30
<input type="checkbox"/> Labor Data	2003-09-30

Project ID: 20030930 Project Name: ABCDEFG

Project Issue Date: 2003-09-30

Project Due Date: 2003-12-15

Figure D.9 Create Data for New Plan.



A screenshot of a software window titled "Data Management". It contains a list of three items: "Material Data", "Financial Data", and "Labor Data". Each item has a checkbox to its left. The "Material Data" checkbox is checked. At the bottom, there are three buttons: "Ceate Data", "Update", and "Exit".

☒ Material Data

☐ Financial Data

☐ Labor Data

Figure D.10 Data management Menu.

Data Management

Material Data:

Material Code	Name	Unit	Price
C002	Cement 50#	Ton	10000
SD 18	Steel Bar 18mm	Ton	15000
P009	Pipe 90mm	M	500

Data Create Date: 2003-09-30

Save Exit

Figure D.11 Create New Data.

Generate Report

Create Report Date: 2003-09-30

Plan Report Project Report Exit

Figure D.12 Generate Report Interface.

Project Plan Report

Project Plan List:

Plan ID	Plan Name
<input checked="" type="checkbox"/> 20001112	ABCDEFGH
<input type="checkbox"/> 20010830	HJKLMNO
<input type="checkbox"/> 20020918	MNOPQRST

Choose Plan ID to do the Project Plan Report.

View Exit

Figure D.13 Choose Plan for Report.

Generate Plan Report

Plan ID: 20030930 Plan Name: ABCEDFG

Plan Location: Esat of BKK Total Investment: 20,000,000 Baht

Plan Issue Date: 2003-09-30 Plan Due Date: 2003-12-15

Plan Description:

Anything you can describe here.

Plan Costs Analysis:

Material Investment:	9,000,000Baht.	Management Cost:	935,000Baht.
Labor Wage:	1,200,000Baht.	Equipment Cost:	500,000Baht.
Financial Loan:	8,000,000Baht.	Utility Fee:	178,000Baht.

Print Exit

Figure D.14 Generate Project Plan Report.



APPENDIX E

REPORT DESIGN



ABC Real Estate Company

TEL: 02-88888888 FAT:02-99999999 Email:ABC@ABC.com

Estimation Project Plan Report

Project Plan	
Plan Number:	20030930
Date:	2003-09-30

Location	East of BKK
Issue Date	2003-09-30
Due Date	2003-12-15
Total Investment	54,783,000 Baht.

Cost Analysis	Invested	Future Invest	Total
1. Material Costs:		9,000,000	9,000,000
2. Labor Costs:		1,200,000	1,200,000
3. Financial Loan 8,000,000Baht. Need pay for Interest		800,000	800,000
4. Management Costs:		935,000	935,000
5. Utility Fee:	78,000	100,000	178,000
6. Design Fee:		900,000	900,000
7. Land Value:	40,000,000		40,000,000
8. Government Fee:	350,000	500,000	850,000
9. Equipment Fee:		500,000	500,000
10. Other Fee:	120,000	300,000	420,000
Estimate Costs Total:			54,783,000
Forecast Sale value:			80,000,000
Forecast benefits:			25,217,000

Plan Description

Plan Description:	
ESTIMATOR SIGNATURE:	DATE

Figure E.1 Project Plan Estimation Report.

Project Number	ReporterID	Report Date
P20030930	A008	2003-09-30

ABC Real Estate Company



Project Approved	
Project Plan Number:	20030930
Approved Date:	2003--9-30
Approver Signature:	

Comany Address: Bangkok Thailand

Comapny Tel: 02-8888888

Company Fax: 02-9999999

Comapany Email: ABC@ABC.com

Project Execute Report

Project Name: ABC-Commerce Bulding

Project Location: East of BKK

Total Investment: 300,000,000Baht.

Project Type: Individual Project

Project Issue Date: 2003-09-30

Project Due Date: 2005-12-30

Project Manager: Mr.Henry

Project Finance manager: Ms.Annie

Project Financial Budget:

Item	QTY	Unit	Description	Price/Unit	Value
1. Material Investment:			The whole Investment		120,000,000
1.1 Cement	3000	Tan	Under 2003-09-30 Price caculating	15,000	45,000,000
1.2 Steel Bar	980	Tan	Use 2003-09-18 Price (Average Price)	20,000	19,000,000
1.3 Glass Plate	20,000	Sq.M		2,500	50,000,000
1.4 Other Materials			Other need material (Forecast)		6,000,000
2. Labor Investment:					50,000,000
2.1 Daily wage		Hour		280	
2.2 Night Wage		Hour		330	
3. Financial Loaned:					
3.1 Loan 2 year			Loan from A Bank 20,000,000Baht, Interest 15%		
3.2 Loan 2 year			Loan from B Bank 30,000,000Baht, Interest 12%		
3.3 Loan 1 year			Loan from C Bank 800,000Baht, Interest 10%		
4. Other Fee					
4.1 Equipment					80,000,000
4.2 Air control Equipment					50,000,000
Total Value:					<u>300,000,000</u>

Report Description:

Figure E.2 Project Report.



ABC Real Estate Company

Project Number	ReporterID	Report Date
P20030930	A008	2003-09-30

Project Executing Problem Report

Project Name:	ABC-Commerce Buliding	Project Issue Date:	2003-09-30
Project Location:	East of BKK	Project Due Date:	2005-12-30
Total Investment:	300,000,000Baht.	Project Manager:	Mr.Henry
Project Type:	Individual Project	Project Finance manager:	Ms.Annie

Project Executing Problems Description:

- 1.*****
- 2.*****
- 3.*****
- 4.*****
- 5.*****
- 6.*****

Department

Report Problems from: Project Management

Report Date: 2003-10-31

Solution Description

Problems Solution Description:	
SOLUTIONIST TOR SIGNATURE:	DATE

Figure E.3 Project Executing Problems Report.

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