Project Cost Control System Development

by

Ms. Piyanun Jitchaiwisut

A Final Report of the Three-Credit Course
CE 6998 Project

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer and Engineering Management
Assumption University

November 2004

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Project Title	Project Cost Control System Development
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Project Advisor	Dr. Chamnong Jungthirapanich
Academic Year	November 2004

The Graduate School of Assumption University has approved this final report of the three-credit course, CE 6998 PROJECT,. Submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer and Engineering Management

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November 2004

ABSTRACT

This project is a result of research and database set up to specify an approximate computation of probable project cost especially for the onshore and offshore construction by the Oil and Gas client company and sub-contractor. The research experiment was conducted in Facilities Engineering Department of an oil and gas business and the result has been measured in terms of the degree of achievement process cost reduction on the proposed system process compared with an existing system.

There are two main functions in this research. The first function is to design and set up database for data collection and the second is to calculate probable project actual cost to date and the cost forecast against the budget cost base line for monitoring, measuring, and analysis actual project cost status and currently trend of client and sub-contractor mode in the company. The program could generate various reports upon the filter defined by user to present summary cost and steps in which the indicated actual construction cost.

The result of data calculation and processing of developed system show that the good database management system contains more useful, accurate, reliable, timely information, and better than the conventional type by taking only 5 minutes to generate various types of report when users require. In term of accuracy for data storage and processing, the system can be analyzed to delicate level of the costs required to construct facilitating equipment, manpower, material, consumable, and including transportation service to construction. Database has been gathered and executed under Microsoft Access. The database management software is by keeping shared data among several users under distributed client/server network routing.

ACKNOWLEDGEMENTS

I wish to acknowledge the people who have made contributions to help this project possible, both directly and indirectly. There were certainly enough obstacles to overcome. Since the Database development, I have gone through a slew of hard drives, power supplies, and other obstacles to operating systems.

My project advisor, Dr.Chamnong Jungthirapanich, deserves a great deal of thanks, for his valuable suggestion and advice given in to preparation of this project. Thanks go also to the Project cost control team at the Oil & Gas Company, with whom I am honored for their information provided. The support of Graduate committee has been particularly helpful to bring facilitate to me.

Finally, I also wish to thank my mother and father who have pushing their effort to my continuing hard work and supporting me until the success of my project.

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I. INTRODUCTION

1.1 Background of the Project

From the study of an existing system in one global enterprise company that has core business in Oil and Gas production; however the diversity of Project to support the core business is ranged from simple community related projects, through complex platform upgrades, to the design, fabrication and building of new production facilities. These activities are performed throughout and across the world and although company standards are in place for the control of project costs and schedules there were no Global Standard tools and procedures available that enabled the collection of project information to facilitate the management of such diversity by individual Projects, Departments, Divisions and Company's.

Cost Engineers can not provide good analytical methods and procedures for the costs forecasting and controlling on construction project to meet timely and profitable completion. There is no customized system for the Facilities Engineering department in Thailand Business Unit to imply or determine the client and sub-contractor construction cost to date against the budget baseline especially they have no clues for the cost finding between invoices of not incoming period. To determine the client and sub-contractor construction cost to date, the cost engineers encounter with the problem of gathering the invoices which are always late for 2 or 3 months to manual report in excel file which normally takes at least 3-4 days to complete.

I have analyzed, and tried to solve the problem by introducing a new computerized system program to help facilitate the construction cost calculation and to consolidate cost reporting between actual expenditure, cost forecast, and baseline budget to measuring and monitoring project cost status. The system is expected to minimize inaccuracy, invalidity and missing in data input process. This computer

program is written by using in Microsoft Access 2002, the database management software, which can be shared among several computers under distributed client/server network routing for the timely data input process manners, to work in cooperation in Microsoft Windows XP or a higher version that would be suitable for the new wireless LAN Company.

1.2 Objectives of the Project

(1) To develop project cost control system and to set up cost database for Facilities Engineering department in the Oil and Gas Company.

(2) To centralize all actual and soft-commitment cost which is the cost that already occurs but invoice not in-coming period in unique database system for providing the various type of report upon management require.

(3) To provide cost information services to support management decision making in establishing capital budgets.

(4) To standardize cost code structure conducted to the real work breakdown structure to capture cost baseline and further to typical project cost estimations.

(5) To monitor and control the execution of work onshore and offshore of client and sub-contractor.

(6) To provide estimating data and guidance to evaluate project economics, to establish capital budgets, to obtain funding approval, and to help monitor and control the execution of work.

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1.3 Scope of the Project

It is to study and to analysis an existing system, work flow including system input and output requirement to set up standard working procedures and develop computerize database customize system for the Facilities Engineering department of the Oil and Gas Company in Thailand Business Unit. Also, it is to combine all actual and soft-commitment cost from client / sub-contractor of the onshore and offshore construction and centralize database. This database allows the convenient update from several data providers and also, it is useful in preparing various kinds of management report responding to different purposes and used as reference to develop pricing document for the new typical project cost estimations.

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II. AN EXISTING SYSTEM

2.1 Background of the Organization

The Oil and Gas Company is a global enterprise corporation ranks among to world's largest and most competitive global energy companies. Headquartered in USA, it is engaged in every aspect of the oil and gas industry, including exploration and production; refining, marketing and transportation; chemicals manufacturing and sales; and power generation. The company explores and produces oil and gas in some 35 countries including Thailand.

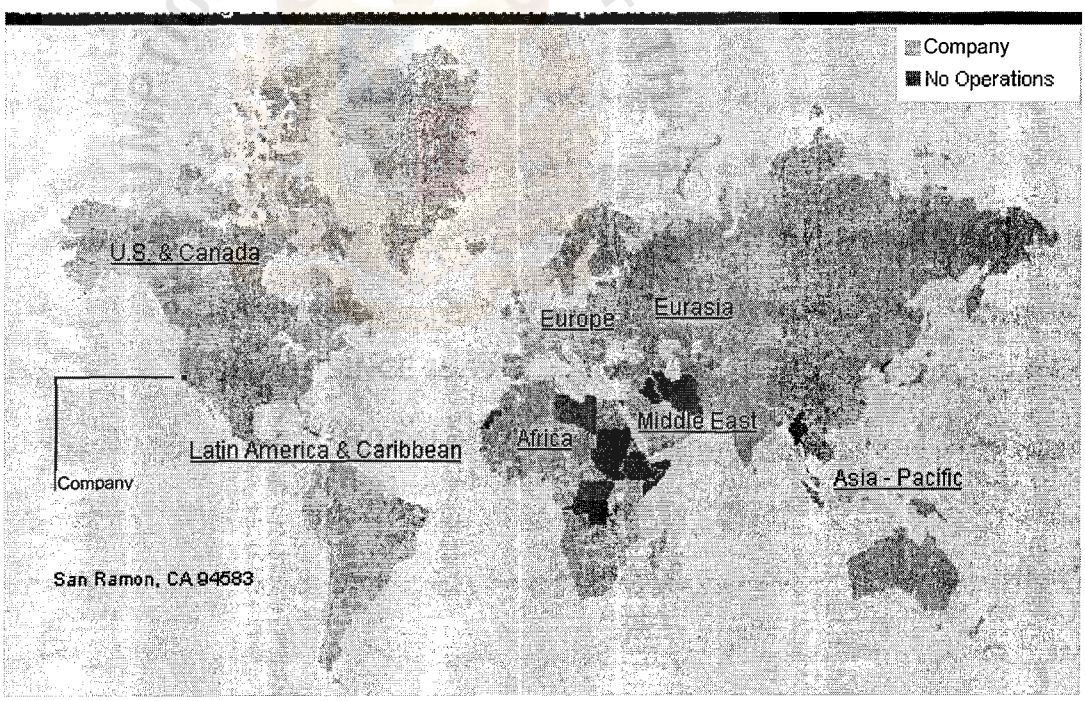

Figure 2.1. Map of All World View Showing Location of All Company Operations.

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Africa — Africa's largest U.S.-based investor, The Oil and Gas company is active in more than 50 African nations. During the past five years, the company has invested nearly $5 billion in the region.

Asia - Pacific — The Oil and Gas company's energy activities where operates in 27 countries and leads all other international regions in company production range from exploring for oil and gas to generating electric power to marketing through service stations.

Eurasia — The Caspian region's leading oil producer, through its partnership, today operates the world's largest new oil field in a presence 13 Eurasian countries.

Europe — In 1964, The Oil and Gas company drilled the first exploration well in the North Sea. Today, the company's daily net production exceeds 168,000 barrels of oil and 477 million cubic feet of natural gas per day. With refining interests active in 39 European countries.

Latin America & Caribbean — The Oil and Gas Company is among the top oil producers in Argentina, Colombia and Venezuela and has operations in more than 39 countries in the region. In Argentina, the company operates the nation's largest oil find in the past 15 years.

Middle East — A pioneer in the 1930s, The Oil and Gas Company is active in 11 of the region's countries. Production in the Partitioned Neutral Zone, between Saudi Arabia and Kuwait, has more than tripled since 1990. The company has exploratory activities in Bahrain and holds chemical interests in Saudi Arabia and Qatar.

U.S. & Canada — Since its discovery of oil north of Los Angeles, The Oil and Gas Company has expanded exploration and production activities and is now the third-

largest producer in the United States. The company is a prominent refiner of crude oil and operates about 8,000 service stations in 28 states and British Columbia, Canada.

The company holds promising exploration acreage in deep. Two operating companies, International Upstream manage this "upstream" business, a key driver for growth. International Upstream, headquartered in the United State, is organized by strategic business unit (headquarters in parentheses): Australasia, China, Eurasia, Indonesia, Latin America, Middle East, Southern Africa, and Thailand.

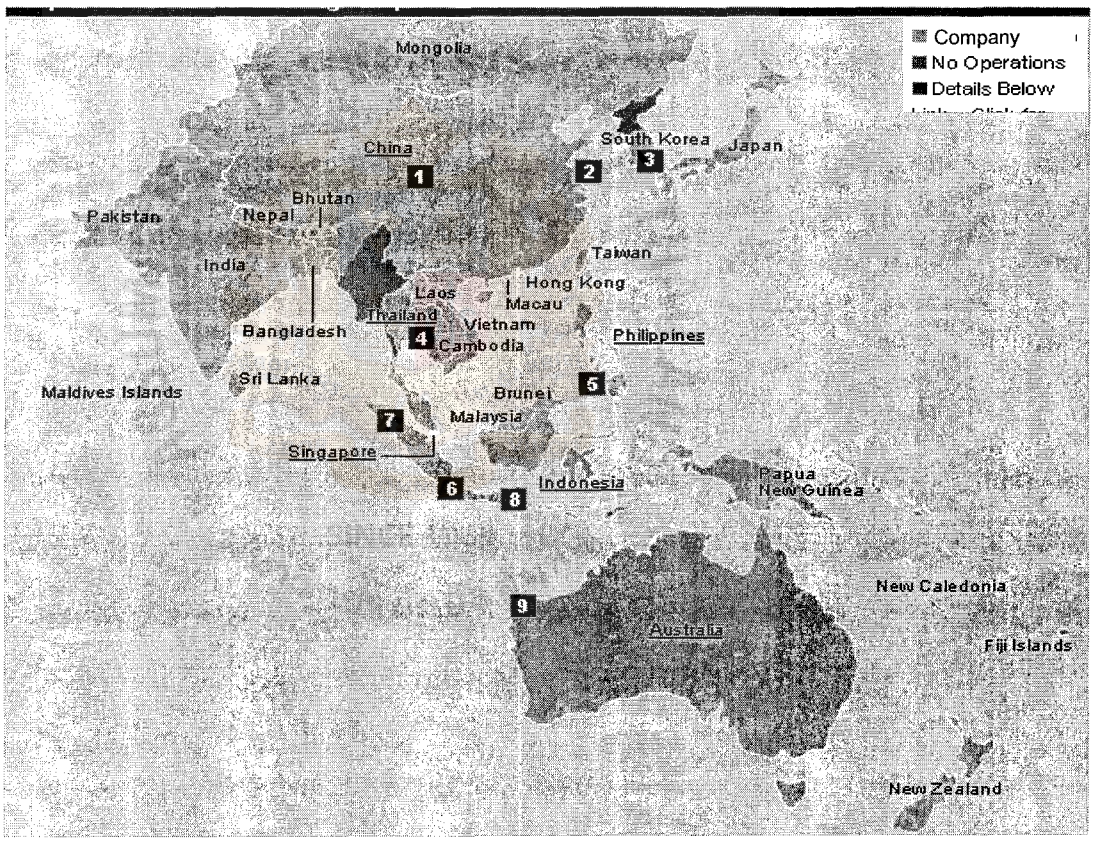

Figure 2.2. Map of All Asia & Pacific Company Operations.

Asia - Pacific All Operations:

(1) China – One of China's leading foreign oil producer; interests include service stations, storage terminals and a paraxylene plant.

(2) China – Bohai Bay is the site of significant production and exploration.

(3) South Korea – 650,000-barrel refinery complex is among the world's largest.

(4) Thailand – No.1 oil producer, operates about 500 service stations, a power plant and — with Shell – a refinery.

(5) Philippines – $4.5 billion Malampaya deepwater project to supply gas for power plants is Philippine's largest industrial undertaking.

(6) Indonesia – Besides 50-year, 10 billion-barrel production, sells chemicals, lubricants and operates Dumai Terminal.

(7) Indonesia – Bolstered by world's largest steam flood, Duri Field produces a total of 204,000 barrels of oil per day in 2003.

(8) Indonesia – On Java, Amoseas International operates a 90-megawatt geothermal power plant and supplies steam to a 55-megawatt plant.

(9) Australia – Australia interests include the North West Shelf, the Greater Gorgon gas fields and two refineries.

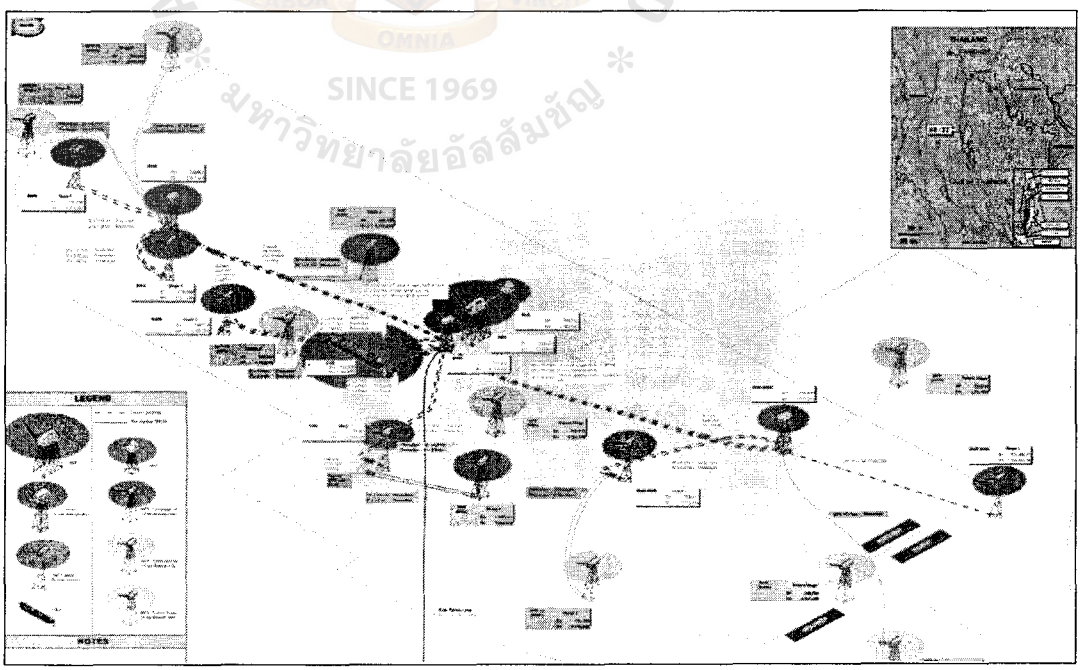

Figure 2.3. Field Infrastructure.

A presence in Thailand since 1948, The Company operates Block B8 in the Gulf of Thailand with a 52 percent interest. During 2003, the company was awarded the exploration and production rights to two additional offshore concessions. The company is interested in the newly acquired Block G4 and 9A which are 85 percent and 52 percent, respectively. The company also holds a 33 percent interest in exploration Blocks 7, 8, and 9, which are currently inactive pending resolution of border issues between Thailand and Cambodia.

Block B8 produces oil and natural gas from three fields: T1, M1 and B1. Net daily production in 2003 from these fields was 104 million cubic feet of natural gas and 24,600 barrels of crude oil. During the year, the company drilled 44 development wells and installed three platforms in Block B8.

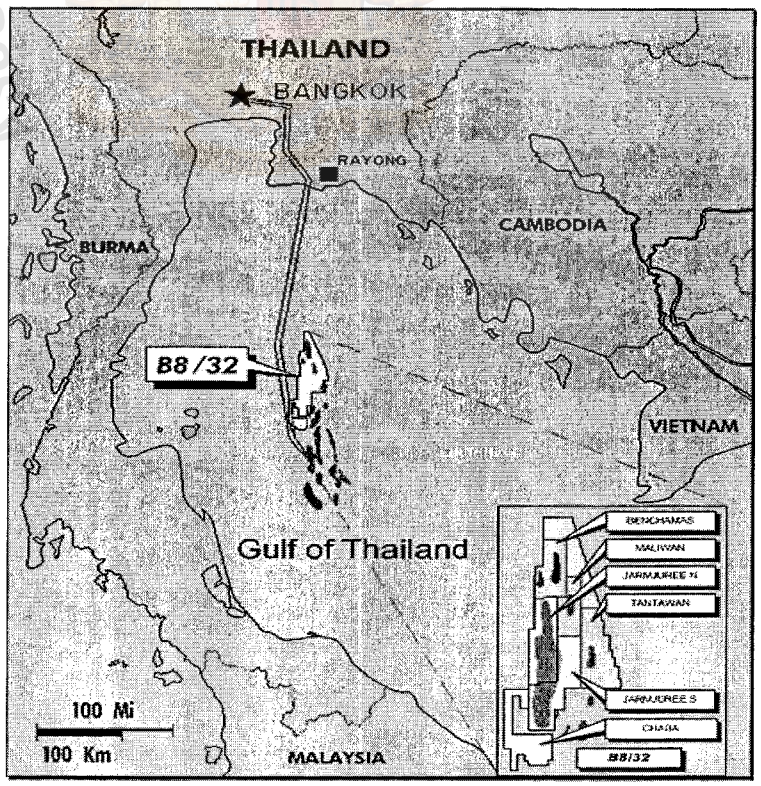

Figure 2.4. The Gulf of Thailand Operation Map.

In 2004, the company plans to complete an upgrade of processing capacity at the B1 field, increasing total capacity to approximately 65,000 barrels of crude oil per day. In addition, an exploration program is planned to continue to evaluate the remaining area of Block B8 and the recently acquired concessions.

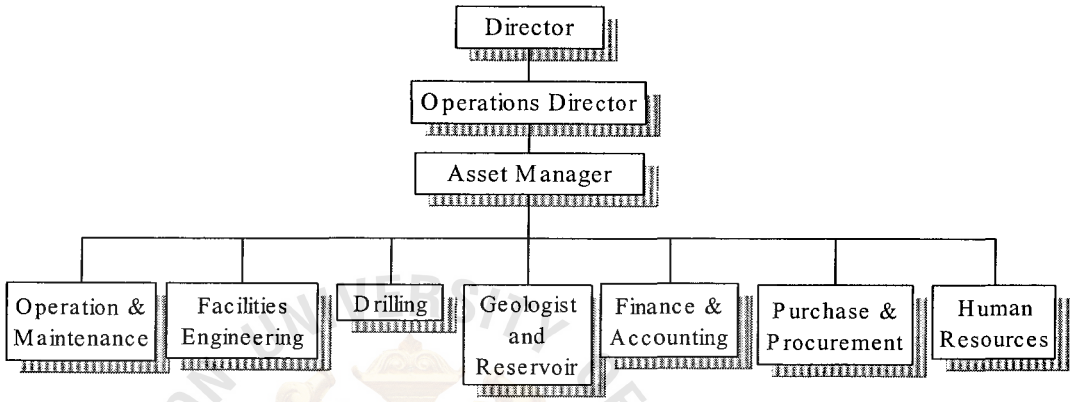

Figure 2.5. The Oil and Gas Company Thailand Business Unit Organization Chart.

2.2 Existing Business Function

The analysis of current procedures identifies 2 distinct prime roles in the management of projects within the company and The Project Manager / Engineer and the Project Controls Manager / Engineer. The processes and system have been defined with these roles in mind.

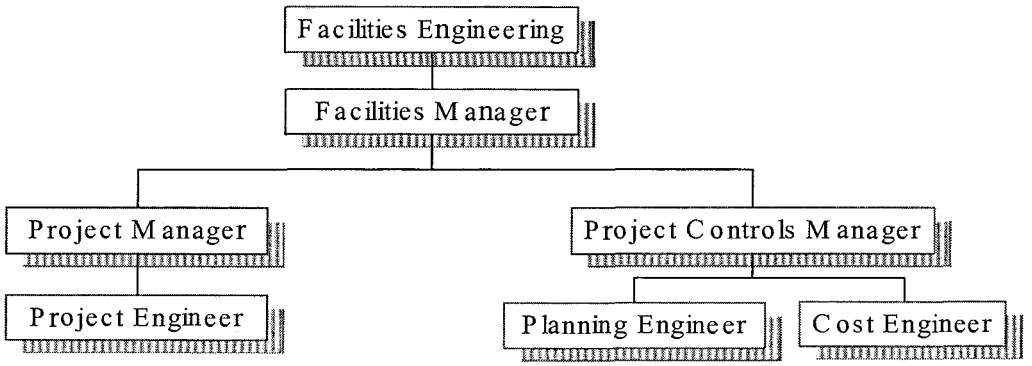

Figure 2.6. Typical Organization of Direct Project Control.

An existing business function of the Cost Control System in the Oil and Gas Company uses the global standard Job Cost Module in JD Edwards's software to integrates the functionality of costs, contracts, maintenance and purchase, with a 'drill-down' facility to the actual costs from the invoices payment in response to the distinct requirement of Project management, Project Engineers, Planning Engineers, and Cost Engineers to find and monitor the actual project cost after the payment done. An existing Cost Control System business functions can be summarized as follows;

Process 1. Project Initiation Authorization for Expenditure

The project engineer provides project work scope, road map or execute plan, approximately cost estimate for expected budgets, schedule, and contracting plan based on the historical data into the JD Edwards's System upon request of the authorization for expenditure.

Process 2. Prepare Work Breakdown Structure

The planning engineer prepares work breakdown structure, which is the cost code numbering into system to describe work element of a project in logical hierarchy for the activity control.

Process 3. Prepare Cost Breakdown

The cost engineer prepares the delicate project cost breakdown by manual calculating the quantity of manpower, equipment, material, consumable, transportation, and etc. cost upon work breakdown structure.

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Process 4. Approved Budget

The management approves the project budget and the new project number expenditure authorization is created in the project master file.

Process 5. Prepare Purchase Order

In purchasing, the system indicates the project engineering requisition plan with inventory to check availability of material and to help procure materials and to prepare the purchase order.

Process 6. Update Actual Costs

During the project execution phases, the cost engineer would review the actual cost from invoices and allocate into cost breakdown, submitting to the project manager and the project controls manager for approval, Then it is passed to Finance department to keep record into the system which take time as least one month for completed the whole approve process. The manual calculation of soft commitment cost is accrued which identifies to be the value of work cost from equipment, manpower time writing, material, consumable, outstanding purchase order, and marine transportation based on the historical cost record to provide cost report at the end of month.

Process 7. Prepare Cost Report

At the month-end, the cost engineer will pull the actual costs which have payment done and the project budget from the job cost module in JD Edwards's software to integrate with the manual invoices lock sheet and

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earned value from excel and prepare various types of report to present to the project engineer and the management team.

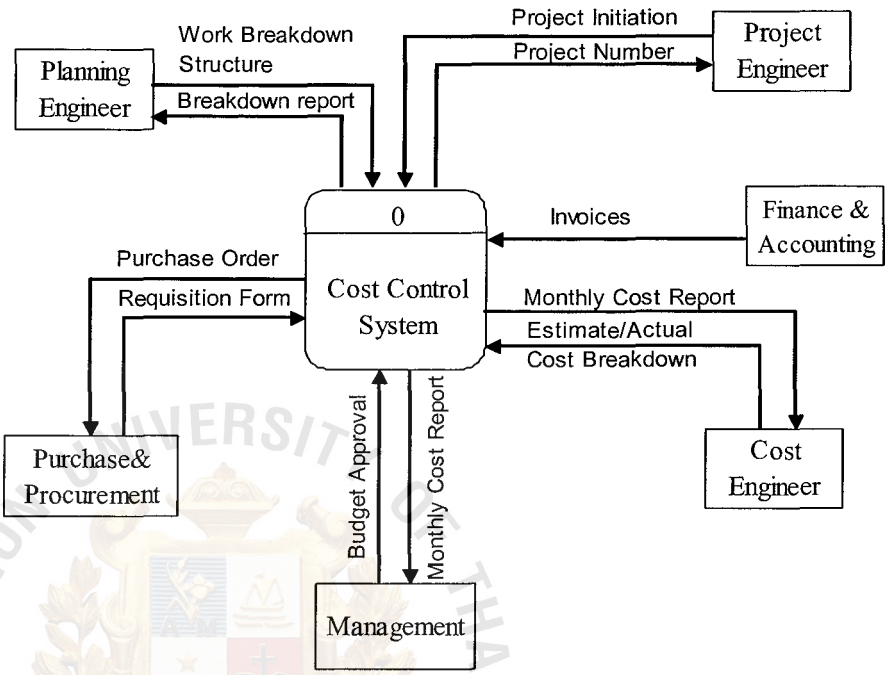

Figure 2.7. Context Diagram of an Existing System.

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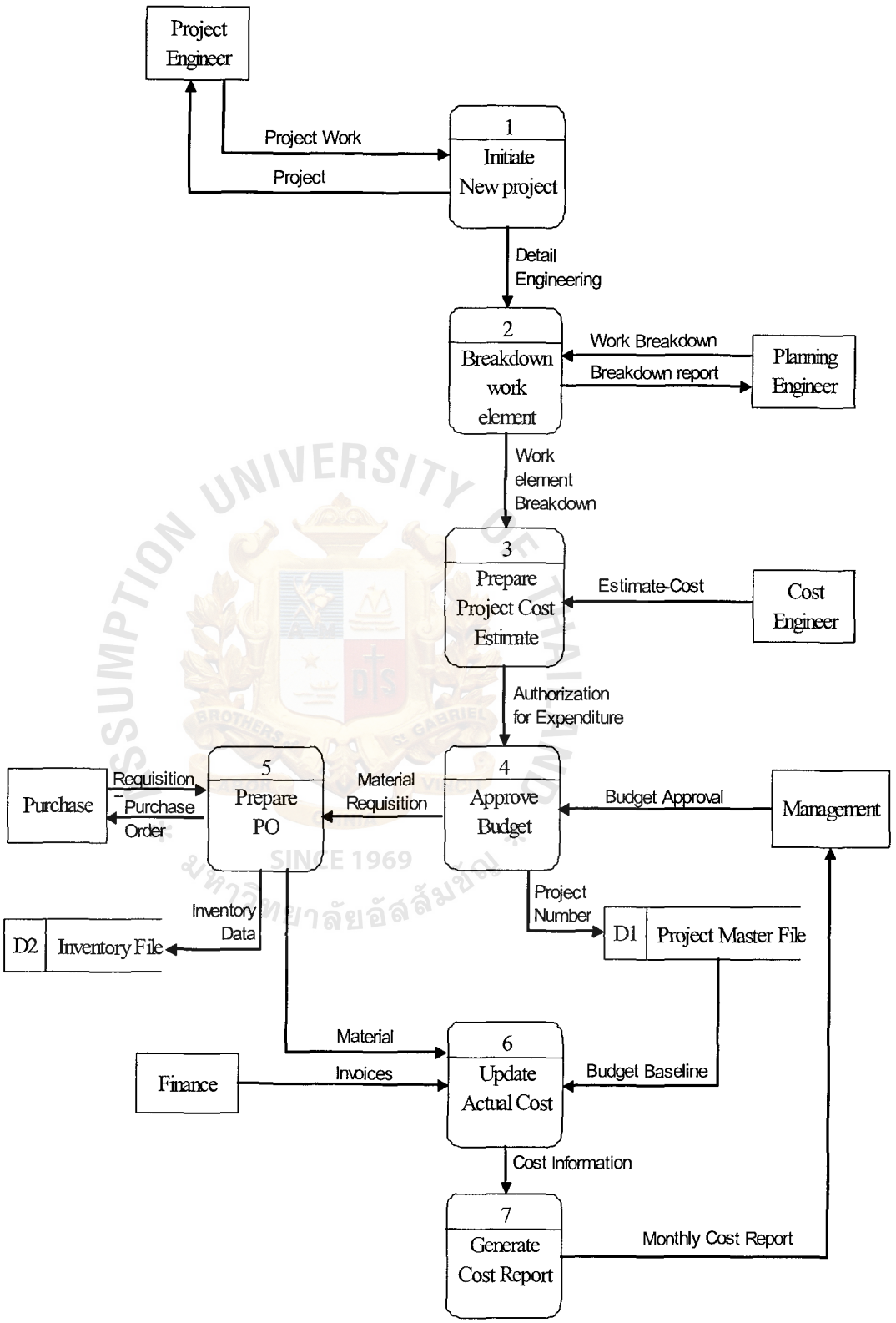

Figure 2.8. Data Flow Diagram Level 0 of an Existing System.

2.3 Existing Cost Structure and Definition

(1) Overview of the structure is made up of 5 elements

(1) Business Type – This is assigned to the job or Project Number.

(2) Phase – element of Cost Code denoting "when".

(3) Process – element of Cost Code, representing the activity.

(4) Component – element of Cost Code, indicates the deliverable.

(5) Cost Type – a Cost Type code, defining the "nature" of the cost.

The business type and the cost codes have significance outside the boundary of Job Cost as they define the key elements of cost for financial purposes when capitalizing the resulting asset after the work has been completed. The structure is illustrated in the following diagram.

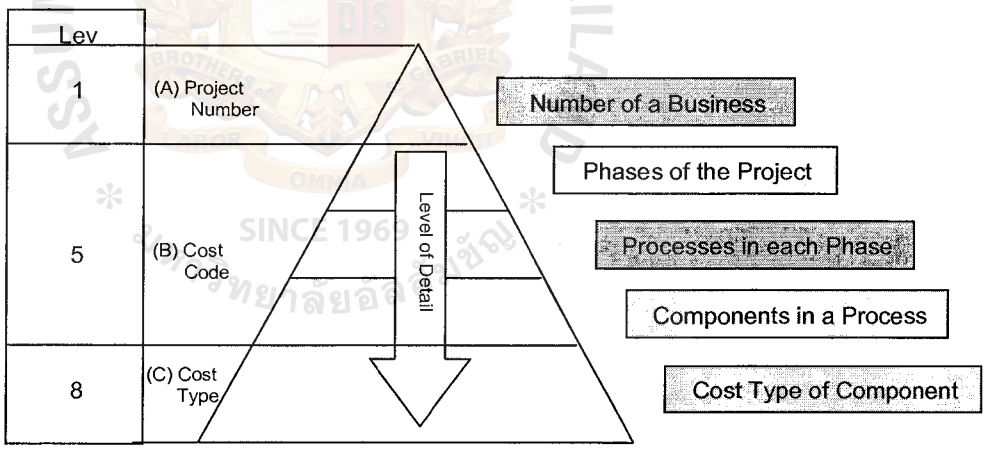

Figure 2.9. Hierarchy of Cost Structure.

The level is the assigned level of detail that the system uses to roll-up costs. It is the entire structured system required to identify LEVEL 8 items, which are invoices and vouchers etc. that associate a cost to the cost type.

The correct Project Number + Cost Code + Cost Type must be accurately identified when issuing or authorizing vouchers / PO's / Contracts and invoices associated with the work. Absence of the code or inaccuracy will result in the voucher being returned to the requester without being initiated.

Table 2.1. Cost Code Format.

PROJECT NUMBER	COST CODE			COST TYPE
ABC123	Phase	Process	Component	258000
	1	120	000	

A predefined series of allowable Business unit / Project Types Number and combinations of Cost Codes and Cost Types have been incorporated into the system. The catalogue is not intended to be definitive but is designed to cover most types of Jobs undertaken.

(A) Business Unit / Project Types

(1) The Business Unit / Project Type is a code of two numbers that is assigned to the job when the project is raised. It is related to a series of templates and related to the type of project being raised.

(2) The Business Unit / Project Type may be used to locate and aggregate like Project Number's, but it is not a required reference after the Project Number is raised in the system.

(3) The Business Type identifies the general type of work related to: road, topside work, community project, and building

A full list of Business Types is referenced in the chart of Cost Code Catalog, shown in Appendix A.

(B) Cost Codes

The Cost Code Structure chart is the "Master Cost Code Structure" for centrally defined and controlled, and is a key point in the assurance of uniformity and standardization in the management and benchmarking potential using the Project Cost Management. Each Type of "Master Cost Code Structure" aligns with a type of Project, and the particular asset type that will be constructed using the associated Cost Code Structure. The process provides the creation of "Model" Cost Code Structures as sub-divisions of the Master Cost Code Structures both as the global level, and locally, designated for the purpose.

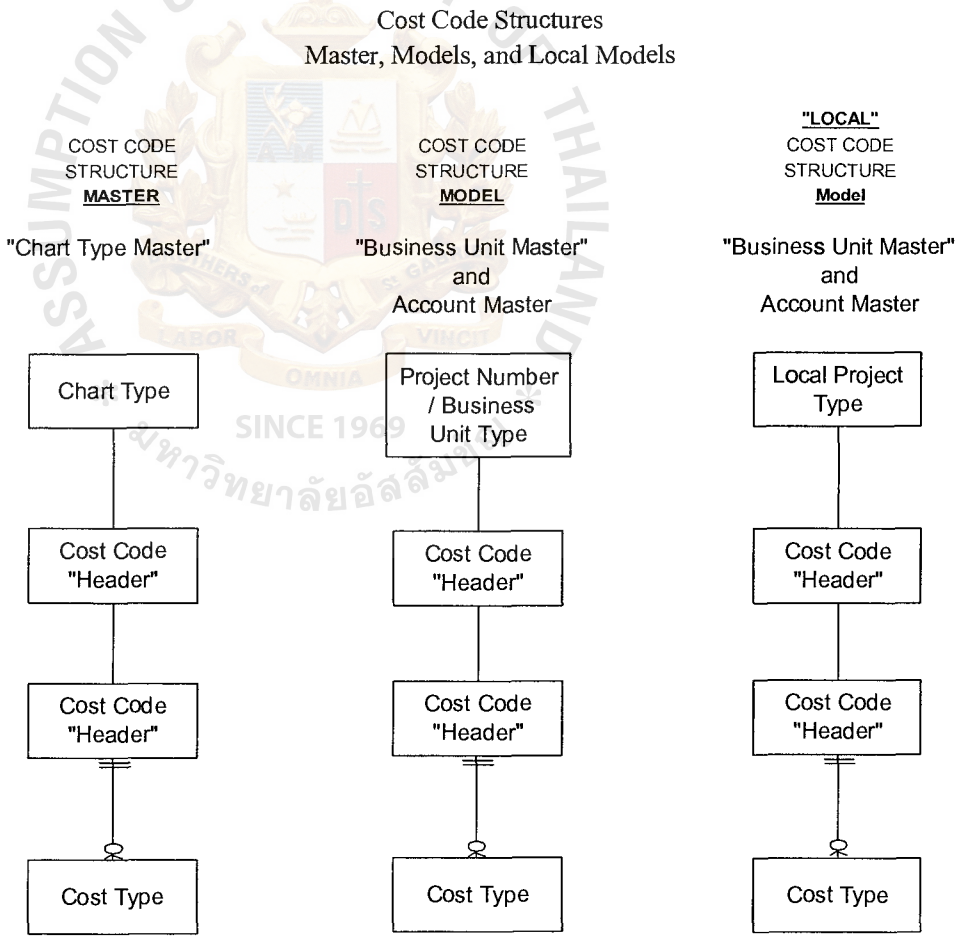

Figure 2.10. Cost Code Structure for Master, Model, and Local Model.

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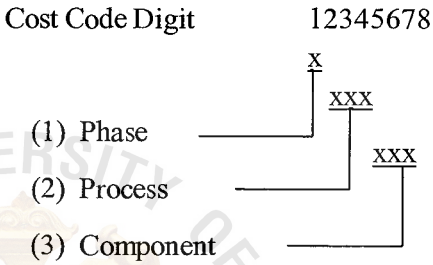
There is a key point in the assurance of uniformity and standardization in the management and benchmarking potential using the Project Cost Management System. Each Type of "Master Cost Code Structure" aligns with a type of Project, and the particular asset type that will be constructed using the associated Cost Code Structure. The process provides the creation of "Model" Cost Code Structures as sub-divisions of the Master Cost Code Structures.

There is a basic configuration to the Cost Code Structure as follows:



(1) Phases: There are 9 Phases – however, not all Phases are necessarily applicable to all jobs.

Table 2.2. Phases of Cost within a Job.

Phase	Phase Description
0	Identify / Assess
1	FE Engineering
2	Detail Design
3	Management / Materials
4	Site Preparation / Fabrication
5	Execution / Installation
6	Hook-up / Commission
7	Testing / Inspection
8	Services, Taxes & General
9	Finance - Standard for All Business AFE Type

(2) Process: The Process is a verb that describes what is being done within the Phase of the Project. Examples are:

(a) Install

(b) Survey

(c) Design

(d) Fabricate

The process along with the phase gives the full descriptive of what is done.

(e) Process xxx – Survey

(3) Components: The component is to define what the process is being applied to. Examples are:

(a) Steel

(b) Pipe work

(c) Pump

(d) Etc.

(C) Cost Types

The Cost Types fall into 2 categories Direct and Indirect. They portray the nature of the cost:

(1) The Direct Cost Types are the cost of company labor, consumable, material, contracted, rented equipment, non operated expended, and direct transportation.

(2) Indirect Costs are all other cost types associated with allocations, taxes and other similar types of costs.

2.4 Current Problems and Areas for Improvement

According to the existing system capturing the actual construction cost from sub-contractor invoices which are always arriving late for 2 or 3 months after the actual work done, Cost Engineer can not find or determines the offshore construction cost between that 2 or 3 month period due to the late invoice. In order to achieve the company goals with demonstrated ability to set contingency for appropriate class of the construction cost determinate and estimate, the first thing should be considered is the accurate tool to capture construction activities and spending cost occurred in the real time before the actual invoices arrival, and the second thing should be standardize and re-classify the construction cost structure.

From studying the existing system, current problems and things that could be improved were identifying as follows;

(1) The monthly cost reports are not issued in a timely manner, because of the cost report producing time consumed.

(2) Cost Engineer can not identify any costs that have been charged to the Project, because of no accurate database system to capture the cost detail.

(3) Project Engineers have not seen their actual project cost because of the 2 or 3 months late invoices.

(4) Project Engineer has to make estimates without the data, so they never knew how realistic they were.

(5) Making departments accountable for costs without providing the requisite information to tract those costs.

(6) The calculation method always changes upon the personnel idea.

(7) Have a lot of duplicate data storage files that make confusing when the uses are required, because of the poor database management system.

(8) In the end of month, Cost Engineers have waste time to review their actual project cost code charged and transfer the wrong charged cost into the right project cost code for more accurate month end actual cost report.

2.5 Existing Computer System

The existing computer system of the Oil and Gas Company is Global System, JD Edward System, which are not still customized and flexible to Thailand Business Unit. A lot of function of Cost Module is not flexible to uses and spent much more timing to be compiled. Users still have to work manually on the excel file, and to transfer the bottom line of amount into the Global system to keep record. Cost Engineers product cost is reported once a month by retrieving the actual payment data from the global system to analyze, calculate, and generate document report on the excel file by taking 2 or 3 days to gather the completed data for one report and to keep their report file independently on their own computer stand-alone without file sharing even though the computer network system is being LAN due to the concern about the security problem on their confidential data.

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III. THE PROPOSED SYSTEM

3.1 User Requirements

New Project Cost Control system is a flexible database management system that provides to keep all project activities that are taken by clients and sub-contractors at onshore and offshore together and record in computer files to response to the distinct requirement of Project Manager, Project Engineers, and Cost Engineers to find and to monitor the actual project cost to plan, evaluate, control, and uses historical cost base line to estimate their new typical project cost from the computer outputs that contain useful, accurate, reliable, and timely information to meet the needs of their requirements. The new computerized system is also providing several benefits to meet requirements of the both engineering and management level as follows;

(1) To reduce cost report producing time consume, historical data finding, calculation or typing error from the previous manual way.

(2) To track real time construction cost - 24 hours a day, 7 day a week.

(3) To provide support data for the new typical project cost estimates.

(4) To provide complete and readily accessible actual construction cost information for Project Manager, Project Engineer, and Cost Engineer.

(5) To provide useful, accurate, reliable, and timely information to support management decision making.

(6) To increase the effectiveness of job by provide faster access system with the quickly response of input.

(7) To unify and centralize database and related data from several sources.

(8) Speed up input, since shared database allows direct update by the authorized data source department.

(9) To generate various types of report upon user's request.

(10) To standardize cost code structure that conduct to the real activities of work breakdown structure for capturing cost baseline to the further typical project cost estimates.

3.2 System Design

The proposed system design purpose is to meet the users' requirements and to support the decision making process for the management. The computerized database management information system can be used to fulfill these purposes by improving the efficiency and productivity of Cost Engineer information.

The principles, concepts, and basis of design are as follows;

(1) Monitor against approved budget targets

(a) Approved Appropriation Amounts

Process and procedures allow for the monitoring of:

(1) Project cost against the original approved, the revised (Supplemented) and the expected budgets. This promotes early detection of overspending against the approved amounts.

(2) Committed costs of contracts and purchase order values as soon as they are posted.

(3) Actual costs (Accounts Payable, Inventory Issues, and Payroll Time Entry) as soon as they are posted during the period.

(4) Allow the Project Manager / Engineer to record variance and changes to budget lines (Cost Heads) and manage budget amounts between these budget lines.

(b) Agreements and Annual Budgets

The system is provided for:

(1) The project costs to be monitored against annual budget constraints.

(2) The expectations are to be revised and forecast on an annual basis to aid the requesting and management of current and future years annual budget requirements and constraints.

(c) Collect Benchmark Data

(1) By recording progress, earned value from actual invoices by period along with activity date information in a common currency the system allows the use of the empirical data to benchmark like project across field.

(2) To enable benchmarking, a frame work has to be defined to collect the data into a common structure.

(2) Combine Cost with Schedule

(a) The two dimensional approaches are:

(1) The system has been designed to combine cost with schedule, which enables a two dimensional perspectives to be applied to the project cost.

(2) This provides in additional to the forecasting of expected costs, the ability to determine when the cost are likely to be incurred and when the money is required to be called (i.e. cash flow).

(3) The system also provides the ability to collect and use the planning information collected within for use and analysis from many different views by Cost and Project Controls Engineers.

(b) The key drivers

There are 6 key drivers that are applied to each budget line:

(1) Forecast / Actual Dates – which are required for both the budget start and finish. These define the duration of the budget line.

(2) Cost Profile – a curve shape that determines the pattern of expenditure throughout the duration of the budget line.

(3) % Complete – defines the physical progress of work achieved for the budget line at a point in time.

(4) Expected Amounts – in essences a forecast at completion which is the sum of "expected" cost variances to the budget line.

(5) Sponsors Estimate – The cost value of the progress made to date for the budget line, as estimated by the Project Engineers / Cost Engineer.

(3) Single Currency Estimating and Control

The global nature of the Oil & Gas Company business requires common currencies in $ USD.

(1) All budget lines are expressed in $ USD equivalents.

(2) The system enables any dual currency requirement to be expressed as a % split between $ USD and Thai currency for each budget line.

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(3) All actual costs are converted back to $ USD equivalents for the purpose of comparison and control by the Project Engineers / Cost Engineer.

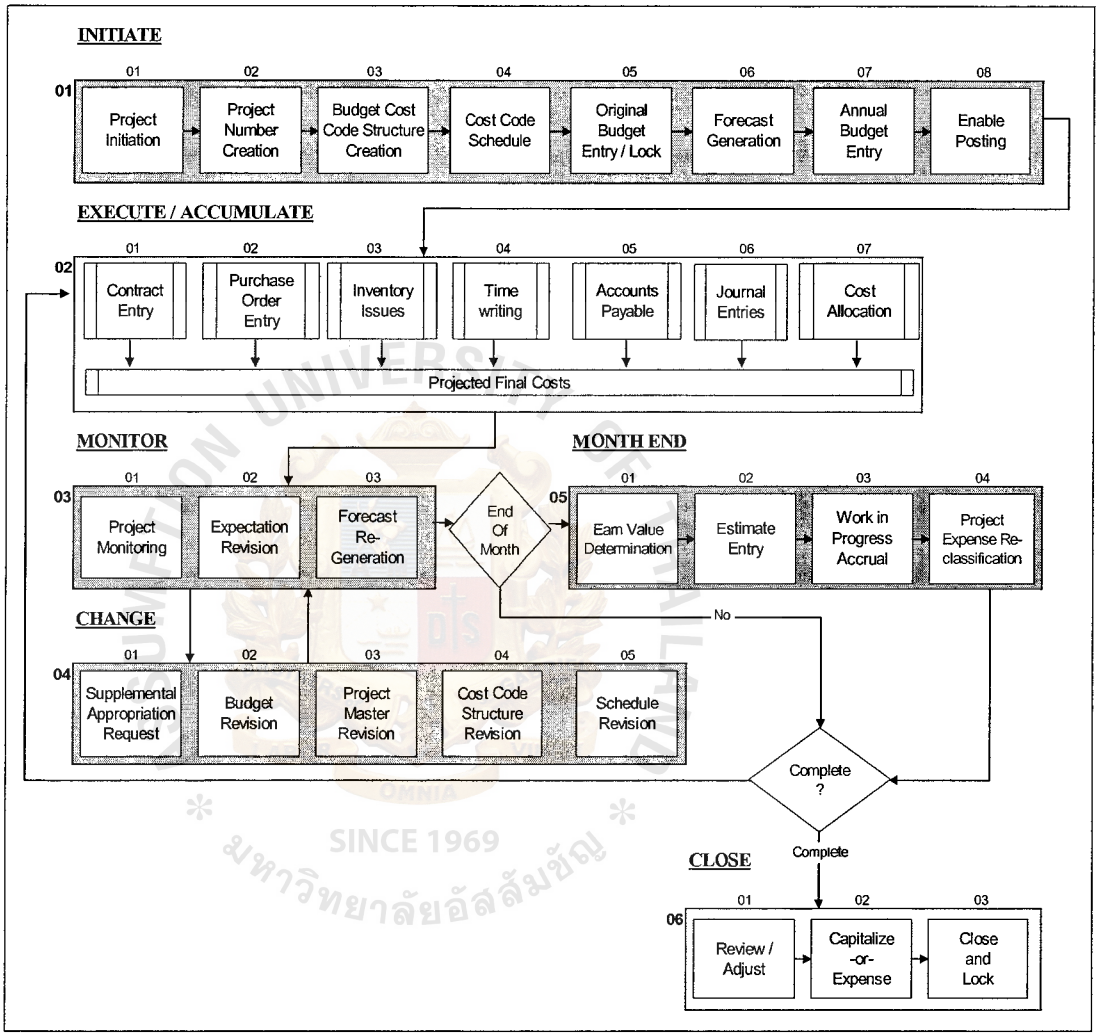

Figure 3.1. The Proposed Cost Control System Process Overview.

The context diagram and the logical data flow diagrams (DFD), shown in Appendix B and process specification are used as the tools for both structure analysis and system design of the proposed system is divided into 10 processes as follows;

Process 1. Verify the Authorized User

According to the Cost Control System there are many confidential costing files and many user levels for different authorities to reach each system module, The company needs to assign ID and password to any specified user levels to access the program by entering user name and password to log on the system.

Process 2. Create new Project Master Record

The project engineer initiates new project for approval. Once the approval process (external to the Cost Control System) is completed. The project number would be created in the system. Project information will be entered according to strict data entry standards and conventions. The minimum identifying information to set up a new Project Master Record is the Project Number and Description. The Project Number is any activity for which an entity manages costs, tracks progress, and reporting information.

Process 3. Create / Update Cost Code Structure

After the project master record has been created, the next step is to create and assign a cost code structure to the project. A cost code structure is a breakdown of the accounts (cost codes and cost types) that relate to the job. The cost code structures are used to track, manage and report on the costs (budget, estimate, and actual) associated with a project number.

Process 4. Create / Update Cost Code Schedule

The Cost Code Schedule aids in the communication of the anticipated chronology of the tasks in the project, which are

represented by the associated cost codes. Information on the cost code schedule is used by several subsequent processes to structure the financial information related to the project number. Budget start and finish dates can be entered for each cost code as the budget is formulated, and then as the project progresses, the forecast start and finish dates can be entered.

Process 5. Enter the Original Budget Information

Enter the original budget information which contains both monetary and unit amounts related to each project cost account. Once the original budget information has been entered for a new project, it must be locked to prevent accidental changes. (Original budgets can be locked and unlocked by authorized users at any time).

Process 6. Enable Posting the Actual Cost

Then the system will enable posting the actual project cost. When the projects are executed and accumulated, the actual costs are capturing into the system by contract entry, purchase order entry, inventory issues, time writing, accounts payable, journal entries, and cost allocations. Then all above costs would comply to be the final project costs.

Process 7. Close Project

The project may go through different stages during its life. Work in process accounting will be responsible for obtaining correct information from the sponsor and properly updating the project status. The status update is an important process because some statuses will enable the project to keep receiving changes while

other statuses will prevent it or just prevent accruals from being charged against the project.

The system provides a number of online inquiries that can be used to review the project status and activities. The project status inquiry program is used to review variety information related to the project such as actual amounts and quantities, budget and commitment information, projected final amounts and quantities percentage of completion information, and budget to actual variances.

The following standard reports are available for use to review the project status and activities: master project cost report, summary by cost type, unit cost analysis, project status inquiry print, period trend analysis, project master list, project account master list, chart type report, detail by project, transaction analysis, budget revision detail, project detail by sub ledger, project cost report, supplemental data by project, supplemental data by data type.

Process 8. Generate Cost Forecast

Forecast generation when project budget is formulated. (and as the project progresses) the activities being budgeted have timelines associated with them that define the expected beginning and ending dates for each activity. These dates facilitate coordination and scheduling of the resources associated with each task of the project. These dates occur within the start / finish of the project, but their associated interval may extend across period and year boundaries. The forecast is dynamic across fiscal years,

so the forecast amount must include actual amounts through the date of the forecast, with amounts yet to be realized interpolate across the remaining time. (Otherwise, once the project is in-progress, that portion of the forecast line that pertains to history will be inaccurate, making the remainder of the forecast inaccurate.) The project budget would be translated into annual amounts that reflect the timing and pattern of expenditure as currently anticipated by the project manager.

Process 9. Generate Annual Budget Status Report

Project Budgets are managed both at the project number level for the total span of the project, and at the annual level for the amount apportioned to each year of the project's existence. The annual project budgets are entered at the project number level – one line item per project. The total project budgets are entered at the cost code level. During the course of the project associated with the project, the project manager or the engineer is able to enter "Expectations" for the project that depict the best guess of the sponsor of the timing and amounts that will be incurred. This total project budget (with the option of including the "Expectation") is then parsed into the periods and years that the project spans, into a "Forecast" ledger. The forecast ledger depicts the expectation of the sponsor of how the total project budget spent will occur.

The purpose of this program is to report the status of the annual project budget with respect to the actual expenditures to date, the amount forecast to be spent to date, and the amount forecast to be

spent for the year. The report can be run at the project level, where there is one line per project, or at the detail level with a line for each cost code budget.

Process 10. Retrieve Month End Report

The project progress report would enable to compare with the project budget and the actual project costs to make appropriate estimates to job progress. Then the estimated cost of project would be entering directly into system to be the basis to generate the monthly project accrual. Project accruals bring the project total costs to the project cost estimate base on the progress of the projects. An accrual entry will be booked if the estimated cost to date is greater than the booked cost to date. After accruals have been made to each project, expense projects should be reclassified to expense, resulting in the balance for expense project's being zero for the period. This results in the correct classification of work in process expenses to the general accounting expense accounts.

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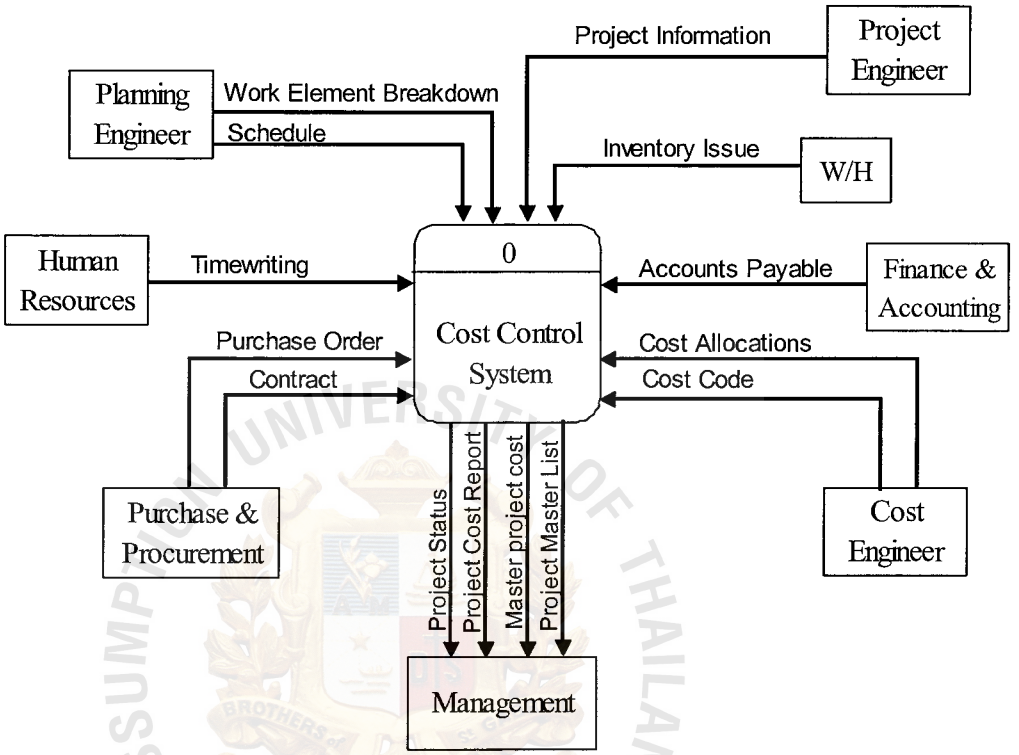

Figure 3.2. Context Diagram of the Proposed System.

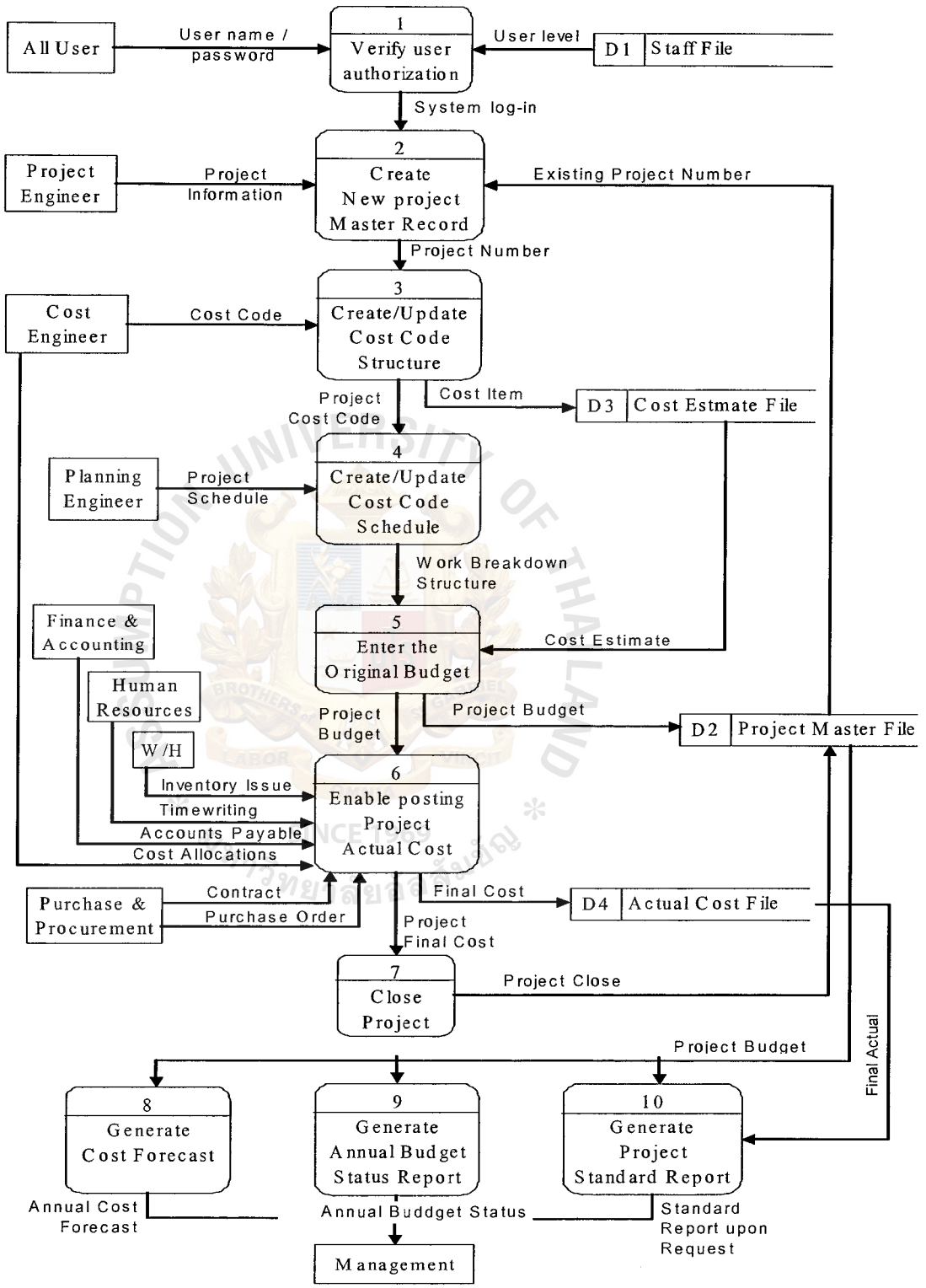

Figure 3.3. Data Flow Diagram Level 0 of the Proposed System

Input Design: the input design refers to the design of screen design, document form, and document flow. The basic functions are to accept data entry, verification, validation, editing, adding, changing and deleting information. The input design is the most important, and also one of most difficult parts which take more time in programming and designing because of the validation, checking, retrieving, saving, looping, calculation, screen positioning, and viewing functions must be done by the input function.

Typically, most programmers try to design attractive input screens which are time consuming but are not concerned with the exact functionality of those screens. Good input screen should be user-friendly. The users spend a considerable amount of time to input the data. The efficiency of entering data is the most critical part in screen and document from design in order to gather the information into the database files. Thus more time should be spent on input functions design rather than designing the screen. The document forms and flow are shown in Appendix D and E respectively.

3.3 Proposed Cost Structure and Definition

The proposed standard cost accounts will be used to accumulate all cost on the Oil and Gas Company projects. The intent is that all global and local projects will follow at a minimum, the prime/sub prime levels of the cost codes which have detail XXX level to identify optional and specific cost to project requirement.

The Cost Code of Accounts is divided into four parts:

Part I : Direct Field Labor, Material and Subcontract

Part II : Field Distributable, Labor, Material and Subcontract

Part III: Office Costs

Part IV: Other Cost and Fees

Part I - is separated into the following Prime Accounts:

(a) Excavation and Civil

(b) Structural Steel

(c) Fabrication

(d) Machinery and Equipment

(e) Piping

(f) Electrical

(g) Instrumentation

(h) Insulation and Coatings

All Costs coded to Part I will be those costs incurred for the permanent facility.

Part II - is separated into the following groups:

(a) International Expense

(b) Temporary Construction Facilities

(c) Construction Services, Supplies and Expense

(d) Field Staff

(e) Craft Benefit, Field Payroll Burdens and Insurance

(f) Construction Tools and Equipment

(g) Insurances and Bonds

All costs coded to Part II will be those costs necessary to support the construction of a permanent facility, but do not become a part of the facility.

Part III – Office Costs is separated into the following groups:

(a) Office Labor

(b) Office Expense

(c) Office Payroll Burdens

Part IV – Other Costs and Fees

This group contains all the Cost Codes pertaining to:

Contingency, Escalation, Office and Field Staff In-directs Fees, etc.

A total of 19 digits make up the Cost Codes. Position 1 to 5 will be uses for the CONTRACT NUMBER.

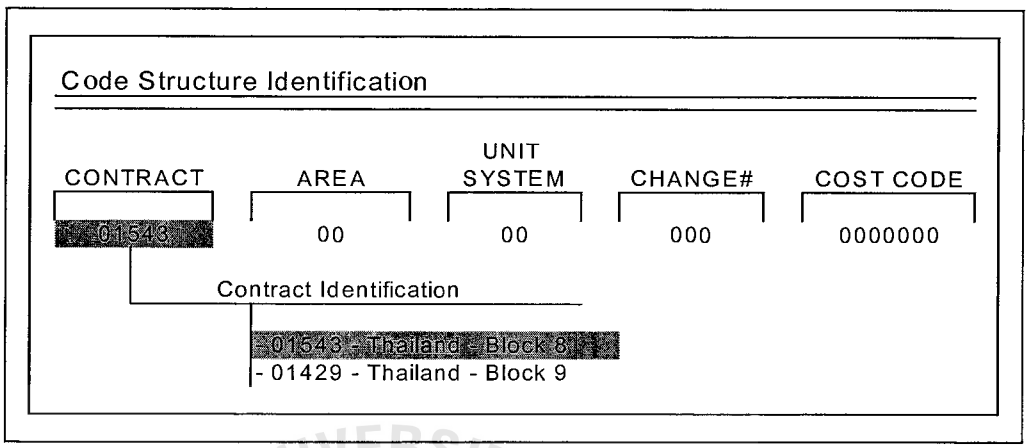

Figure 3.4. The 5 Position of Contract Field identify.

A unique project designation for identify the Prime Contract cost within the Prime Contract either for office providing services, offshore construction services, smaller projects within the Prime Contract, or other significant division to the Prime Contract.

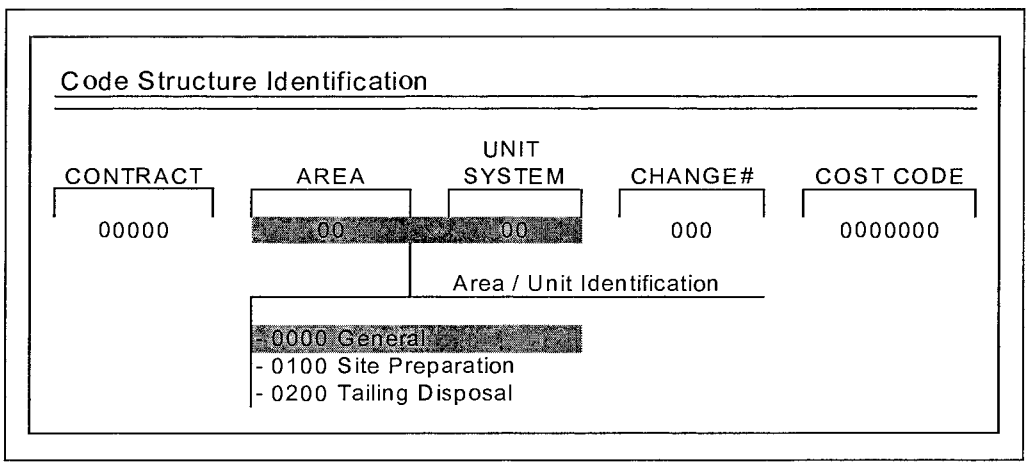

Figure 3.5. The 4 Position of Area / Unit field identify.

A Project-specific breakdown, Positions 6 and 7 are for project AREA and the Position 8 and 9 are for project UNIT/SYSTEM. These may be uses for any four digits Work Breakdown Structure designation.

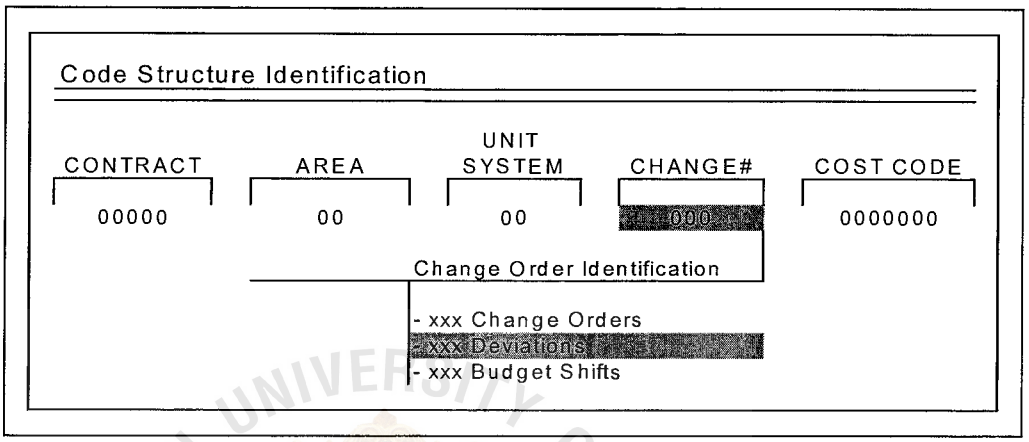

Figure 3.6. The 3 Position of the Change Order field identify.

The Change Number Division, Position 10, 11, 12 is for cost chargeable to a CHANGE. These includes: Deviations, Change Orders, Budget Shifts and Back charges.

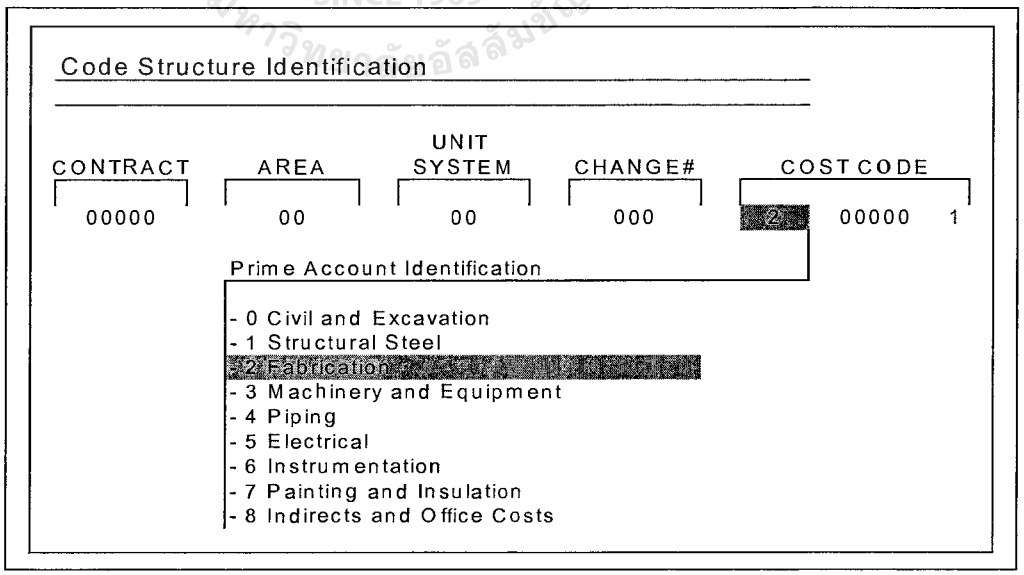

Figure 3.7. The 1st Position of the Cost Code identify.

Position 13 to 18 is for the CODE OF ACCOUNTS which position 13 is for the PRIME ACCOUNT, as illustrated below. This position cannot be altered.

Prime Account	Description
0	Civil and Excavation
1	Structural Steel
2	Fabrication
3	Machinery and Equipment
4	Piping
5	Electrical
6	Instrumentation
7	Painting and Insulation
8	Indirect and Office Costs

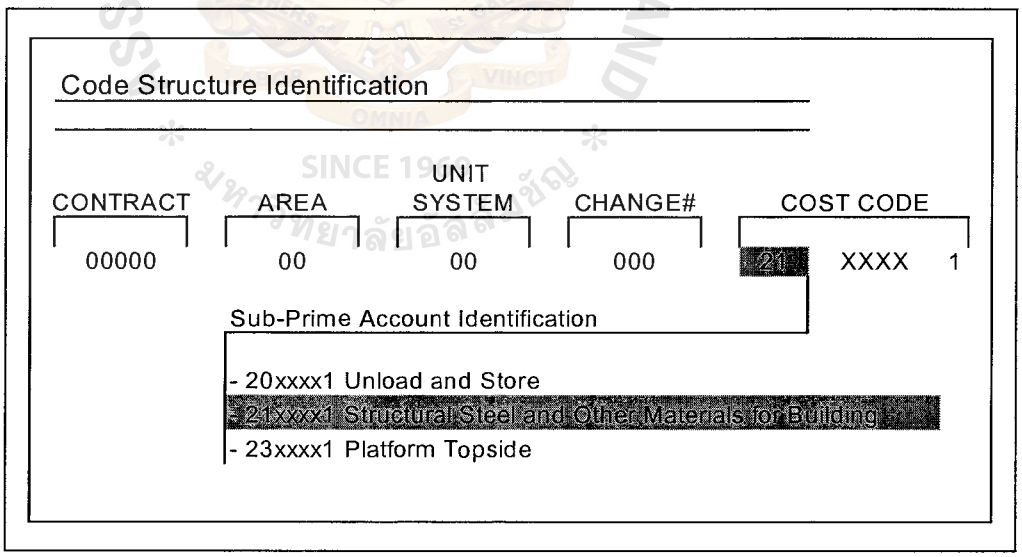

Figure 3.8. The 2nd position of the Cost Code, Sub prime Account.

Position 14 uses the digit 0 through 9 to break down the PRIME ACCOUNTD into SUB-ACCOUNTS, and further defines work.

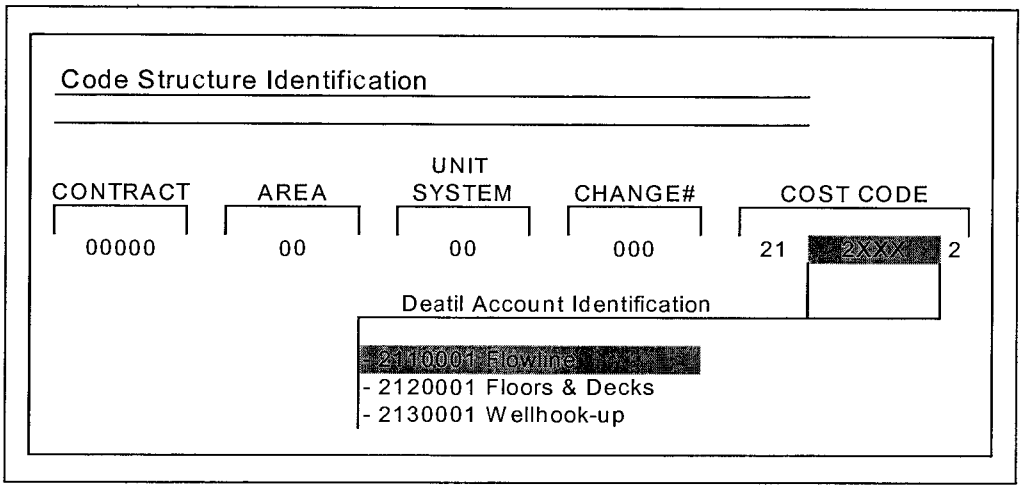

Figure 3.9. The 3 position of the Cost Code, Detail Account.

Position 15, 16, and 17 are alpha/numeric and are uses to define the DETAIL-ACCOUNTS, which can be uses to break down the SUB-ACCOUNTS as requires. Numbers that have been designated may not be altered, and further define cost within Sub and Prime Account.

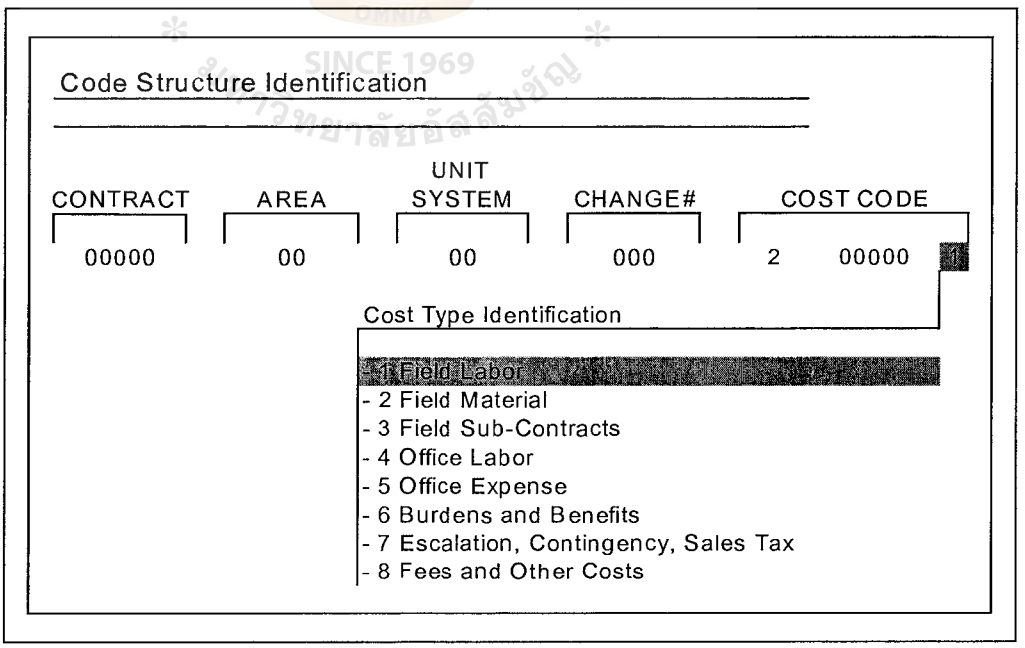

Figure 3.10. The last position of the Cost Code identifies.

The last position 18 is uses to determine the cost type. They are as follows:

Position 18	Description
1	Field Labor. The Field Labor payroll at the jobsite, including salaried foreman paid on the Field payroll
2	Field Material and Expense. All Materials and supplies purchased for or transferred to the job under Prime Accounts 0 through 9, Do not use this code for sub-contracts.
3	Field Sub-Contracts. All sub-contract charges for labor, material and expense that fall with-in the Prime Account 0 through 9.
4	Office Labor
5	Office Expense
6	Office Payroll Burdens and Benefits
7	Sales/Use Tax and Memorandum Items
8	Overheads and Fees

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3.4 Hardware and Software Requirement

The specification of the system requires Microsoft Access 2000, the database management software to collect and processing data. It also requires LAN network as an existing to link several PCs within department and others.

Network Architecture: the company already apply Client/Server Computing (Two-Tier Client/Server) connected by the company's Local Area Network (LAN) using Bus technology of Ethernet. This Technology will be cooperated with a LAN operating system using Microsoft Windows NT Server. It manages point to point

communication between computers and devices on the bus and resolves contention that occurs when more than one computer or device attempts to send a message, instruction, or data across the bus at the same time. Therefore, the database server is installed to store the data so that all database commands will be executed on this database server and returns only the result of the database command processing. The database servers generate much less network traffic.

Data Architecture: the company already has the Oracle Server as distributed RDBMS to control access and data storage maintenance. This also provides more sophisticated backup, recovery, security, integrity and processing.

Interface Architecture: the Company uses on-line processing. This interface architecture allows faster in error detection and error correction than batch processing because it allows greater human interaction in decision making. Furthermore, the company brings GUI technology to enhance the user interface in its client/server application.

Process Architecture: the company uses SDEs for Two-Tier Client/Server application composed of a client/based programming language with build-in Microsoft Access connectivity to database server of the company.

3.5 Security and Control

Access Control - An authorize users have to identify themselves by enter user name and password for system log-in. The system will verify user name and password to set security level. Each user could reach different module in the system upon their authorize level.

Physical Security - To prevent system breakdown according to electrical circuit supply fails. The system was designed to have UPS or Uninterruptible Power Supply which is usable to supply power instead of the main power supply in order to an electrical circuit breakdown.

3.6 Cost and Benefit Analysis

3.6.1. Cost Analysis

The system cost analysis can distinguish IS-related development costs as either one-time or recurring. One-time costs refer to an investment cost associated with project initiation and development and the start-up of the system. One-time costs are established by plan that the system would require approximately 6 months to develop by a team that composes of 3 programmer, 1 cost engineer, 1 project engineer, and 1 finance who have labor monthly rate of $750, $1,250, $1,750, and $1,000 respectively. To effectively run the proposed system, it requires new 1 database server, 3 client PC (at $750 each), and 1 network connection. Additionally, software licenses are required for network operation, and Microsoft Access for each workstation (10 workstations at $825 each) and modest user training fees (10 users at $250 each). Details are analyzed as follows table;

ONE-TIME COSTS WORKSHEET
Cost Control System Development Project

		Year 0
A. Development Costs	$	37,500
B. New hardware		
- Database Server	$	3,125
- 3 Client PC ($750 each)	$	2,250
- Network connection	$	350
C. New software		
- Network Operation System	$	675
- Operating System - Microsoft Access software	$	8,250
D. User Training	$	2,500
TOTAL one-time cost	**$**	**54,650**

Figure 3.11. One-Time Costs Analysis Worksheet.

The recurring costs refer to the costs resulting from the ongoing evolution and use of the system that occur as an operating and maintenance cost

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which the global nature of the Oil & Gas Company business requires common currencies in $USD. As the proposed system will be highly dynamic and will require, on average, five months of annual maintenance, primarily for enhancements as users expect more from the system that required 1 access experts with rate $1,500 a month ($1,500 x 1 experts x 12 months). Other ongoing expenses such as increased data storage about 50 MB per year (50 MB x $50), The communications equipment and supplies should also be expected to be $500 per year, stationary such as diskette, CD Rom about $250 per year, and just in case additional other miscellaneous cost about 5% of the total recurring cost per year = $1000 per year.

RECURRING COST WORKSHEET
Cost Control System Development Project

	Year 1 through 5
A. Application software maintenance	$ 18,000
B. Incremental data storage required: 50 MB x 50$ ($50 per 1MB)	$ 2,500
C. Incremental communications (lines, messages)	$ 2,500
D. Stationary cost	$ 250
E. Miscellaneous cost	$ 1,000
TOTAL recurring cost	**$ 24,250**

Figure 3.12. Recurring Cost Analysis Worksheet.

3.6.2. Benefit Analysis

In general, the benefits can be viewed as being both tangible and intangible. Tangible benefits refer to items that can be measured in dollars and with certainly. Within the cost control system, several tangible benefits are identified and summarized on a tangible benefit worksheet shown in Figure 3.6 after collecting information from users of an existing job cost system.

First interviewed cost engineer and Finance who are responsible for collecting, entering, and analyzing the correctness of the current job cost tracking data. They estimate that they spend 10 percent of their time correcting data entry error. Given these person's annual salary is $27,000 (($1,250 + $1,000) x 12 months), so estimating an error reduction benefit of $2,700. Other tangible benefits are estimated from interviewing managers who use the existing cost report.

The cost reduction or avoidance benefit could be gained due to better project cost management would save $4,500 a year. Also, increased flexibility would likely occur from a reduction in the time normally taken to manually reorganize data for different purpose from 3 Cost Engineer spent 10% of their time to generate monthly cost report upon manager requirement (3 Cost Engineer x $1,250 monthly rate x 12 months x 10%).

Regarding increased speed of activity, assumed that the proposed system has 10% speed faster than an existing one. The job cost module has 10 users with average monthly rate around $1,125, so it could save $13,500 annually (10 users x $1,125 average rate x 12 month x 10% speed up).

Further, improvements in management planning and control due to the result from a broader range of analyses in the new system helps Cost Engineer, Planning Engineer, Project Engineer better control, schedule, and manages cost of their project which Project Engineer says that the system could help them save about 10% of their project cost.

Overall, this analysis forecast would benefit approximately $52,450 per year, from the system.

TANGIBLE BENEFIT WORKSHEET Cost Control System Development Project		
		Year 1 through 5
A. Cost reduction or avoidance	$	4,500
B. Error reduction	$	2,700
C. Increased flexibility	$	6,750
D. Increased speed of activity	$	13,500
E. Improvement in management planning or control	$	25,000
TOTAL tangible benefit	**$**	**52,450**

Figure 3.13. Tangible Benefit Analysis Worksheet.

The intangible benefit is a class of benefit that cannot quantify value that were summarize as follows;

(1) Reduce human error from manual report calculation.

(2) Provide timely report that up-to-date all the time require.

(3) Provide flexible report with accurate information to meet user requirement.

(4) Provide 24 hours data available for make analysis and decisions.

(5) Improve employee morale due to less manual job.

(6) Allow convenient update from several data providers.

3.6.3. Time Value of Money Analysis

Most techniques used to determine economic feasibility encompass the concept of the time value of money that refers to the concept of comparing present cash outlays to future expect returns. All cost and benefit must be viewed in relation to their present value comparing to investment option. The 12% discount rate in this time value of money calculations is the rate which money can be borrowed from the foreign bank for investment.

THE OIL AND GAS COMPANY
ECONOMIC FEASIBILITY ANALYSIS
Cost Control System Development Project

	Year of Project						
	Year 0	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**TOTALS**
Net economic benefit	$ 0	$ 52,450	$ 52,450	$ 52,450	$ 52,450	$ 52,450	
Discount rate (12%)	**1.0000**	**0.8929**	**0.7972**	**0.7118**	**0.6355**	**0.5674**	
PV of benefits	$ 0	$ 46,833	$ 41,813	$ 37,334	$ 33,332	$ 29,760	
NPV of all BENEFITS	$ 0	$ 46,833	$ 88,646	$ 125,980	$ 159,312	$ 189,072	$ 189,072
One-time COSTS	($54,650)						
Recurring Costs	$ 0	($24,250)	($24,250)	($24,250)	($24,250)	($24,250)	
Discount rate (12%)	**1.0000**	**0.8929**	**0.7972**	**0.7118**	**0.6355**	**0.5674**	
PV of Recurring Costs	$ 0	($21,653)	($19,332)	($17,261)	($15,411)	($13,759)	
NPV of all COSTS	($54,650)	($76,303)	($95,635)	($112,896)	($128,307)	($142,066)	($142,066)
Overall NPV							$ 47,005
Overall ROI - (Overall NPV / NPV of all COSTS)							0.33
Break-even Analysis							
Yearly NPV Cash Flow	($54,650)	$ 25,180	$ 69,314	$ 108,719	$ 143,901	$ 175,312	
Overall NPV Cash Flow	($54,650)	$ (29,470)	$ (6,989)	$ 13,084	$ 31,005	$ 47,005	
Project break-even occurs between years 2 and 3							
Actual break-even occurred at	**2.9**	**years**					

Figure 3.14. Time Value of Money Analysis.

Break-Even Analysis in Figure 3.8 illustrates comparison between yearly NPV cash flow and overall NPV cash flow of the Oil and Gas Company which two curves intersect at actual break-even occurred at 2.9 years with ROI (Rate of Return) at 33%. Therefore, the investment of the proposed system will be recovered with in 2.9 years.

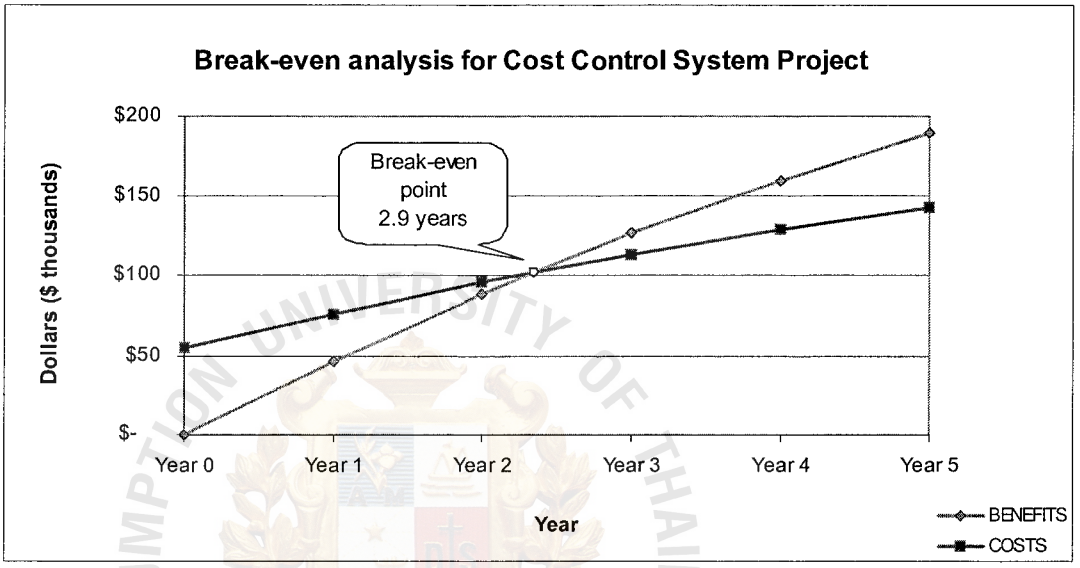

Figure 3.15. Break-even analysis for Cost Control System Project.

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IV. PROJECT IMPLEMENTATION

4.1 System Implementation

4.1.1 System Testing

Network Testing

(1) Review network architecture document with the system network.

(2) Test run network.

Database Testing

(1) Review database table property

(2) Analyze database tables, performance, relationship diagram, security, and data utilities.

(3) Test run database query, user interface form, macro, and report.

(4) Test run database result with the example data.

4.1.2 User Training

(1) Prepare user manual for student guides and training presentations.

(2) Arrange training course and set training schedule.

(3) Conduct training sessions

4.1.3 System Conversion

The conversion uses parallel method on system changeover. Both old and new system are operated at the same time with data conversed to minimize operated failure risk and to compare result between 2 systems. If any deviation occurs in the results, corrective action can be taken between period times. The old operation can still be undertaken in concurrent with the new system for the new system major flaws and suitable to converse manual file to computerization until the users and company are ready to fully comply with the new system

4.1.4 Maintenance

To keep the current software with the changing processing requirements, to fix the errors of defects of the software and to keep up with changes in computer technology, system maintenance plan had been developed. The plan includes adaptive maintenance, corrective maintenance and perfective maintenance.

Adaptive maintenance will be undertaken when the program needs to be modified to incorporate new system requirement. Routine maintenance tasks using utilities program include back-up server to be on time retrieved or restored when need, regulation update data table to keep reliable and valid information system.

Corrective maintenance is required in responding to software failure. To track and solve the problems, Critical incident report will log the software failures, their probable cause and corrective action taken. These reports help identify the error classes of program logic, operating, or user.

Perfective maintenance is to improve or maintain program efficiency and to help effectiveness database management.

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V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The Project Cost Control system has been designed to provide a good analytical methods and procedures for the costs forecasting and controlling on construction project to meet timely and profitable completion of Project Engineer, Cost Engineer, and Project management team in the Facilities Engineering department of Thailand Business Unit to imply or determine the client and sub-contractor construction cost to date against with the budget baseline especially for not incoming invoices period. This database allows convenient update from several data providers and also useful in preparing various kinds of management report responding to different purpose and uses as pricing document reference to develop cost estimates for the new typical project.

The proposed system could fix the suffering problem that an existing system confront with 2 or 3 month late invoices by accrue the periodic final cost that occurred before the actual invoices arrival from the real time interface with contract entry, time writing, purchase order entry, and daily construction activities. This computer program is written by using Microsoft Access 2002, the database management software, which can be shared among several computers under distributed client/server network routing for the timely data input process manners, to work in cooperation in Microsoft Windows XP or a higher version that would be suitable for the new wireless LAN Company.

Beside that the new computerized system also provides several benefits to meet requirements of the both engineering level and management level by reducing report producing time consume, providing more synchronized environment in producing useful, accurate, reliable, and timely information to support management decision making and problem solving, and increasing the effectiveness of job by providing faster

access system with the quickly response of input even to generate various types of reports upon user request.

The degree of achievement in using the proposed system can be measured in terms of process cost reduction on each process compared with an existing system as detail from stop-watch time baseline;

Table 5.1. The Proposed System Achievement.

Process	Concern	Average $rate/hour	Existing System		Proposed System		Cost reduction per transaction times
			Time (mins.)	Cost ($)	Time (mins.)	Cost ($)	
Data Entry Correction	2 Users	$ 5	120	$ 20	-	$ -	$ 20
Transaction process (Data update/Retrieval)	10 Users	$ 5	15	$ 13	10	$ 8	$ 4
Cost Breakdown Process	1 Planning Engineer	$ 10	180	$ 30	60	$ 10	$ 20
Data Gathering and Estimated Accrue (Between invoice not incoming period)	3 Cost Engineer	$ 6	4,320	$ 1,296	5	$ 2	$ 1,295
Generate Monthly Cost Report	3 Cost Engineer	$ 6	60	$ 18	5	$ 2	$ 17
Reorganize data for different report	3 Cost Engineer	$ 6	80	$ 24	15	$ 5	$ 20
							$ 1,375

5.2 Recommendations

To have effective cost control system, it should be noted that the configuration of the project cost and work breakdown structure is dependant upon many variables related to a particular environment. Cost code should be standardized and deliberately developed from the beginning of the proposed system implementation. The completion of a project must be viewed as all budget lines being status to 100% complete and the project number should only be closed on the system once all actual costs have been posted.

When system first introduced, the management team should support and bring positive attitudes of the users toward the new system. Because most users often resist the new system due to the potentially changes. And together with the system

implementation, system specification and standard data definition from application to application up until department to department needs to be initiated for data integrity purpose. Such data consistency, under careful administrative control, is essential in developing management information. Tracking and reporting on construction project cost status with full supportive information from other related business function is possible.

Furthermore, the system may need to be modified from time to time to keep technology up-to-date or with different purpose level. Form initial phase, it is expected to meet short term application oriented goals of routine transaction processing. After that, long term data-oriented goals of managing information as corporate resource should be of upcoming need to anticipate. For the system further expansion, it would be recommended to modify the existing global system to add Project Cost Control into Job Cost Module by creating worldwide language programming with the Oracle for the bigger database management which fixes calculation feature on Visual Basic language, and modifies user interface screen into Web base design.

ASSUMPTION UNIVERSITY OF THAILAND
SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

APPENDIX A

CHART OF AN EXISTING COST CODE CATALOG

ASSUMPTION UNIVERSITY OF THAILAND
SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

Table A.1. Chart of an Existing Cost Code Catalog.

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
C-Detail Engineering	1	130	000	253000			Yes		Yes
C-Detail Eng-Topside	1	130	110	253000		Yes		Yes	
L-Detail Eng-Topside	1	130	110	254000		Yes		Yes	
C-Detailed Eng VentBm/	1	130	118	253000		Yes			
L-Detailed Eng VentBm/	1	130	118	254000		Yes			
C-Detailed Pile	1	130	131	253000		Yes			
L-Detailed Pile	1	130	131	254000		Yes			
C-Detailed-Subcontractor	1	130	170	253000		Yes			
L-Detailed-Subcontractor	1	130	170	254000		Yes			
C-Detailed-Surface	1	130	190	253000		Yes			
L-Detailed-Surface	1	130	190	254000		Yes			
C-Detailed Eng Misc.St	1	130	390	253000		Yes		Yes	
L-Detailed Eng Misc.St	1	130	390	254000		Yes		Yes	
C-Detail Engineering	1	130	660	253000		Yes		Yes	
L-Detail Engineering	1	130	660	254000		Yes		Yes	
C-Detailed Engineering	1	130	810	253000		Yes		Yes	
L-Detailed Engineering	1	130	810	254000		Yes		Yes	
C-Detail Eng Mechanical	1	130	830	253000		Yes		Yes	
L-Detail Eng Mechanical	1	130	830	254000		Yes		Yes	
C-Detailed Eng	1	130	840	253000		Yes		Yes	
L-Detailed Eng	1	130	840	254000		Yes		Yes	
C-Detailed Eng	1	130	850	253000		Yes		Yes	
L-Detailed Eng	1	130	850	254000		Yes		Yes	
C-Detail Eng Instrumen	1	130	860	253000		Yes		Yes	
L-Detail Eng Instrumen	1	130	860	254000		Yes		Yes	
C-Detail Eng Fire & Sa	1	130	880	253000		Yes		Yes	
L-Detail Eng Fire & Sa	1	130	880	254000		Yes		Yes	
M-Procure-Deck structu	1	140	111	251000		Yes		Yes	
M-Procure-Topsides Eqp	1	140	113	251000		Yes		Yes	
C-Procure-Topsides Eqp	1	140	113	253000		Yes		Yes	
M-Procure-MCC	1	140	115	251000		Yes		Yes	
M-Procure-Primary stee	1	140	121	251000		Yes		Yes	
M-Procure Tubing	1	140	160	251000		Yes			
C-Procure Tubing	1	140	160	253000		Yes			
D-Procure Tubing	1	140	160	258120		Yes			
M-Procure Manifolds	1	140	200	251000		Yes			
C-Procure Manifolds	1	140	200	253000		Yes			
D-Procure Manifolds	1	140	200	258120		Yes			
M-Procure Pipe	1	140	210	251000		Yes		Yes	Yes
C-Procure Pipe	1	140	210	253000		Yes		Yes	Yes
D-Procure Pipe	1	140	210	258120		Yes			
M-Procure Anodes	1	140	220	251000		Yes			
C-Procure Anodes	1	140	220	253000		Yes			
D-Procure Anodes	1	140	220	258120		Yes			
C-Procure-Misc. Struct	1	140	390	253000		Yes		Yes	Yes
A-Procure-MAOE List	1	140	500	250100	Yes				
M-Procure-MAOE List	1	140	500	251000	Yes				
L-Procure-MAOE List	1	140	500	254000	Yes				
R-Procure-General	1	140	500	255000	Yes				
D-Procure-MAOE List	1	140	500	258120	Yes				
M-Procure Crane	1	140	525	251000		Yes		Yes	

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
C-Procure Crane	1	140	525	253000		Yes			Yes
D-Procure Crane	1	140	525	258120		Yes			
M-Procure EngineeredEq	1	140	600	251000		Yes			
C-Procure EngineeredEq	1	140	600	253000		Yes			
D-Procure EngineeredEq	1	140	600	258120		Yes			
M-Procure AtmospVessel	1	140	610	251000		Yes			
C-Procure AtmospVessel	1	140	610	253000		Yes			
D-Procure AtmospVessel	1	140	610	258120		Yes			
M-Procure Compressor	1	140	630	251000		Yes		Yes	
C-Procure Compressor	1	140	630	253000		Yes			
D-Procure Compressor	1	140	630	258120		Yes			
M-Procure Header	1	140	670	251000		Yes			
C-Procure Header	1	140	670	253000		Yes			
D-Procure Header	1	140	670	258120		Yes			
M-Procure Heat Exchang	1	140	680	251000		Yes			
C-Procure Heat Exchang	1	140	680	253000		Yes			
D-Procure Heat Exchang	1	140	680	258120		Yes			
M-Procure PresVessel	1	140	720	251000		Yes		Yes	
C-Procure PresVessel	1	140	720	253000		Yes			
D-Procure PresVessel	1	140	720	258120		Yes			
M-Procure Pump	1	140	740	251000		Yes			
C-Procure Pump	1	140	740	253000		Yes			
D-Procure Pump	1	140	740	258120		Yes			
M-Procure Valves / Act	1	140	745	251000		Yes		Yes	
C-Procure Valves / Act	1	140	745	253000		Yes		Yes	
D-Procure Valves / Act	1	140	745	258120		Yes			
C-Proc Consumable Matl	1	140	761	253000	Yes	Yes			
M-Procure Storage Tank	1	140	770	251000		Yes			
C-Procure Storage Tank	1	140	770	253000		Yes			
D-Procure Storage Tank	1	140	770	258120		Yes			
M-Procure Equipment	1	140	780	251000		Yes			
C-Procure Equipment	1	140	780	253000		Yes			
D-Procure Equipment	1	140	780	258120		Yes			
M-Procure-Startup/Comm	1	140	789	251000		Yes		Yes	
C-Procure-Startup/Comm	1	140	789	253000		Yes		Yes	
M-Procure System	1	140	800	251000		Yes		Yes	
C-Procure System	1	140	800	253000		Yes		Yes	
D-Procure System	1	140	800	258120		Yes			
M-Procure-Mech. System	1	140	830	251000		Yes		Yes	Yes
C-Procure-Mech. System	1	140	830	253000		Yes		Yes	Yes
M- Procure Monitoring	1	140	845	251000		Yes		Yes	Yes
M-Procure Elec	1	140	850	251000		Yes		Yes	Yes
C-Procure Elec	1	140	850	253000		Yes		Yes	Yes
D-Procure Elec	1	140	850	258120		Yes			
M-Procure Generator	1	140	851	251000		Yes		Yes	
C-Procure Generator	1	140	851	253000		Yes			
D-Procure Generator	1	140	851	258120		Yes			
M-Procure-Instr. Syste	1	140	860	251000		Yes		Yes	Yes
C-Procure-Instru. Syst	1	140	860	253000		Yes		Yes	Yes
C-Procure-Telecom. Sys	1	140	870	253000		Yes		Yes	
M-Procure-fire & safet	1	140	880	251000		Yes		Yes	Yes
C-Procure-fire & safet	1	140	880	253000		Yes		Yes	Yes
M-Procure Computer Sof	1	140	895	251000		Yes			
C-Procure-Computer Sof	1	140	895	253000		Yes			
M-Procure-HVAC system	1	140	900	251000		Yes		Yes	
M-Procure Steel	1	140	910	251000		Yes		Yes	

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
C-Procure Steel	1	140	910	253000		Yes		Yes	
D-Procure Steel	1	140	910	258120		Yes			
C-Procure-Seafastening	1	140	914	253000		Yes		Yes	
M-Procure Coat	1	140	970	251000		Yes			
C-Procure Coat	1	140	970	253000		Yes		Yes	
D-Procure Coat	1	140	970	258120		Yes			
M-Procure Paint	1	140	974	251000		Yes		Yes	Yes
C-Procure-Paint	1	140	974	253000		Yes		Yes	Yes
M-Procure Insulation	1	140	980	251000		Yes		Yes	Yes
C-Procure-Insulation	1	140	980	253000		Yes		Yes	Yes
M-Procure Other Mat'l	1	140	990	251000		Yes		Yes	Yes
C-Procure-Other Mat'l	1	140	990	253000		Yes		Yes	Yes
C-Fabricate Building	1	160	310	253000		Yes		Yes	
C-Operations Manual	5	510	110	253000		Yes		Yes	
C-Proj Mgmt	7	730	000	253000	Yes	Yes	Yes	Yes	Yes
L-Proj Mgmt	7	730	000	254000	Yes	Yes	Yes	Yes	Yes
C-Const Mgmt	7	740	000	253000	Yes	Yes		Yes	Yes
L-Const Mgmt	7	740	000	254000	Yes	Yes		Yes	Yes
C-Const Mgmt-Site	7	740	020	253000	Yes	Yes			
C-Const Mgmt-Facility	7	740	300	253000	Yes	Yes			
C-Eng Mgmt	7	750	000	253000	Yes	Yes	Yes	Yes	Yes
L-Eng Mgmt	7	750	000	254000	Yes	Yes		Yes	Yes
R-Proc Contractor Equi	1	140	590	255000	Yes	Yes			
C-Fab-Deck structure	1	160	111	253000		Yes		Yes	
M-Fabricate VentBm/Brd	1	160	118	251000		Yes			
S-Fabricate VentBm/Brd	1	160	118	252000		Yes			
C-Fabricate VentBm/Brd	1	160	118	253000		Yes			
L-Fabricate VentBm/Brd	1	160	118	254000		Yes			
D-Fabricate VentBm/Brd	1	160	118	258120		Yes			
M-Fabricate Primary St	1	160	121	251000		Yes			
S-Fabricate Primary St	1	160	121	252000		Yes			
C-Fabricate Primary St	1	160	121	253000		Yes			
L-Fabricate Primary St	1	160	121	254000		Yes			
D-Fabricate Primary St	1	160	121	258120		Yes			
C-Fab-Appurtenance	1	160	123	253000		Yes		Yes	
M-Fabricate BuoyancyTa	1	160	129	251000		Yes			
S-Fabricate BuoyancyTa	1	160	129	252000		Yes			
C-Fabricate BuoyancyTa	1	160	129	253000		Yes			
L-Fabricate BuoyancyTa	1	160	129	254000		Yes			
D-Fabricate BuoyancyTa	1	160	129	258120		Yes			
M-Fabricate Pi	1	160	131	251000		Yes			
S-Fabricate Pi	1	160	131	252000		Yes			
C-Fabricate Pi	1	160	131	253000		Yes			
L-Fabricate Pi	1	160	131	254000		Yes			
D-Fabricate Pi	1	160	131	258120		Yes			
M-Fabricate Su	1	160	170	251000		Yes			
S-Fabricate Su	1	160	170	252000		Yes			
C-Fabricate Su	1	160	170	253000		Yes			
L-Fabricate Su	1	160	170	254000		Yes			
D-Fabricate Su	1	160	170	258120		Yes			
M-Fabricate Su	1	160	190	251000		Yes			
S-Fabricate Su	1	160	190	252000		Yes			
C-Fabricate Su	1	160	190	253000		Yes			
L-Fabricate Su	1	160	190	254000		Yes			
D-Fabricate Su	1	160	190	258120		Yes			
M-Fabricate Manifolds	1	160	200	251000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
S-Fabricate Manifolds	1	160	200	252000		Yes			
C-Fabricate Manifolds	1	160	200	253000		Yes			
L-Fabricate Manifolds	1	160	200	254000		Yes			
D-Fabricate Manifolds	1	160	200	258120		Yes			
C-Fab- Pipe & Fitting	1	160	210	253000		Yes		Yes	Yes
M-Fabricate Misc.Struc	1	160	390	251000		Yes			
S-Fabricate Misc.Struc	1	160	390	252000		Yes			
C-Fabricate Misc.Struc	1	160	390	253000		Yes			
L-Fabricate Misc.Struc	1	160	390	254000		Yes			
D-Fabricate Misc.Struc	1	160	390	258120		Yes			
M-Fabricate AtmospVess	1	160	610	251000		Yes			
S-Fabricate AtmospVess	1	160	610	252000		Yes			
C-Fabricate AtmospVess	1	160	610	253000		Yes			
L-Fabricate AtmospVess	1	160	610	254000		Yes			
D-Fabricate AtmospVess	1	160	610	258120		Yes			
M-Fabricate Header	1	160	670	251000		Yes			
S-Fabricate Header	1	160	670	252000		Yes			
C-Fabricate Header	1	160	670	253000		Yes			
L-Fabricate Header	1	160	670	254000		Yes			
D-Fabricate Header	1	160	670	258120		Yes			
M-Fabricate Pipeline	1	160	700	251000		Yes			
S-Fabricate Pipeline	1	160	700	252000		Yes			
C-Fabricate Pipeline	1	160	700	253000		Yes			
L-Fabricate Pipeline	1	160	700	254000		Yes			
D-Fabricate Pipeline	1	160	700	258120		Yes			
M-Fabricate PresVessel	1	160	720	251000		Yes			
S-Fabricate PresVessel	1	160	720	252000		Yes			
C-Fabricate PresVessel	1	160	720	253000		Yes			
L-Fabricate PresVessel	1	160	720	254000		Yes			
D-Fabricate PresVessel	1	160	720	258120		Yes			
M-Fabricate-Other	1	160	760	251000	Yes				
C-Fabricate-Other	1	160	760	253000	Yes				
D-Fabricate-Other	1	160	760	258120	Yes				
M-Fabricate Storage Ta	1	160	770	251000		Yes			
S-Fabricate Storage Ta	1	160	770	252000		Yes			
C-Fabricate Storage Ta	1	160	770	253000		Yes			
L-Fabricate Storage Ta	1	160	770	254000		Yes			
D-Fabricate Storage Ta	1	160	770	258120		Yes			
C-Fabricate Mechanical	1	160	830	253000		Yes		Yes	Yes
C-Fab Pipelines/ Flowl	1	160	840	253000		Yes		Yes	
C-Fab- Steel	1	160	910	253000		Yes		Yes	Yes
C-Load out-Topsides	1	170	110	253000		Yes		Yes	
M-Loadout Pili	1	170	131	251000		Yes			
S-Loadout Pili	1	170	131	252000		Yes			
C-Loadout Pili	1	170	131	253000		Yes			
L-Loadout Pili	1	170	131	254000		Yes			
M-Loadout Sub	1	170	170	251000		Yes			
S-Loadout Sub	1	170	170	252000		Yes			
C-Loadout Sub	1	170	170	253000		Yes			
L-Loadout Sub	1	170	170	254000		Yes			
M-Loadout Surf	1	170	190	251000		Yes			
S-Loadout Surf	1	170	190	252000		Yes			
C-Loadout Surf	1	170	190	253000		Yes			
L-Loadout Surf	1	170	190	254000		Yes			
M-Loadout Misc	1	170	390	251000		Yes			
S-Loadout Misc	1	170	390	252000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code			Cost Type	Project Cost Code Structure				
	Cost Code				Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
C-Loadout Misc	1	170	390	253000		Yes			
L-Loadout Misc	1	170	390	254000		Yes			
M-Mobilize Site	2	210	020	251000		Yes			
S-Mobilize Site	2	210	020	252000		Yes			
C-Mobilize Site	2	210	020	253000		Yes			
L-Mobilize Site	2	210	020	254000		Yes			
C-Mob-marine V+F212ess	2	210	560	253000		Yes	Yes	Yes	
M-Survey Topside	2	220	110	251000		Yes			
S-Survey Topside	2	220	110	252000		Yes			
C-Survey Topside	2	220	110	253000		Yes		Yes	Yes
L-Survey Topside	2	220	110	254000		Yes			
D-Survey Topside	2	220	110	258120		Yes			
M-Survey Deck Struct	2	220	111	251000		Yes			
S-Survey Deck Struct	2	220	111	252000		Yes			
C-Survey Deck Struct	2	220	111	253000		Yes			
L-Survey Deck Struct	2	220	111	254000		Yes			
D-Survey Deck Struct	2	220	111	258120		Yes			
M-Survey Helideck	2	220	112	251000		Yes			
S-Survey Helideck	2	220	112	252000		Yes			
C-Survey Helideck	2	220	112	253000		Yes			
L-Survey Helideck	2	220	112	254000		Yes			
D-Survey Helideck	2	220	112	258120		Yes			
M-Survey Topside Equip	2	220	113	251000		Yes			
S-Survey Topside Equip	2	220	113	252000		Yes			
C-Survey Topside Equip	2	220	113	253000		Yes			
L-Survey Topside Equip	2	220	113	254000		Yes			
D-Survey Topside Equip	2	220	113	258120		Yes			
M-Survey Facilities	2	220	300	251000		Yes			
S-Survey Facilities	2	220	300	252000		Yes			
C-Survey Facilities	2	220	300	253000		Yes			
L-Survey Facilities	2	220	300	254000		Yes			
D-Survey Facilities	2	220	300	258120		Yes			
M-Survey Platform	2	220	710	251000		Yes			
S-Survey Platform	2	220	710	252000		Yes			
C-Survey Platform	2	220	710	253000		Yes			
L-Survey Platform	2	220	710	254000		Yes			
D-Survey Platform	2	220	710	258120		Yes			
M-Survey Process Sys	2	220	810	251000		Yes			
S-Survey Process Sys	2	220	810	252000		Yes			
C-Survey Process Sys	2	220	810	253000		Yes			
L-Survey Process Sys	2	220	810	254000		Yes			
D-Survey Process Sys	2	220	810	258120		Yes			
M-Survey Dehydrat Sys	2	220	820	251000		Yes			
S-Survey Dehydrat Sys	2	220	820	252000		Yes			
C-Survey Dehydrat Sys	2	220	820	253000		Yes			
L-Survey Dehydrat Sys	2	220	820	254000		Yes			
D-Survey Dehydrat Sys	2	220	820	258120		Yes			
M-Survey Mech Sys	2	220	830	251000		Yes			
S-Survey Mech Sys	2	220	830	252000		Yes			
C-Survey Mech Sys	2	220	830	253000		Yes			
L-Survey Mech Sys	2	220	830	254000		Yes			
D-Survey Mech Sys	2	220	830	258120		Yes			
M-Survey Electric Sys	2	220	850	251000		Yes			
S-Survey Electric Sys	2	220	850	252000		Yes			
C-Survey Electric Sys	2	220	850	253000		Yes			
L-Survey Electric Sys	2	220	850	254000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code			Cost Type	Project Cost Code Structure				
	Cost Code				Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
D-Survey Electric Sys	2	220	850	258120		Yes			
M-Survey Instrument Sy	2	220	860	251000		Yes			
S-Survey Instrument Sy	2	220	860	252000		Yes			
C-Survey Instrument Sy	2	220	860	253000		Yes			
L-Survey Instrument Sy	2	220	860	254000		Yes			
D-Survey Instrument Sy	2	220	860	258120		Yes			
M-Survey Telecom Sys	2	220	870	251000		Yes			
S-Survey Telecom Sys	2	220	870	252000		Yes			
C-Survey Telecom Sys	2	220	870	253000		Yes			
L-Survey Telecom Sys	2	220	870	254000		Yes			
D-Survey Telecom Sys	2	220	870	258120		Yes			
M-Survey CorrsionProt	2	220	972	251000		Yes			
S-Survey CorrsionProt	2	220	972	252000		Yes			
C-Survey CorrsionProt	2	220	972	253000		Yes			Yes
L-Survey CorrsionProt	2	220	972	254000		Yes			
D-Survey CorrsionProt	2	220	972	258120		Yes			
C-Precommiss-Topsides	1	180	110	253000		Yes		Yes	
C-Transport Pi	1	190	131	253000		Yes			
T-Transport Pi	1	190	131	256000		Yes			
I-Transport Pi	1	190	131	258200		Yes			
C-Transport Su	1	190	170	253000		Yes			
T-Transport Su	1	190	170	256000		Yes			
I-Transport Su	1	190	170	258200		Yes			
C-Transport Su	1	190	190	253000		Yes			
T-Transport Su	1	190	190	256000		Yes			
I-Transport Su	1	190	190	258200		Yes			
Trans - Marine	1	190	300	256100			Yes		
Trans - Land	1	190	300	256200			Yes		
Trans - Air	1	190	300	256300			Yes		
C-Transport Mi	1	190	390	253000		Yes			
T-Transport Mi	1	190	390	256000		Yes			
I-Transport Mi	1	190	390	258200		Yes			
C-Mob-marine vessels	2	210	560	253000				Yes	
M-Construct Living Qtr	2	260	116	251000		Yes			
S-Construct Living Qtr	2	260	116	252000		Yes			
C-Construct Living Qtr	2	260	116	253000		Yes			
L-Construct Living Qtr	2	260	116	254000		Yes			
M-Construct Stor/Works	2	260	117	251000		Yes			
S-Construct Stor/Works	2	260	117	252000		Yes			
C-Construct Stor/Works	2	260	117	253000		Yes			
L-Construct Stor/Works	2	260	117	254000		Yes			
M-Construct-Facility	2	260	300	251000	Yes		Yes		
C-Construct-Facility	2	260	300	253000	Yes		Yes		
L-Construct-Facility	2	260	300	254000	Yes		Yes		
R-Construct-Facility	2	260	300	255000	Yes		Yes		
E-Construct-Facility	2	260	300	255500	Yes				
T-Construct-Facility	2	260	300	256000	Yes		Yes		
U-Construct Facility	2	260	300	257200	Yes		Yes		
Communication	2	260	300	257400			Yes		
Other Costs	2	260	300	258000			Yes		
Duties/Fees-Facility	2	260	300	258100	Yes		Yes		
M-Construct Super Stru	2	260	314	251000		Yes			
S-Construct Super Stru	2	260	314	252000		Yes			
C-Construct Super Stru	2	260	314	253000		Yes			
L-Construct Super Stru	2	260	314	254000		Yes			
M-Construct Roofing	2	260	316	251000		Yes			

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Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
S-Construct Roofing	2	260	316	252000		Yes			
C-Construct Roofing	2	260	316	253000		Yes			
L-Construct Roofing	2	260	316	254000		Yes			
M-Construct Fencing	2	260	374	251000		Yes			
S-Construct Fencing	2	260	374	252000		Yes			
C-Construct Fencing	2	260	374	253000		Yes			
L-Construct Fencing	2	260	374	254000		Yes			
M-Construct Misc.Struc	2	260	390	251000		Yes			
S-Construct Misc.Struc	2	260	390	252000		Yes			
C-Construct Misc.Struc	2	260	390	253000		Yes			
L-Construct Misc.Struc	2	260	390	254000		Yes			
M-Construct Platform	2	260	710	251000		Yes			
S-Construct Platform	2	260	710	252000		Yes			
C-Construct Platform	2	260	710	253000		Yes			
L-Construct Platform	2	260	710	254000		Yes			
M-Install-Topsides	2	270	110	251000		Yes		Yes	
S-Install-Topsides	2	270	110	252000		Yes		Yes	
C-Install-Topsides	2	270	110	253000		Yes		Yes	
L-Install-Topsides	2	270	110	254000		Yes		Yes	
R-Install-Topsides	2	270	110	255000		Yes		Yes	
C-Install-Topsides Eqp	2	270	113	253000		Yes		Yes	
M-Install VentBm/Brdg	2	270	118	251000		Yes			
S-Install VentBm/Brdg	2	270	118	252000		Yes			
C-Install VentBm/Brdg	2	270	118	253000		Yes			
L-Install VentBm/Brdg	2	270	118	254000		Yes			
M-Install Primary Stee	2	270	121	251000		Yes			
S-Install Primary Stee	2	270	121	252000		Yes			
C-Install Primary Stee	2	270	121	253000		Yes			
L-Install Primary Stee	2	270	121	254000		Yes			
M-Install Secndry Stee	2	270	122	251000		Yes			
S-Install Secndry Stee	2	270	122	252000		Yes			
C-Install Secndry Stee	2	270	122	253000		Yes			
L-Install Secndry Stee	2	270	122	254000		Yes			
M-Install BuoyancyTank	2	270	129	251000		Yes			
S-Install BuoyancyTank	2	270	129	252000		Yes			
C-Install BuoyancyTank	2	270	129	253000		Yes			
L-Install BuoyancyTank	2	270	129	254000		Yes			
M-Install Pili	2	270	131	251000		Yes			
S-Install Pili	2	270	131	252000		Yes			
C-Install Pili	2	270	131	253000		Yes			
L-Install Pili	2	270	131	254000		Yes			
M-Install Manifolds	2	270	200	251000		Yes			
S-Install Manifolds	2	270	200	252000		Yes			
C-Install Manifolds	2	270	200	253000		Yes			
L-Install Manifolds	2	270	200	254000		Yes			
M-Install Pipe	2	270	210	251000		Yes			
S-Install Pipe	2	270	210	252000		Yes			
C-Install Pipe	2	270	210	253000		Yes			
L-Install Pipe	2	270	210	254000		Yes			
M-Install Sewer Treatm	2	270	440	251000		Yes			
S-Install Sewer Treatm	2	270	440	252000		Yes			
C-Install Sewer Treatm	2	270	440	253000		Yes			
L-Install Sewer Treatm	2	270	440	254000		Yes			
M-Install CommunicLine	2	270	470	251000		Yes			
S-Install CommunicLine	2	270	470	252000		Yes			
C-Install CommunicLine	2	270	470	253000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
L-Install CommunicLine	2	270	470	254000		Yes			
M-Install Power Line	2	270	480	251000		Yes			
S-Install Power Line	2	270	480	252000		Yes			
C-Install Power Line	2	270	480	253000		Yes			
L-Install Power Line	2	270	480	254000		Yes			
M-Install Crane	2	270	525	251000		Yes			
S-Install Crane	2	270	525	252000		Yes			
C-Install Crane	2	270	525	253000		Yes			
L-Install Crane	2	270	525	254000		Yes			
M-Install EngineeredEq	2	270	600	251000		Yes			
S-Install EngineeredEq	2	270	600	252000		Yes			
C-Install EngineeredEq	2	270	600	253000		Yes			
L-Install EngineeredEq	2	270	600	254000		Yes			
M-Install Compressor	2	270	630	251000		Yes			
S-Install Compressor	2	270	630	252000		Yes			
C-Install Compressor	2	270	630	253000		Yes			
L-Install Compressor	2	270	630	254000		Yes			
M-Install Heat Exchang	2	270	680	251000		Yes			
S-Install Heat Exchang	2	270	680	252000		Yes			
C-Install Heat Exchang	2	270	680	253000		Yes			
L-Install Heat Exchang	2	270	680	254000		Yes			
M-Install Pump	2	270	740	251000		Yes			
S-Install Pump	2	270	740	252000		Yes			
C-Install Pump	2	270	740	253000		Yes			
L-Install Pump	2	270	740	254000		Yes			
M-Install Valves / Act	2	270	745	251000		Yes			
S-Install Valves / Act	2	270	745	252000		Yes			
C-Install Valves / Act	2	270	745	253000		Yes			
L-Install Valves / Act	2	270	745	254000		Yes			
M-Install Storage Tank	2	270	770	251000		Yes			
S-Install Storage Tank	2	270	770	252000		Yes			
C-Install Storage Tank	2	270	770	253000		Yes			
L-Install Storage Tank	2	270	770	254000		Yes			
M-Install Equipment	2	270	780	251000		Yes			
S-Install Equipment	2	270	780	252000		Yes			
C-Install Equipment	2	270	780	253000		Yes			
L-Install Equipment	2	270	780	254000		Yes			
M-Install Process Sys	2	270	810	251000		Yes			
S-Install Process Sys	2	270	810	252000		Yes			
C-Install Process Sys	2	270	810	253000		Yes			
L-Install Process Sys	2	270	810	254000		Yes			
M-Install Dehydrat Sys	2	270	820	251000		Yes			
S-Install Dehydrat Sys	2	270	820	252000		Yes			
C-Install Dehydrat Sys	2	270	820	253000		Yes			
L-Install Dehydrat Sys	2	270	820	254000		Yes			
M-Install Mech Sys	2	270	830	251000		Yes			
S-Install Mech Sys	2	270	830	252000		Yes			
C-Install Mech Sys	2	270	830	253000		Yes			
L-Install Mech Sys	2	270	830	254000		Yes			
M-Install Pipe/Flowlin	2	270	840	251000		Yes			
S-Install Pipe/Flowlin	2	270	840	252000		Yes			
C-Install Pipe/Flowlin	2	270	840	253000		Yes		Yes	
L-Install Pipe/Flowlin	2	270	840	254000		Yes			
C - Install Monitoring	2	270	845	253000		Yes		Yes	Yes
M-Install Electric Sys	2	270	850	251000		Yes			
S-Install Electric Sys	2	270	850	252000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
C-Install Electric Sys	2	270	850	253000		Yes		Yes	
L-Install Electric Sys	2	270	850	254000		Yes			
M-Install Generator	2	270	851	251000		Yes			
S-Install Generator	2	270	851	252000		Yes			
C-Install Generator	2	270	851	253000		Yes			
L-Install Generator	2	270	851	254000		Yes			
M-Install Light Sys	2	270	852	251000		Yes			
S-Install Light Sys	2	270	852	252000		Yes			
C-Install Light Sys	2	270	852	253000		Yes			
L-Install Light Sys	2	270	852	254000		Yes			
M-Install Instrument S	2	270	860	251000		Yes			
S-Install Instrument S	2	270	860	252000		Yes			
C-Install Instrument S	2	270	860	253000		Yes		Yes	
L-Install Instrument S	2	270	860	254000		Yes			
M-Install Telecom Sys	2	270	870	251000		Yes			
S-Install Telecom Sys	2	270	870	252000		Yes			
C-Install Telecom Sys	2	270	870	253000		Yes		Yes	
L-Install Telecom Sys	2	270	870	254000		Yes			
M-Install Fire/Safety	2	270	880	251000		Yes			
S-Install Fire/Safety	2	270	880	252000		Yes			
C-Install Fire/Safety	2	270	880	253000		Yes		Yes	
L-Install Fire/Safety	2	270	880	254000		Yes			
M-Install Computer Sys	2	270	890	251000		Yes			
S-Install Computer Sys	2	270	890	252000		Yes			
C-Install Computer Sys	2	270	890	253000		Yes		Yes	
L-Install Computer Sys	2	270	890	254000		Yes			
C-Install Steel	2	270	910	253000		Yes		Yes	
M-Install CorrsionProt	2	270	972	251000		Yes			
S-Install CorrsionProt	2	270	972	252000		Yes			
C-Install CorrsionProt	2	270	972	253000		Yes			
L-Install CorrsionProt	2	270	972	254000		Yes			
C-Install Insulation	2	270	980	253000		Yes		Yes	
C-Paint	3	300	000	253000		Yes		Yes	
M-Paint Topside	3	300	110	251000		Yes			
S-Paint Topside	3	300	110	252000		Yes			
C-Paint Topside	3	300	110	253000		Yes		Yes	
L-Paint Topside	3	300	110	254000		Yes			
M-Paint Deck Struct	3	300	111	251000		Yes			
S-Paint Deck Struct	3	300	111	252000		Yes			
C-Paint Deck Struct	3	300	111	253000		Yes			
L-Paint Deck Struct	3	300	111	254000		Yes			
M-Paint Living Qtrs	3	300	116	251000		Yes			
S-Paint Living Qtrs	3	300	116	252000		Yes			
C-Paint Living Qtrs	3	300	116	253000		Yes			
L-Paint Living Qtrs	3	300	116	254000		Yes			
M-Paint Stor/Workshp	3	300	117	251000		Yes			
S-Paint Stor/Workshp	3	300	117	252000		Yes			
C-Paint Stor/Workshp	3	300	117	253000		Yes			
L-Paint Stor/Workshp	3	300	117	254000		Yes			
M-Paint VentBm/Brdg	3	300	118	251000		Yes			
S-Paint VentBm/Brdg	3	300	118	252000		Yes			
C-Paint VentBm/Brdg	3	300	118	253000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
L-Paint VentBm/Brdg	3	300	118	254000		Yes			
M-Paint BuoyancyTank	3	300	129	251000		Yes			
S-Paint BuoyancyTank	3	300	129	252000		Yes			
C-Paint BuoyancyTank	3	300	129	253000		Yes			
L-Paint BuoyancyTank	3	300	129	254000		Yes			
M-Paint Pipe	3	300	210	251000		Yes			
S-Paint Pipe	3	300	210	252000		Yes			
C-Paint Pipe	3	300	210	253000		Yes			
L-Paint Pipe	3	300	210	254000		Yes			
M-Paint Misc.Struct	3	300	390	251000		Yes			
S-Paint Misc.Struct	3	300	390	252000		Yes			
C-Paint Misc.Struct	3	300	390	253000		Yes			
L-Paint Misc.Struct	3	300	390	254000		Yes			
M-Paint Platform	3	300	710	251000		Yes			
S-Paint Platform	3	300	710	252000		Yes			
C-Paint Platform	3	300	710	253000		Yes			
L-Paint Platform	3	300	710	254000		Yes			
M-Coat-Riser	3	301	124	251000				Yes	
C-Coat-Riser	3	301	124	253000		Yes			
C-Transport out-Topsid	4	420	110	253000		Yes		Yes	
M-Upgrade Topside Equi	5	540	113	251000		Yes			
S-Upgrade Topside Equi	5	540	113	252000		Yes			
C-Upgrade Topside Equi	5	540	113	253000		Yes			
L-Upgrade Topside Equi	5	540	113	254000		Yes			
M-Upgrade MCC/Control	5	540	115	251000		Yes			
S-Upgrade MCC/Control	5	540	115	252000		Yes			
C-Upgrade MCC/Control	5	540	115	253000		Yes			
L-Upgrade MCC/Control	5	540	115	254000		Yes			
M-Upgrade Living Qtrs	5	540	116	251000		Yes			
S-Upgrade Living Qtrs	5	540	116	252000		Yes			
C-Upgrade Living Qtrs	5	540	116	253000		Yes			
L-Upgrade Living Qtrs	5	540	116	254000		Yes			
M-Upgrade VentBm/Brdg	5	540	118	251000		Yes			
S-Upgrade VentBm/Brdg	5	540	118	252000		Yes			
C-Upgrade VentBm/Brdg	5	540	118	253000		Yes			
L-Upgrade VentBm/Brdg	5	540	118	254000		Yes			
M-Upgrade BuoyancyTank	5	540	129	251000		Yes			
S-Upgrade BuoyancyTank	5	540	129	252000		Yes			
C-Upgrade BuoyancyTank	5	540	129	253000		Yes			
L-Upgrade BuoyancyTank	5	540	129	254000		Yes			
M-Upgrade Manifolds	5	540	200	251000		Yes			
S-Upgrade Manifolds	5	540	200	252000		Yes			
C-Upgrade Manifolds	5	540	200	253000		Yes			
L-Upgrade Manifolds	5	540	200	254000		Yes			
M-Upgrade Fencing	5	540	374	251000		Yes			
S-Upgrade Fencing	5	540	374	252000		Yes			
C-Upgrade Fencing	5	540	374	253000		Yes			
L-Upgrade Fencing	5	540	374	254000		Yes			
M-Upgrade Misc.Struct	5	540	390	251000		Yes			
S-Upgrade Misc.Struct	5	540	390	252000		Yes			
C-Upgrade Misc.Struct	5	540	390	253000		Yes			
L-Upgrade Misc.Struct	5	540	390	254000		Yes			
M-Upgrade Sewer Treatm	5	540	440	251000		Yes			
S-Upgrade Sewer Treatm	5	540	440	252000		Yes			
C-Upgrade Sewer Treatm	5	540	440	253000		Yes			
L-Upgrade Sewer Treatm	5	540	440	254000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
M-Upgrade Compressor	5	540	630	251000		Yes			
S-Upgrade Compressor	5	540	630	252000		Yes			
C-Upgrade Compressor	5	540	630	253000		Yes			
L-Upgrade Compressor	5	540	630	254000		Yes			
M-Upgrade Heat Exchang	5	540	680	251000		Yes			
S-Upgrade Heat Exchang	5	540	680	252000		Yes			
C-Upgrade Heat Exchang	5	540	680	253000		Yes			
L-Upgrade Heat Exchang	5	540	680	254000		Yes			
M-Upgrade PresVessel	5	540	720	251000		Yes			
S-Upgrade PresVessel	5	540	720	252000		Yes			
C-Upgrade PresVessel	5	540	720	253000		Yes			
L-Upgrade PresVessel	5	540	720	254000		Yes			
M-Upgrade Pump	5	540	740	251000		Yes			
S-Upgrade Pump	5	540	740	252000		Yes			
C-Upgrade Pump	5	540	740	253000		Yes			
L-Upgrade Pump	5	540	740	254000		Yes			
M-Upgrade Valves / Act	5	540	745	251000		Yes			
S-Upgrade Valves / Act	5	540	745	252000		Yes			
C-Upgrade Valves / Act	5	540	745	253000		Yes			
L-Upgrade Valves / Act	5	540	745	254000		Yes			
M-Upgrade Storage Tank	5	540	770	251000		Yes			
S-Upgrade Storage Tank	5	540	770	252000		Yes			
C-Upgrade Storage Tank	5	540	770	253000		Yes			
L-Upgrade Storage Tank	5	540	770	254000		Yes			
M-Upgrade Equipment	5	540	780	251000		Yes			
S-Upgrade Equipment	5	540	780	252000		Yes			
C-Upgrade Equipment	5	540	780	253000		Yes			
L-Upgrade Equipment	5	540	780	254000		Yes			
M-Upgrade Generator	5	540	851	251000		Yes			
S-Upgrade Generator	5	540	851	252000		Yes			
C-Upgrade Generator	5	540	851	253000		Yes			
L-Upgrade Generator	5	540	851	254000		Yes			
M-Upgrade Light Sys	5	540	852	251000		Yes			
S-Upgrade Light Sys	5	540	852	252000		Yes			
C-Upgrade Light Sys	5	540	852	253000		Yes			
L-Upgrade Light Sys	5	540	852	254000		Yes			
M-Upgrade Instrument S	5	540	860	251000		Yes			
S-Upgrade Instrument S	5	540	860	252000		Yes			
C-Upgrade Instrument S	5	540	860	253000		Yes			
L-Upgrade Instrument S	5	540	860	254000		Yes			
M-Upgrade Telecom Sys	5	540	870	251000		Yes			
S-Upgrade Telecom Sys	5	540	870	252000		Yes			
C-Upgrade Telecom Sys	5	540	870	253000		Yes			
L-Upgrade Telecom Sys	5	540	870	254000		Yes			
M-Upgrade Fire/Safety	5	540	880	251000		Yes			
S-Upgrade Fire/Safety	5	540	880	252000		Yes			
C-Upgrade Fire/Safety	5	540	880	253000		Yes			
L-Upgrade Fire/Safety	5	540	880	254000		Yes			
M-Upgrade Computer Sys	5	540	890	251000		Yes			
S-Upgrade Computer Sys	5	540	890	252000		Yes			
C-Upgrade Computer Sys	5	540	890	253000		Yes			
L-Upgrade Computer Sys	5	540	890	254000		Yes			
M-Upgrade CorrsionProt	5	540	972	251000		Yes			
S-Upgrade CorrsionProt	5	540	972	252000		Yes			
C-Upgrade CorrsionProt	5	540	972	253000		Yes			
L-Upgrade CorrsionProt	5	540	972	254000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
M-Refurbish Living Qtr	6	610	116	251000		Yes			
S-Refurbish Living Qtr	6	610	116	252000		Yes			
C-Refurbish Living Qtr	6	610	116	253000		Yes			
L-Refurbish Living Qtr	6	610	116	254000		Yes			
M-Refurbish Misc.Struc	6	610	390	251000		Yes			
S-Refurbish Misc.Struc	6	610	390	252000		Yes			
C-Refurbish Misc.Struc	6	610	390	253000		Yes			
L-Refurbish Misc.Struc	6	610	390	254000		Yes			
M-Remove Deck Struct	6	630	111	251000		Yes			
S-Remove Deck Struct	6	630	111	252000		Yes			
C-Remove Deck Struct	6	630	111	253000		Yes			
L-Remove Deck Struct	6	630	111	254000		Yes			
M-Remove Topside Equip	6	630	113	251000		Yes			
S-Remove Topside Equip	6	630	113	252000		Yes			
C-Remove Topside Equip	6	630	113	253000		Yes			
L-Remove Topside Equip	6	630	113	254000		Yes			
M-Remove Living Qtrs	6	630	116	251000		Yes			
S-Remove Living Qtrs	6	630	116	252000		Yes			
C-Remove Living Qtrs	6	630	116	253000		Yes			
L-Remove Living Qtrs	6	630	116	254000		Yes			
M-Remove VentBm/Brdg	6	630	118	251000		Yes			
S-Remove VentBm/Brdg	6	630	118	252000		Yes			
C-Remove VentBm/Brdg	6	630	118	253000		Yes			
L-Remove VentBm/Brdg	6	630	118	254000		Yes			
C-Remove-Pipe	6	630	210	253000		Yes		Yes	
M-Remove Facilities	6	630	300	251000		Yes			
S-Remove Facilities	6	630	300	252000		Yes			
C-Remove Facilities	6	630	300	253000		Yes			
L-Remove Facilities	6	630	300	254000		Yes			
M-Remove Misc.Struct	6	630	390	251000		Yes			
S-Remove Misc.Struct	6	630	390	252000		Yes			
C-Remove Misc.Struct	6	630	390	253000		Yes			
L-Remove Misc.Struct	6	630	390	254000		Yes			
C-Remove-Steel	6	630	910	253000		Yes		Yes	
Construction Services	7	740	000	253000			Yes		Yes
C-Hook up-Topsides	2	290	110	253000		Yes		Yes	
S-Hook-Up PresVessel	2	290	720	252000		Yes			
C-Hook-Up PresVessel	2	290	720	253000		Yes			
L-Hook-Up PresVessel	2	290	720	254000		Yes			
S-Hook-Up Pump	2	290	740	252000		Yes			
C-Hook-Up Pump	2	290	740	253000		Yes			
L-Hook-Up Pump	2	290	740	254000		Yes			
S-Hook-Up Process Sys	2	290	810	252000		Yes			
C-Hook-Up Process Sys	2	290	810	253000		Yes			
L-Hook-Up Process Sys	2	290	810	254000		Yes			
S-Hook-Up Mech Sys	2	290	830	252000		Yes			
C-Hook-Up Mech Sys	2	290	830	253000		Yes			
L-Hook-Up Mech Sys	2	290	830	254000		Yes			
S-Hook-Up Pipe/Flowlin	2	290	840	252000		Yes			
C-Hook-Up Pipe/Flowlin	2	290	840	253000		Yes		Yes	
L-Hook-Up Pipe/Flowlin	2	290	840	254000		Yes			
S-Hook-Up Electric Sys	2	290	850	252000		Yes			
C-Hook-Up Electric Sys	2	290	850	253000		Yes			
L-Hook-Up Electric Sys	2	290	850	254000		Yes			
S-Hook-Up Generator	2	290	851	252000		Yes			
C-Hook-Up Generator	2	290	851	253000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
L-Hook-Up Generator	2	290	851	254000		Yes			
S-Hook-Up Light Sys	2	290	852	252000		Yes			
C-Hook-Up Light Sys	2	290	852	253000		Yes			
L-Hook-Up Light Sys	2	290	852	254000		Yes			
S-Hook-Up Instrument S	2	290	860	252000		Yes			
C-Hook-Up Instrument S	2	290	860	253000		Yes			
L-Hook-Up Instrument S	2	290	860	254000		Yes			
S-Hook-Up Telecom Sys	2	290	870	252000		Yes			
C-Hook-Up Telecom Sys	2	290	870	253000		Yes			
L-Hook-Up Telecom Sys	2	290	870	254000		Yes			
S-Hook-Up Fire/Safety	2	290	880	252000		Yes			
C-Hook-Up Fire/Safety	2	290	880	253000		Yes			
L-Hook-Up Fire/Safety	2	290	880	254000		Yes			
C-Commission-Topsides	3	310	110	253000		Yes		Yes	
S-Commission Topside E	3	310	113	252000		Yes			
C-Commission Topside E	3	310	113	253000		Yes		Yes	
L-Commission Topside E	3	310	113	254000		Yes			
S-Commission VentBm/Br	3	310	118	252000		Yes			
C-Commission VentBm/Br	3	310	118	253000		Yes			
L-Commission VentBm/Br	3	310	118	254000		Yes			
S-Commission Sewer Tre	3	310	440	252000		Yes			
C-Commission Sewer Tre	3	310	440	253000		Yes			
L-Commission Sewer Tre	3	310	440	254000		Yes			
M-Commision Equip	3	310	500	251000		Yes			
C-Commision Equip	3	310	500	253000		Yes		Yes	
L-Commision Equip	3	310	500	254000		Yes		Yes	
S-Commission Crane	3	310	525	252000		Yes			
C-Commission Crane	3	310	525	253000		Yes			
L-Commission Crane	3	310	525	254000		Yes			
S-Commission Engineere	3	310	600	252000		Yes			
C-Commission Engineere	3	310	600	253000		Yes			
L-Commission Engineere	3	310	600	254000		Yes			
S-Commission Compresso	3	310	630	252000		Yes			
C-Commission Compresso	3	310	630	253000		Yes			
L-Commission Compresso	3	310	630	254000		Yes			
S-Commission Equipment	3	310	780	252000		Yes			
C-Commission Equipment	3	310	780	253000		Yes			
L-Commission Equipment	3	310	780	254000		Yes			
S-Commission Process S	3	310	810	252000		Yes			
C-Commission Process S	3	310	810	253000		Yes			
L-Commission Process S	3	310	810	254000		Yes			
S-Commission Dehydrat	3	310	820	252000		Yes			
C-Commission Dehydrat	3	310	820	253000		Yes			
L-Commission Dehydrat	3	310	820	254000		Yes			
S-Commission Mech Sys	3	310	830	252000		Yes			
C-Commission Mech Sys	3	310	830	253000		Yes			
L-Commission Mech Sys	3	310	830	254000		Yes			
C-Commission-Pipe/Flow	3	310	840	253000		Yes		Yes	
S-Commission Electric	3	310	850	252000		Yes			
C-Commission Electric	3	310	850	253000		Yes			
L-Commission Electric	3	310	850	254000		Yes			
S-Commission Generator	3	310	851	252000		Yes			
C-Commission Generator	3	310	851	253000		Yes			
L-Commission Generator	3	310	851	254000		Yes			
S-Commission Light Sys	3	310	852	252000		Yes			
C-Commission Light Sys	3	310	852	253000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
L-Commission Light Sys	3	310	852	254000		Yes			
S-Commission Instrumen	3	310	860	252000		Yes			
C-Commission Instrumen	3	310	860	253000		Yes			
L-Commission Instrumen	3	310	860	254000		Yes			
S-Commission Telecom S	3	310	870	252000		Yes			
C-Commission Telecom S	3	310	870	253000		Yes			
L-Commission Telecom S	3	310	870	254000		Yes			
S-Commission Fire/Safe	3	310	880	252000		Yes			
C-Commission Fire/Safe	3	310	880	253000		Yes			
L-Commission Fire/Safe	3	310	880	254000		Yes			
S-Commission Computer	3	310	890	252000		Yes			
C-Commission Computer	3	310	890	253000		Yes			
L-Commission Computer	3	310	890	254000		Yes			
S-Commission HVAC Syst	3	310	900	252000		Yes			
C-Commission HVAC Syst	3	310	900	253000		Yes			
L-Commission HVAC Syst	3	310	900	254000		Yes			
C-Inspect-Topsides	2	250	110	253000		Yes		Yes	
S-Inspect BuoyancyTank	2	250	129	252000		Yes			
C-Inspect BuoyancyTank	2	250	129	253000		Yes			
L-Inspect BuoyancyTank	2	250	129	254000		Yes			
S-Inspect Manifolds	2	250	200	252000		Yes			
C-Inspect Manifolds	2	250	200	253000		Yes			
L-Inspect Manifolds	2	250	200	254000		Yes			
C-Inspect-Marine Vesse	2	250	560	253000		Yes	Yes	Yes	
S-Inspect EngineeredEq	2	250	600	252000		Yes			
C-Inspect EngineeredEq	2	250	600	253000		Yes		Yes	
L-Inspect EngineeredEq	2	250	600	254000		Yes			
S-Inspect Compressor	2	250	630	252000		Yes			
C-Inspect Compressor	2	250	630	253000		Yes			
L-Inspect Compressor	2	250	630	254000		Yes			
C - Test - Inspect Mon	2	250	845	253000		Yes		Yes	
S-Inspect Generator	2	250	851	252000		Yes			
C-Inspect Generator	2	250	851	253000		Yes			
L-Inspect Generator	2	250	851	254000		Yes			
S-Inspect Fire/Safety	2	250	880	252000		Yes			
C-Inspect Fire/Safety	2	250	880	253000		Yes			
L-Inspect Fire/Safety	2	250	880	254000		Yes			
C-Test-InspectCorrosio	2	250	950	253000		Yes			
C- Test - Inspect Pain	2	250	974	254000		Yes		Yes	
S-Test MCC/Control	3	320	115	252000		Yes			
C-Test MCC/Control	3	320	115	253000		Yes			
L-Test MCC/Control	3	320	115	254000		Yes			
C-Test-Pipe & Fitting	3	320	210	253000		Yes		Yes	
C - Test - Test Compre	3	320	630	253000		Yes		Yes	
S-Test Equipment	3	320	780	252000		Yes			
C-Test Equipment	3	320	780	253000		Yes			
L-Test Equipment	3	320	780	254000		Yes			
S-Test Process Sys	3	320	810	252000		Yes			
C-Test Process Sys	3	320	810	253000		Yes			
L-Test Process Sys	3	320	810	254000		Yes			
S-Test Dehydrat Sys	3	320	820	252000		Yes			
C-Test Dehydrat Sys	3	320	820	253000		Yes			
L-Test Dehydrat Sys	3	320	820	254000		Yes			
S-Test Mech Sys	3	320	830	252000		Yes			
C-Test Mech Sys	3	320	830	253000		Yes			
L-Test Mech Sys	3	320	830	254000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
S-Test Pipe/Flowline	3	320	840	252000		Yes			
C-Test Pipe/Flowline	3	320	840	253000		Yes			
L-Test Pipe/Flowline	3	320	840	254000		Yes			
S-Test Electric Sys	3	320	850	252000		Yes			
C-Test Electric Sys	3	320	850	253000		Yes			
L-Test Electric Sys	3	320	850	254000		Yes			
S-Test Generator	3	320	851	252000		Yes			
C-Test Generator	3	320	851	253000		Yes			
L-Test Generator	3	320	851	254000		Yes			
S-Test Light Sys	3	320	852	252000		Yes			
C-Test Light Sys	3	320	852	253000		Yes			
L-Test Light Sys	3	320	852	254000		Yes			
S-Test Instrument Sys	3	320	860	252000		Yes			
C-Test Instrument Sys	3	320	860	253000		Yes			
L-Test Instrument Sys	3	320	860	254000		Yes			
S-Test Telecom Sys	3	320	870	252000		Yes			
C-Test Telecom Sys	3	320	870	253000		Yes			
L-Test Telecom Sys	3	320	870	254000		Yes			
S-Test Fire/Safety	3	320	880	252000		Yes			
C-Test Fire/Safety	3	320	880	253000		Yes			
L-Test Fire/Safety	3	320	880	254000		Yes			
S-Test Computer Sys	3	320	890	252000		Yes			
C-Test Computer Sys	3	320	890	253000		Yes			
L-Test Computer Sys	3	320	890	254000		Yes			
S-NDT Test Manifolds	3	321	200	252000		Yes			
C-NDT Test Manifolds	3	321	200	253000		Yes			
L-NDT Test Manifolds	3	321	200	254000		Yes			
C-NDT Test Pipe/Flowli	3	321	840	253000		Yes		Yes	
C-NDT-Steel	3	321	910	253000		Yes		Yes	
L-NDT-Steel	3	321	910	254000		Yes		Yes	
M-Demobilize Site	4	410	020	251000		Yes			
S-Demobilize Site	4	410	020	252000		Yes			
C-Demobilize Site	4	410	020	253000		Yes			
L-Demobilize Site	4	410	020	254000		Yes			
C-Demob-Marine vessels	4	410	560	253000		Yes	Yes	Yes	
InterCo-Gen-Corrosion	0	010	950	258800		Yes			
Marine-Srvc Transp	1	190	000	256100	Yes	Yes	Yes	Yes	Yes
Land-Srvc Transp	1	190	000	256200	Yes	Yes	Yes	Yes	Yes
Air-Srvc Transp	1	190	000	256300	Yes	Yes	Yes	Yes	Yes
Travel Expense	1	190	000	256900	Yes	Yes	Yes	Yes	Yes
T-Marine-Sup Marine Ve	7	700	560	256100	Yes	Yes			
L-Legal Supp	8	810	000	254000	Yes	Yes			
C-Safety/Training	8	820	000	253000		Yes		Yes	
L-Safty/Trng	8	820	000	254000	Yes	Yes		Yes	
C-Operations Support	8	840	000	253000	Yes	Yes		Yes	
L-Operations Support	8	840	000	254000		Yes		Yes	
U-Utilities	8	870	000	257000	Yes	Yes	Yes		Yes
Power-Srvc Utils	8	870	000	257100	Yes	Yes	Yes		Yes
Fuel-Srvc Utils	8	870	000	257200	Yes	Yes	Yes	Yes	Yes
Water-Srvc Utils	8	870	000	257300	Yes	Yes	Yes		Yes
Tele-Servc Utils	8	870	000	257400	Yes	Yes	Yes	Yes	Yes
Radio-Srvc Utils	8	870	000	257500	Yes	Yes	Yes		Yes
Waste-Srvc Utils	8	870	000	257600	Yes	Yes	Yes		Yes
Other-Srvc Utils	8	870	000	257900	Yes	Yes	Yes	Yes	Yes
C-Training Allowance	8	885	993	253000		Yes			
L-TraIning Allowance	8	885	993	254000		Yes			

Table A.1. Chart of an Existing Cost Code Catalog. (Continued)

Account Description	Account Code				Project Cost Code Structure				
	Cost Code			Cost Type	Global Model:		Thai Model:		
	Phase	Process	Component		Misc Producing	Topside	Misc Producing	Topside	Small Project
C-Travel Allowance	8	885	996	253000	[redacted]	Yes	[redacted]	Yes	[redacted]
L-Travel Allowance	8	885	996	254000	[redacted]	Yes	[redacted]	Yes	[redacted]
C-Weather Allowance	8	885	997	253000	[redacted]	Yes	[redacted]	Yes	[redacted]
L-Weather Allowance	8	885	997	254000	[redacted]	Yes	[redacted]	Yes	[redacted]
S-General-Office	8	890	000	252000	[redacted]	Yes	[redacted]	Yes	[redacted]
R-Support-General	8	890	000	255000	[redacted]	Yes	[redacted]	Yes	[redacted]
Other	8	890	000	258000	Yes	Yes	Yes	Yes	Yes
Insurance	8	890	000	258200	Yes	Yes	Yes	Yes	Yes
Payroll Ins, Benefits	8	890	000	258500	Yes	Yes	[redacted]	[redacted]	[redacted]
Misc Other	8	890	000	258700	Yes	Yes	[redacted]	[redacted]	[redacted]
Misc InterComp	8	890	000	258800	Yes	Yes	Yes	Yes	Yes
Extra Ordinary Cost	8	890	000	258900	Yes	Yes	[redacted]		[redacted]
Taxes-General	8	890	994	258100	Yes	Yes	[redacted]	Yes	[redacted]
VAT Taxes	8	890	995	258110	Yes	Yes	[redacted]	Yes	[redacted]
Accrue-Facility	9	910	000	259130	Yes	Yes	Yes	Yes	Yes
Logistics Allocation	9	930	000	259330	Yes	Yes	Yes	Yes	Yes
G&A Allocation	9	930	000	259340	Yes	Yes	Yes	Yes	Yes
G&A Other Allocation	9	930	000	259341	Yes	Yes	[redacted]	Yes	[redacted]
G&A Drilling/Resv Mgmt	9	930	000	259342	Yes	Yes	[redacted]	Yes	[redacted]
G&A Facilities Eng.	9	930	000	259343	Yes	Yes	[redacted]	Yes	[redacted]
Operator Fee Allocate	9	930	000	259350	Yes	Yes	Yes	Yes	Yes
C&S Fee Allocation	9	930	000	259360	Yes	Yes	Yes	Yes	[redacted]
Warehouse Allocation	9	930	000	259370	Yes	Yes	Yes	Yes	Yes
Close-Facility->Asset	9	940	000	259430	Yes	Yes	[redacted]	[redacted]	[redacted]
Close-Facility->Exp	9	940	000	259440	Yes	Yes	[redacted]	[redacted]	[redacted]

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APPENDIX B

ENTITY RELATIONSHIP DIAGRAM

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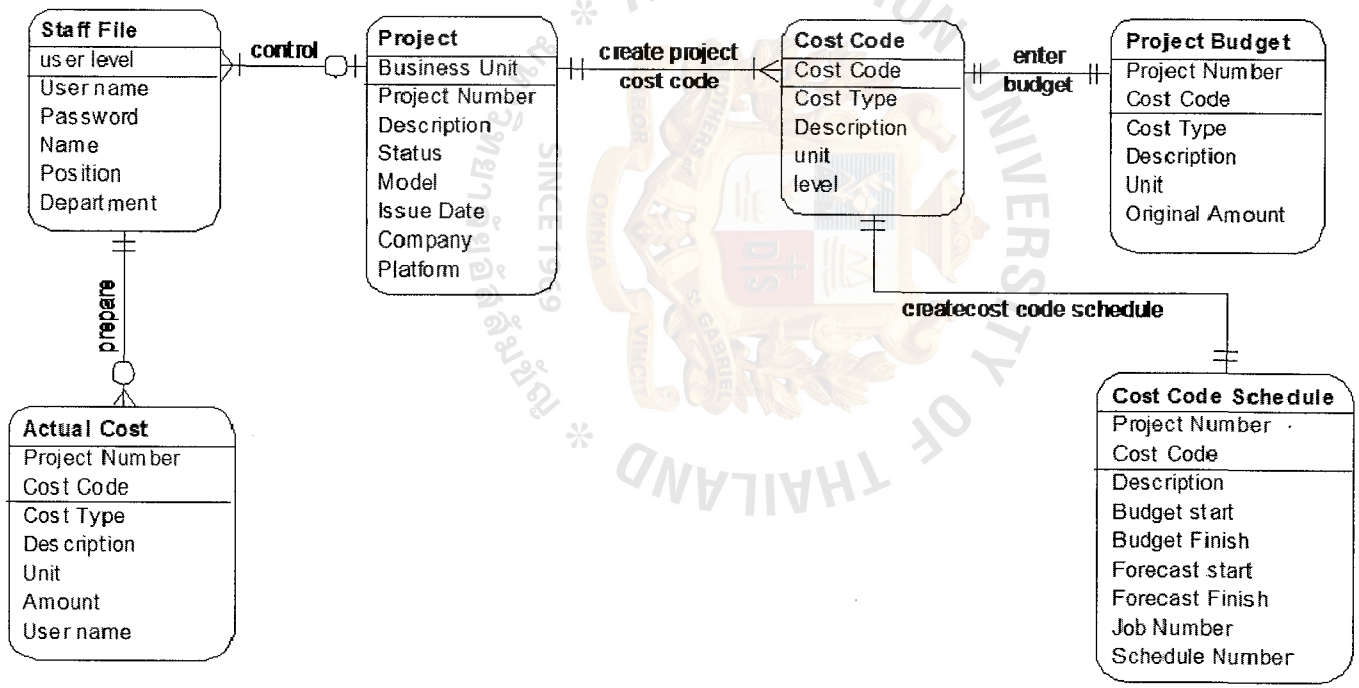
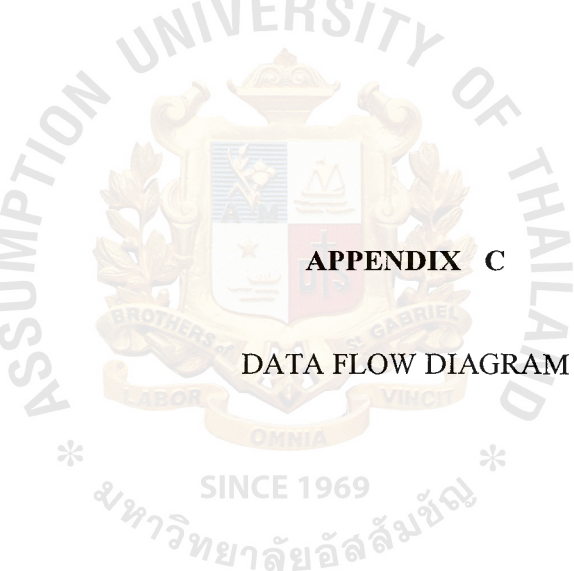


Figure B.1. Entity-Relationship Diagram.



APPENDIX C

DATA FLOW DIAGRAM

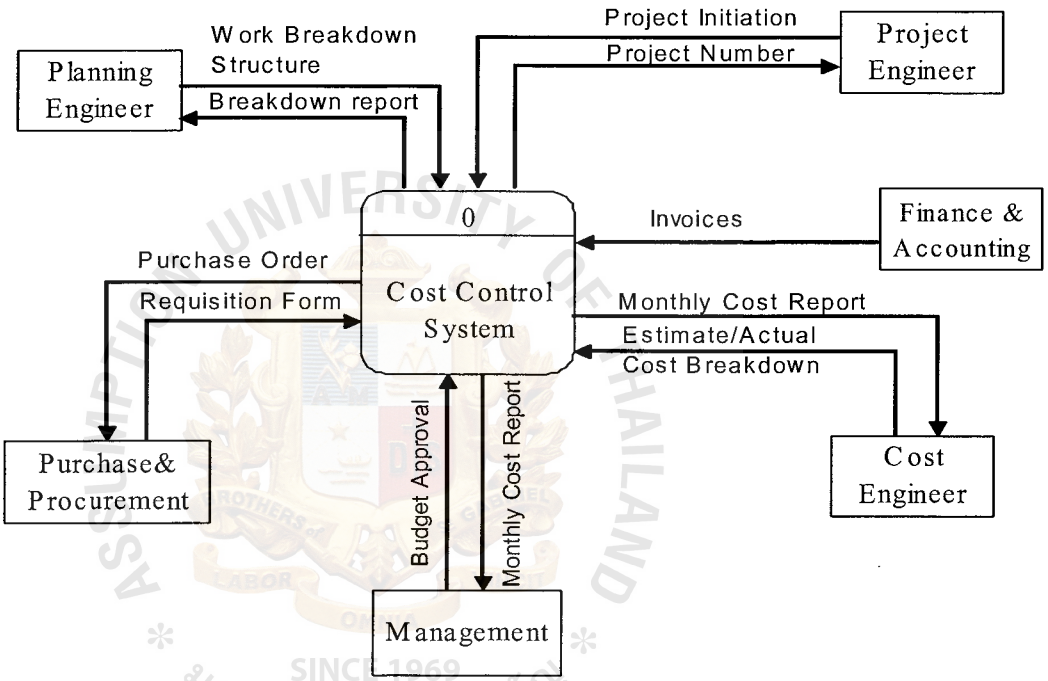


Figure C.1. Context Diagram of the Proposed System.

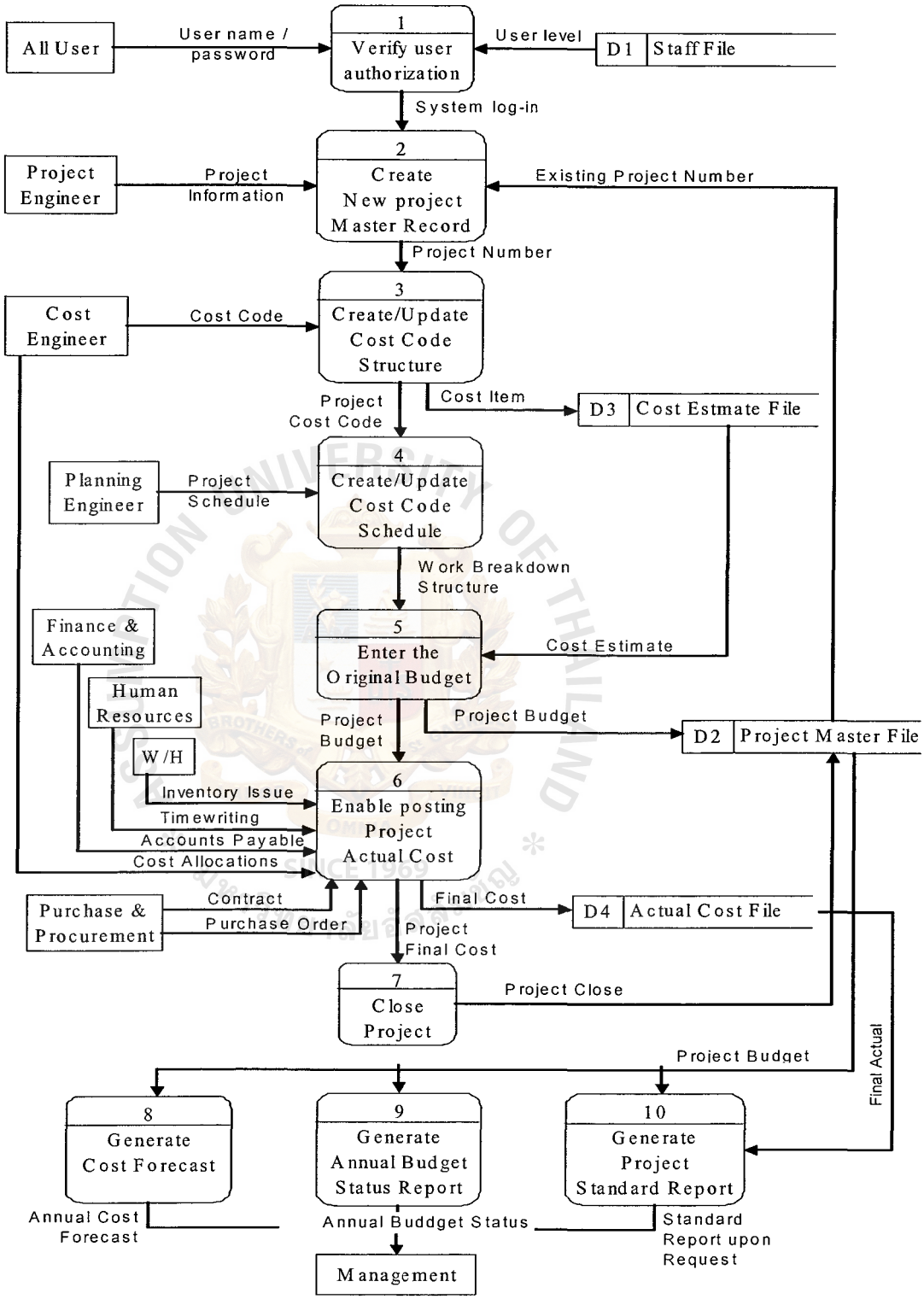


Figure C.2. Data Flow Diagram Level 0 of the Proposed System.

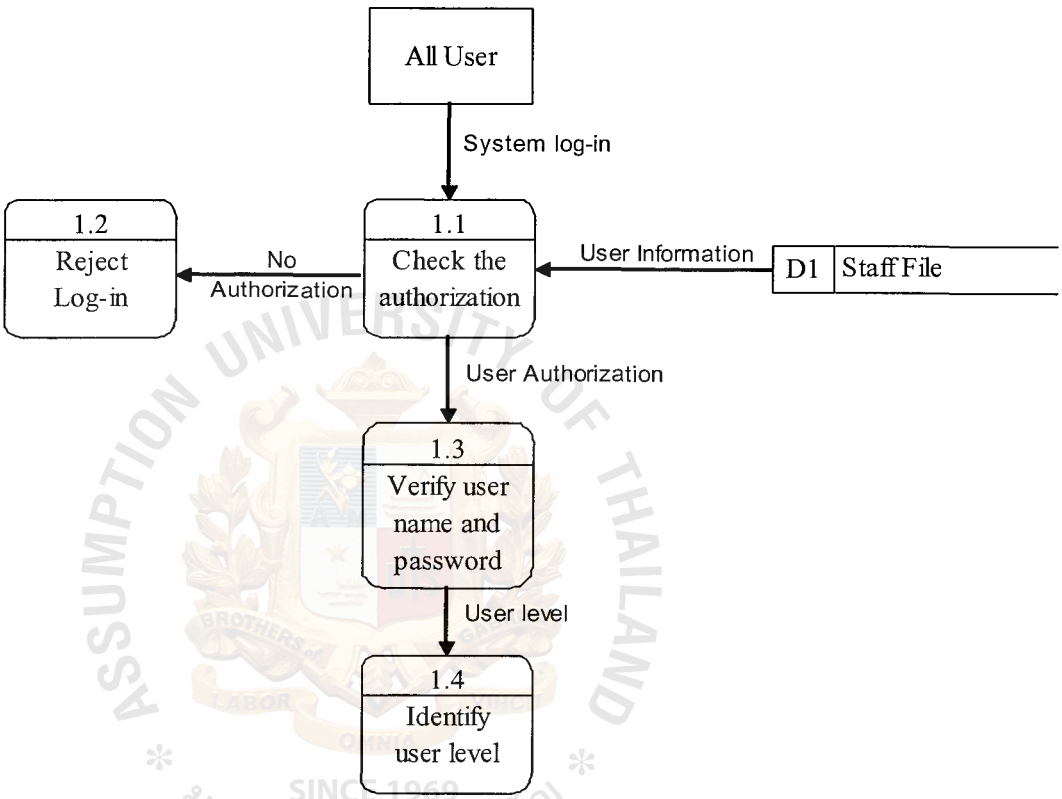


Figure C.3. Data Flow Diagram Level 1 of the Proposed System.

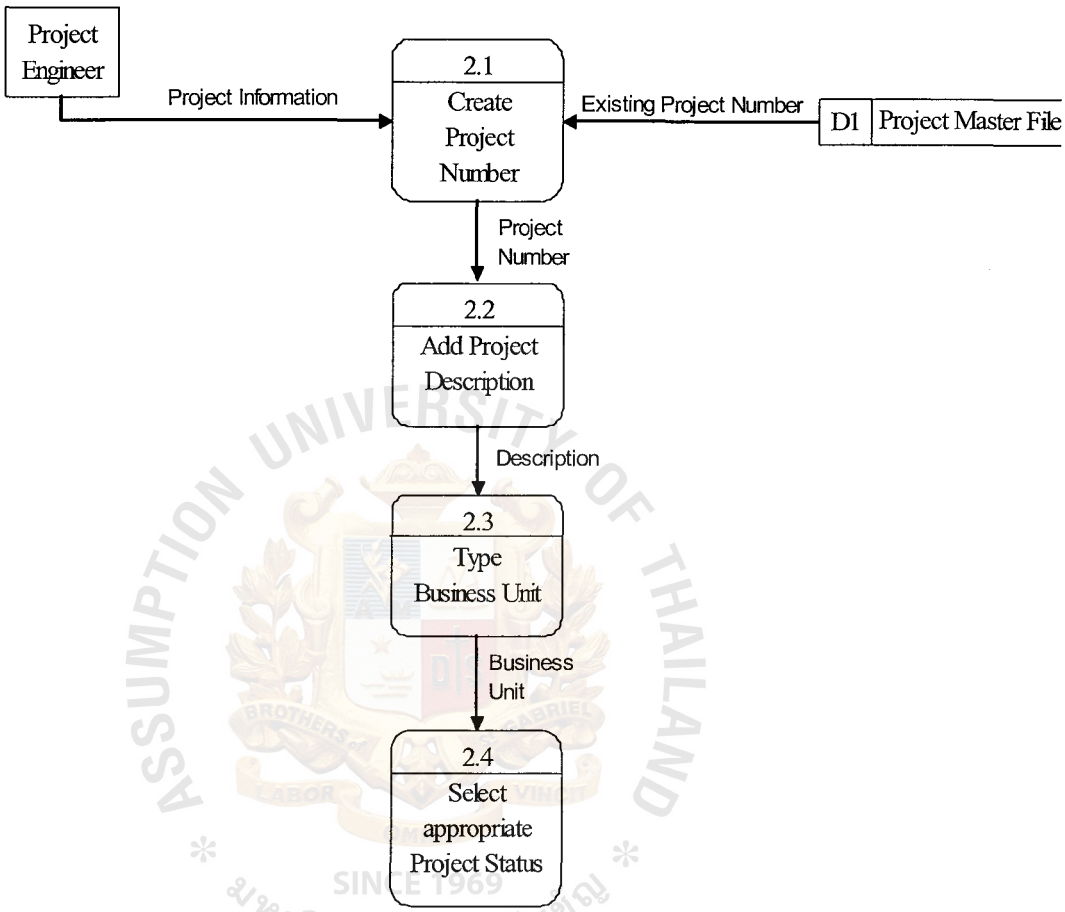


Figure C.4. Data Flow Diagram Level 2 of the Proposed System.

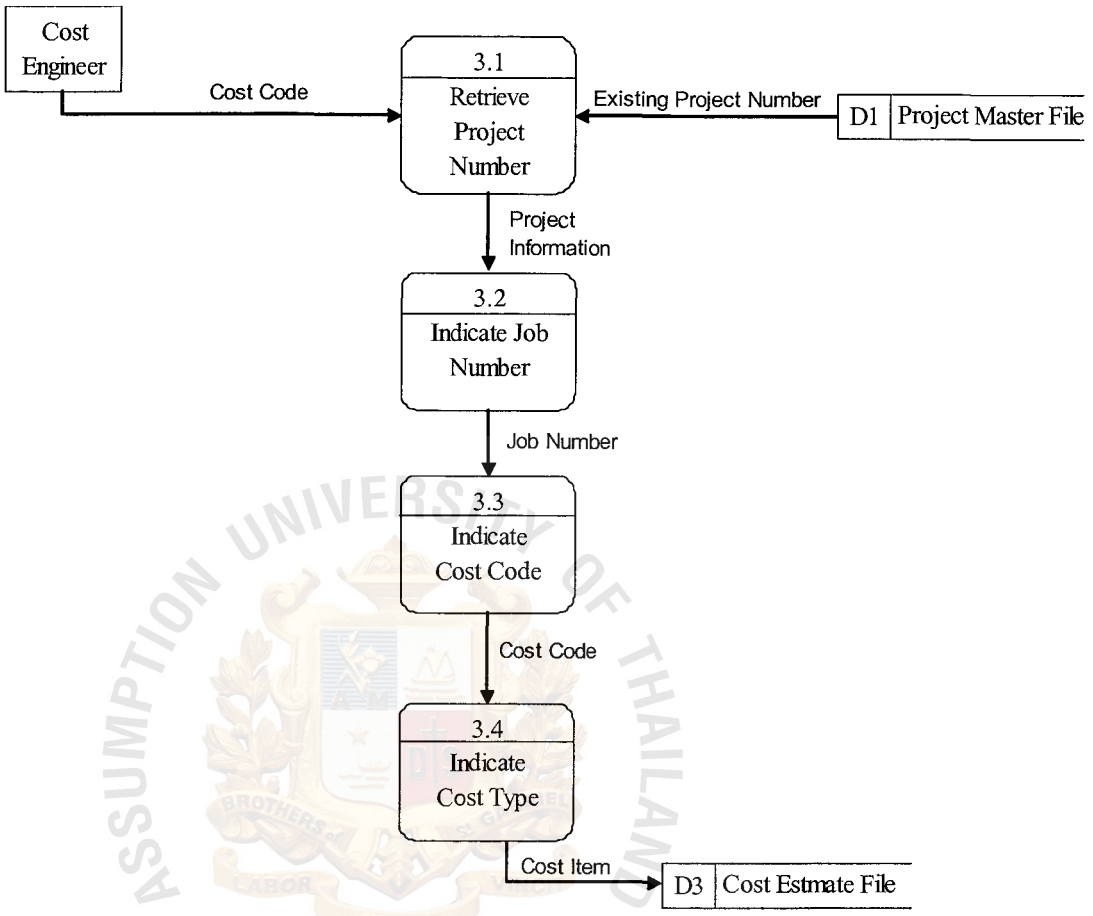


Figure C.5. Data Flow Diagram Level 3 of the Proposed System.

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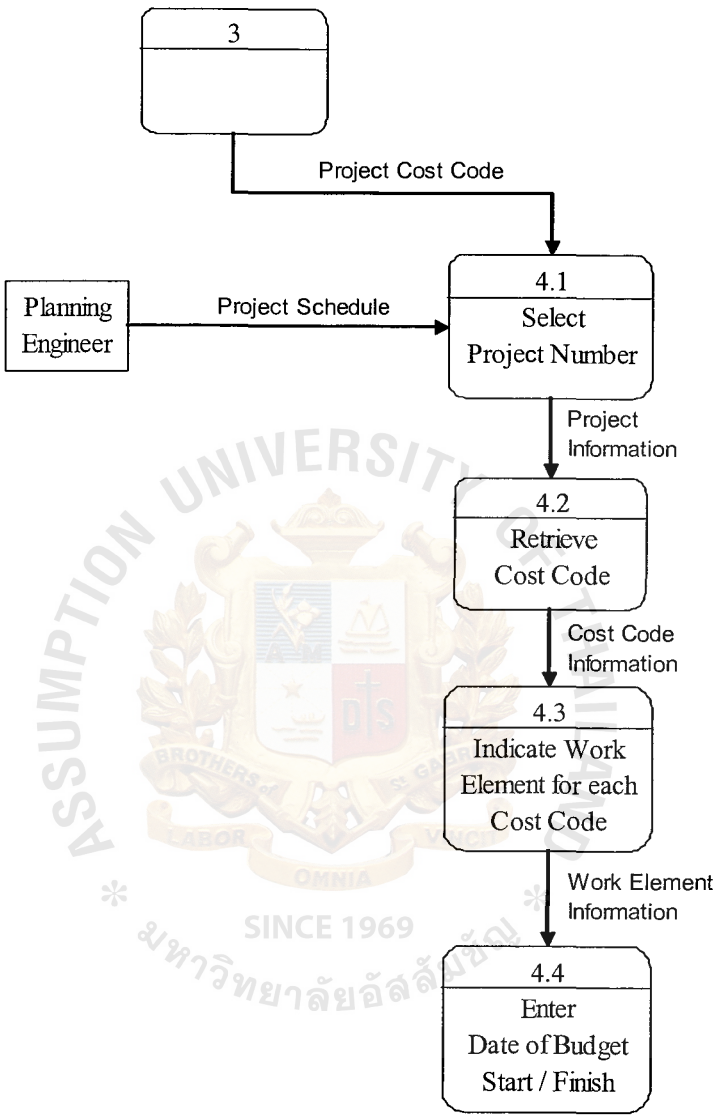

Figure C.6. Data Flow Diagram Level 4 of the Proposed System.

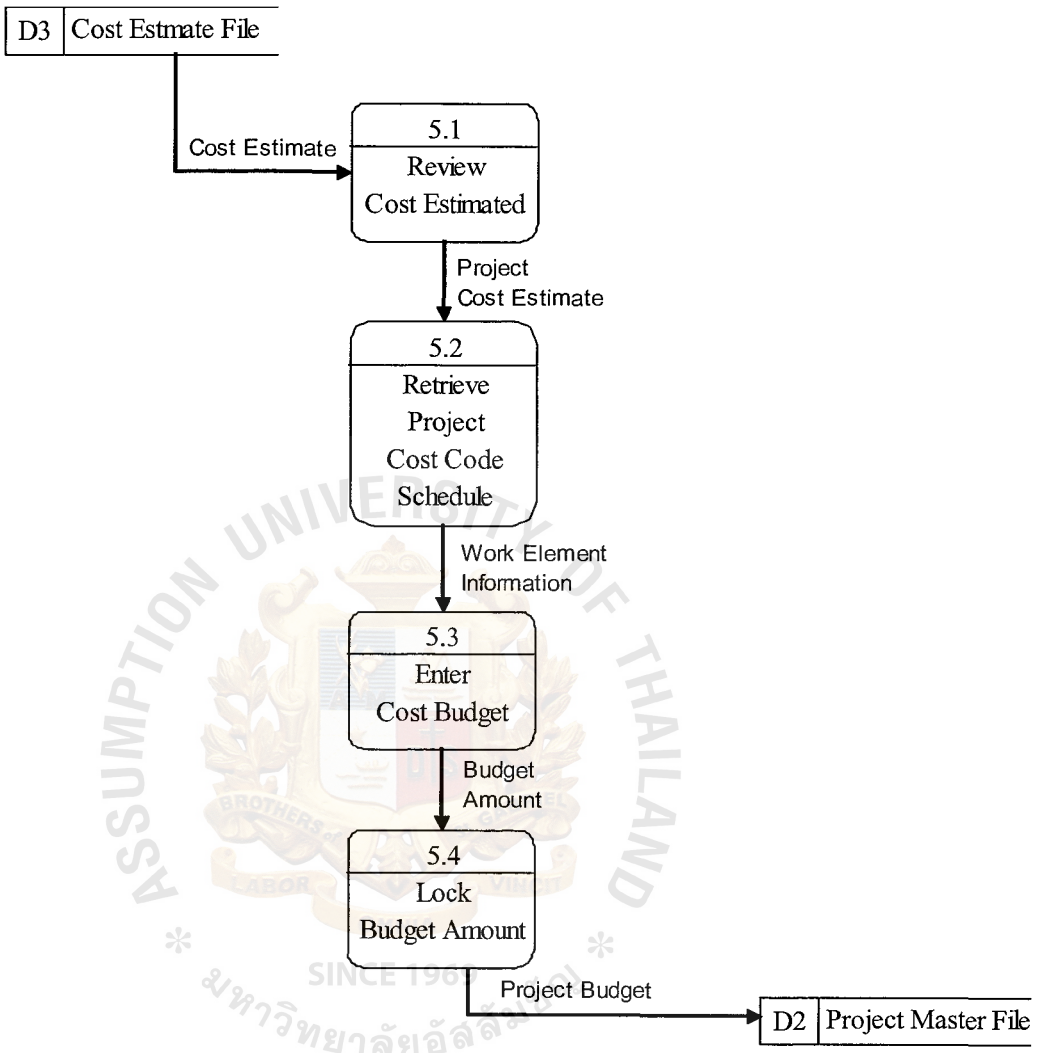

Figure C.7. Data Flow Diagram Level 5 of the Proposed System.

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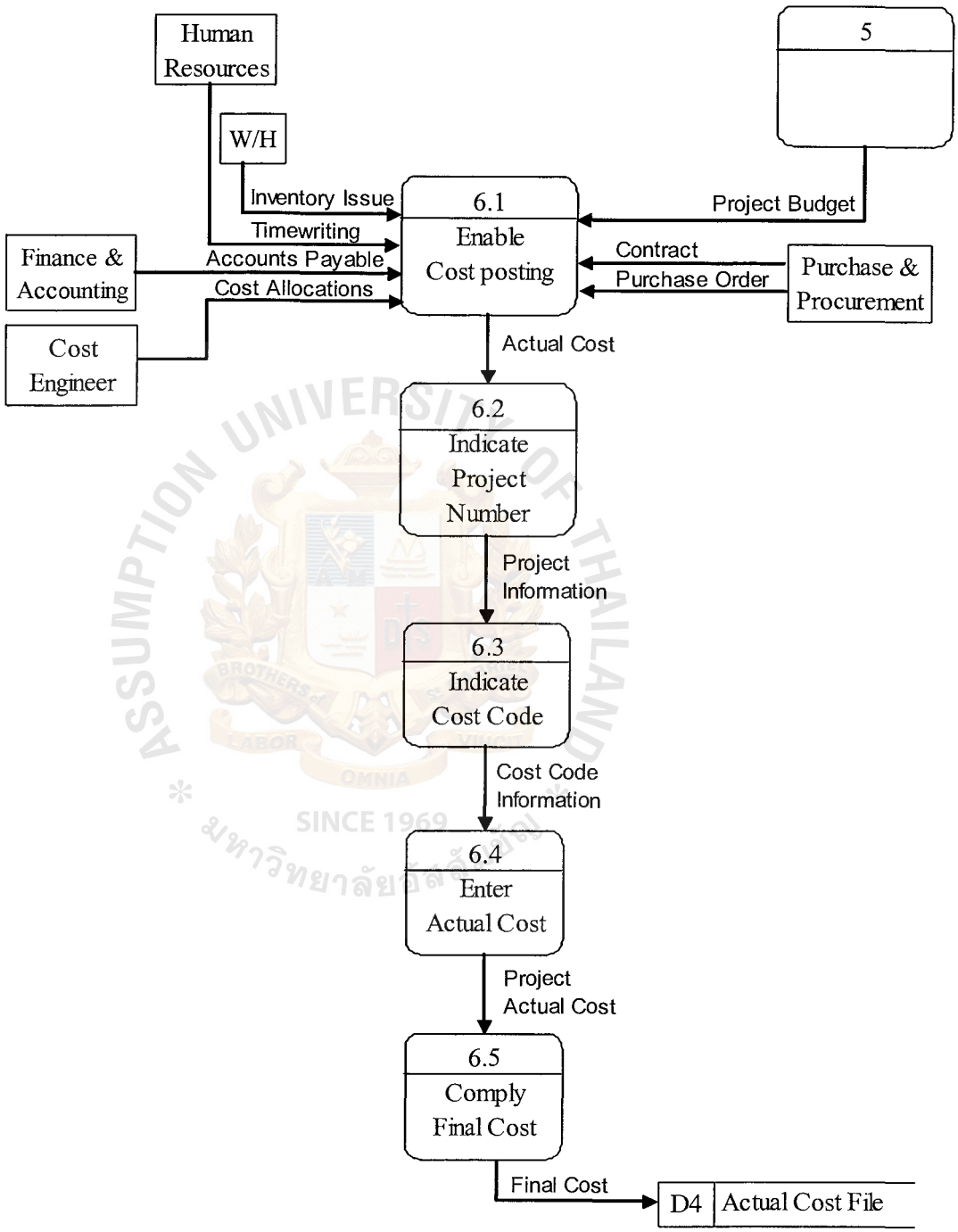

Figure C.8. Data Flow Diagram Level 6 of the Proposed System.

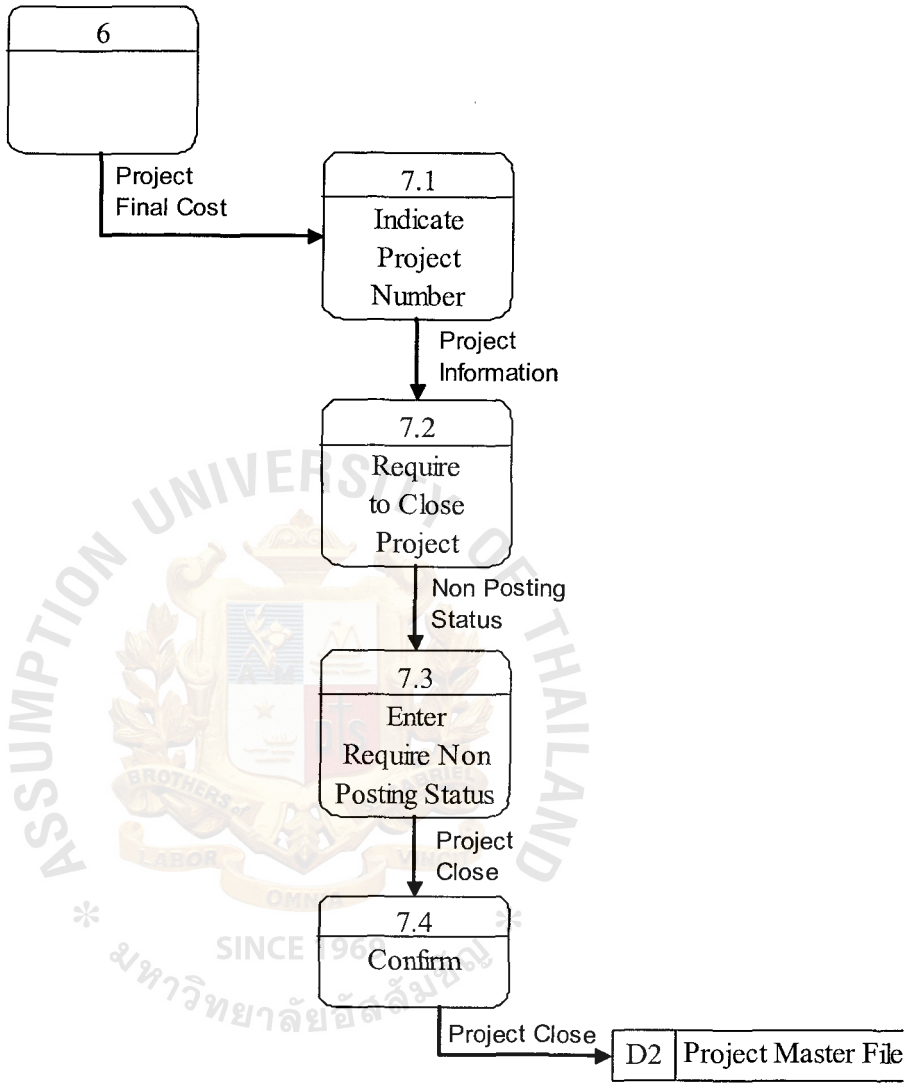

Figure C.9. Data Flow Diagram Level 7 of the Proposed System.

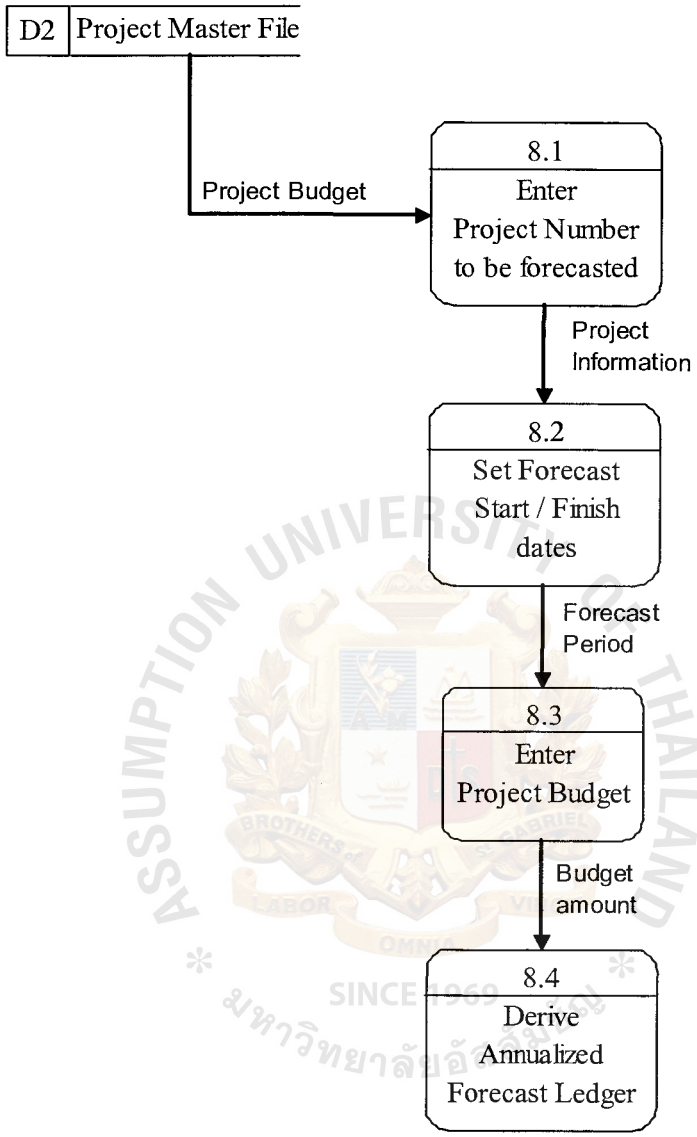

Figure C.10. Data Flow Diagram Level 8 of the Proposed System.

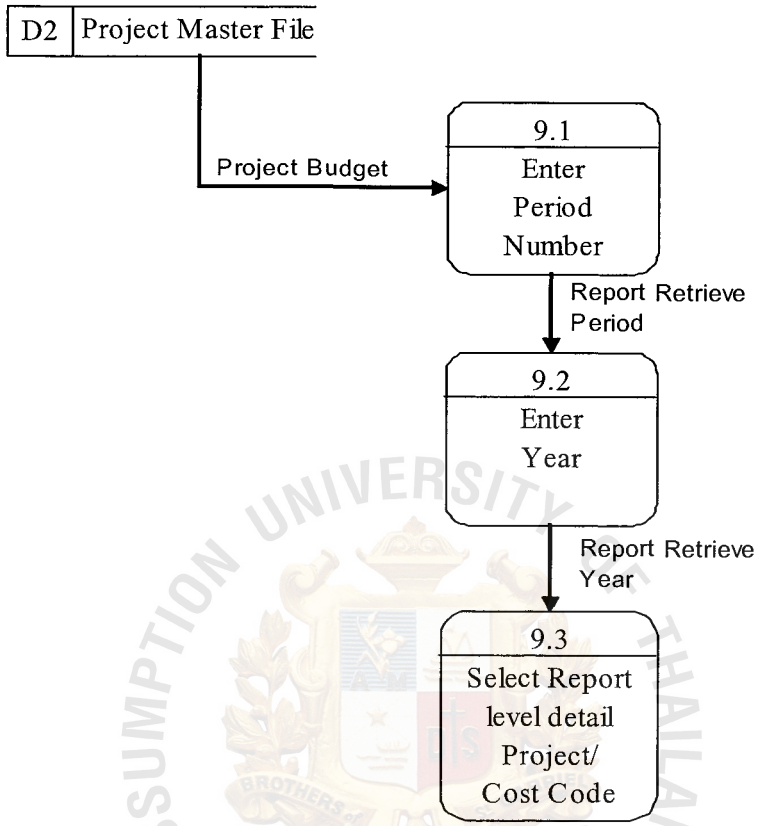

Figure C.11. Data Flow Diagram Level 9 of the Proposed System.

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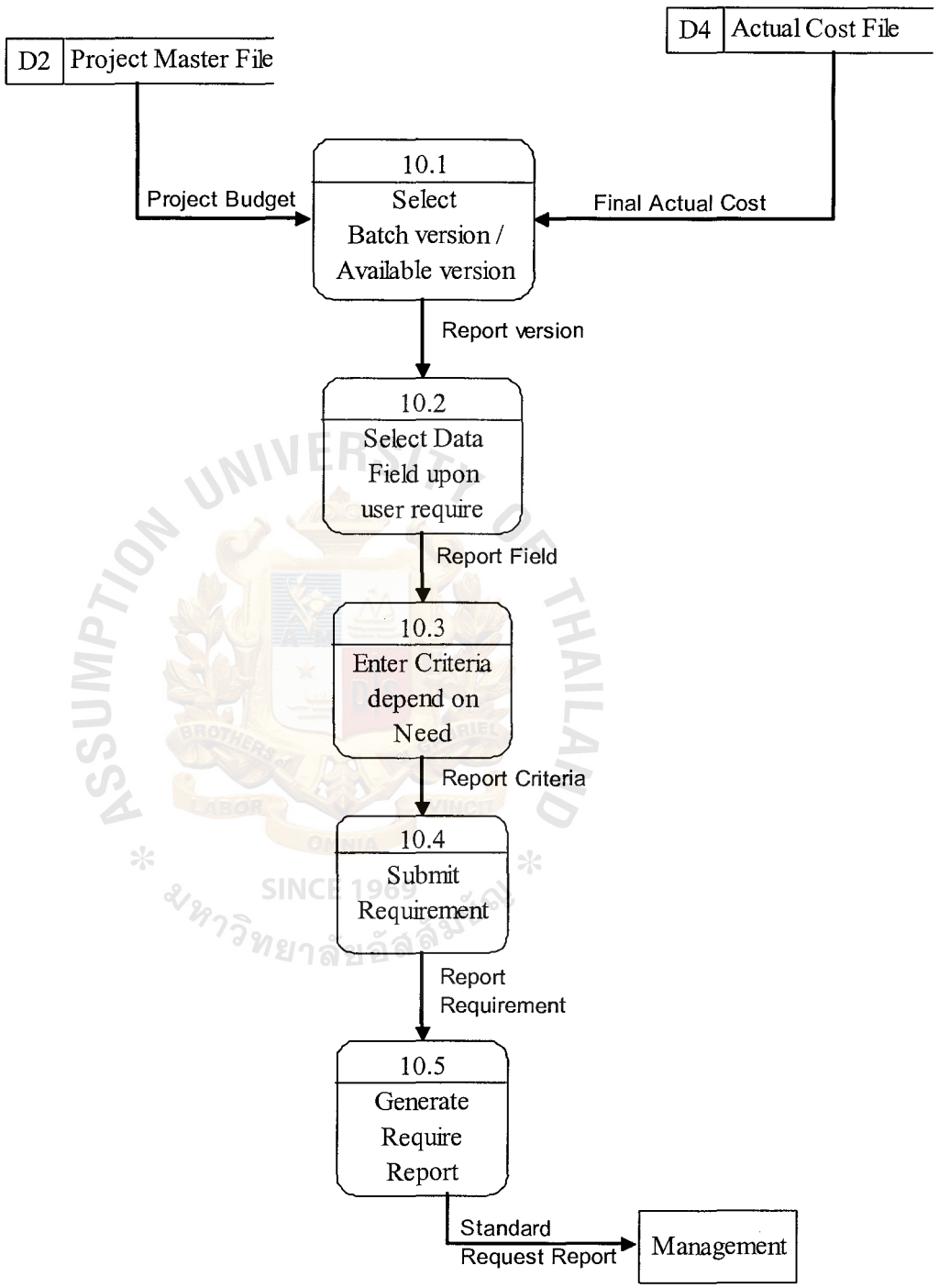

Figure C.12. Data Flow Diagram Level 10 of the Proposed System.

APPENDIX D

DATA DICTIONARY

ASSUMPTION UNIVERSITY OF THAILAND
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DATA DICTIONARY

Project Initiation	=	Project Start-up phase
Project Number	=	9 digit running number of the new project that uses for project naming reference
Work Breakdown	=	Project Work element breakdown
Breakdown report	=	Report of Project Cost that breakdown upon the job
Monthly Cost Report	=	All report of project budget and information for monitoring and controlling cost status that generate on the end of month
Estimate/Actual Cost Breakdown	=	An estimate or Actual cost that breakdown upon the project cost structure.
Requisition Form	=	Form that uses for material request
Purchase Order	=	Form that would generated after order for material
Budget Approval	=	Approval for the authorization of project budget consumption
Detail Engineering	=	Engineering scope of work
Work Element Breakdown	=	Project work breakdown to be job element
Estimate-Cost	=	Cost estimated of work items prepared during project bidding stage
Authorization for Expenditure	=	Project Budget approval for the authorization of expenditure consumption
Budget Baseline	=	The Original Budget that uses to be cost baseline

Cost Information	=	Information of work in particular construction project as determined in unit cost.
Schedule	=	Schedule of Construction project as planned to meet completion in efficient manner. Mostly in form of table, bar chart, Gantt chart
Inventory Issue	=	The supply of goods on hand, stock
Time writing	=	The working time record
Accounts Payable	=	A record or statement especially of business dealings or money received or spent
Cost Allocations	=	The costs of each resource item that would re-assign directly to the project
Cost Code	=	Classification and categorization of all items of work or cost pertaining to a particular construction project
Contract	=	An enforceable agreement before work
User level	=	An authorization level of each user to access to the system module
System Log-in	=	Access to the system by user name and password
Project Information	=	Information to identify project such as Project number, Description, Work Scope
Cost Item	=	Items of work in particular construction project as determined in cost estimate prepared during project bidding stage

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Final Cost	=	The summary actual cost accrue to come as a gain or increase
Project Close	=	Project complete

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APPENDIX E

USER INTERFACE DESIGN

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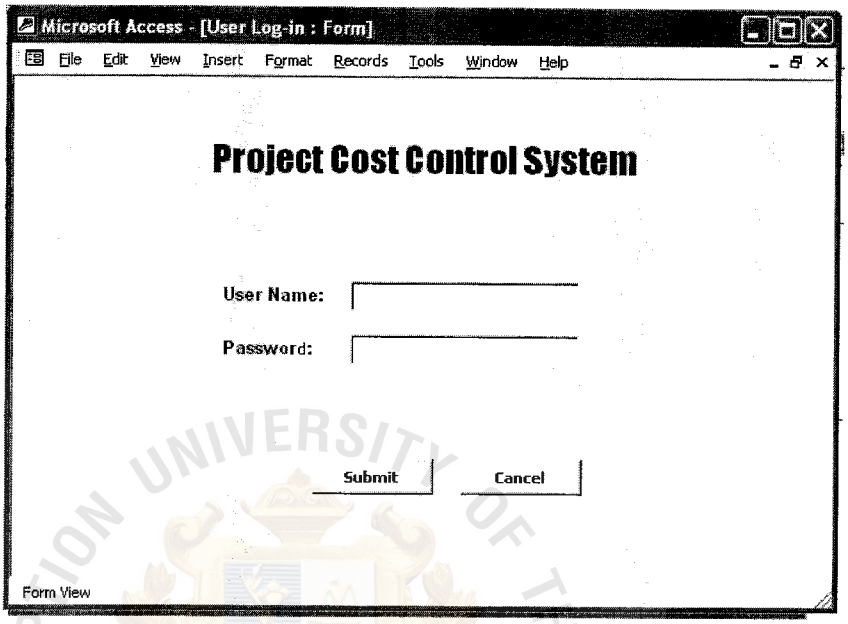

Figure E.1. Log-in Screen.

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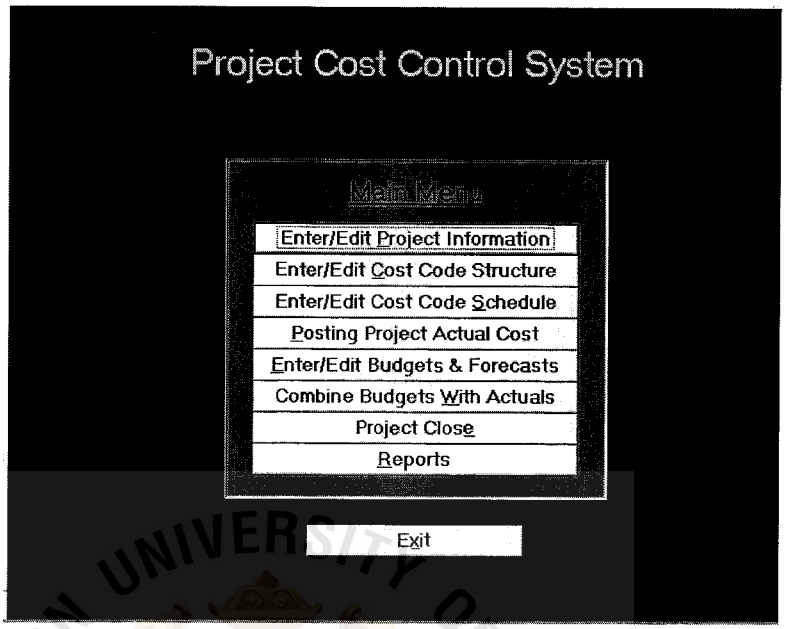

Figure E.2. Main Menu Screen.

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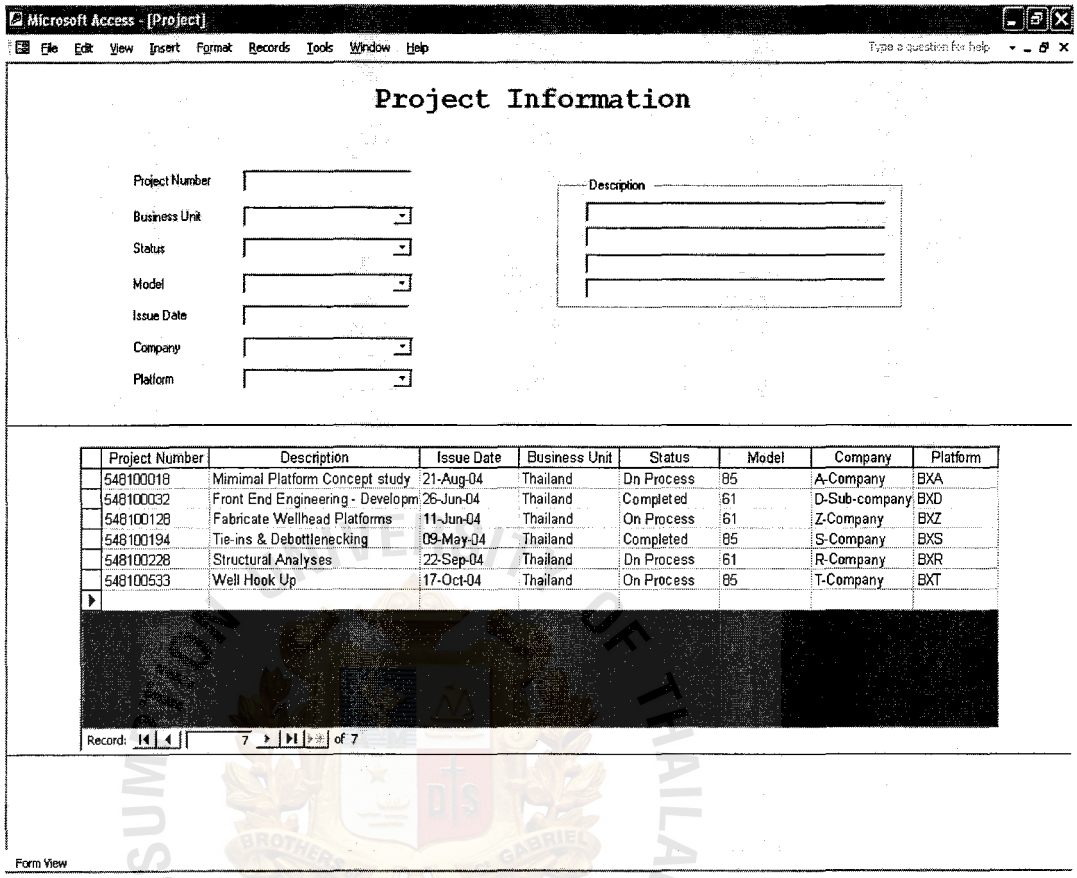

Figure E.3. Project Information Input Screen.

ASSUMPTION UNIVERSITY OF THAILAND
SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

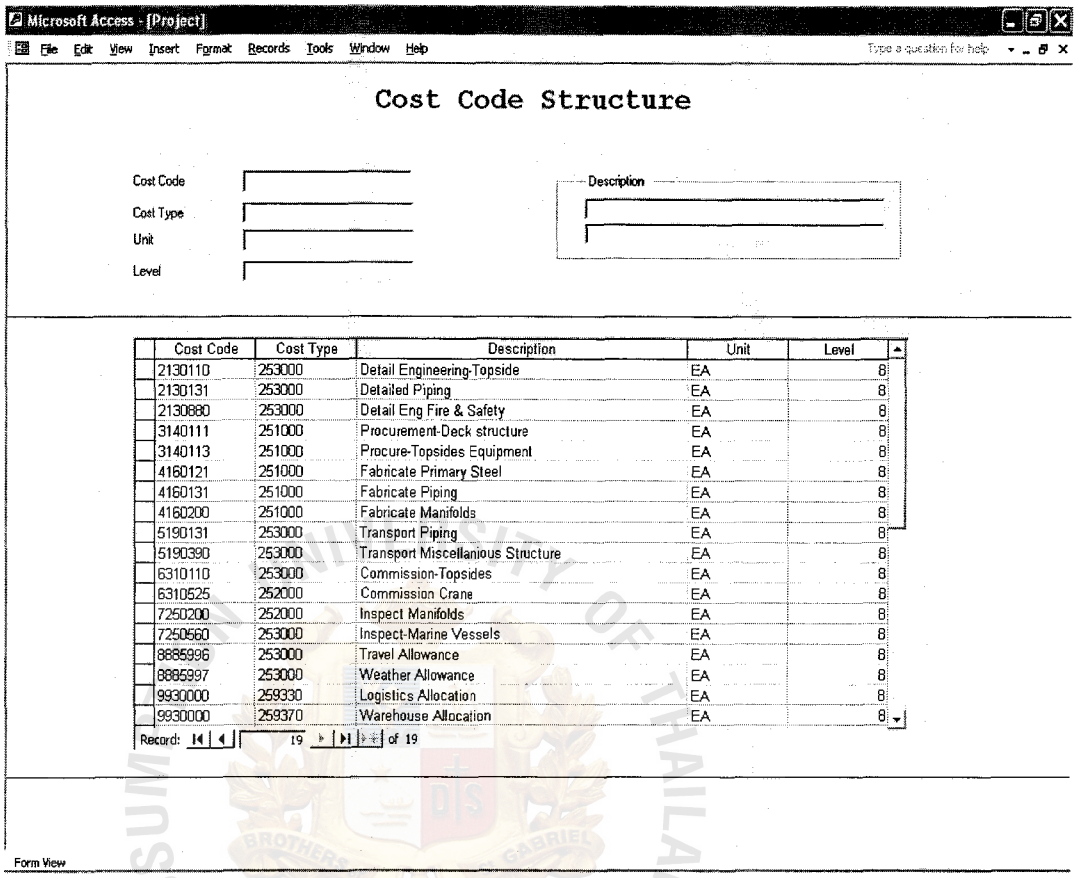

Figure E.4. Cost Code Structure Input Screen.

ASSUMPTION UNIVERSITY OF THAILAND
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มหาวิทยาลัยอัสสัมชัญ

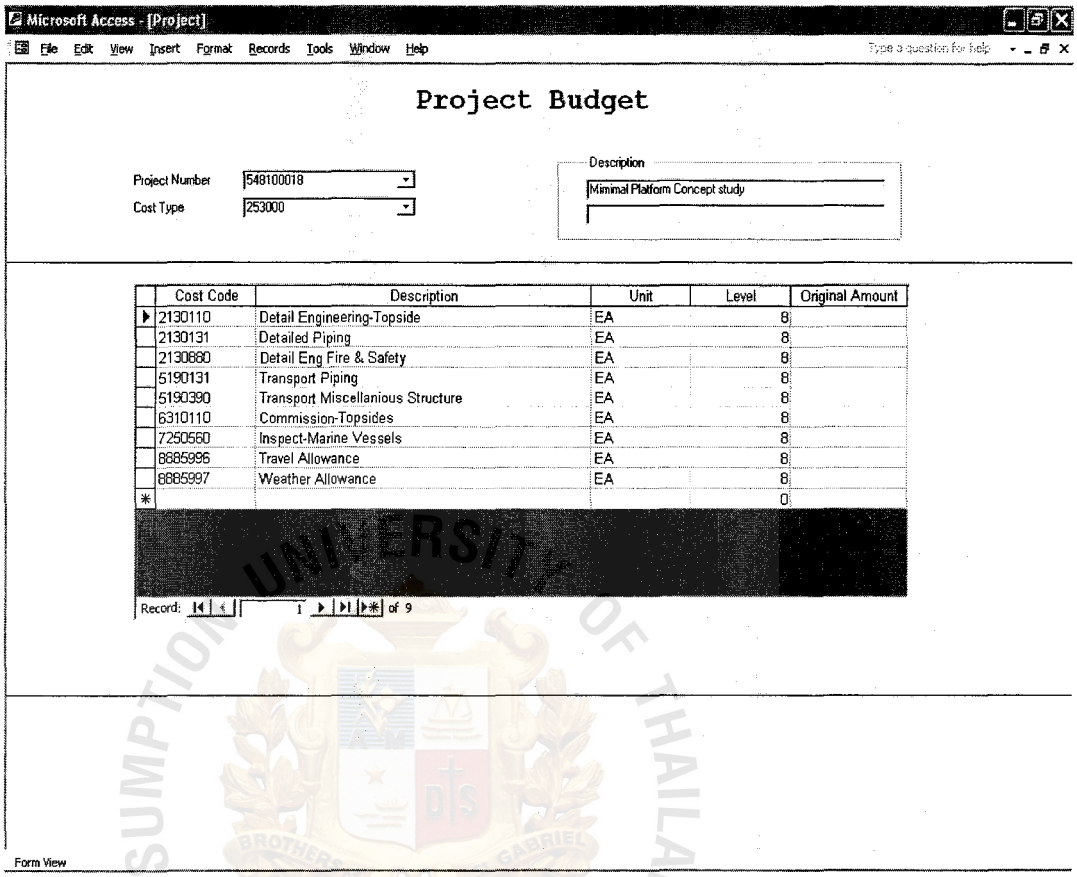

Figure E.5. Project Budget Input Screen.

ASSUMPTION UNIVERSITY OF THAILAND
SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

St. Gabriel's Library, Au

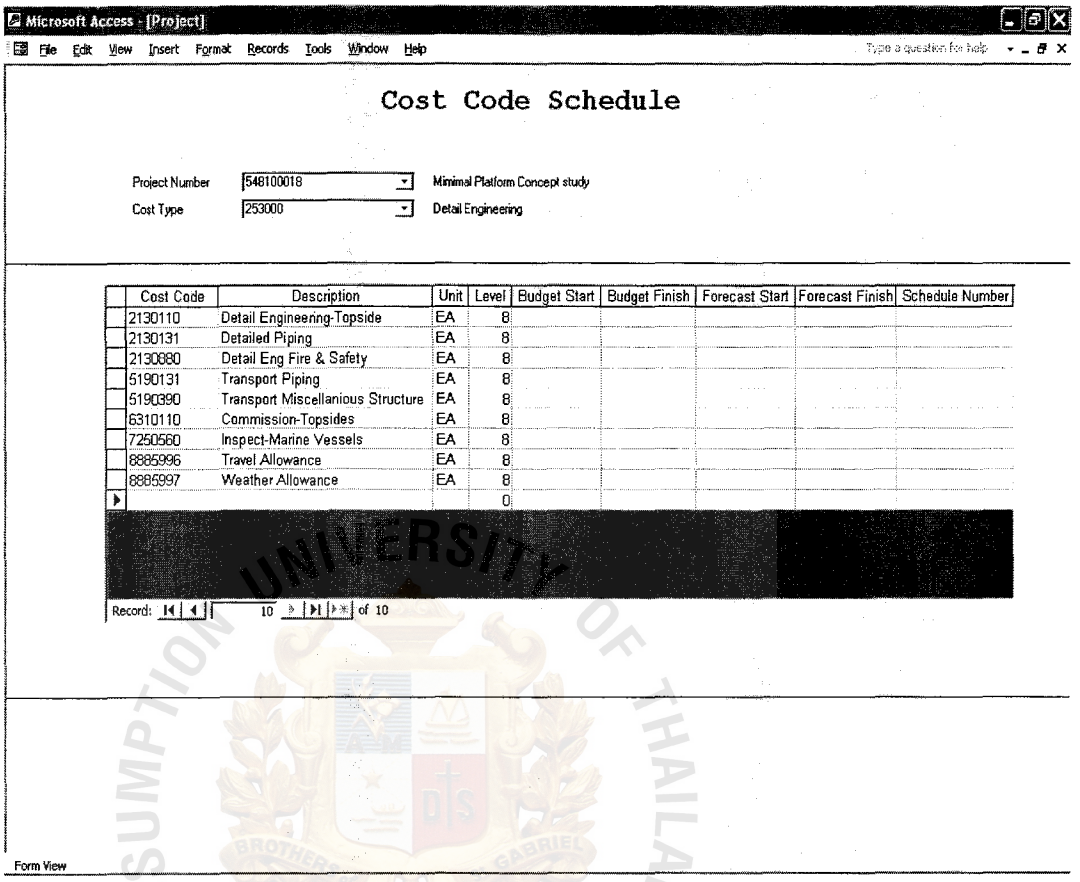

Figure E.6. Cost Code Schedule Input Screen.

ASSUMPTION UNIVERSITY OF THAILAND
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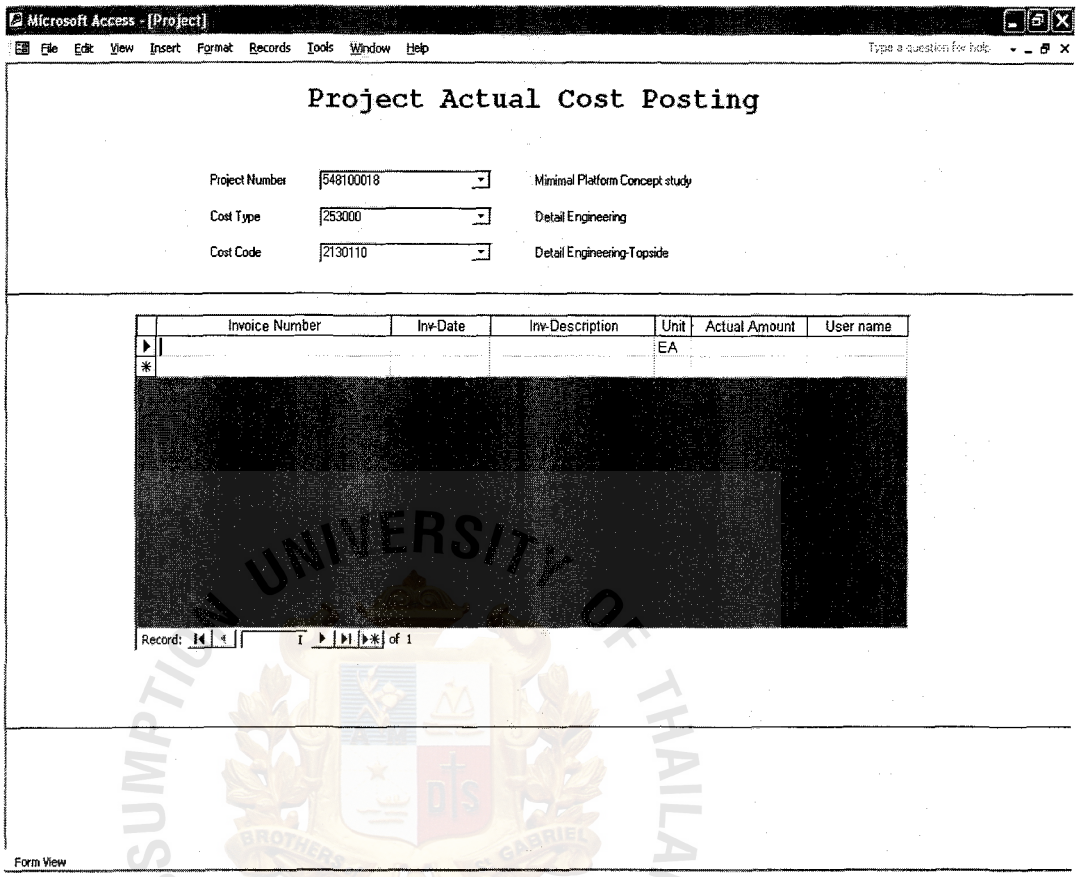

Figure E.7. Project Actual Cost Posting Screen.

ASSUMPTION UNIVERSITY OF THAILAND
SINCE 1969
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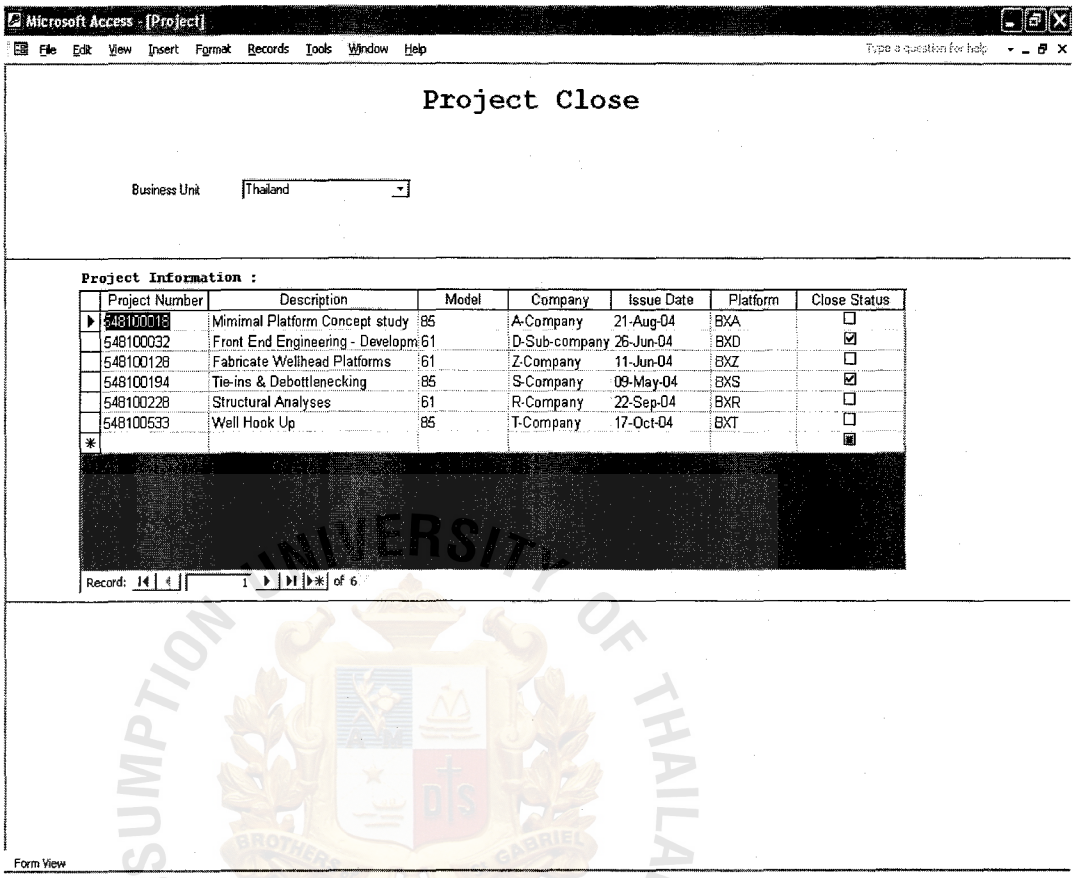


Figure E.8. Project Close Screen.

ASSUMPTION UNIVERSITY OF THAILAND
SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

APPENDIX F

OUTPUT REPORT

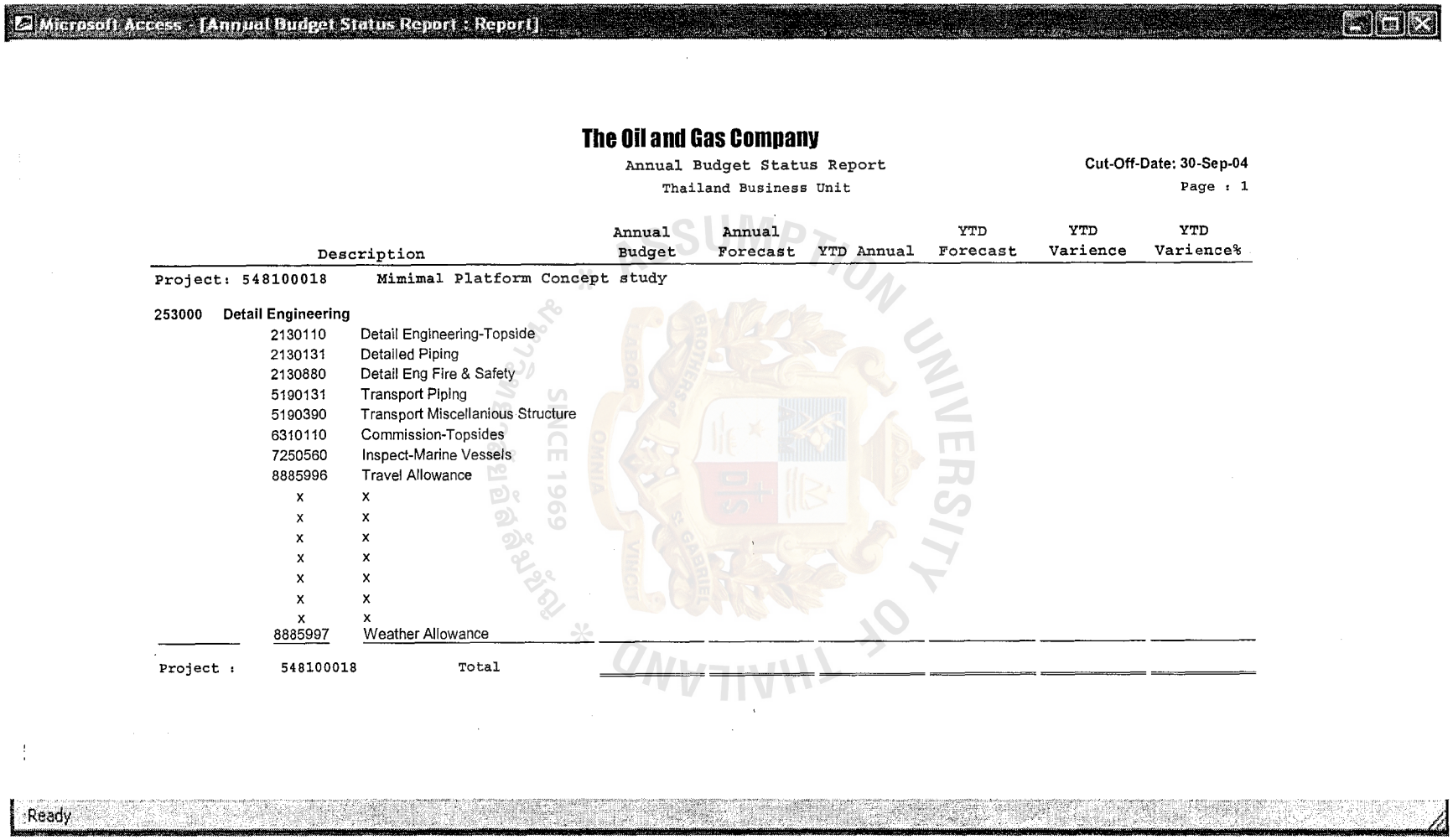


Figure F.1. Annual Budget Status Report.

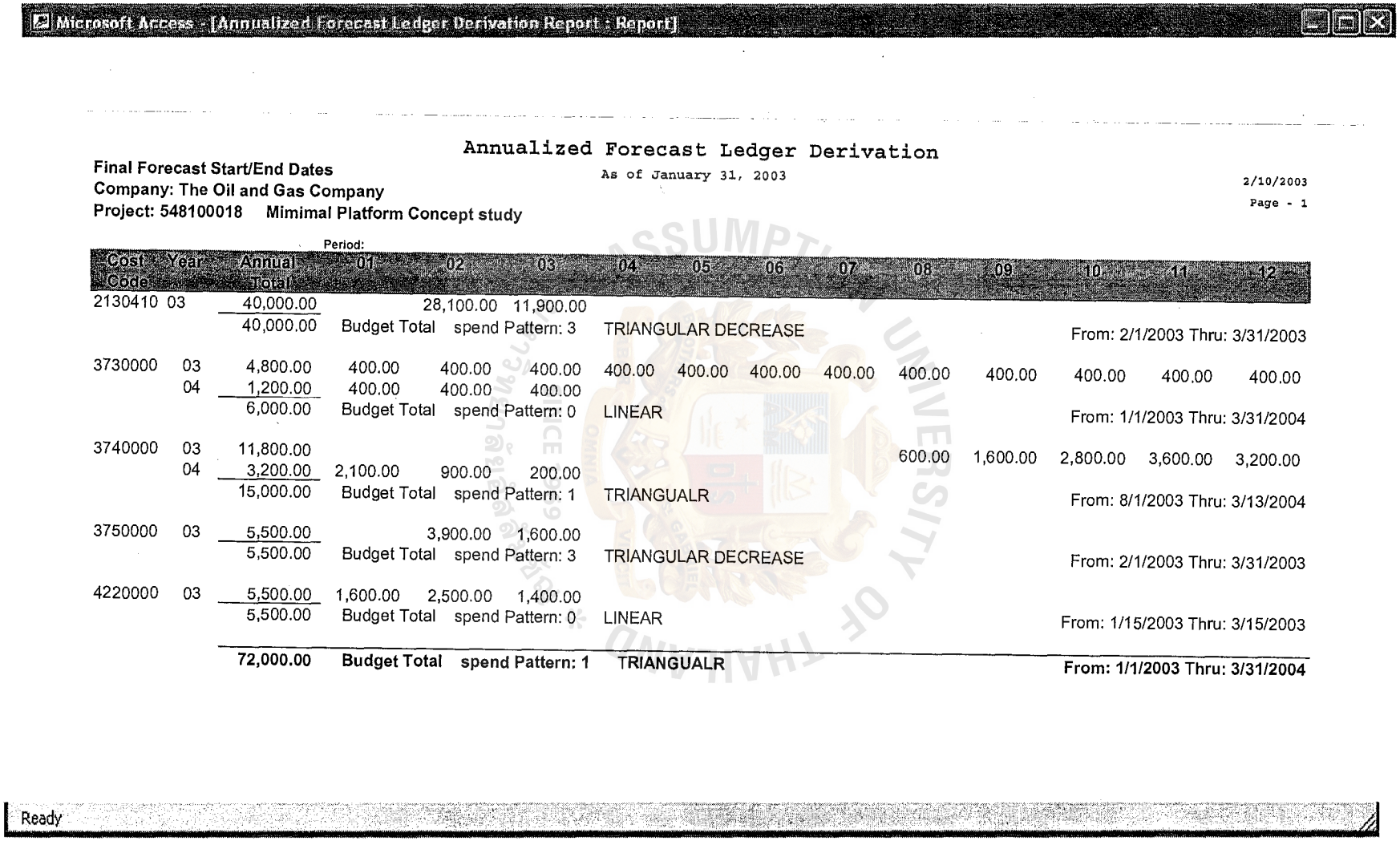


Figure F.2. Annualized Forecast Ledger Derivation Report.

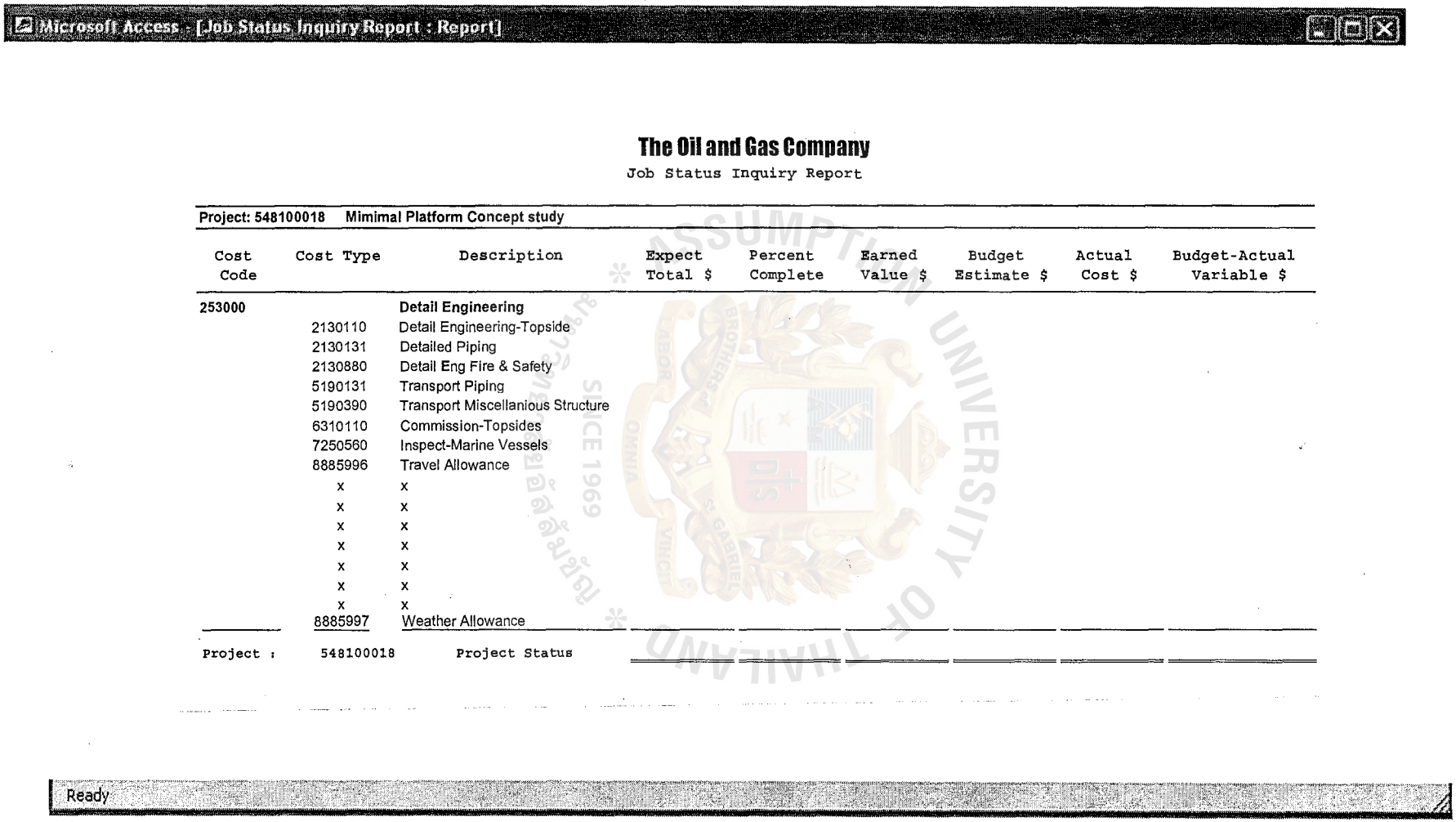


Figure F.3. Job Status Inquiry Report.

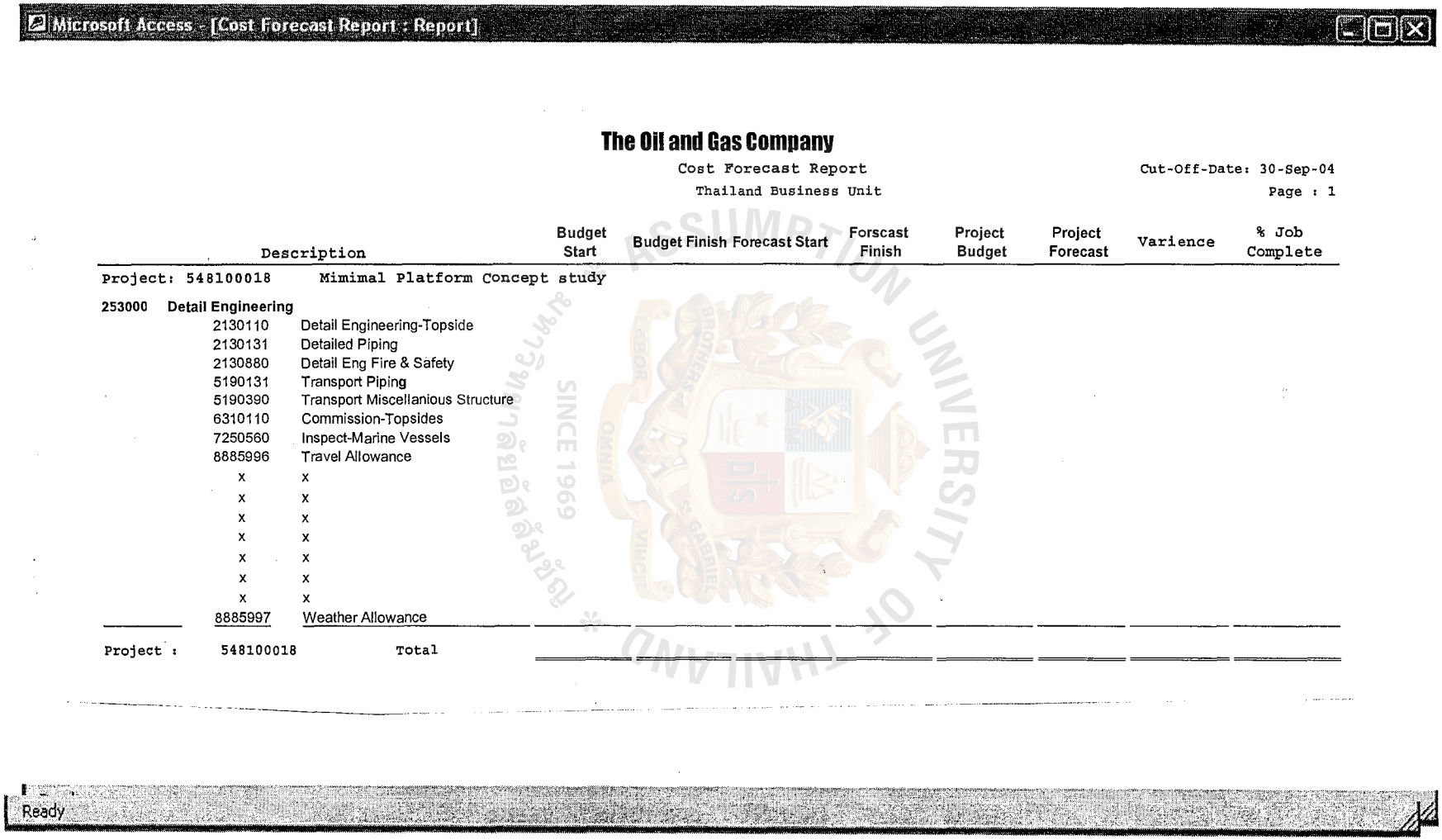


Figure F.4. Cost Forecast Report.

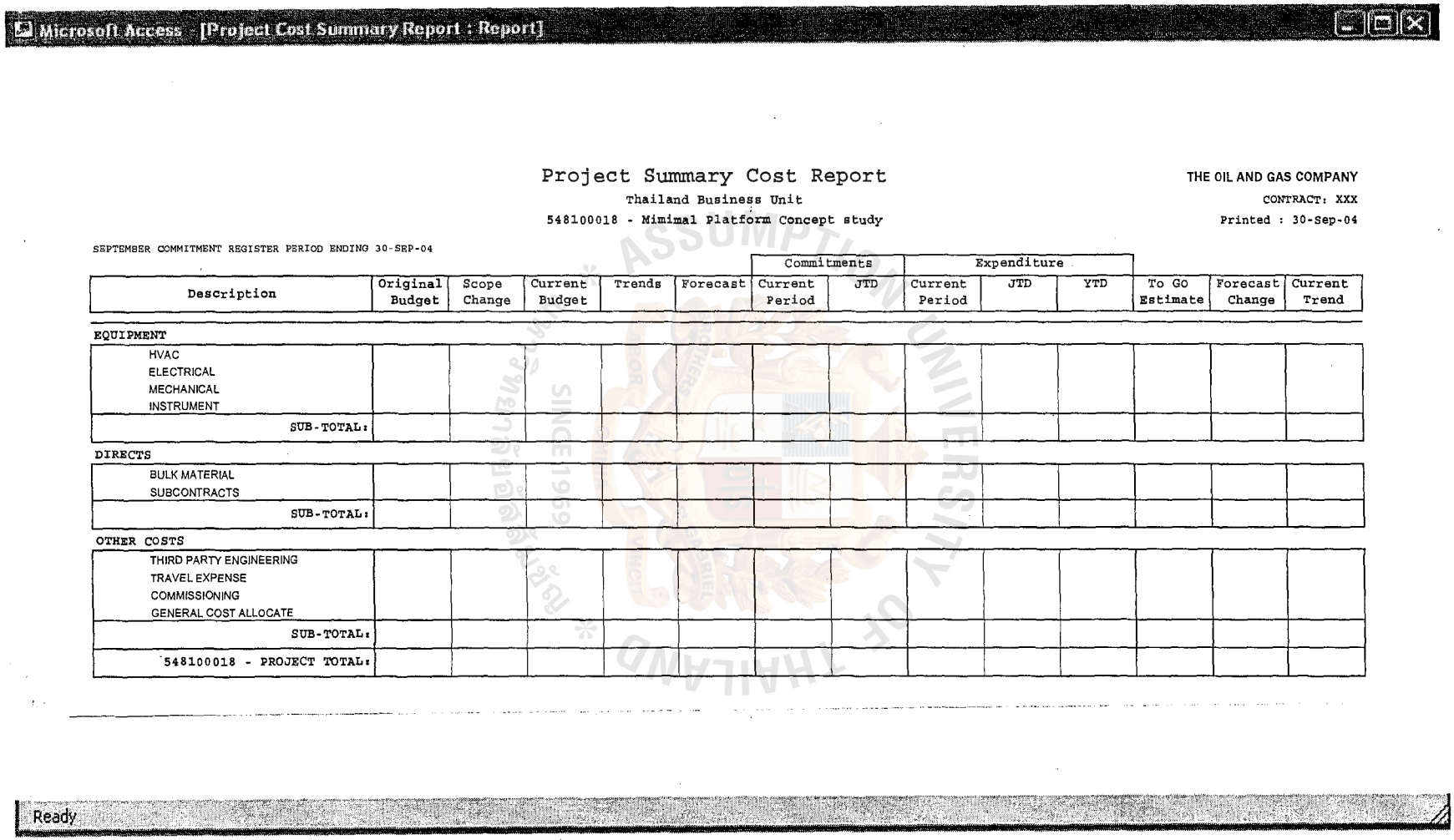
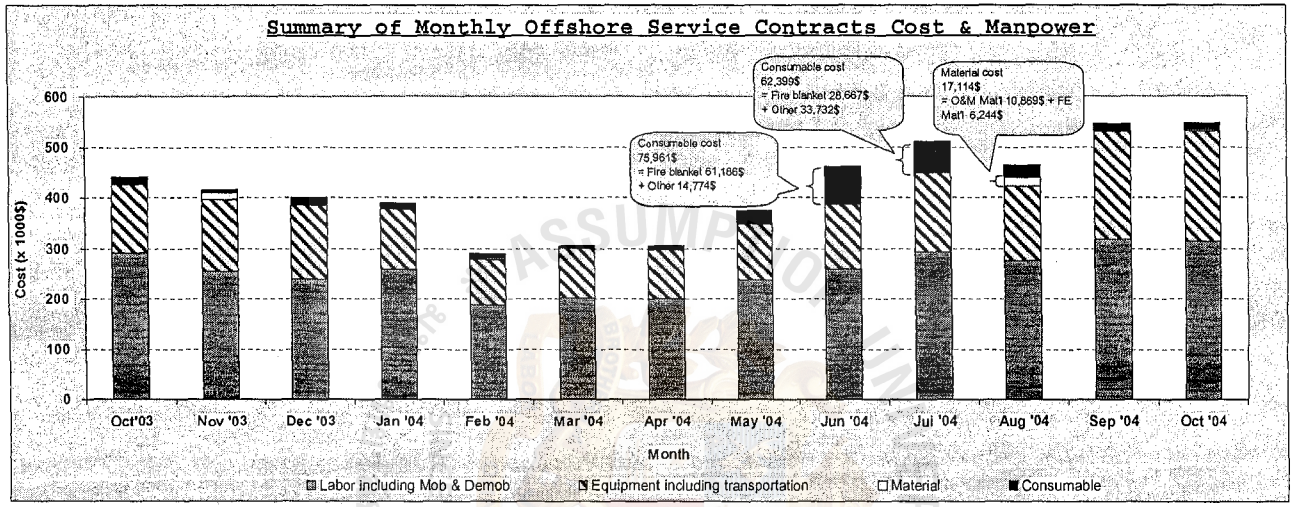


Figure F.5. Project Cost Summary Report.

Microsoft Access - [Summary of Monthly Offshore Service Contracts Cost & Manpower : Report]

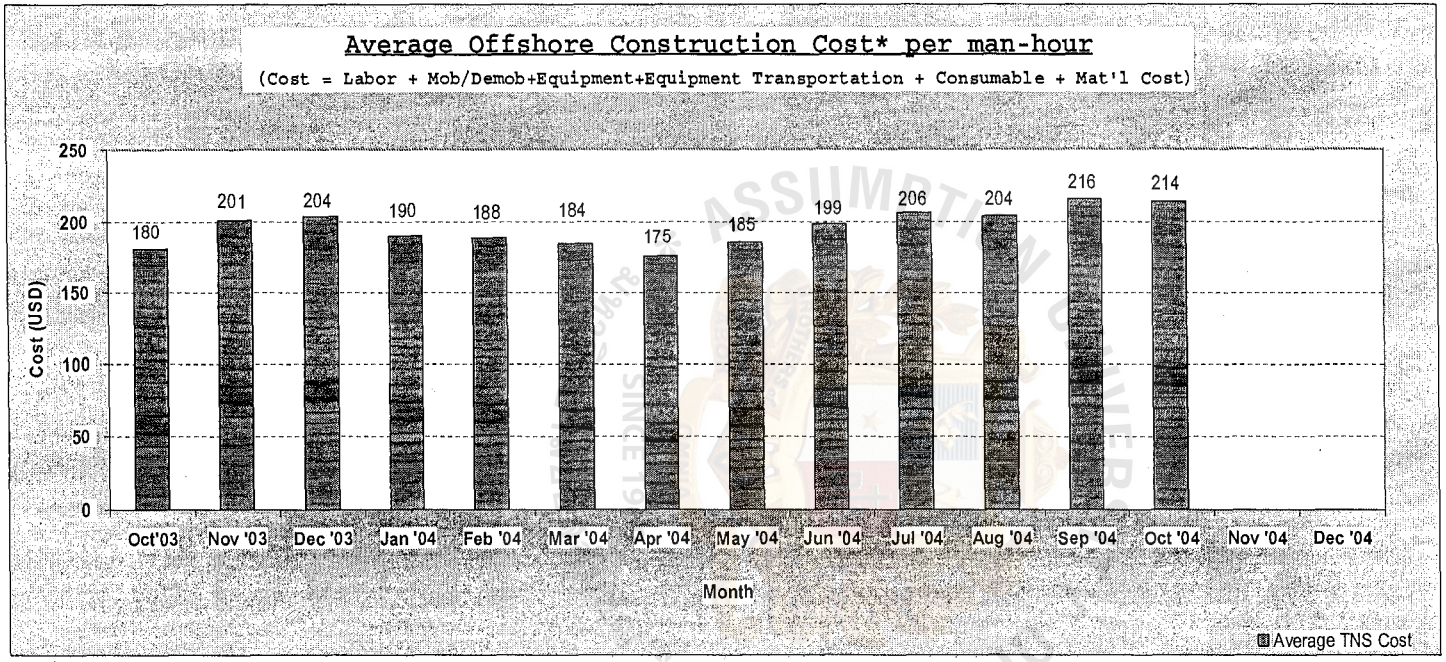


Month	2003			2004									
	Oct'03	Nov '03	Dec '03	Jan '04	Feb '04	Mar '04	Apr '04	May '04	Jun '04	Jul '04	Aug '04	Sep '04	Oct '04
: Manpower													
Average Manpower	72	65	59	55	45	48	52	58	70	73	68	81	75
% OT of Manpower	10%	7%	7%	20%	16%	13%	12%	17%	11%	10%	11%	1%	10%
: Cost (x 1000$)													
Labor including Mob & Demob	292.7	255.6	239.5	258.7	187.4	200.2	199.7	236.8	259.3	293.1	276.6	318.3	315.0
Equipment including transportation	134.1	141.0	145.8	119.3	91.4	100.5	97.6	111.2	128.0	156.5	146.2	213.1	217.5
Material	0.0	13.4	1.5	1.5	2.9	0.0	0.5	2.3	0.1	0.4	17.1	2.6	2.6
Consumable	14.5	6.2	13.2	9.4	7.3	4.7	8.1	23.6	76.0	62.4	24.9	12.8	12.8
Total Cost:	441.3	416.2	400.0	386.9	289.0	305.3	305.9	373.9	463.3	512.4	464.9	546.7	547.9
: Percentage of Cost													
Labor including Mob & Demob	66%	61%	60%	67%	65%	66%	65%	63%	56%	57%	60%	58%	57%
Equipment including transportation	30%	34%	36%	31%	32%	33%	32%	30%	28%	31%	31%	39%	40%
Material	0%	3%	0%	0%	1%	0%	0%	1%	0%	0%	4%	0%	0%
Consumable	3%	2%	3%	2%	3%	2%	3%	6%	16%	12%	5%	2%	2%
Total Cost:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Ready

Figure F.6. Summary of Monthly Offshore Service Contracts Cost & Manpower

Microsoft Access - [Average Offshore Construction Cost* per man-hour : Report]

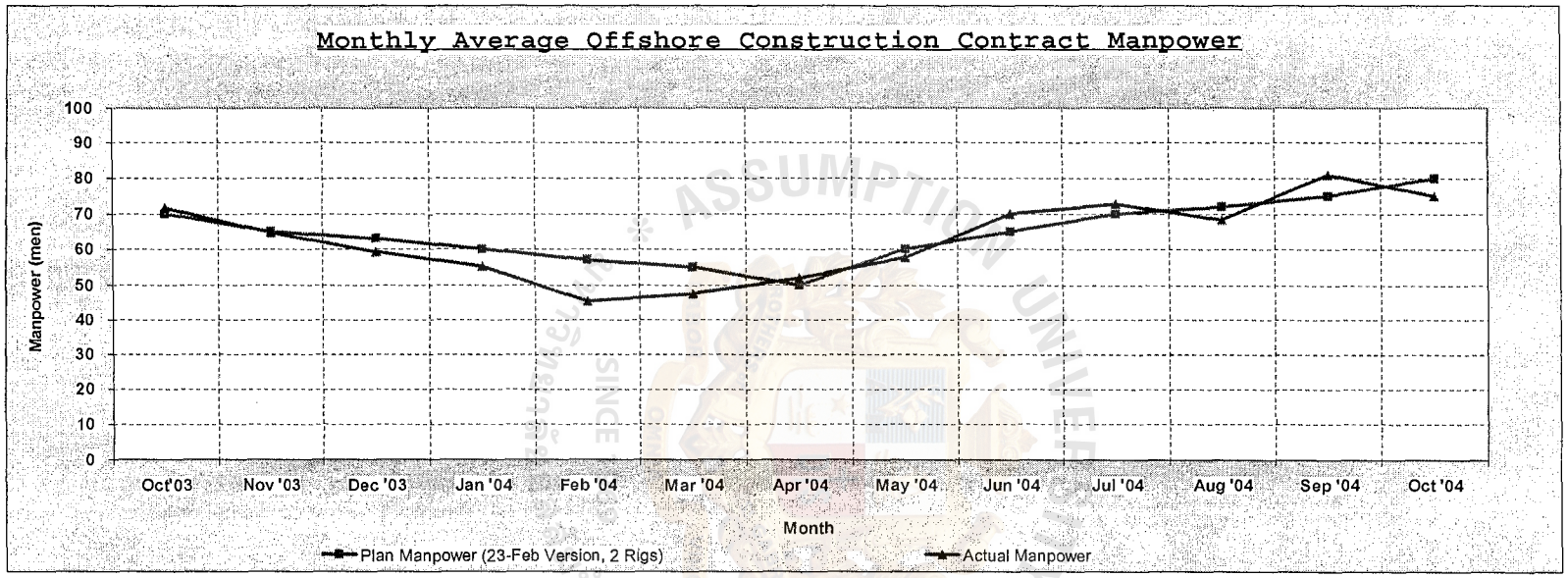


Month	2003			2004											
	Oct'03	Nov'03	Dec'03	Jan'04	Feb'04	Mar'04	Apr'04	May'04	Jun'04	Jul'04	Aug'04	Sep'04	Oct'04	Nov'04	Dec'04
Average TNS Cost	180	201	204	190	188	184	175	185	199	206	204	216	214		

Ready

Figure F.7. Average Offshore Construction Cost* per man-hour.

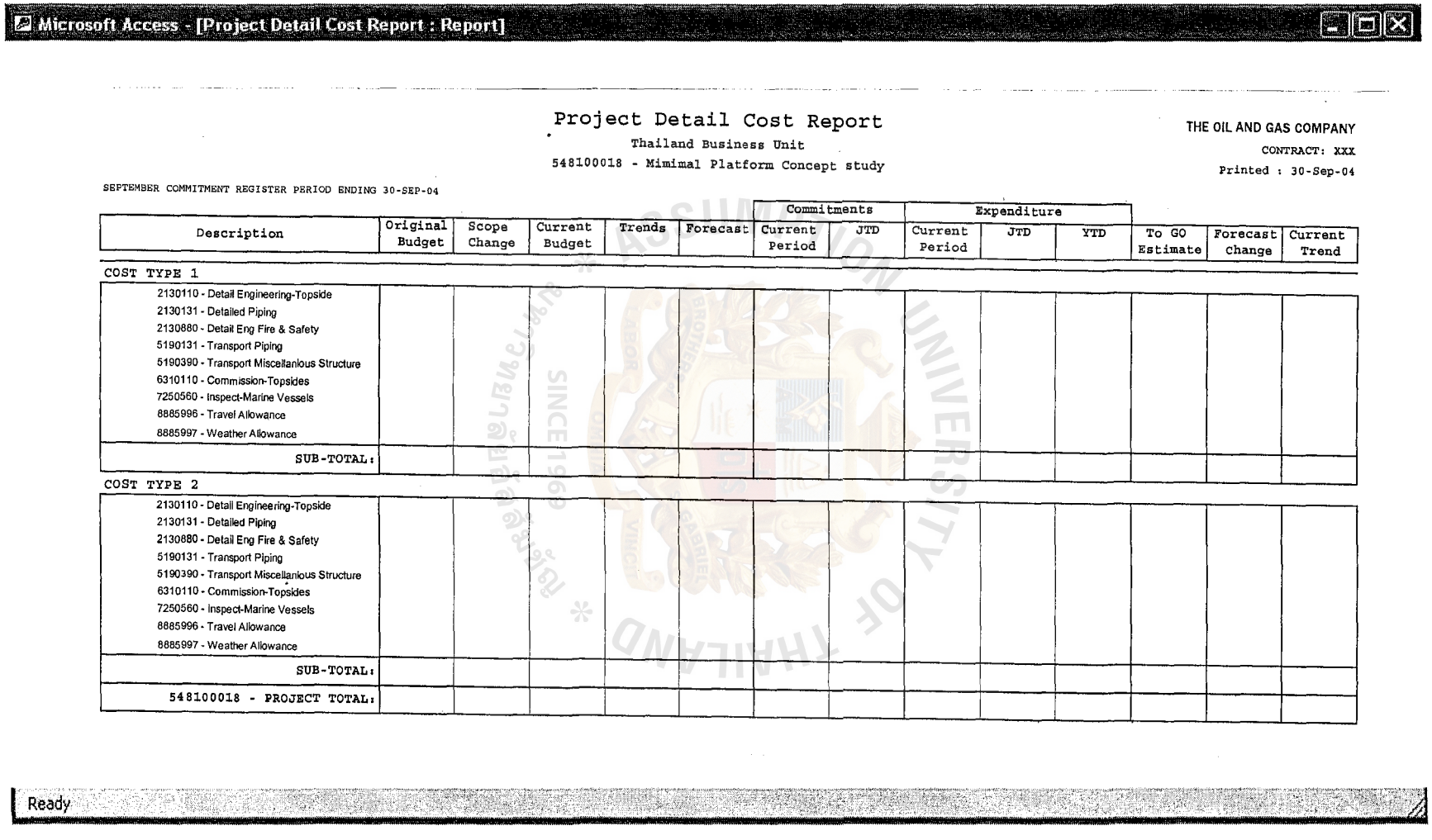
Microsoft Access - [Monthly Average Offshore Construction Contract Manpower : Report]



Month	2003			2004									
	Oct '03	Nov '03	Dec '03	Jan '04	Feb '04	Mar '04	Apr '04	May '04	Jun '04	Jul '04	Aug '04	Sep '04	Oct '04
Manpower													
Plan Manpower (23-Feb Version, 2 Rigs)	70.0	65.0	63.0	60	57	55	50	60	65	70	72	75	80
Actual Manpower	71.6	64.5	59.0	55.1	45.4	47.5	52.0	57.7	70.0	72.9	68.3	81.0	75.0
Varience													
Plan - Actual	(1.6)	0.5	4.0	4.9	11.6	7.5	(2.0)	2.3	(5.0)	(2.9)	3.7	(6.0)	5.0

Ready

Figure F.8. Monthly Average Offshore Construction Contract Manpower.


Microsoft Access - [Project Detail Cost Report : Report]

Project Detail Cost Report

Thailand Business Unit

548100018 - Mimimal Platform Concept study

THE OIL AND GAS COMPANY

CONTRACT: XXX

Printed : 30-Sep-04

SEPTEMBER COMMITMENT REGISTER PERIOD ENDING 30-SEP-04

Description	Original Budget	Scope Change	Current Budget	Trends	Forecast	Commitments		Expenditure			To GO Estimate	Forecast Change	Current Trend
						Current Period	JTD	Current Period	JTD	YTD			
COST TYPE 1													
2130110 - Detail Engineering-Topside													
2130131 - Detailed Piping													
2130880 - Detail Eng Fire & Safety													
5190131 - Transport Piping													
5190390 - Transport Miscellanious Structure													
6310110 - Commission-Topsides													
7250560 - Inspect-Marine Vessels													
8885996 - Travel Allowance													
8885997 - Weather Allowance													
SUB-TOTAL:													
COST TYPE 2													
2130110 - Detail Engineering-Topside													
2130131 - Detailed Piping													
2130880 - Detail Eng Fire & Safety													
5190131 - Transport Piping													
5190390 - Transport Miscellanious Structure													
6310110 - Commission-Topsides													
7250560 - Inspect-Marine Vessels													
8885996 - Travel Allowance													
8885997 - Weather Allowance													
SUB-TOTAL:													
548100018 - PROJECT TOTAL:													

Ready

Figure F.9. Project Detail Cost Report.

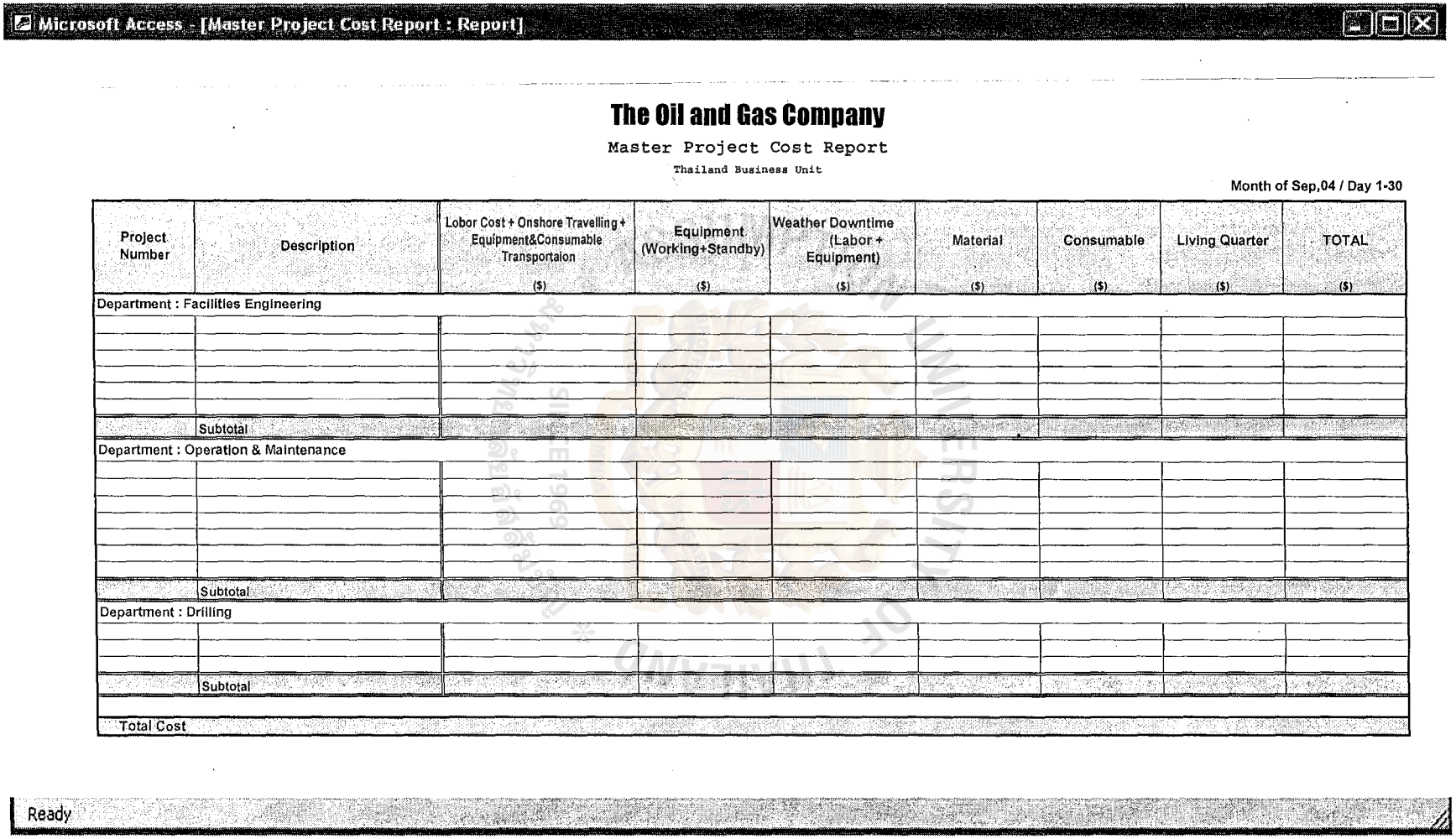


Figure F.10. Master Project Cost Report.

The Oil and Gas Company

Project Staff Report

Project Number / Description

Project Period: 01-Jan-04 to 31-Jan-04

No	Name	Title	HOUR			COST-USD		
			STD	OT	Total	STD	OT	Total
Date:								
01-Jan-04								
1	SURACHAI PANKERD	FITTER	12.00	1.00	13.00	87.50	7.30	94.80
2	BOONSONG NINKHAM	FITTER	12.00	1.00	13.00	87.50	7.30	94.80
3	SANAN KLINMOREE	WELDER GTAW	12.00	1.00	13.00	95.00	7.93	102.93
4	CHALERM MONGKOLNAM	SAFETY OFFICER	12.00	1.00	13.00	205.00	17.08	222.08
5	AOYPORN AUTSAHA	M/C SUPV	6.00	0.00	6.00	102.50	0.00	102.50
6	JARAN JANTRANUSORN	SENIOR SUPV	12.00	1.00	13.00	235.00	19.58	254.58
7	WALLOP JANTANAM	WELDER GTAW	12.00	1.00	13.00	95.00	7.93	102.93
8	PRASONG SAITONG	QA/QC TECH	12.00	1.00	13.00	142.50	11.88	154.38
9	SAKSAN UDOMSUK	GRP FITTER	12.00	1.00	13.00	87.50	7.30	94.80
10	PRASAN SURAENAT	FITTER	12.00	1.00	13.00	87.50	7.30	94.80
	TOTAL COST BY DAY		**114.00**	**9.00**	**123.00**	**49.09**	**3.73**	**52.82**
02-Jan-04								
1	SURACHAI PANKERD	FITTER	12.00	1.00	13.00	87.50	7.30	94.80
2	BOONSONG NINKHAM	FITTER	7.00	0.00	7.00	51.05	0.00	51.05
3	SANAN KLINMOREE	WELDER GTAW	12.00	1.00	13.00	95.00	7.93	102.93
4	CHALERM MONGKOLNAM	SAFETY OFFICER	12.00	1.00	13.00	205.00	17.08	222.08
5	AOYPORN AUTSAHA	M/C SUPV	12.00	1.00	13.00	205.00	17.08	222.08
6	JARAN JANTRANUSORN	SENIOR SUPV	12.00	4.00	16.00	235.00	78.33	313.33
7	WALLOP JANTANAM	WELDER GTAW	12.00	4.00	16.00	95.00	31.68	126.68
8	PRASONG SAITONG	QA/QC TECH	6.00	0.00	6.00	71.25	0.00	71.25
9	SAKSAN UDOMSUK	GRP FITTER	12.00	4.00	16.00	87.50	29.18	116.68
10	PRASAN SURAENAT	FITTER	12.00	1.00	13.00	87.50	7.30	94.80
11	APICHAI KANTHONG	FITTER	12.00	4.00	16.00	87.50	29.18	116.68
12	VICHAIN KUMMING	SCAFFOLDER	6.00	0.00	6.00	40.00	0.00	40.00
	TOTAL COST BY DAY		**127.00**	**21.00**	**148.00**	**1,969.80**	**296.70**	**2,266.50**
03-Jan-04						0	0	0
1	PICHAI WANAPITAKKUL	GRP FITTER	12.00	1.00	13.00	87.50	7.30	94.80
2	SANAN KLINMOREE	WELDER GTAW	12.00	1.00	13.00	95.00	7.93	102.93
3	CHALERM MONGKOLNAM	SAFETY OFFICER	12.00	1.00	13.00	205.00	17.08	222.08
4	AOYPORN AUTSAHA	M/C SUPV	12.00	1.00	13.00	205.00	17.08	222.08
5	JARAN JANTRANUSORN	SENIOR SUPV	12.00	2.00	14.00	235.00	39.18	274.18
6	WALLOP JANTANAM	WELDER GTAW	12.00	2.00	14.00	95.00	15.83	110.83
7	SAKSAN UDOMSUK	GRP FITTER	12.00	2.00	14.00	87.50	14.58	102.08
8	PRASAN SURAENAT	FITTER	12.00	1.00	13.00	87.50	7.30	94.80
9	APICHAI KANTHONG	FITTER	12.00	2.00	14.00	87.50	14.58	102.08
10	SOMPORN DEESOMSAK	QA/QC TECH	12.00	1.00	13.00	142.50	11.88	154.38
	TOTAL COST BY DAY		**120.00**	**14.00**	**134.00**	**1,532.50**	**169.78**	**1,702.28**
04-Jan-04						0	0	0
1	SANAN KLINMOREE	WELDER GTAW	12.00	1.00	13.00	95.00	7.93	102.93
2	CHALERM MONGKOLNAM	SAFETY OFFICER	12.00	1.00	13.00	205.00	17.08	222.08
3	AOYPORN AUTSAHA	M/C SUPV	12.00	1.00	13.00	205.00	17.08	222.08
4	JARAN JANTRANUSORN	SENIOR SUPV	12.00	2.00	14.00	235.00	39.18	274.18
5	WALLOP JANTANAM	WELDER GTAW	12.00	2.00	14.00	95.00	15.83	110.83
6	SAKSAN UDOMSUK	GRP FITTER	12.00	2.00	14.00	87.50	14.58	102.08
7	PRASAN SURAENAT	FITTER	12.00	1.00	13.00	87.50	7.30	94.80
8	APICHAI KANTHONG	FITTER	12.00	2.00	14.00	87.50	14.58	102.08
	TOTAL COST BY DAY		**96.00**	**12.00**	**108.00**	**1,240.00**	**145.40**	**1,385.40**
	TOTAL COST		**457.00**	**56.00**	**513.00**	**4,791.39**	**615.61**	**5,407.00**
	GRAND TOTAL COST BY PROJECT		**457.00**	**56.00**	**513.00**	**4,791.39**	**615.61**	**5,407.00**

Figure F.11. Project Staff Report.

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