Practical Development of Information System in Business Context: Pipes graphic visual aids and cost estimation application for Prachakul Co.

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Submitted in Partial Fulfillment
of the Course BC 4500 280 Hour Training Program
Bachelor's Degree of Business Administration
in Business Computer Program
Assumption University

March, 2003

Project Name:	Pipes Graphic Visual Aids and Cost Estimation Application , Prachakul Company Limited
Intern:	Mr. Warrapath Mongkolvirakul Mr. Puth Onla-aid Ms. Anyarat Ruangkittivilas
Advisor:	A. Jitti Thongmuang
Academic Year:	2003

The Department of Business Computer, ABAC School of Management has approved the aforementioned student's BC 4500 280-Hour Training Project, which includes complete documentation and program as a partial fulfillment of the requirements for the Bachelor's Degree of Business Administration in Business Computer

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PROJECT WRITE-UP

Prepared by

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I. INTRODUCTION

1.1 Background of the Organization

Prachakul Co.,Ltd. was established in 1993. The company is located at 7/460 Soi Vibbhavadee-Rangsit 36, Vibhavadee Road, Ladyao, Chatuchak, Bangkok 10900. Currently, the company provides a service for designing and installing a water treatment system for industrial factories. The company will participate in a government bidding projects and will start to provide a water system for agricultural sections in the future.

There are several competitors in the business but the company differentiates itself from the others by using pipes and tools from Israel. The company has a license to be only one dealer in the Southeast Asia. If customers want to buy the products, they have to contact Prachakul Co.,Ltd.

The company has about 30 workers. There are 6 departments in the company. The application to develop is under the Technician department. Following figures show the company's organization chart and department chart.

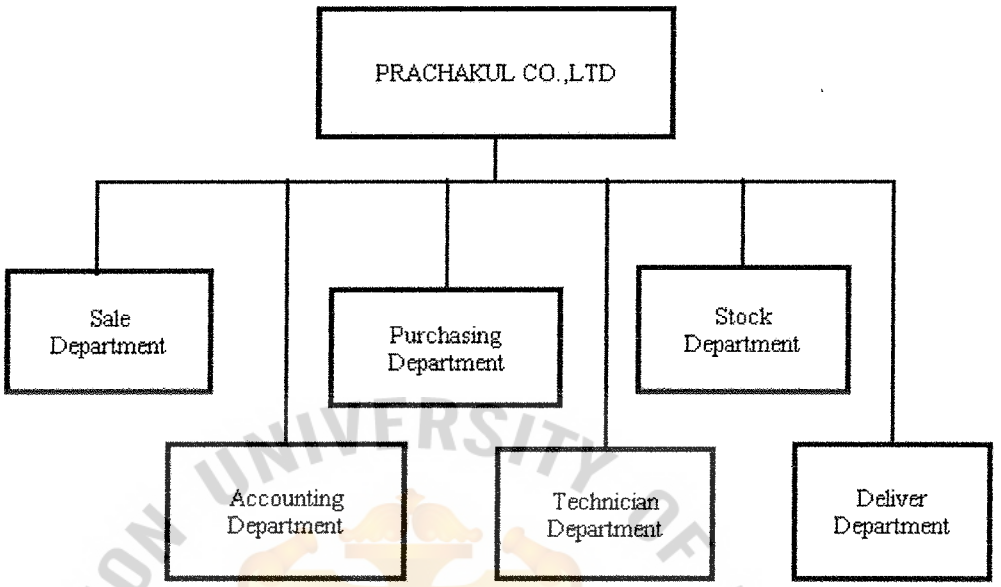

Figure 1.1 Organization Chart

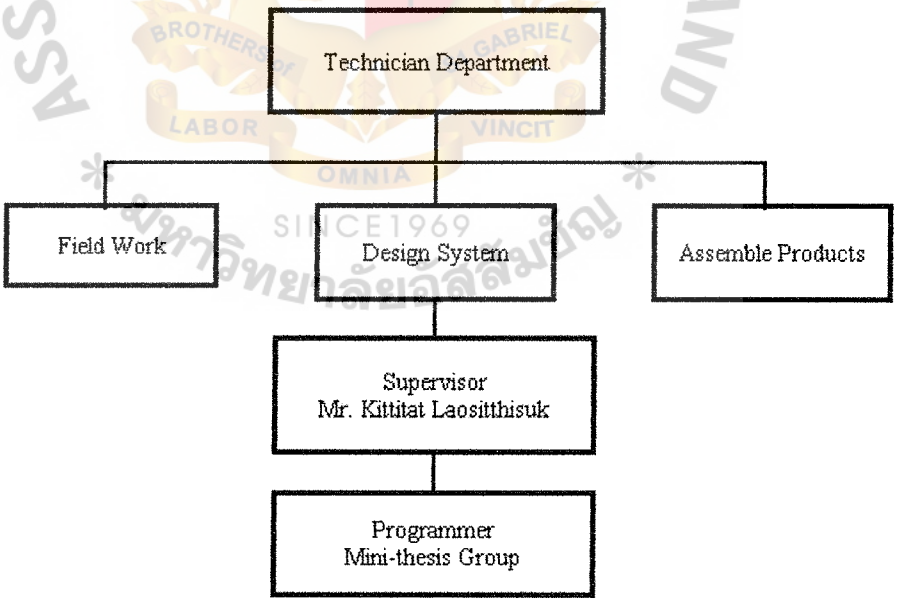

Figure 1.2 Department Chart

1.2 Objectives of the System

(1) To improve the speed of work when design, redesign and modify project system with the Pipe Graphic Visual Aids and Cost Estimation Application (GVA) .

(2) To create the result of designing system more accurate and effective, by reducing the operational time and errors.

(3) To reduce the paperwork, which saving company's cost by introducing a new Pipe Graphic Visual Aids and Cost Estimation Application (GVA) .

(4) To make systematic documentation for future reference.

1.3 Scope of the System

(1) To be able to design, redesign and modify the tool objects and properties within each project.

(2) To manipulate database, keep tracking of records as it uses for providing information, including add, update, save, search mechanism.

(3) To be able to generate reports for future reference.

1.4 Project Plan

This project starts at the beginning of December and finishes at the end of March totally 4 months. Figure 1.3 shows a project plan for Prachakul Co., Ltd

No.	Task Name	December				January				February				March			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	I. Analysis of the Existing System																
1.	Study the Existing System																
2.	Identify the Existing Problems																
3.	Existing Context Diagram																
4.	Existing Data Flow Diagram																
	II. Preliminary Investigation																
5.	Define the objectives and scope																
6.	Hardware Requirements																
7.	Software Requirements																
	III. Analysis and Design of the Proposed System																
8.	Entity-Relationship Diagram																
9.	Database Design																
10.	Data Flow Diagram																
11.	Functional Description																
12.	Interface Design																
13.	Report Design																
	IV. Implementation of the Proposed System																
14.	Coding																
15.	Testing																
16.	Documentation																

Figure 1.3 Project Plan for Prachakul Co., Ltd.

II. THE EXISTING SYSTEM

2.1 Background of Existing System

Currently, the information of each project is kept manually. The process starts when the customer contacts, then engineers in the technician department go to the work site. Engineers collect information at the work site and interview the customer for requirements of project.

After get all information and requirements, engineers come back to the office and start to design a drawing layout of the project on the paper with the designer. After the drawing layout is finished, they list tools and equipment needed to be used and estimate the total price for the project. Next step they present the completed design of the project, a blue printed, to the customer. If the customer refuses the designed system the designers must modify and redesign the system again until the customer satisfies. When customer accepts the designed system, the designers will send the list of tools and equipment to the stock department.

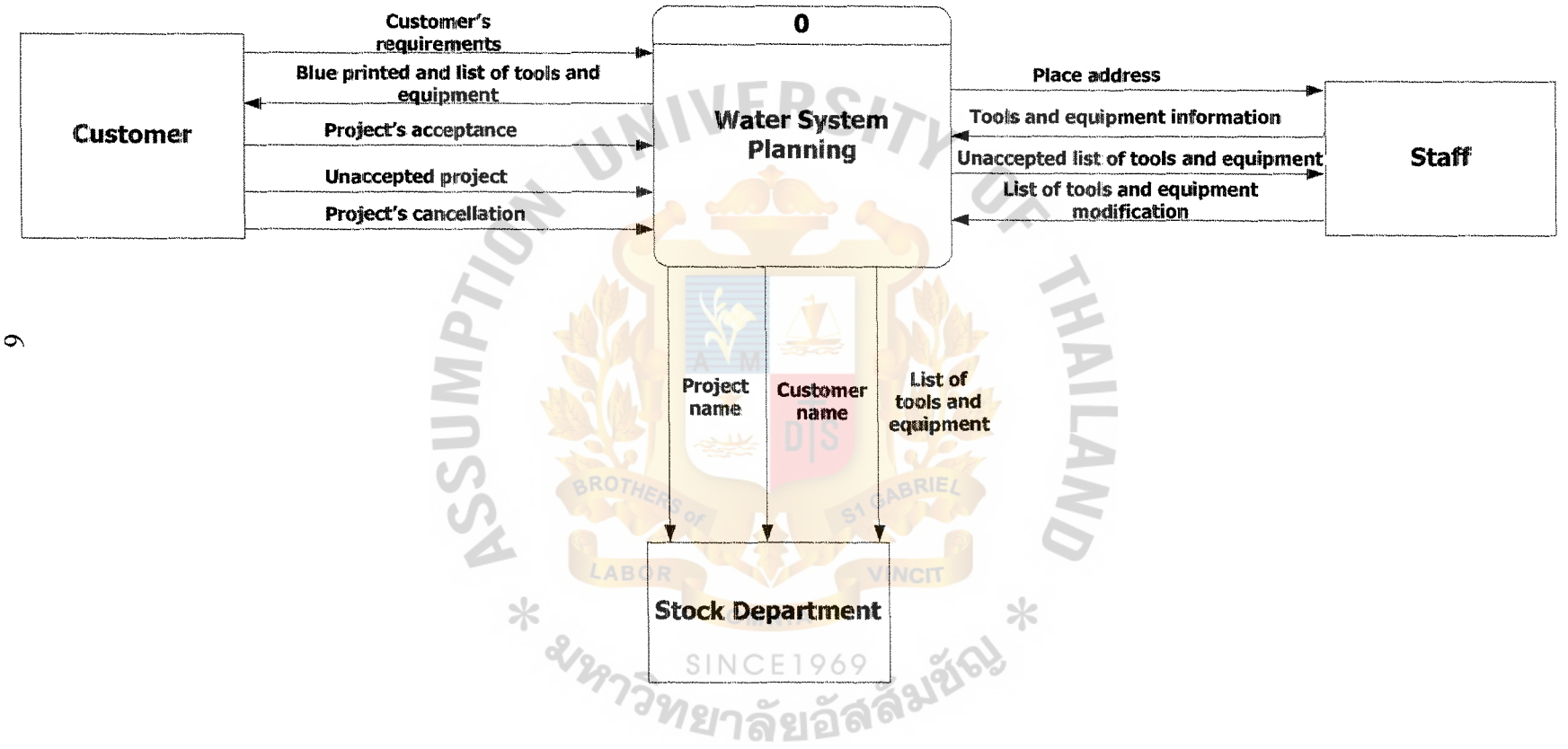

Figure 2.1 Context Diagram of Existing System

2.1 Problem Definition

(1) Dissatisfaction with the first project design.

Most of customers dissatisfy with the project designs at the first time. This problem happens because at the time when the system designers start to designs the project, customer could not participate and understanding with the designer and designs, itself.

Designers can not explain and make customer understand about the design works. There is many symbolic and technical words use in the design work. This is the reason that makes customer's dissatisfaction. And customer does not willing to participate at the designing time.

(2) Ineffective in redesign and modify a designed project.

If the designed system does not meet the customer's expectation, designers have to redesign or modify it again.At this point, designers need much time to redesign and modify the finished project because all works were done in a paper form. Modifying, erasing, and retrieving information with the paper work take long time to complete.

(3) Difficult to retrieve and maintain the information of project and tools

The company does not have database to keep these kinds of information properly. All information of project, tools, and equipment are kept alphabetically in a bulk of paper sheet. Designers have to take too long time to retrieve these information. Sometimes these parts of information have been lost or damage easily.

III. THE PROPOSED SYSTEM

3.1 System Specification

(1) Hardware Requirements

HARDWARE	SPECIFICATION
CPU	CPU AMD Duron 1.3 GHz
RAM	128 MB SDRAM
Hard disk	20.4 GB
Monitor	Color monitor
Printer	Inkjet color printer

Table 3.1 Hardware Requirements

Reason : We would recommend to use AMD duron because this kind of product is support graphic work better than other kinds. The speed of product should be at least 1 GHz in order to work effectively with the graphic work. Additionally, the price of the specification is not expensive. For Random Access Memory should be high enough to support the graphic works. Here we recommend for 128 MB SDRAM. For the space of hard disk at 20.4 GB is enough to store the work and it also available at a reasonable price in the current market. The monitor should be a color monitor. Inkjet color printer is recommended.

(2) Software Requirements

SOFTWARE	SPECIFICATION
Operating System	**Microsoft Windows 98 or higher**
Application	**1. Microsoft Access 97 or higher** **2 Microsoft Visual Basic 6 Runtime**

Table 3.2 Software Requirements

Reason : For the operating system program, at least, Window98SE is recommended because this version is the most completed version. It also supports many kinds of application. Microsoft Access97 or higher is needed to keep the record of database.

3.2 Pipe Graphic Visual Aids and Cost Estimation Application Design

(1) Concept of Pipe Graphic Visual Aids and Cost Estimation Application

1. Develop integrated working environment and tools

The main concept of the Pipe Graphic Visual Aids and Cost Estimation Application (GVA) is to make variety type of data to be able to work together effectively. The graphical is used to show the picture of tools and equipment. Then the data in the database will be set to each tool and equipment as a tool's property.

The program also allows end-user to manipulate the details of each tool's property in the database as well as the report of tools and equipment available for the project.

2. Improve design process flow

The purposes of introducing Pipe Graphic Visual Aids and Cost Estimation Application (GVA) are to reduce the paperwork as well as improving the speed of the work. This application is designed for using the most similar functions to the manual works. Additionally, by using the computer as a tool, Pipe Graphic Visual Aids and Cost Estimation Application (GVA) could complete project effectively and faster than before.

3. Use of Pipe Graphic Visual Aids and Cost Estimation Application

This software application provides the user interface with the uses of graphical form. This will help end-users to understand and know how to use the application easily and quickly.

The application also provides tools tips text for end-users to quickly understanding what the function of each control does. This could make end-users to use the Pipe Graphic Visual Aids and Cost Estimation Application (GVA) effectively.

(2) Component Builder

The Pipe Graphic Visual Aids and Cost Estimation Application (GVA) is build by Microsoft Visual Basic programming language. Some path and its function are connecting with other program such as Microsoft Access and Windows API Function.

For Pipe Graphic Visual Aids and Cost Estimation Application (GVA), it uses many variety controls to form up this application. Some of them are listed and described below.

1.) Picture Box Control: This control is used to provide a place (canvas) for picture of tools and equipment to be laid and designed.

2.) Frame Control: The control that contains other controls. The purpose is to group and classify related function together.

4.) ADO Data Control: To make Pipe Graphic Visual Aids and Cost Estimation Application (GVA) connecting with the database. This can increase the ability of Pipe Graphic Visual Aids and Cost Estimation Application (GVA) to manage and use information of tools and equipment from database.

5.) Textbox, Combo Box, Label Control: For Pipe Graphic Visual Aids and Cost Estimation Application (GVA), it uses many of these controls for printing text output and accepting text input to/from user.

6.) Command, Button Control: This control uses for accepting command from users.

The Pipe Graphic Visual Aids and Cost Estimation Application also uses the function command from windows API for manage the Bitmap data type. These commands are :

1. Bitblt function

```
Module1:
Option Explicit
Public Declare Function BitBlt Lib "gdi32" (ByVal hDestDC As Long, ByVal X, _
      ByVal nWidth As Long, ByVal nHeight As Long, ByVal hSrcDC As Long, _
      ByVal xSrc As Long, ByVal ySrc As Long, ByVal dwRop As Long) As Long

Public Sub BitbltFx (DhDC As Long, DLeft As Long, DTop As Long, _
            DWidth As Long, DHeight As Long, ScrhDC As Long, _
            ScrLeft As Long, ScrTop As Long)
      Call BitBlt(DhDC, DLeft, DTop, DWidth, DHeight, ScrhDC, ScrLeft, ScrTop,
_    vbSrcCopy)
End Sub

frmCanvas:
Private Sub ObjSetFocus()
   Tools.Move ToolsposY * 60, ToolsPosX * 60
   DhDC = Tools.hdc: ScrhDC = picCanvas.hdc
   DWidth = Tools.Width:   DHeight = Tools.Height
   DLeft = Tools.Left: DTop = Tools.Top
   BitbltFx DhDC, ScrDef, ScrDef, DWidth, DHeight, ScrhDC, ToolsposY * 60, _
        ToolsPosX * 60
   Tools.Refresh
   BitbltFx ScrhDC, DLeft, DTop, DWidth, DHeight, ScrhDC, ScrDef, ScrDef
End Sub
```

Figure 3.1 Example of rotate coding

The Pipe Graphic Visual Aids and Cost Estimation Application (GVA) also uses other components such as picture file and database file to make the program work effectively.

Picture files are used to denote the tools and equipment that use in the project design. This picture files are bitmap data type

Database file is used in Pipe Graphic Visual Aids and Cost Estimation Application (GVA). This allows user to manage and manipulate the information of tools and equipments, project designed and customer Picture files are used to provide the easy look to the user, which it can be better to simulate the designing The Pipe Graphic Visual Aids and Cost Estimation Application (GVA) allows users to update and search information from database file.

3.3 Pipe Graphic Visual Aids and Cost Estimation Application (GVA) and Database Integration Design

(1) Data Flow Diagram

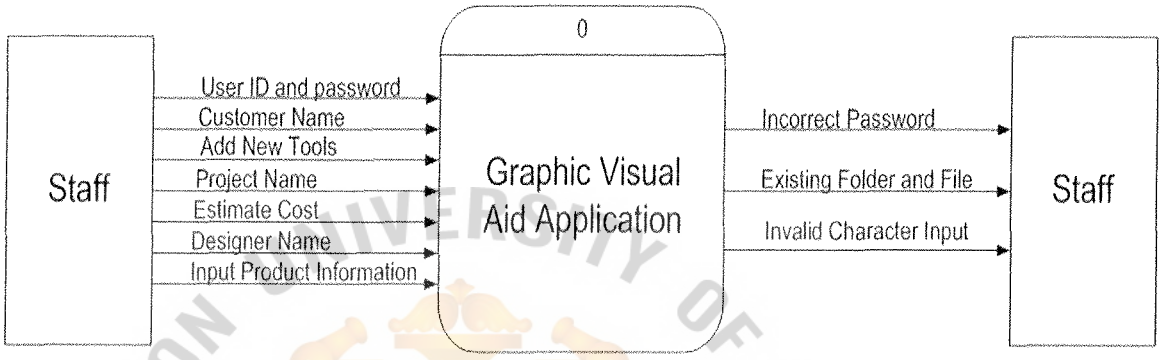

Figure 3.2. Context Diagram

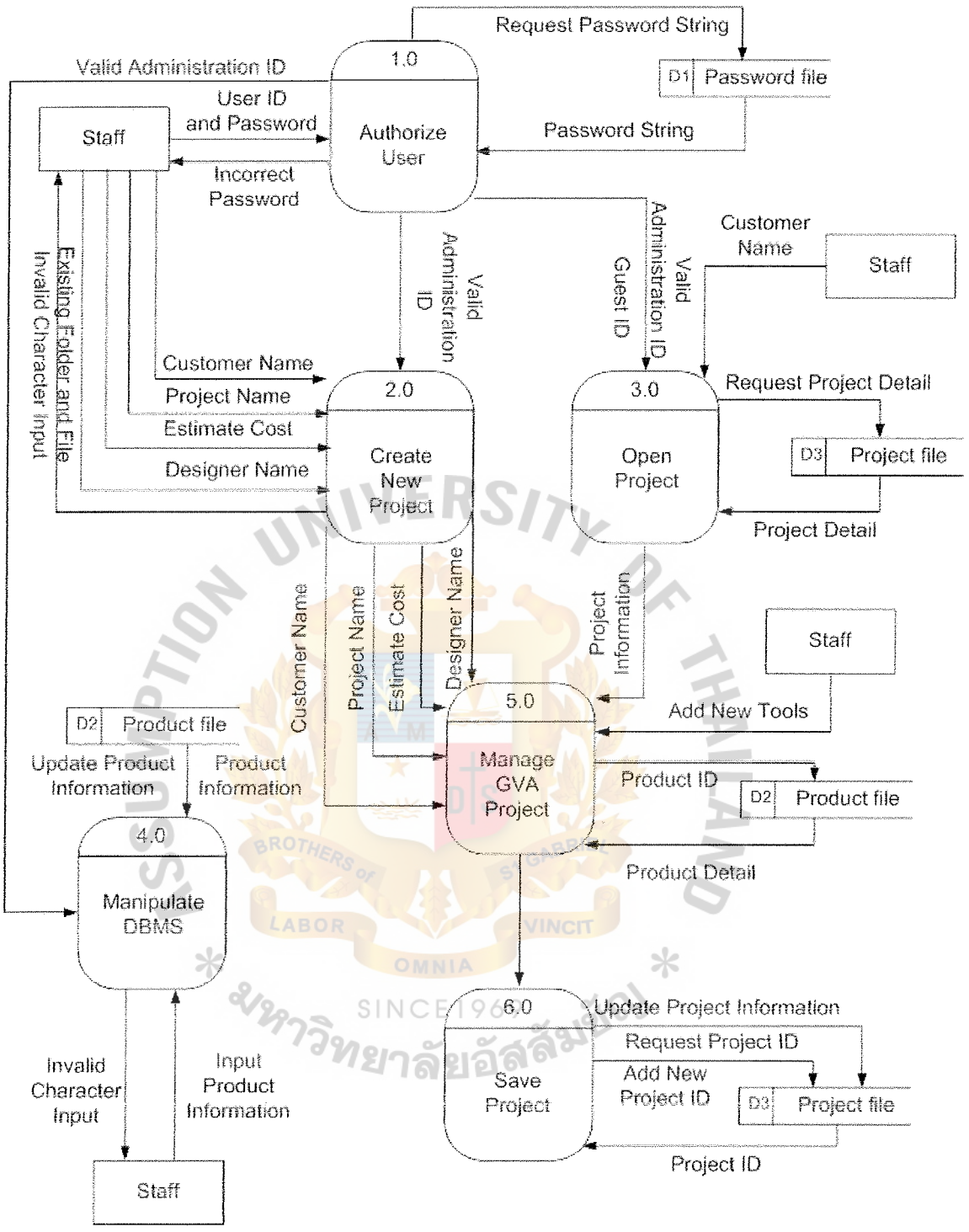

Figure 3.3 Data Flow Diagram – Level 0

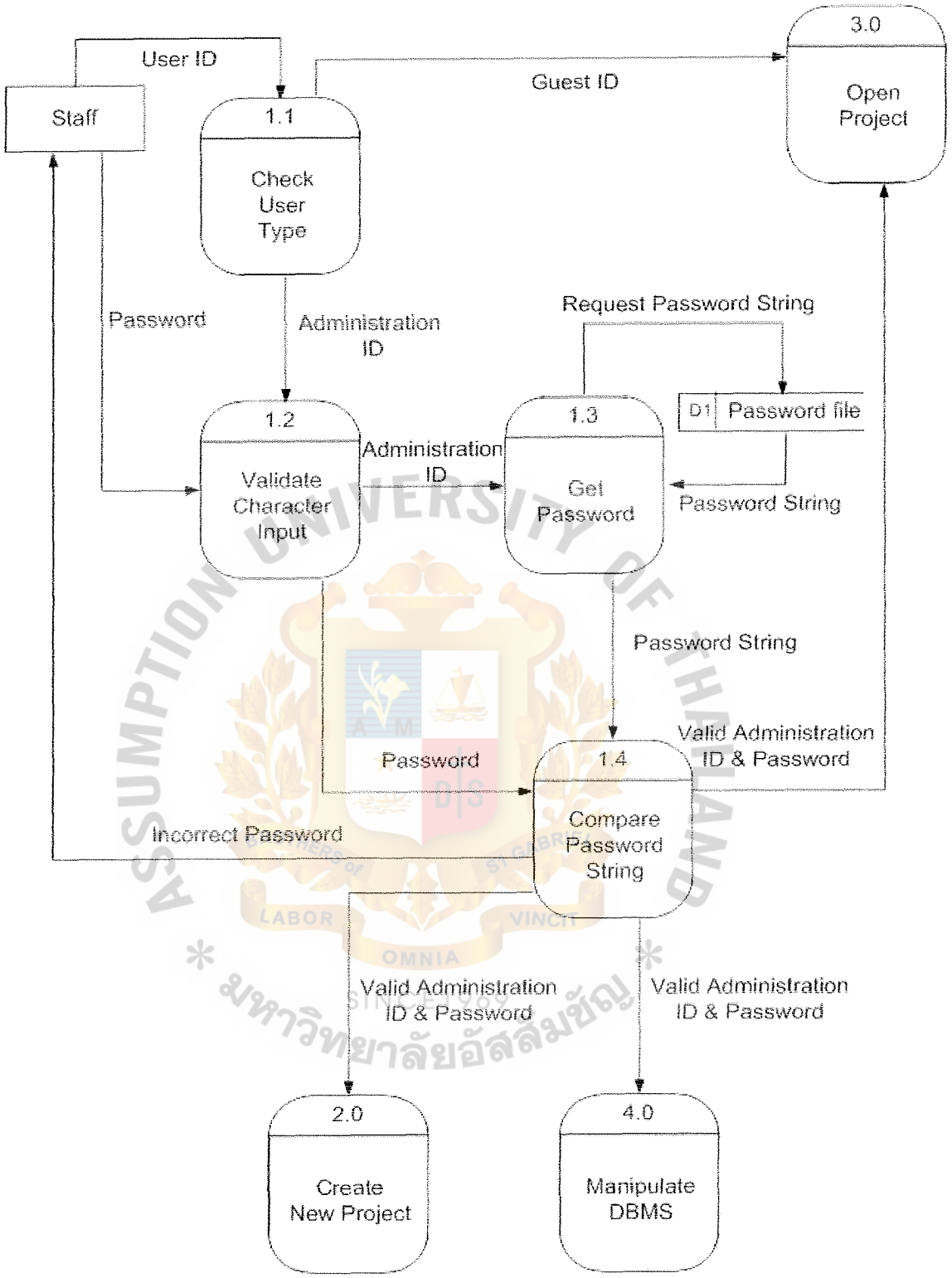

Figure 3.4 Data Flow Diagram – Level 1 for Process 1

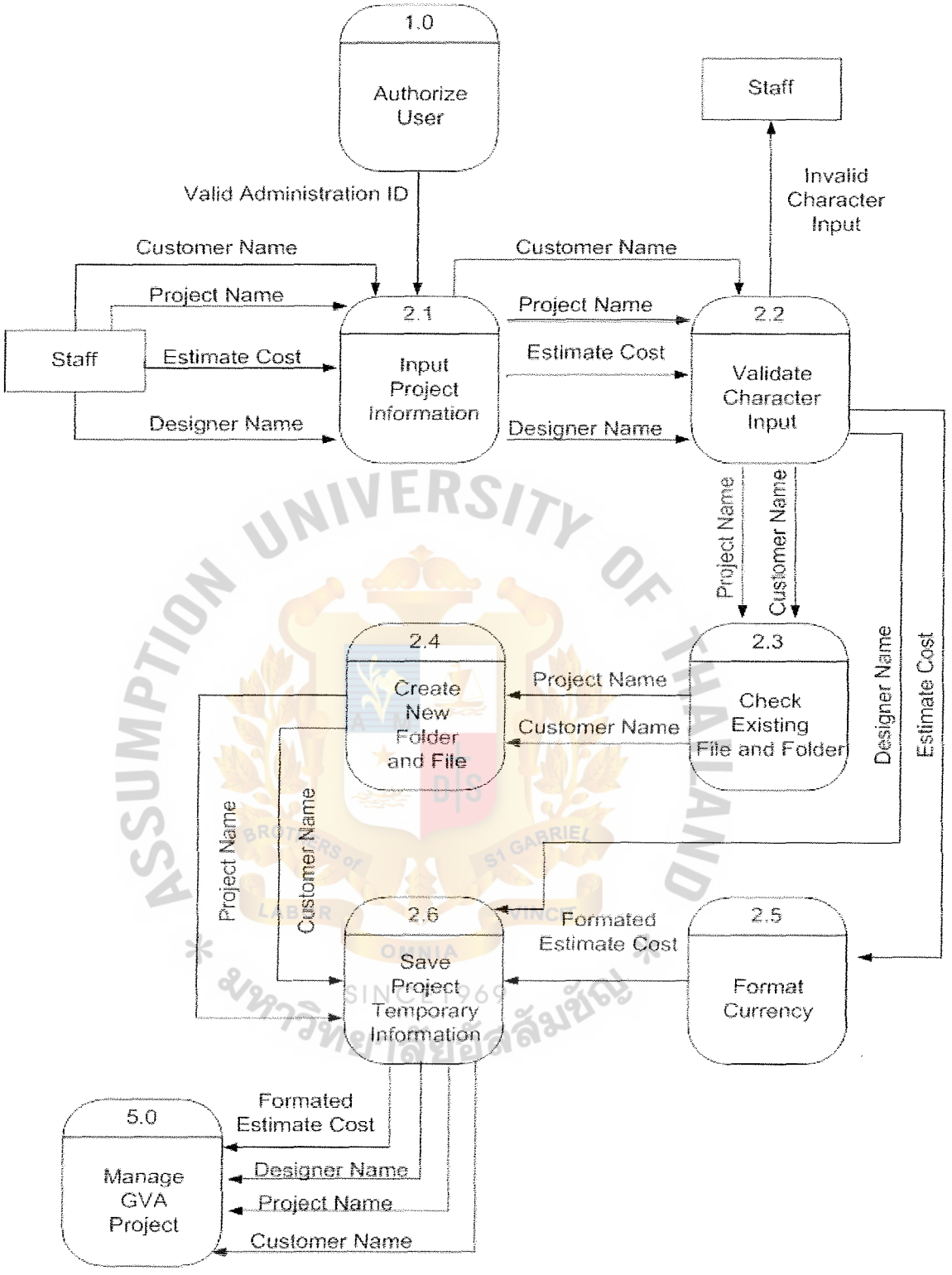

Figure 3.5 Data Flow Diagram – Level 1 for Process 2

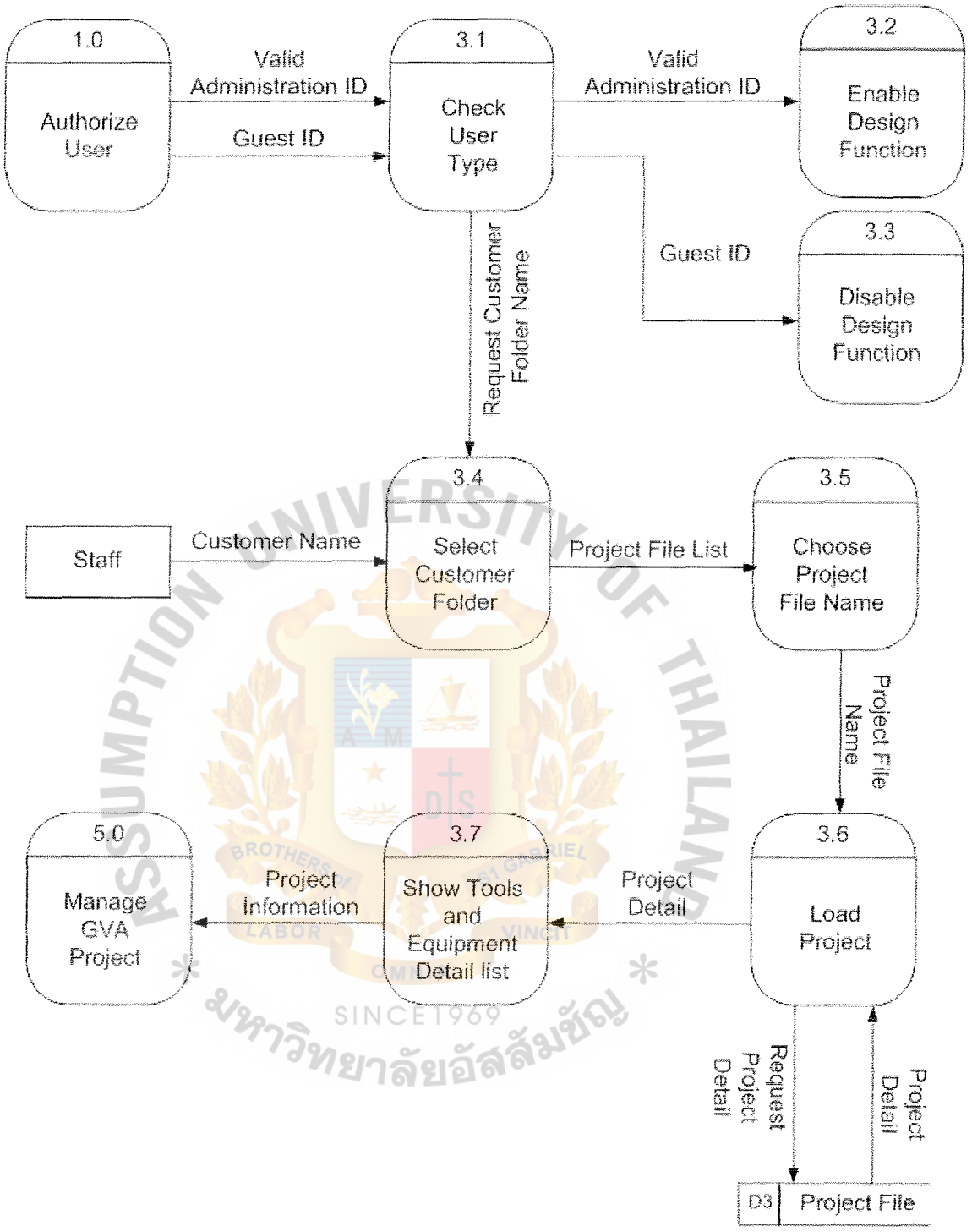

Figure 3.6 Data Flow Diagram – Level 1 for Process 3

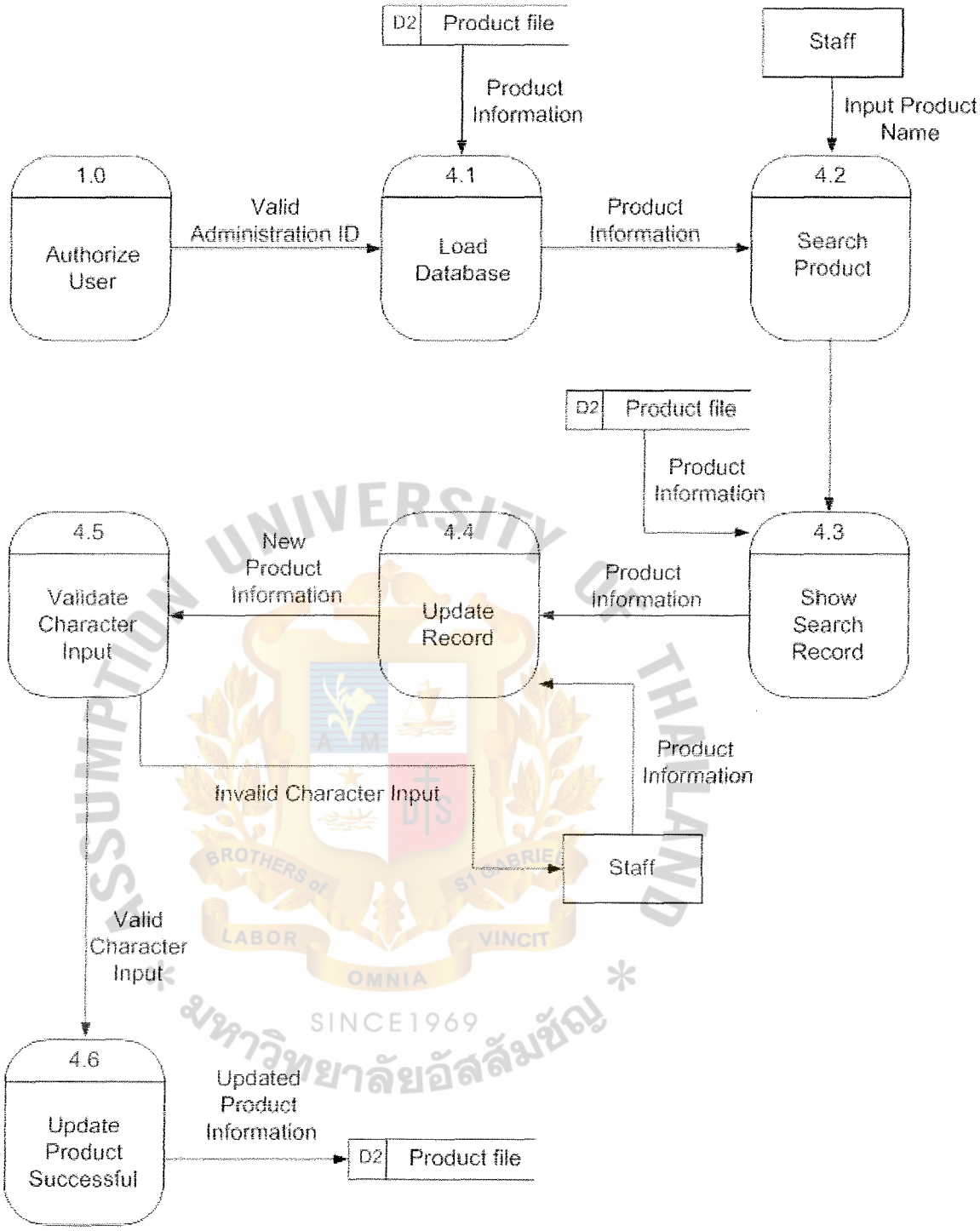

Figure 3.7 Data Flow Diagram – Level 1 for Process 4

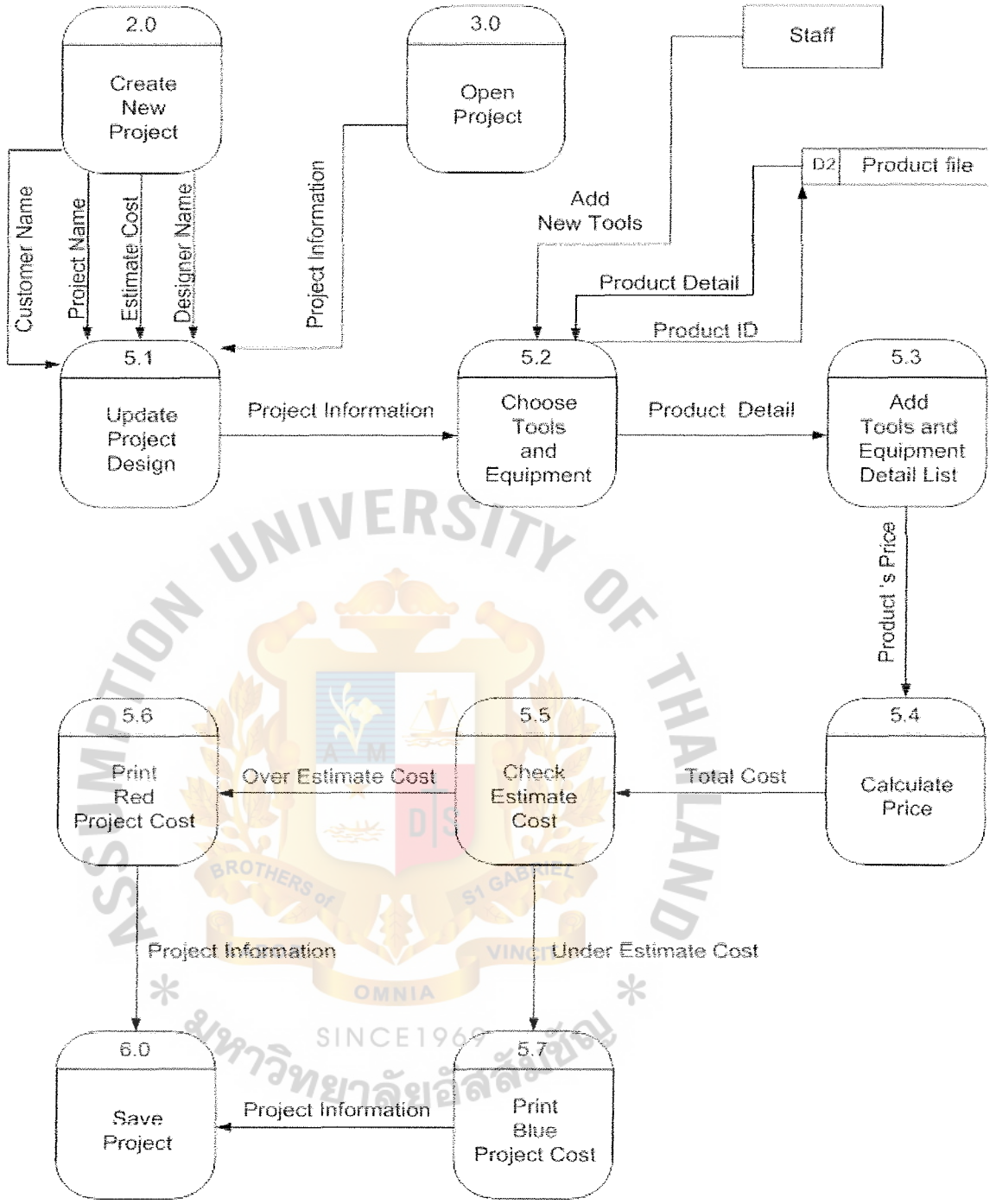

Figure 3.8 Data Flow Diagram – Level 1 for Process 5

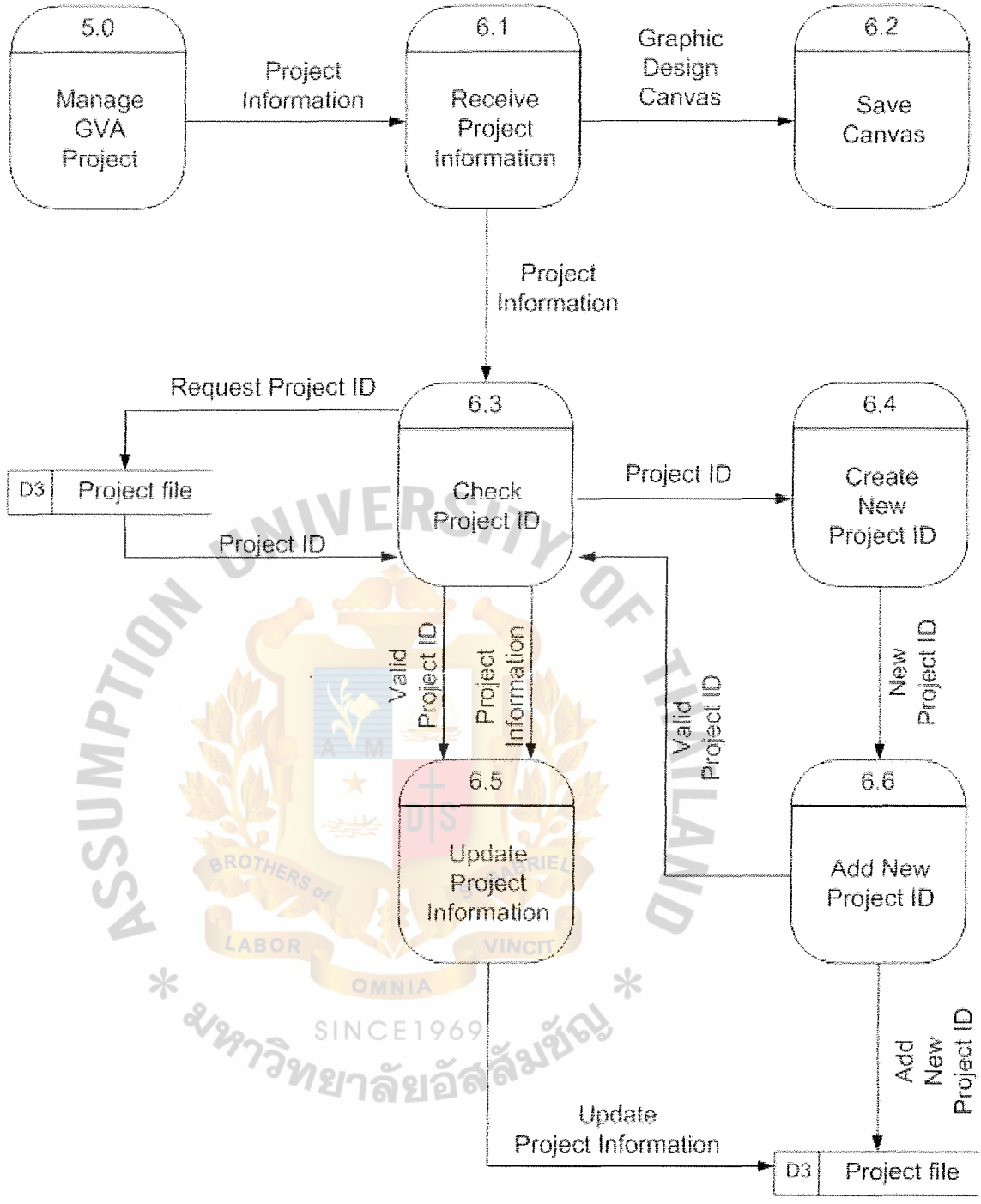

Figure 3.9 Data Flow Diagram – Level 1 for Process 6

(2) Process Specification

Process Name	Process 1.0 Authorize User
Data In:	(1) User ID and Password (2) Password String
Data Out:	(1) Valid Administration ID (2) Valid Guest ID
Process:	(1) User select login type, Administrator or Guest (2) Check password for Administrator ID
Attachment:	(1) Staff (2) Process 2.0 Create New Project (3) Process 3.0 Open Project (4) Data Store D1 Password File

Table 3.3 Process Specification for Process 1.0

Process Name	Process 1.1 Check User Type
Data In:	(1) User ID
Data Out:	(1) Administration ID (2) Guest ID
Process:	(1) Check User ID whether user log in as Administrator or Guest (2) If user log in as Administrator, user need to type in a password to be able to log in (3) If user log in as Guest, no need to type any password
Attachment:	(1) Staff (2) Process 1.2 Validate Character Input (3) Process 3.0 Open Project

Table 3.4 Process Specification for Process 1.1

Process Name	Process 1.2 Validate Character Input
Data In:	(1) Administration ID (2) Password
Data Out:	(1) Administration ID (2) Password
Process:	(1) Check character input for password require to log in as Administrator
Attachment:	(1) Staff (2) Process 1.1 Check User Type (3) Process 1.3 Get Password (4) Process 1.4 Compare Password String

Table 3.5 Process Specification for Process 1.2

Process Name	Process 1.3 Get Password
Data In:	(1) Administration ID (2) Password String
Data Out:	(1) Request Password String (2) Password String
Process:	(1) Application get the password from Password File
Attachment:	(1) Process 1.2 Validate Character Input (2) Process 1.4 Compare Password String (3) Data Store D1 Password File

Table 3.6 Process Specification for Process 1.3

Process Name	Process 1.4 Compare Password String
Data In:	(1) Password String (2) Password
Data Out:	(1) Incorrect Password (2) Valid Administration ID and Password
Process:	(1) Application compare password from Password File with the one user type in
Attachment:	(1) Staff (2) Process1.2 Valid Character Input (3) Process 1.3 Get Password (4) Process 2.0 Create New Project (5) Process 3.0 Open Project (6) Process 4.0 Manipulate DBMS

Table 3.7 Process Specification for Process 1.4

Process Name	Process 2.0 Create New Project
Data In:	(1) Customer Name (2) Project Name (3) Estimate Cost (4) Designer Name (5) Valid Administration ID
Data Out:	(1) Existing Folder and File (2) Invalid Character Input (3) Customer Name (4) Project Name (5) Estimate Cost (6) Designer Name
Process:	(1) Create new project information
Attachment:	(1) Staff (2) Process 1.0 Authorize User (3) Process 5.0 Manage GVA Project

Table 3.8 Process Specification for Process 2.0

Process Name	Process 2.1 Input Project Information
Data In:	(1) Valid Administration ID (2) Customer Name (3) Project Name (4) Estimate Cost (5) Designer Name
Data Out:	(1) Customer Name (2) Project Name (3) Estimate Cost (4) Designer Name
Process:	(1) The user set project name, customer name, estimate cost and designer name
Attachment:	1. Staff 2. Process 1.0 Authorize User 3. Process 2.2 Validate Character Input

Table 3.9 Process Specification for Process 2.1

Process Name	Process 2.2 Validate Character Input
Data In:	(1) Customer Name (2) Project Name (3) Estimate Cost (4) Designer Name
Data Out:	(1) Invalid Character Input (2) Project Name (3) Customer Name (4) Designer Name (5) Estimate Cost
Process:	(1) Application check for character input (2) User can type only text and number for customer name, project name and designer name (3) For estimate cost, user can type only number
Attachment:	(1) Staff (2) Process 2.1 Input Character Project Information (3) Process 2.3 Check Existing File and Folder (4) Process 2.4 Create New Folder and File

Table 3.10 Process Specification for Process 2.2

Process Name	Process 2.3 Checking Existing File and Folder
Data In:	(1) Project Name (2) Customer Name
Data Out:	(1) Project Name (2) Customer Name
Process:	(1) Application will check for the existing file and folder and compare whether the same customer name exist
Attachment:	(1) Process 2.2 Validate Character Input (2) Process 2.4 Create New Folder and File

Table 3.11 Process Specification for Process 2.3

Process Name	Process 2.4 Create New Folder and File
Data In:	(1) Project Name (2) Customer Name
Data Out:	(1) Project Name (2) Customer Name
Process:	(1) If customer name already exist. The new project will be put in the same folder (2) If customer name is not exist. Application will create new folder using customer name and create new project file inside
Attachment:	(1) Process 2.3 Check Existing File and Folder (2) Process 2.6 Save Project Temporal Information

Table 3.12 Process Specification for Process 2.4

Process Name	Process 2.5 Format Currency
Data In:	(1) Estimate Cost
Data Out:	(1) Formatted Estimated Cost
Process:	(1) Application format number in the estimate cost field and use currency type
Attachment:	(1) Process 2.2 Validate Character Input (2) Process 2.6 Save Project Temporal Information

Table 3.13 Process Specification for Process 2.5

Process Name	Process 2.6 Save Project Temporal Information
Data In:	(1) Designer Name (2) Formatted Estimate Cost (3) Project Name (4) Customer Name
Data Out:	(1) Customer Name (2) Project Name (3) Formatted Estimate Cost (4) Designer Name
Process:	(1) Application save these input data as a temporal text file
Attachment:	(1) Process 2.4 Create New Folder and File (2) Process 2.5 Format Currency (3) Process 5.0 Manage GVA Project

Table 3.14 Process Specification for Process 2.6

Process Name	Process 3.0 Open Project
Data In:	(1) Valid Administration ID (2) Valid Guest ID (3) Customer Name (4) Project Detail
Data Out:	(1) Project Information
Process:	(1) Retrieve data from customer folder (2) Load project information
Attachment:	(1) Staff (2) Process 2.0 Create New Project (3) Process 5.0 Manage GVA Project (4) Data Store D3 Project File

Table 3.15 Process Specification for Process 3.0

Process Name	Process 3.1 Check User Type
Data In:	(1) Valid Administration ID (2) Guest ID
Data Out:	(1) Request Customer Folder Name (2) Valid Administration Id (3) Guest ID
Process:	(1) Check user type whether it is Administrator or Guest
Attachment:	(1) Process 1.0 Authorize User (2) Process 3.2 Enable Design Function (3) Process 3.3 Disable Design Function (4) Process 3.4 Select Customer Folder

Table 3.16 Process Specification for Process 3.1

Process Name	Process 3.2 Enable Design Function
Data In:	(1) Valid Administration ID
Data Out:	
Process:	(1) User with Administrator ID will be allow to use Design function and create new project
Attachment:	(1) Process 3.1 Check User Type

Table 3.17 Process Specification for Process 3.2

Process Name	Process 3.3 Disable Design Function
Data In:	(1) Guest ID
Data Out:	
Process:	(1) User with Guest ID will not be allow to use any function except open the existing project file
Attachment:	(1) Process 3.1 Check User Type

Table 3.18 Process Specification for Process 3.3

Process Name	Process 3.4 Select Customer Folder
Data In:	(1) Customer Name
Data Out:	(1) Project File List
Process:	(1) Open customer's folder by customer's name to load project
Attachment:	(1) Staff (2) Process 3.1 Check User Type (3) Process 3.5 Choose Project File Name

Table 3.19 Process Specification for Process 3.4

Process Name	Process 3.5 Choose Project File Name
Data In:	(1) Project File List
Data Out:	(1) Project File Name
Process:	(1) Choose project file(*.pro) to open
Attachment:	(1) Process 3.4 Select Customer Folder (2) Process 3.6 Load Project

Table 3.20 Process Specification for Process 3.5

Process Name	Process 3.6 Load Project
Data In:	(1) Project File Name (2) Project Detail
Data Out:	(1) Request Project Detail
Process:	(1) Application load project detail from customer folder (2) Load project database from database file (3) Load graphic design from bitmap file
Attachment:	(1) Process 3.5 Choose Project File Name (2) Process 3.7 Show Tools and Equipment Detail List (3) Data Store D3 Project File

Table 3.21 Process Specification for Process 3.6

Process Name	Process 3.7 Show Tools and Equipment Detail List
Data In:	(1) Project Detail
Data Out:	(1) Project Information
Process:	(1) Retrieve tool and equipment of the project form Item list file in database (2) Display item list in the item use area
Attachment:	(1) Process 3.6 Load Project (2) Process 5.0 Manage GVA Project

Table 3.22 Process Specification for Process 3.7

Process Name	Process 4.0 Manipulate DBMS
Data In:	(1) Input Product Information (2) Update Product Information
Data Out:	(1) Invalid Character Input (2) Product Information
Process:	(1) Update database
Attachment:	(1) Staff (2) Data Store D2 Product File

Table 3.23 Process Specification for Process 4.0

Process Name	Process 4.1 Load Database
Data In:	(1) Valid Administration ID (2) Product Information
Data Out:	(1) Product Information
Process:	(1) Load product information from product file in database
Attachment:	(1) Process 1.0 Authorize User (2) Process 4.2 Search Product (3) Data Store D2 Product File

Table 3.24 Process Specification for Process 4.1

Process Name	Process 4.2 Search Product
Data In:	(1) Product Information (2) Input Product Name
Data Out:	(1) Product Name
Process:	(1) Get character from user (2) Compare character with the product in database
Attachment:	(1) Staff (2) Process 4.1 Load Database (3) Process 4.3 Show Search Record

Table 3.25 Process Specification for Process 4.2

Process Name	Process 4.3 Show Search Record
Data In:	(1) Product Name (2) Product information
Data Out:	(1) Product information
Process:	(1) Display records that have the same character user search for
Attachment:	(1) Process 4.2 Search Product (2) Process 4.4 Update record (3) Data Store D2 Product File

Table 3.26 Process Specification for Process 4.3

Process Name	Process 4.4 Update Record
Data In:	(1) Product information
Data Out:	(1) New Product Information
Process:	(1) Enable function for user to manipulate database
Attachment:	(1) Staff (2) Process 4.3 Show Search Record (3) Process 4.5 Validate Character Input

Table 3.27 Process Specification for Process 4.4

Process Name	Process 4.5 Validate Character Input
Data In:	(1) New Product Information
Data Out:	(1) Valid Character Input (2) Invalid Character Input
Process:	(1) Validate character input for update product information (2) If user type invalid character, product can not be updated
Attachment:	(1) Staff (2) Process 4.6 Update Product Successful

Table 3.28 Process Specification for Process 4.5

Process Name	Process 4.6 Update Product Successful
Data In:	(1) Valid Character Input
Data Out:	(1) Update Product Information
Process:	(1) If character the user type is compatible, the update successful. New product information save to product file.
Attachment:	(1) Process 4.5 Validate Character Input (2) Data Store D2 Product File

Table 3.29 Process Specification for Process 4.6

Process Name	Process 5.0 Manage GVA Project
Data In:	(1) Add New Tools (2) Product Information (3) Customer Name (4) Project Name (5) Estimate Cost (6) Designer Name (7) Product Detail
Data Out:	(1) Product ID (2) Project Information
Process:	(1) Drag and drop picture to create project design
Attachment:	(1) Staff (2) Process 2.0 Create New Project (3) Process 3.0 Open Project (4) Process 6.0 Save Project (5) Data Store D2 Product File

Table 3.30 Process Specification for Process 5.0

Process Name	Process 5.1 Update Project Design
Data In:	(1) Customer Name (2) Project Name (3) Estimate Cost (4) Designer Name (5) Project Information
Data Out:	(1) Project Information
Process:	(1) Save project information to a temporary text file
Attachment:	(1) Staff (2) Process 2.0 Create New Project (3) Process 3.0 Open Project (4) Process 5.2 Choose Tool and Equipment

Table 3.31 Process Specification for Process 5.1

Process Name	Process 5.2 Choose Tool and Equipment
Data In:	(1) Project Information (2) Add New Tools (3) Product Detail
Data Out:	(1) Product Detail (2) Product ID
Process:	(1) User drag and drop product from tool box in to the canvas area
Attachment:	(1) Staff (2) Process 5.1 Update Project Design (3) Process 5.3 Add Tools and Equipment Detail List (4) Data Store D2 Product File

Table 3.32 Process Specification for Process 5.2

Process Name	Process 5.3 Add Tools and Equipment Detail List
Data In:	(1) Product Detail
Data Out:	(1) Product Price
Process:	(1) Product detail of item user drag in to canvas will be shown on the Item list
Attachment:	(1) Process 5.2 Choose Tool and Equipment (2) Process 5.4 Calculate Price

Table 3.33 Process Specification for Process 5.3

Process Name	Process 5.4 Calculate Price
Data In:	(1) Product Price
Data Out:	(1) Total Cost
Process:	(1) Total cost will be calculate form item list
Attachment:	(1) Process 5.3 Add Tools and Equipment Detail List (2) Process 5.5 Check Estimate Cost

Table 3.34 Process Specification for Process 5.4

Process Name	Process 5.5 Check Estimate Cost
Data In:	(1) Total Cost
Data Out:	(1) Over Estimate Cost (2) Under Estimate Cost
Process:	(1) Application compare value from Estimate cost with Total cost
Attachment:	(1) Process 5.4 Calculate Price (2) Process 5.6 Print Red Project Cost (3) Process 5.7 Print Blue Project Cost

Table 3.35 Process Specification for Process 5.5

Process Name	Process 5.6 Print Red Project Cost
Data In:	(1) Over Estimate Cost
Data Out:	(1) Project Information
Process:	(1) Estimate cost lower thand Total Cost (2) Pop up warning, show cost different (3) Total cost change from blue color to red color
Attachment:	(1) Process 5.5 Check Estimate Cost (2) Process 6.0 Save Project

Table 3.36 Process Specification for Process 5.6

Process Name	Process 5.7 Print Blue Project Cost
Data In:	(1) Under Estimate Cost
Data Out:	(1) Project Information
Process:	(1) Show Blue color Total Cost
Attachment:	(1) Process 5.5 Check Estimate Cost (2). Process 6.0 Save Project

Table 3.37 Process Specification for Process 5.7

Process Name	Process 6.0 Save Project
Data In:	(1) Project ID
Data Out:	(1) Update Project Information (2) Request Project Id (3) Add New Project ID
Process:	(1) Convert Data from text file and save it in to database
Attachment:	(1) Process 5.0 Manage GVA Project (2) Data Store D3 Project File

Table 3.38 Process Specification for Process 6.0

Process Name	Process 6.1 Receive Project Information
Data In:	(1) Project Information
Data Out:	(1) Project Information (2) Graphic Design Canvas
Process:	(1) Receive project in formation from text file
Attachment:	(1) Process 5.0 Manage GVA Project (2) Process 6.2 Save Canvas (3) Process 6.3 Check Project ID

Table 3.39 Process Specification for Process 6.1

Process Name	Process 6.2 Save Canvas
Data In:	(1) Graphic Design Canvas
Data Out:	
Process:	(1) Get graphic design from canvas area
Attachment:	(1) Process 6.1 Receive Project Information

Table 3.40 Process Specification for Process 6.2

Process Name	Process 6.3 Check Project ID
Data In:	(1) Project Information (2) Project ID (3) Valid Project ID
Data Out:	(1) Request Project ID (2) Project ID (3) Project Information
Process:	(1) Check project ID whether it is new one or the ID is existing in database
Attachment:	(1) Process 6.1 Receive Project Information (2) Process 6.4 Create New Project ID (3) Process 6.5 Update Project Information (4) Data Store D3 Project File

Table 3.41 Process Specification for Process 6.3

Process Name	Process 6.4 Create New Project ID
Data In:	(1) Project ID
Data Out:	(1) New Project ID
Process:	(1) If no project ID. Then new ID will be created.
Attachment:	(1) Process 6.3 Check Project ID (2) Process 6.6 Add New Project ID

Table 3.42 Process Specification for Process 6.4

Process Name	Process 6.5 Update Project Information
Data In:	(1)Valid Project ID (2) Project Information
Data Out:	(1) Update Project Information
Process:	(1) Convert project information from text file and save it in to database format
Attachment:	(1) Process 6.3 Check Project ID (2) Data Store D3 Project File

Table 3.43 Process Specification for Process 6.5

Process Name	Process 6.6 Add New Project ID
Data In:	(1) New Project Id
Data Out:	(1) Add New Project ID (2) Valid Project ID
Process:	(1) Add new project ID to the project file in database
Attachment:	(1) Process 6.4 Create New Project ID (2) Data Store D3 Project File

Table 3.44 Process Specification for Process 6.6

(3) Entity-Relationship Diagram

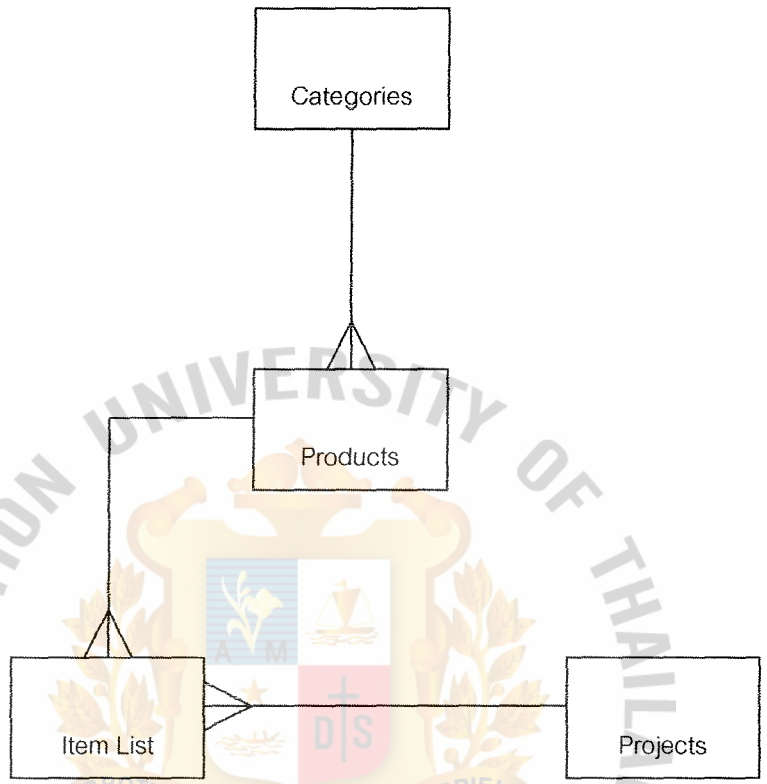

Figure 3.10 Entity-Relationship Diagram

(4) Database Design

This system stores the data in 9 tables as follows.

Table Name	Purpose
Categories	It consists of Category ID and Category Name (Refer to Appendix A-1)
Product	Recording Product Information. It consists of Product ID, Product Model, Product Size, Unit Price (Refer to Appendix A-2)
Item List	It consists of Name, Quantity and Cost (Refer to Appendix A-3)
Project	It consists of Project ID, Project Name, Estimate Cost, Total cost and Project Designer (Refer to Appendix A-4)

Table 3.45 Database Design

(5) Interface Design

The purpose of Interface design is first to allow the staffs to access the system in the way that is congruent with his individual need. Second, to increase speed of the data entry and reduce the errors. Third, to provide the appropriate feedback to staff from the system. Last, to ergonomically sound principal of design for user interfaces and workspaces.

Interface Name	**Purpose**
1. Main Menu	This interface will begin with the small window to let the staff insert the name of project, which the staff can create new name for new project or type old project name for opening old project. And then choose the size of that project. In each time the staff chooses size, it has the description of that size happen in the message box. After click Ok button, The toolbar will happen to serve the staff for planning design. (Refer to Appendix B-1)
2. GVA Form	This interface will allow the staff to design the project. The staff must choose the tools, size and purpose. The total project cost will be shown after designing the project. (Refer to Appendix B-2)

3. Database Form	This interface will shows the item information. It show Item Id, Item name, Kind, size, spec, and price. This page let the staffs add, delete, and update the information of item. (Refer to Appendix B-3)

Table 3.46 Interface Design

(6) Report Design

According from the program, there will be only one reports.

Report Name	**Purpose**
Project Summary Report	To display and print project information such as name, scopes, purpose and total price and items used. (Refer to Appendix C-1)

Table 3.47 Report Design

IV. SYSTEM IMPLEMENTATION

4.1 Overview of the System Implementation

Since we know that all works of the current system are working manually, the best way to implement the new system is to use Parallel Conversion to convert the current system to a new system.

As working with both systems parallel, it might cause additional tasks for worker. However, Parallel conversion can ensure that there will be a complete result to satisfy customers, which it is done by current system.

So far workers in Prachakul Co.,Ltd. are working manually. There would be no doubt that they work best with the current system which, in turn, the result of work done by the old system could be a benchmark for comparing with the result from a new system. The new system must be modified if there are any error or mistake. The modification will be continuously implemented until the result is same or better than the old system.

Finally, when the new system produces the result at the same quality or better than the result produced by the old system, the new system will be allowed to replace the old system.

4.2 Test Plan

The testing methodology that is applied for testing Pipe Graphic Visual Aids and Cost Estimation Application (GVA) software is Top-Down approach.

We use this approach because we have a main system, which link with 2 subsystems. By using Top-down approach, it guides us for early errors occur in the main system, which it allows us for an earlier change. After finish testing with the main system then we continue to test other 2 subsystems for ensuring that they can work effectively and accuracy. The accuracy of work in subsystems will give better performance and better outcome in the main system.

The process of testing Pipe Graphic Visual Aids and Cost Estimation Application (GVA) software starts with "Test Data". We try to input all invalid data and all possible data that could make any error to the application e.g. max value and min value, special character, etc. After "Test Data" is done, we can find out parts of the program that makes errors. Then we change the code to reduce those errors. After modifying the code, input box in the application do not accept special characters.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The Pipes Graphic Visual Aids and Cost Estimation Application (GVA) program has been developed for purpose of improving the process of working in designing and planning in water treatment system, air cooling system and agriculture system.

With the uses of graphic user interface technology in this software application, The Pipes Graphic Visual Aids and Cost Estimation Application (GVA) provides the end users with the graphical buttons and provide for a Tool Tips Text to explain function of each controls.

Moreover, the reduction of the time when the end users have to redesign or modify the project can be greatly reduced. The Pipes Graphic Visual Aids and Cost Estimation Application (GVA) provides the end users for quickly add, delete, rotate tools at the design time. The Pipe Graphic Visual Aids and Cost Estimation Application (GVA) also provides many functions such as add, update and save to manipulate the database as well.

5.2 Recommendations

Because of this is a prototype application program the Pipes Graphic Visual Aids and Cost Estimation Application (GVA) still need to improve the graphic that is using in the designing project as well as providing more tools to use in the systems.

For this demo version, the end users might have difficulties in working with graphical tools for designing each system. The function of drag and drop pictures do not work well when users try to drag and drop those pictures.

For best solution, we would recommend the end-users to point the mouse at the top-left of the picture in order to drag and drop to the desired point.

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APPENDIX A
DATABASE DESIGN

No.	Field Name	Field Type	Index	Unique	Nullable	Validity Check	Key Type	FK Referenced Table
1	Category ID	char (10)	Y	Y		9	PK	
2	Category Name	varchar (15)						

Table A-1 Categories Table

No.	Field Name	Field Type	Index	Unique	Nullable	Validity Check	Key Type	FK Referenced Table
1	Product ID	char (6)	Y	Y		X-9999	PK	
2	Product Model	varchar (20)						
3	Product Name	varchar (50)						
4	Product Size	varchar (10)			Y			
5	Category ID	varchar (10)	Y				FK	Category Table
6	Unit Price	Currency (10)				#,###,###.00		

Table A-2 Products Table

No.	Field Name	Field Type	Index	Unique	Nullable	Validity Check	Key Type	FK Referenced Table
1	Project ID	char (6)	Y	Y		J-9999	FK	Project Table
2	Product ID	char (6)	Y	Y		X-9999	FK	Product Table
3	Name	varchar (50)						
4	Quantity	Number (10)						
5	Cost	Currency (10)				#,###,###.00		

Table A-3 Item List Table

No.	Field Name	Field Type	Index	Unique	Nullable	Validity Check	Key Type	FK Referenced Table
1	Project ID	char (6)	Y	Y			PK	
2	Project Name	varchar (50)						
3	Estimate Cost	Currency (10)				#,###,###.00		
4	Total Cost	Currency (10)				#,###,###.00		
5	Project Designer	varvhar (50)						

Table A-4 Project Table

APPENDIX B
INTERFACE DESIGN

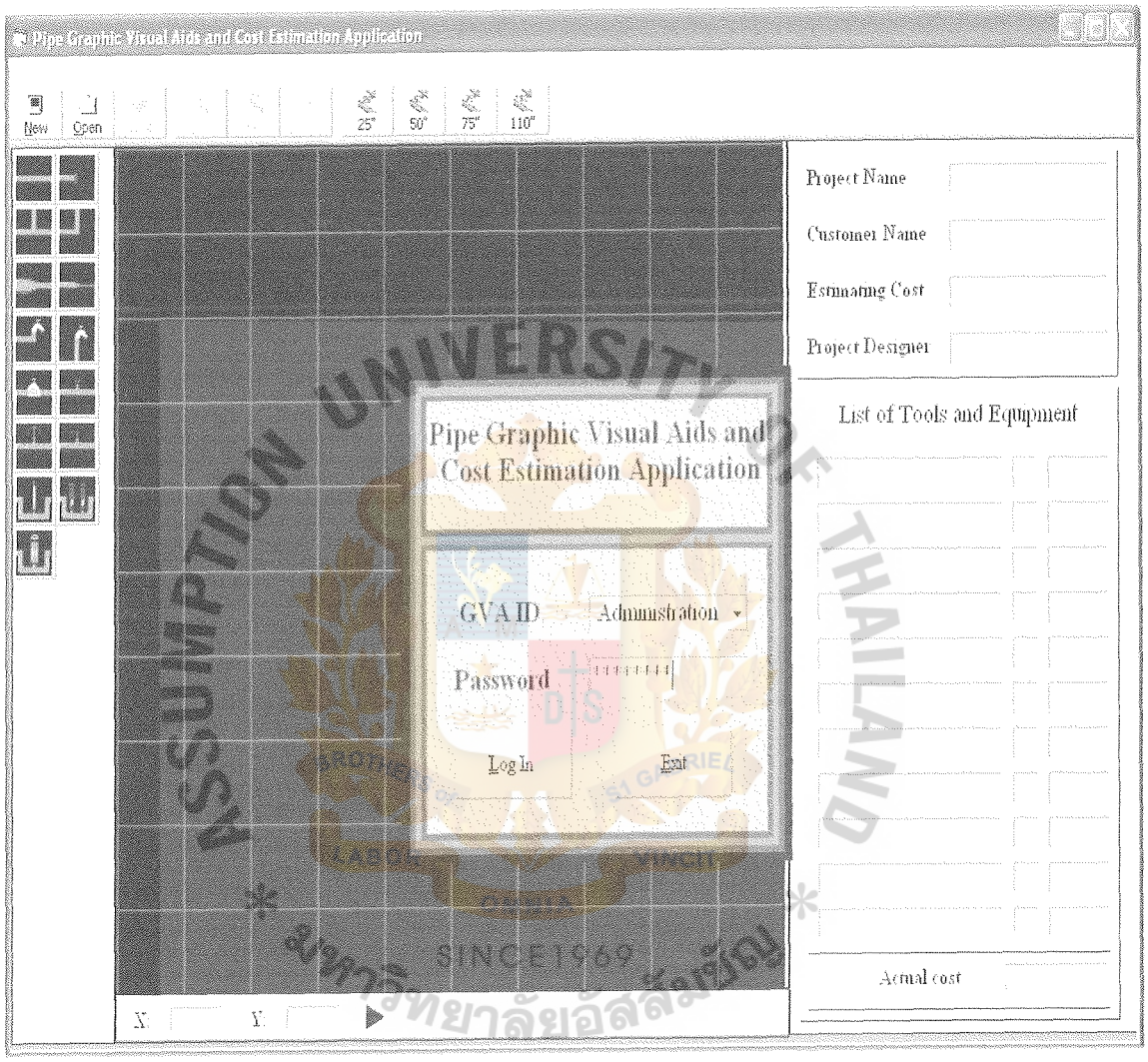

Figure B-1 Login Administration

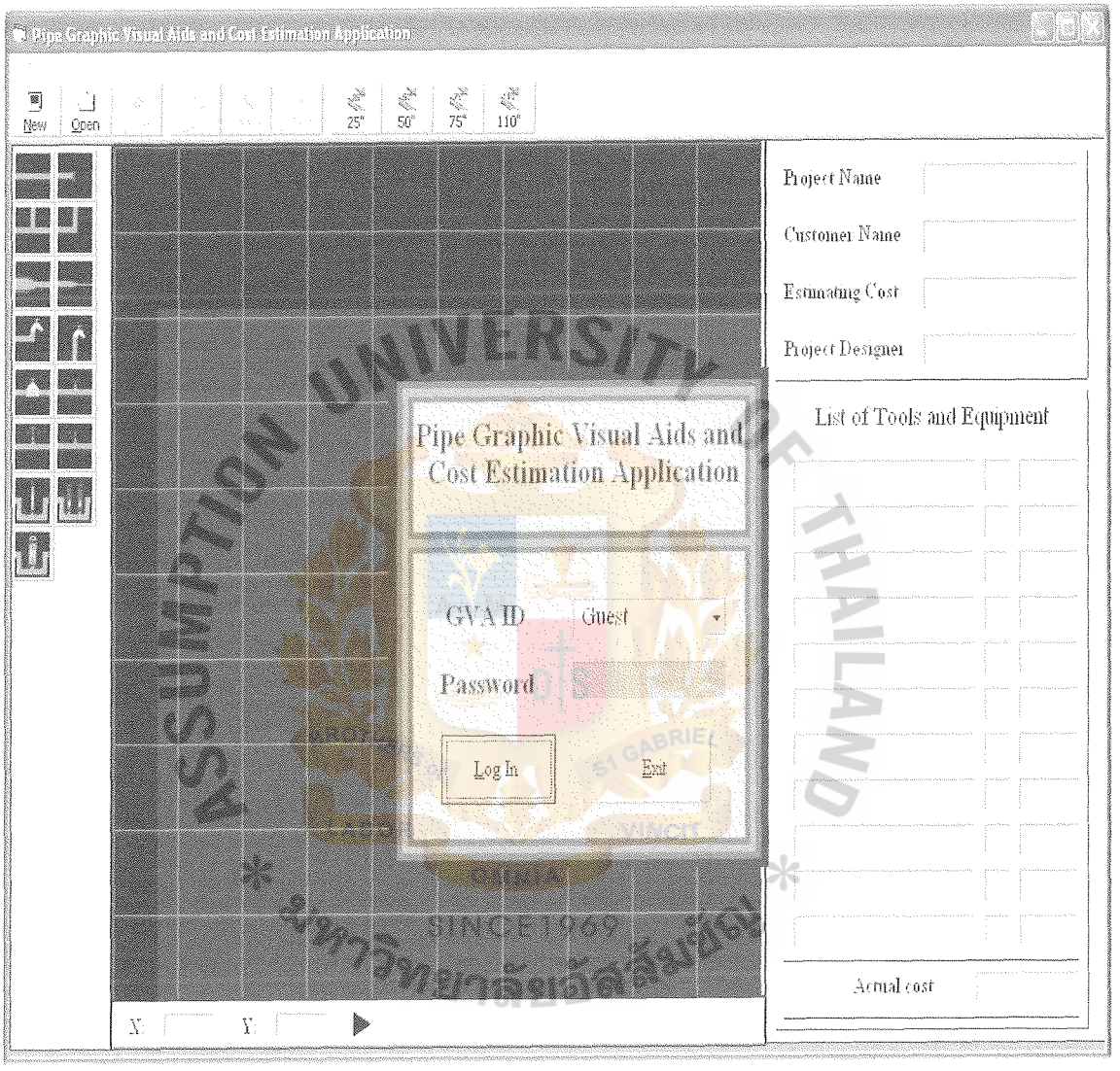

Figure B-2 Login Guest

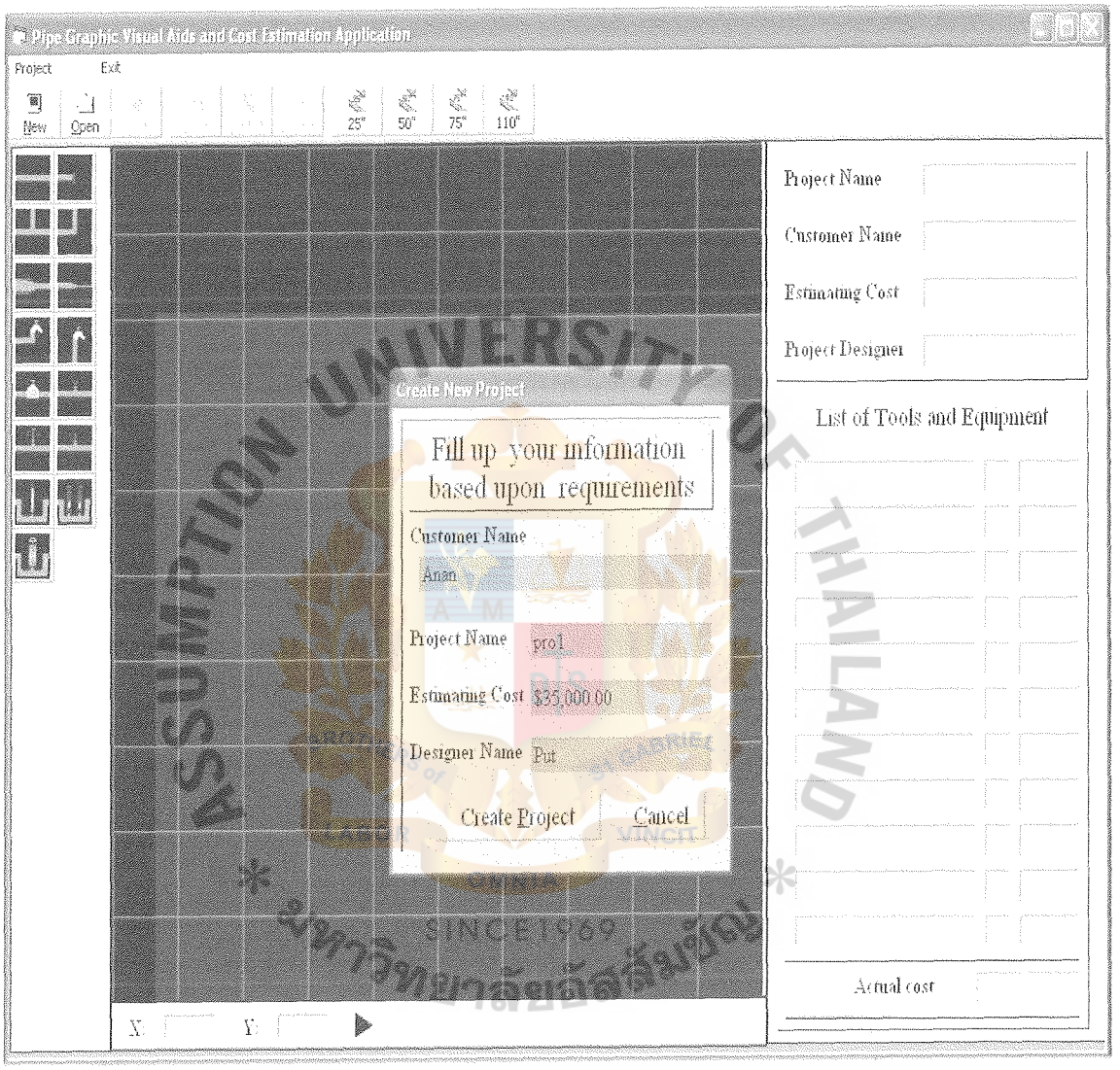

Figure B-3 Create New Project

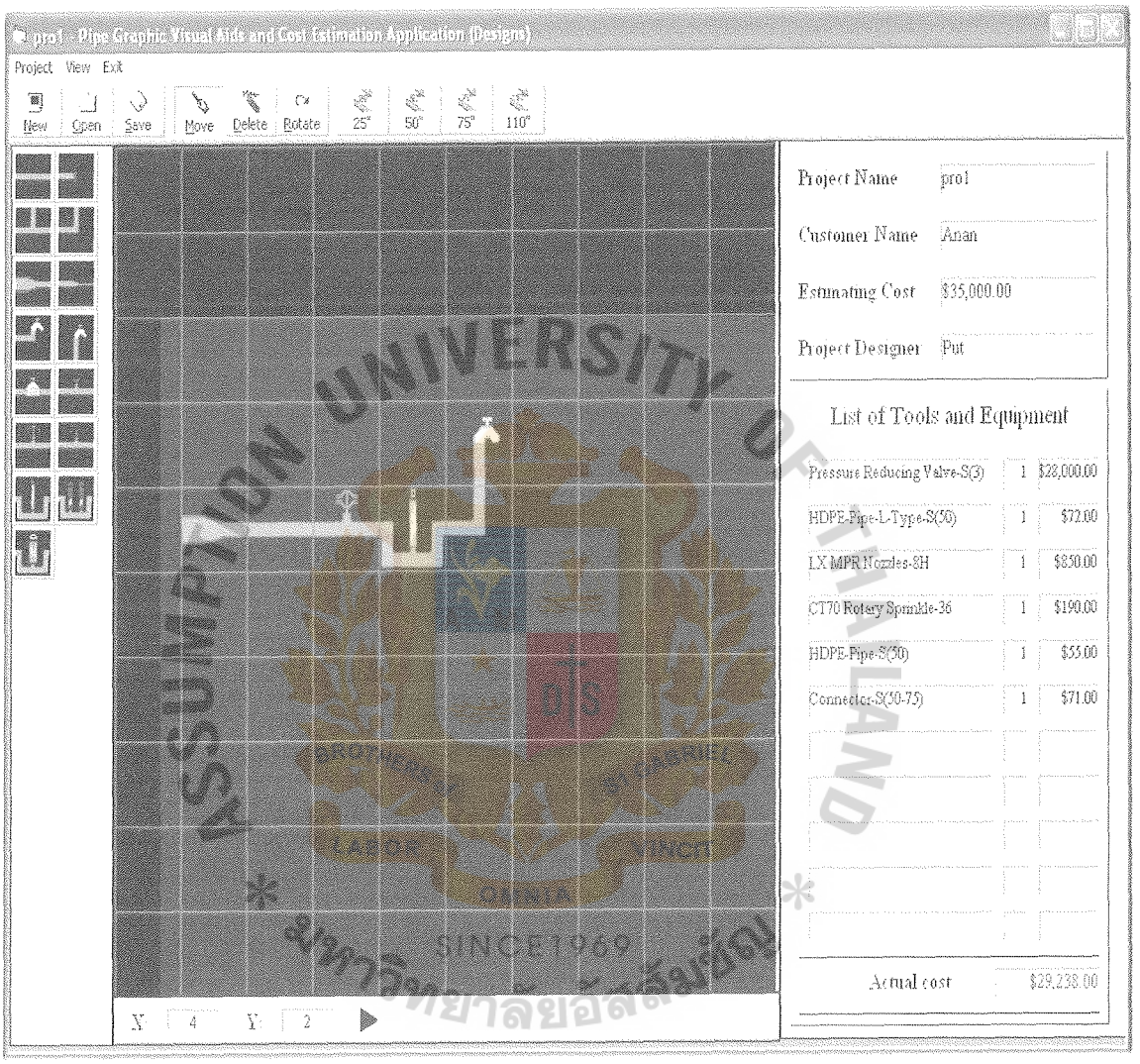

Figure B-4 Design Water System

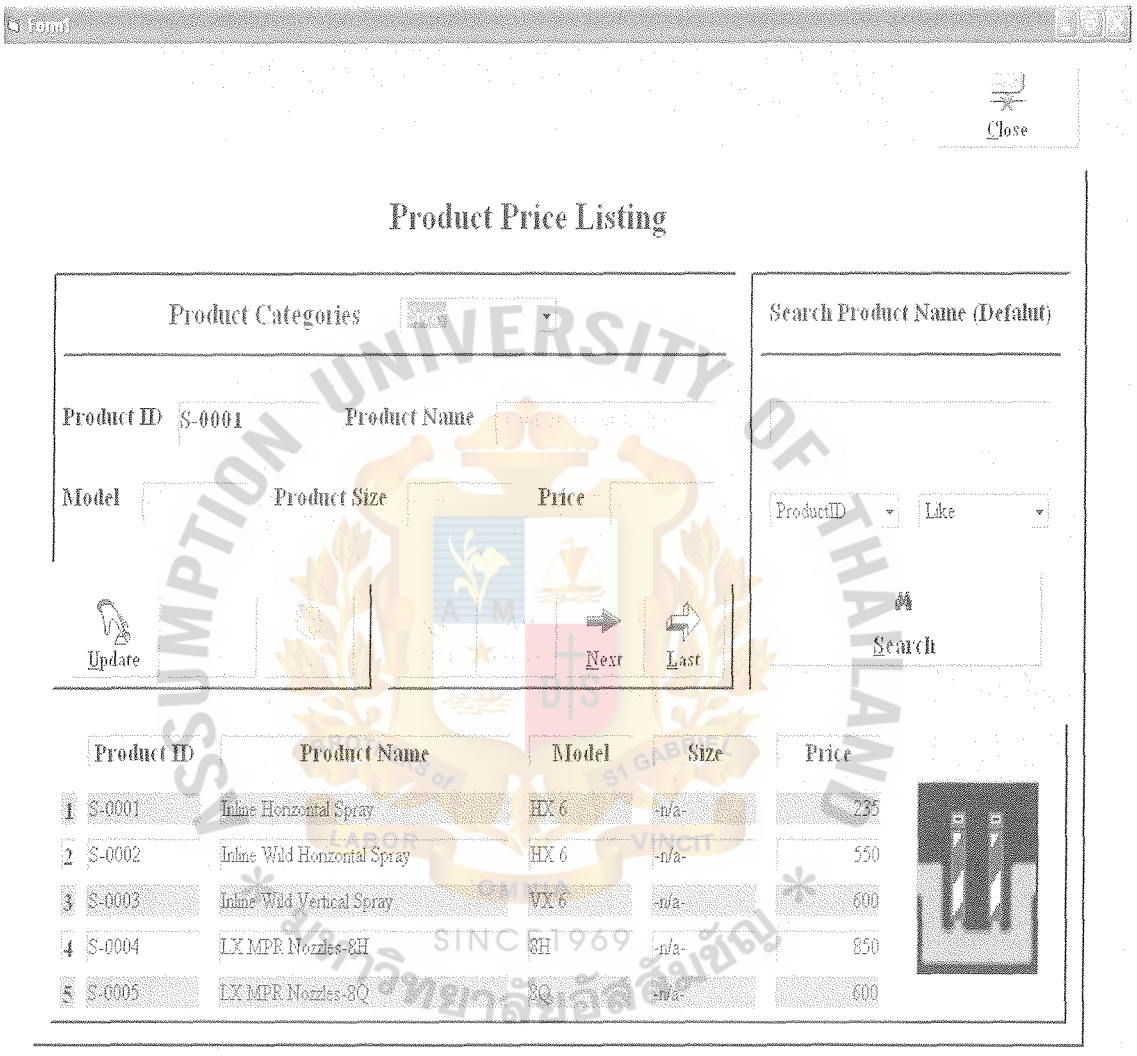

Figure B-5 Product List

APPENDIX C
REPORT DESIGN

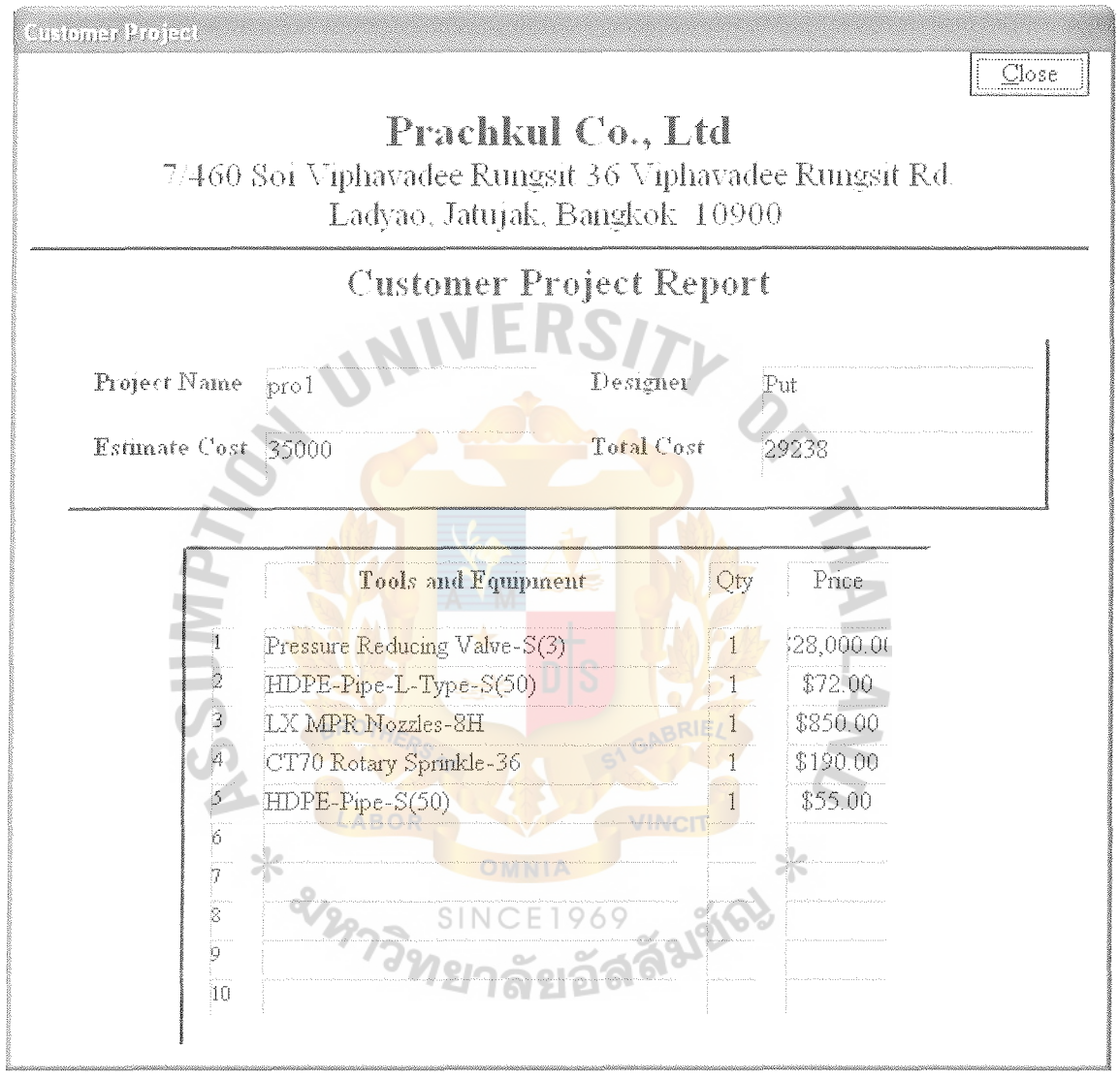

Figure C-1 Project Report

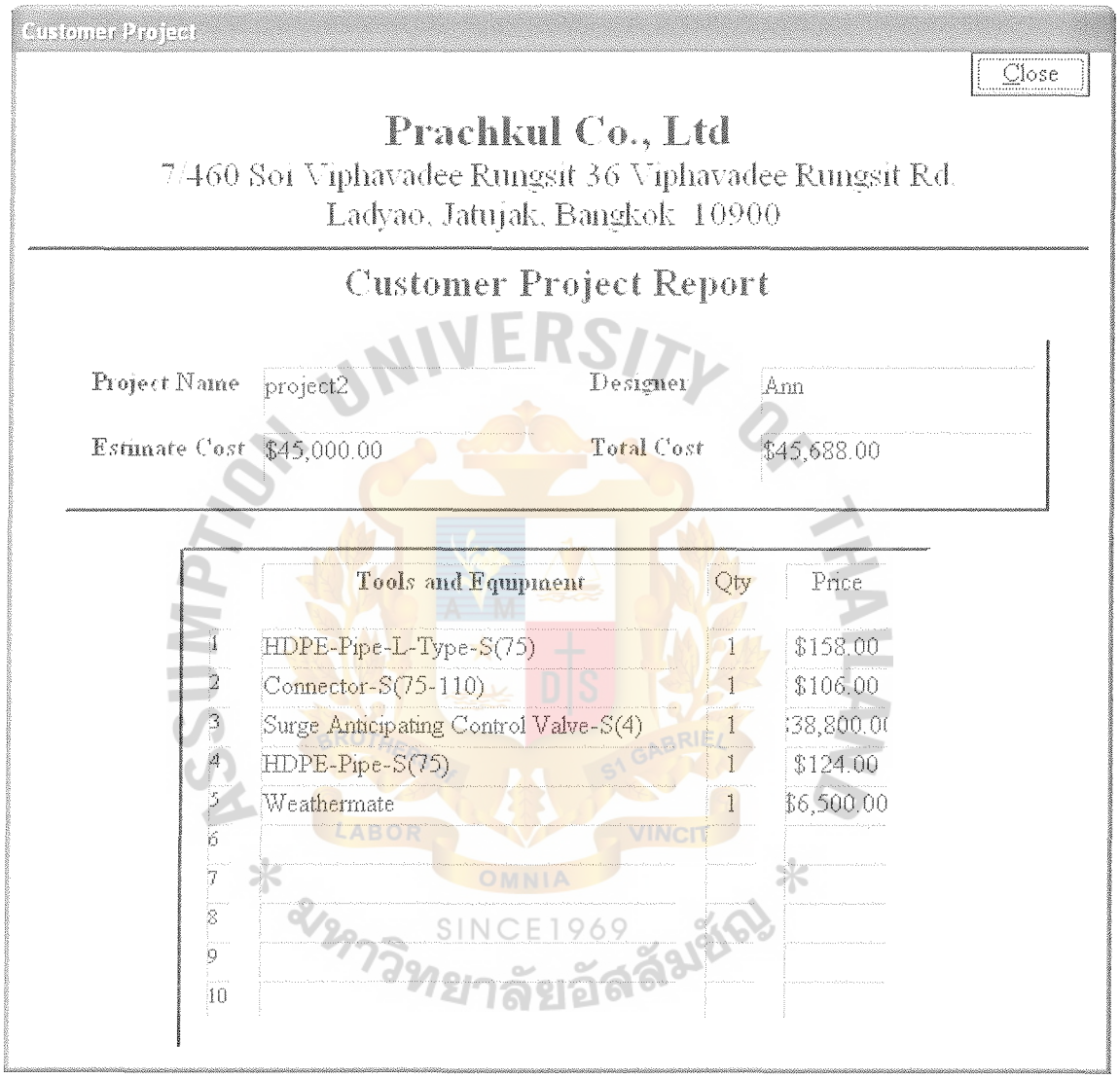

Figure C-2 Butt-Fushion Report