



An Automatic Quotation System for a Printing Company

by

Mr. Arthorn Yongrattanakij

A Final Report of the Six-Credit Course  
CE 6998 - CE 6999 Project

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

November 2003



St. Gabriel's library, Au

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Project Title            An Automatic Quotation System for a Printing Company

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Project Advisor         Dr. Chamnong Jungthirapanich

Academic Year         November 2003


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The Graduate School of Assumption University has approved this final report of the six-credit course, CE 6998 — CE 6999 PROJECT, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer and Engineering Management.

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## ABSTRACT

The purpose of this project is to develop the quotation software for a printing company, called Automatic Quotation Program. To achieve the objective, formulas, calculation methods and software development techniques are studied.

The concept of quotation program is to create a stand-alone program that can be easily used by operators. The program will consist of all essential data and information. The program will be designed in easy-to-use format in which the user is required to put the information, and then the program will calculate and conclude in the quotation form.

This report covers complete analysis and design of quotation using Visual Basic as an application and user interface creator and Microsoft Access as database. The analysis part is done to identify the current problems and to define the scope for improvement. Designing the proposed system covers the application design, database design, data flow design, user interface design and output design.

The evaluation shows high accuracy of calculation by the proposed system compared with the existing system. The accuracy is over 98% which is acceptable.

The cost benefit analysis shows the lowest cost of investment and the payback period within 5 months and 24 days. The operating cost is reduced from 898 baht/month to 112 baht/month. The time for a quotation also is reduced from 6.75 minutes to 0.75 minute per calculation. Other benefits are also expressed in terms of customer satisfaction and improved image of the company, which cannot be interpreted in money, but which will provide long-term revenue for the company.

Successful implementation of the project shows that this program can increase the efficiency of the quotation and competitiveness in customer services. However, the

system still requires modifications to serve more complex calculation for the printing company.



## ACKNOWLEDGEMENTS

I am indebted to the following people and organizations. Without them, this project would not have been possible. I wish to express sincere gratitude to my advisor, Dr. Chamnong Jungthirapanich, Dean of the graduate school of Computer and Engineering Management. His patient assistance, guidance, and constant encouragement has led me throughout the project development.

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Special appreciation is due to my family for their fervent and continuous encouragement. Above all, I am forever grateful to my parents whose willingness to invest in my future has enabled me to achieve my educational goal.

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# I. INTRODUCTION

## 1.1 Introduction

Printing industry is one of the important media industries. Everyday, we are concerned with printing industry, direct by or indirectly. Everybody is in touch with printing media in the form of entertainment, knowledge, information, packaging, etc.

Printing media is mostly used in advertisement in many forms, for example leaflet, handbill, poster, magazine advertisement, etc. Printing media is cheaper compared to radio broadcast and commercials. It can also be reviewed many times and kept for a long time. Printing quality is the most important for designer and printer the same as printing cost which must be considered.

Printing in offset printing system is mostly be used in printing industry. There are many factors to be considered as cost, such as mold (called plate), paper, ink, labor cost, after press process, etc. Quotation process, correctness and rapidity are important factors to impress customers.

Offset lithography is the workhorse of printing. Almost every commercial printer does it. But the quality of the final product is often due to the guidance, expertise and equipment provided by the printer.

Offset lithography works on a very simple principle: ink and water don't mix. Images (words and art) are put on plates (see the next section for more on this), which are dampened first by water, then ink. The ink adheres to the image area, the water to the non-image area. Then the image is transferred to a rubber blanket, and from the rubber blanket to paper. That is why the process is called "offset" -- the image does not go directly to the paper from the plates, as it does in gravure printing.

### (1) Pre-Press Production.

Before the job can be printed, the document must be converted to film and "plates." In the case of How Stuff Works Express, film negatives are created from digital files. Images from the negatives are transferred to printing plates in much the same way as photographs are developed. A measured amount of light is allowed to pass through the film negatives to expose the printing plate. When the plates are exposed to light, a chemical reaction occurs that allows an ink-receptive coating to be activated. This results in the transfer of the image from the negative to the plate.



Figure 1.1. Negatives Color are "stripped" together for each page.

(<http://entertainment.howstuffworks.com/offset-printing3.htm>. October, 2003)





Figure 1.2. A blue-line print is made from "stripped-up" negatives and is used to check image position before printing.

<http://entertainment.howstuffworks.com/offset-printing3.htm>.

October 2003).

There are different materials for plates, including paper (which produces a lower-quality product). The best plate material is aluminum, which is more costly.

Each of the primary colors -- black, cyan (blue), magenta (red), and yellow -- has a separate plate. Even though there are many colors in the finished product, only these four colors are used (this is called the four-color printing process which is a little like the three-color process used in television).



Figure 1.3. The human eye blends four individual color dots into a single color.

(<http://entertainment.howstuffworks.com/offset-printing3.htm>. October. 2003)

## (2) The Inking Process.

Ink and water do not mix -- this is the underlying principle of offset lithography. The ink is distributed to the plates through a series of rollers. On the press, the plates are dampened, first by water rollers, then ink rollers. The rollers distribute the ink from the ink fountain onto the plates.

The image area of the plate picks up ink from the ink rollers. The water rollers keep the ink off of the non-image areas of the plate. Each plate then transfers its image to a rubber blanket that in turn transfers the image to the paper. The plate itself does not actually touch the paper -- thus the term "offset" lithography. All of this occurs at an extremely high speed.

Close-up of rollers. The top series of rollers transfers the yellow ink to the rubber "blanket" cylinder (bottom roller), and then to the paper that is passing horizontally under the "blanket."

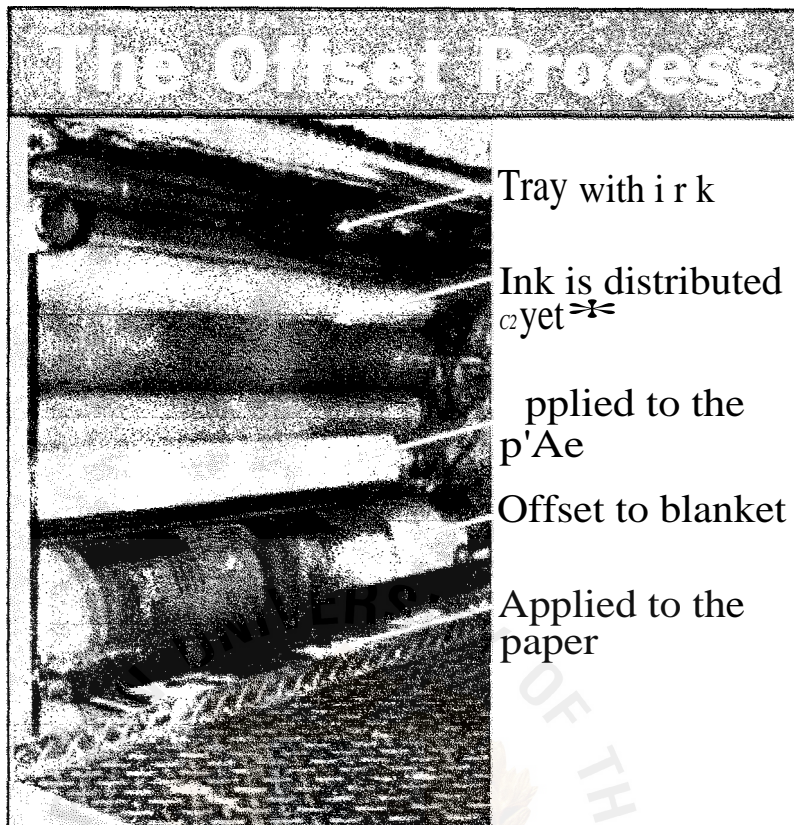


Figure 1.4. The Offset Process. (<http://entertainment.howstuffworks.com/offset-printing4.htm>. October, 2003)

The paper is left slightly wet by all of the ink and water being applied. Obviously, there is a risk of the ink smudging. The smudging is avoided by having the paper pass through an oven. The oven is gas fired, and the temperature inside runs at 350 to 400 degrees Fahrenheit (176 to 206 degrees Celsius).

## 1.2 Objectives of The Project

The objectives for this project are as follows:

- (1) To study the appropriate application software to create a quotation program for printing business.
- (2) To study the appropriate constants and formulas in the program.

- (3) To create a quotation program for printing business.

### **1.3 Scope of The Project**

The scope of this project is to create an initial automatic printing quotation program from appropriate software.

### **1.4 Deliverables**

Deliverable of this project will be the application software or the quotation system.

### **1.5 Terminology**

- (1) Offset printing: A kind of printing process, which is most popular in printing on paper.
- (2) Plate: The mould for offset printing, made from aluminum sheet, which is coated with light reactor substance. It uses the same concept of film finishing in photography. (A plate represent of a printing color, to print 4 colors, 4 plates will be used.)
- (3) Weight of paper: Thickness of paper is measured in terms of gramme as the unit, which represents gram/square meter.
- (4) Art paper: Gloss-surfaced paper, usually used in jobs that require fine quality printing.
- (5) Pound paper: Matt-surfaced paper, known as typewriting paper, normally used due to lower cost compared to art paper.
- (6) Printing cost: The constant values in the formula come from labor cost, ink, power consumption, maintenance and other expenses. Most of the printers in Thailand use these constants but there may be some difference.
- (7) Folding: Bending the paper to the shape needed.

- (8) Undefined cost: The cost that cannot be exactly calculated per unit of printing sheet. They include electric power, printing ink, administrative cost and miscellaneous consumption, for example kerosene, benzene, etc.
- (9) Printing size: The size of paper cut from the full commercial size and that is related to the size of printing machine and size of the plate. In this project, there are 2 printing sizes, 17.5" x 24" and 12" x 17.5"





## H. THE EXISTING SYSTEM

### 2.1 Calculating Formulas.

To make a quotation, necessary information which consists of type of paper, weight of paper, number of printing, number of printing color, printing side, folding requirement and required profit margin are necessary. Then, calculation is done with the following formulas.

- (1) Number of printing sheets;

Full size of commercial paper sheet / printing size =  $S_i$

Number of required sheet + printing factor /  $S_i$  =  $S_2$

- (2) Cost of paper;

$S_2 * \text{paper's price} = S_3$  (cost of paper)

- (3) Printing cost which depends on number of color(s) and page(s)

(a) 1 color 1 size: number of printing sheet / 10000 =  $N_1 * 1000 = P_1$

(b) 1 color 2 sizes: number of printing sheet \* 2 / 10000 =  $N_2 * 1000$   
=  $P_2$

(c) 2 colors 1 size: number of printing sheet / 10000 =  $N_3 * 2000 = P_3$

(d) 2 colors 2 sizes: number of printing sheet \* 2 / 10000 =  $N_4 * 2000$   
=  $P_4$

(e) 3colors 1 size: number of printing sheet / 10000 =  $N_5 * 3000 = P_5$

(f) 3colors 2 sizes: number of printing sheet \* 2 / 10000 =  $N_6 * 3000$   
=  $P_6$

(g) 4 colors 1 size: number of printing sheet / 10000 =  $N_7 * 4000 = P_7$

(h) 4 colors 2 sizes: number of printing sheet \* 2 / 10000 =  $N_8 * 4000$   
=  $P_8$

In case  $N_i$  to  $N_8$  is not the full digit number the decimal point has to be deleted if the decimal is lower than 5 and increased if the decimal is over 5.

(4) Cost of folding;

- |                    |   |
|--------------------|---|
| (a) Fold in half   | $(\text{number of printing} / 1000) * 30$ |
| (b) Fold in third  | $(\text{number of printing} / 1000) * 40$ |
| (c) Fold in fourth | $(\text{number of printing} / 1000) * 50$ |
| (d) Fold in sixth  | $(\text{number of printing} / 1000) * 60$ |

Note: number of printing must be in thousand, and the remaining will be taken as round figure to the nearest thousand.

## 2.2 Fixed Factors

(1) Print factor; it is the number of printing sheets needed for trial printing.

- |                       |                           |
|-----------------------|---------------------------|
| (a) 1 color 1 size:   | print factor = 50 sheets  |
| (b) 1 color 2 sizes:  | print factor = 70 sheets  |
| (c) 2 colors 1 size:  | print factor = 100 sheets |
| (d) 2 colors 2 sizes: | print factor = 150 sheets |
| (e) 3 colors 1 size:  | print factor = 200 sheets |
| (f) 3 colors 2 sizes: | print factor = 300 sheets |
| (g) 4 colors 1 size:  | print factor = 200 sheets |
| (h) 4 colors 2 sizes: | print factor = 300 sheets |

(2) Plate size;

- (a) Number of color 1 — 2 colors, printing size A3,A4,A5

Plate size have to be 12" \* 17"

- (b) Number of color 1-2 colors, printing size A2

Plate size have to be 18" \* 26"

(c) Number of color 3-4 colors, all printing sizes

Plate size has to be 18" \* 26"

(3) Cost of plate (mould); there are 2 sizes of plate. The source of plate cost comes from plate maker factory.

Table 2.1. Cost of Plate.

Color	12" * 17"	18" * 26"
1	400	500
2	800	1200
3	1500	2500
4	3000	4500

### 2.3 Source of Constants in Calculating Formulas

(1) "10000" in Printing Cost Formula.

It is the number of printing sheet. The cost of printing will be counted for every 10000 sheets.

(2) "1000", "2000", "3000" and "4000" in Printing Cost Formula.

The cost of printing, in baht, per color per side of printing sheet, includes labor cost, ink, power consumption, maintenance and other expenses. Most printers in Thailand use these constants but there may be some difference.

(3) "1000" in Cost of Folding.

The cost of folding will be counted for every 1K of folded sheets. The remaining will be rounded to the nearest K unit.

(4) "30", "40", "50", "60" in Cost of Folding.

The cost of folding, in baht, per folded sheet for each type of folding is shown in the following figures.

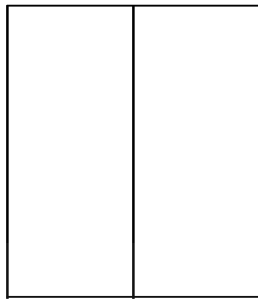


Figure 2.1. Fold to Half

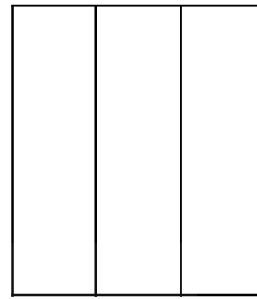


Figure 2.2. Fold to Third.

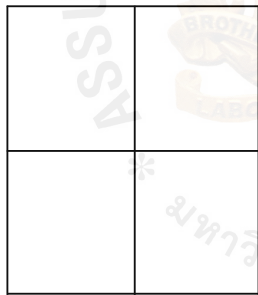


Figure 2.3. Fold to Fourth.

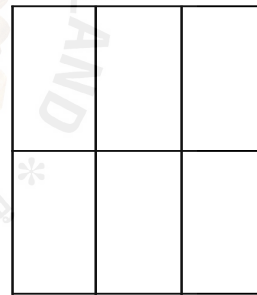


Figure 2.4. Fold to Sixth.

Source of Folding Cost comes from folding factory.

- (5) Print Factor.

Print Factor is the standard number of printing sheets that most printers use in process planning. The Print Factor is used for setting up the printing machine and any error during the printing process.

## 2.4 Analysis of Current Problem

The current system is completely manual. The problems occur as follows:

- (1) A quotation must be made by the owner because the calculating method is kept secret, and is known only by the owner.
- (2) The method is effective in terms of outside service since the price of paper must be checked from the suppliers.
- (3) Waste of time in checking cost of paper from the price list.
- (4) Cannot compete with the competitors who have power to sell to the person that can make the quotation.

## 2.5 Context Diagram

The context diagram of the exiting system (manual calculation) is shown below.

To make a quotation, all information is collected from the customer and the cost of paper is checked by using the price list or calling the vendor.

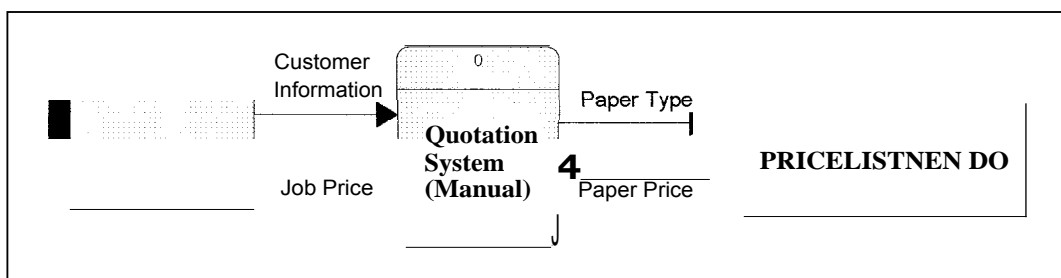


Figure 2.5. Context Diagram of the Existing System.



## 2.6 Data Flow Diagram

The data flow diagram of the existing system shown below is the step of manual quotation. The system does not require any special equipment. With only a calculator, the quotation can be calculated.

After we get the customer's requirement is obtained, the first thing to do is checking the paper price from check list or calling the vendor for price verification. Then, the steps below are carried out.

- (1) Calculate the total cost and number of paper to be used.
- (2) Calculate printing cost, considering the number of pages and colors to be printed.
- (3) Calculate the folding price, considering the folding type.
- (4) Conclude and make a quotation report to the customer.

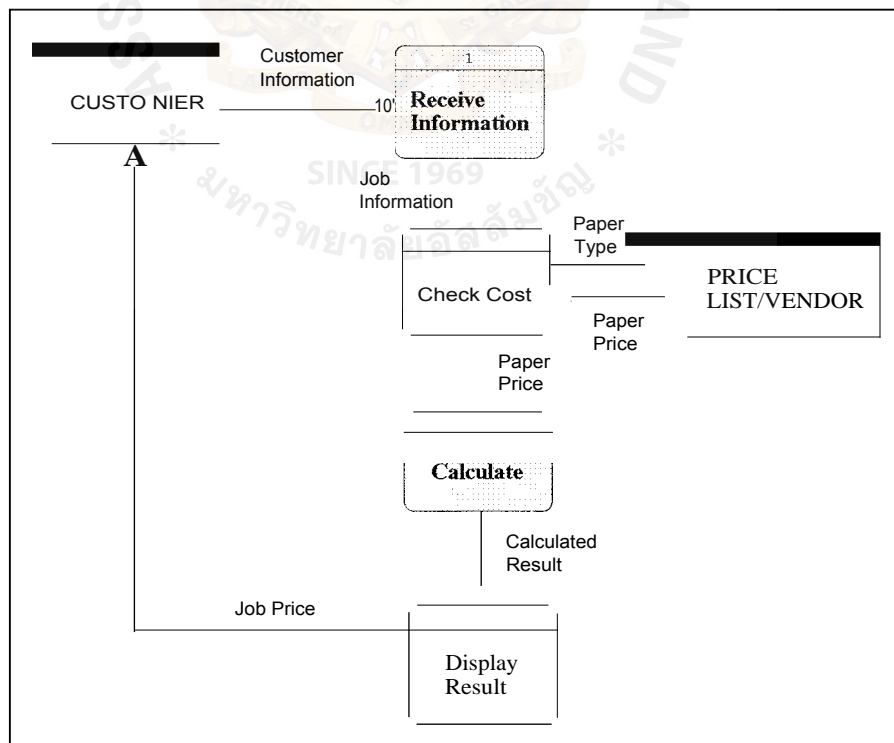


Figure 2.6. Data Flow Diagram Level 0 of the Existing System.

## 2.7 Data Flow Diagram Level 1

- (1) The data flow diagram level 1 of flow 1 is shown below. After collecting the information of customer and job to be done, the record will be kept in the quotation book.

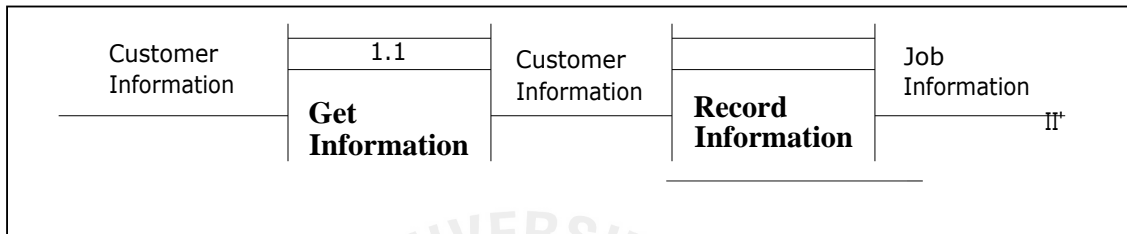


Figure 2.7. Data Flow Diagram level 1 of flow 1.

- (2) The data flow diagram level 1 of flow 2 is shown below. To use the calculation formulas, the cost of selected paper type is checked with the price list or by requesting the vendor.

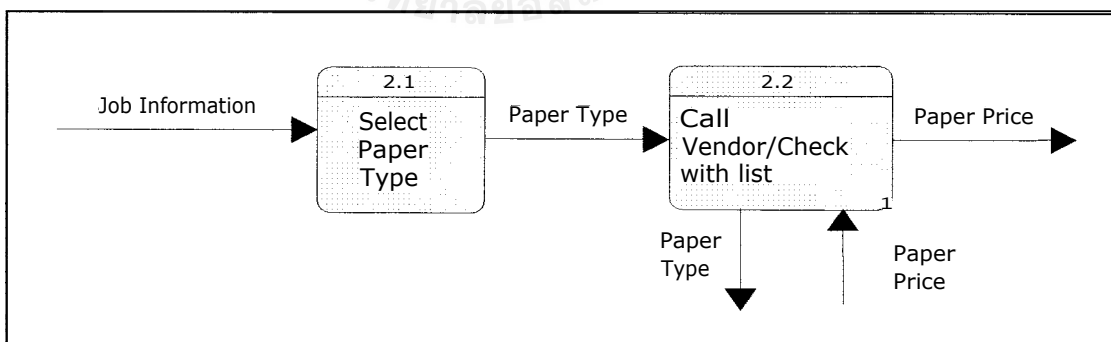


Figure 2.8. Data Flow Diagram level 1 of flow 2.

(3) The data flow diagram level 1 of flow 3 is shown below. After the cost of paper is known, printing cost can be calculated by using the existing formulas.

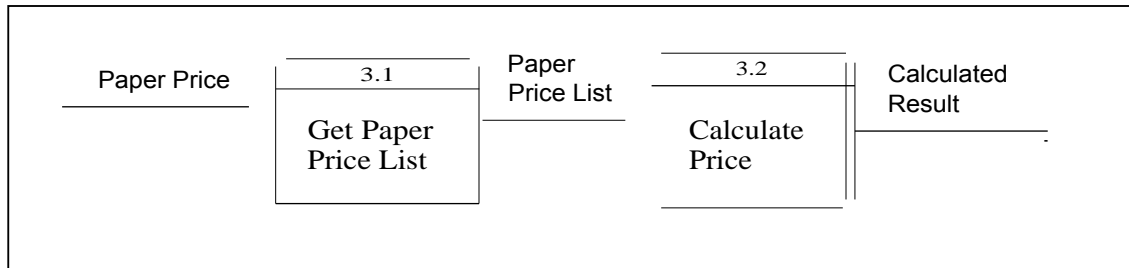


Figure 2.9. Data Flow Diagram level 1 of flow 3.

(4) The data flow diagram level 1 of flow 4 is shown below. After calculation, a quotation document is printed and sent to the customer or as an initial report, giving a verbal report to the customer.

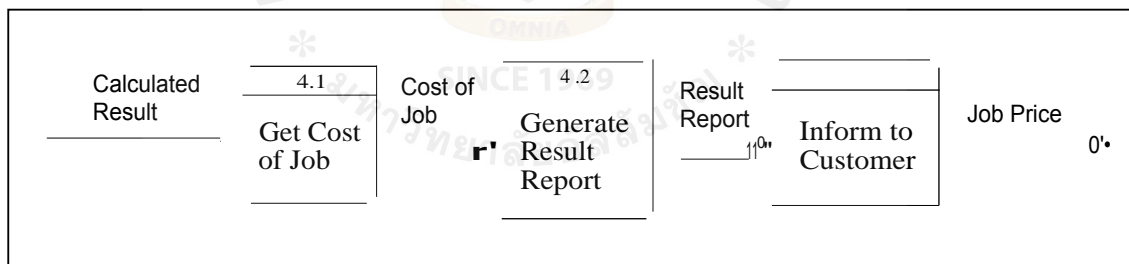


Figure 2.10. Data Flow Diagram level 1 of flow 4.

## III. THE PROPOSED SYSTEM

### 3.1 Software Development Concept

A software, sometimes called a program, is a set of command which is written in a computer language. This set of command makes the computer process the input data to the results, such as word processing program, drawing program, etc. Software is one major component in the information system, which consists of:

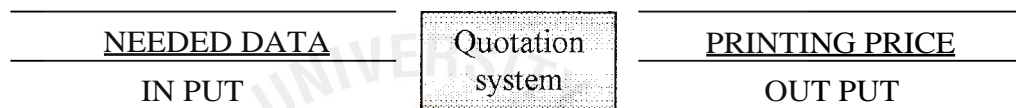


Figure 3.1. Normal Step for Quotation.

In this report, the quotation system is the processing program to calculate the needed printing price.

To develop a program for calculating the printing price, manual calculation is used as the fundamental for development. The major factors input in the program are as follows:

- (1) Type, size and number of paper needed; these data come from customer requirements. Then paper consumptions is calculated, because, in printing industry, sizes of paper sheet are standardized as 24" x 35" or 25" x 36" or 31" x 43". Then the cost of paper, which is the main cost of printing job is calculated.
- (2) Number of colors and pages; these data are used for mould calculation, reserve paper and layout setting.

- (3) Folding; this is a customer requirement, for example, A4 size could be folded 2 times in width.
- (4) Profit factor; profit margin, in another word, is the number that is added in the final calculation. The profit margin can start from 0 to any margin as desired, but normally the numbers are between 10-30 %

Two popular programs, Visual basic and Access, in Microsoft operating system, are used in writing this project. Because they are the easiest program to create any uncomplicated calculation program such as this quotation program.

### **3.2 User Requirements Analysis**

The existing system has the problem in limitation of people who can make the quotation, time consumption in calculation due to waste of time in checking the cost of paper in price list, etc. To solve the problem, the proposed system has to meet the minimum following requirements.

- (1) The proposed system should be easy to operate by trained people.
- (2) Updating of paper price should be easier.
- (3) Viewing the quotation should be easy.
- (4) Data should be properly and adequately kept.
- (5) The system must able to improve for more complex calculation in the future.
- (6) Backup data must be easy to do.

### **3.3 Calculation Formulas**

The formulas of the proposed system can use the same formulas as the existing system.

- (1) Number of printing sheets.



- (2) Cost of paper. Paper price should be updated at least once a month by asking for the updated price from the vendor.
- (3) Printing cost. The developer must be aware of the formula because it is the most important formula in the program. The developer should prepare for constant changes in the future because this cost must be changed in the same direction as the cost in the market.
- (4) Folding cost. This cost is also subject to change in the future, depending on the market price and may be dealt with the subcontractor.

### 3.4 Context Diagram, Data Flow Diagram and ER Diagram

The system design of quotation system covers context diagram, data flow diagram, entity relationship diagram (ER-diagram), database design user interface design and report design.

- (1) The Context Diagram shows the relation and communication between user and system.

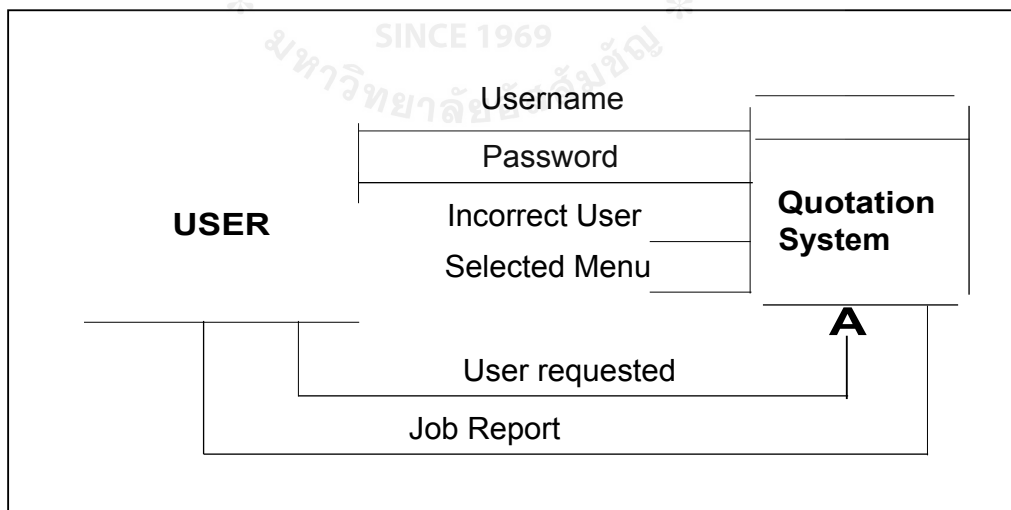


Figure 3.2. Context Diagram of Proposed System.

(2) Data Flow Diagram shows the step and process of the proposed system.

Most of the quotation processes are the same as the existing system with just a change from manual calculation to computerized calculation. Additional processes in the proposed system are:

- (a) The level 1.0 Verify User which proposes to be the security section.
- (b) User Detail Information has to be filled as systematic record.

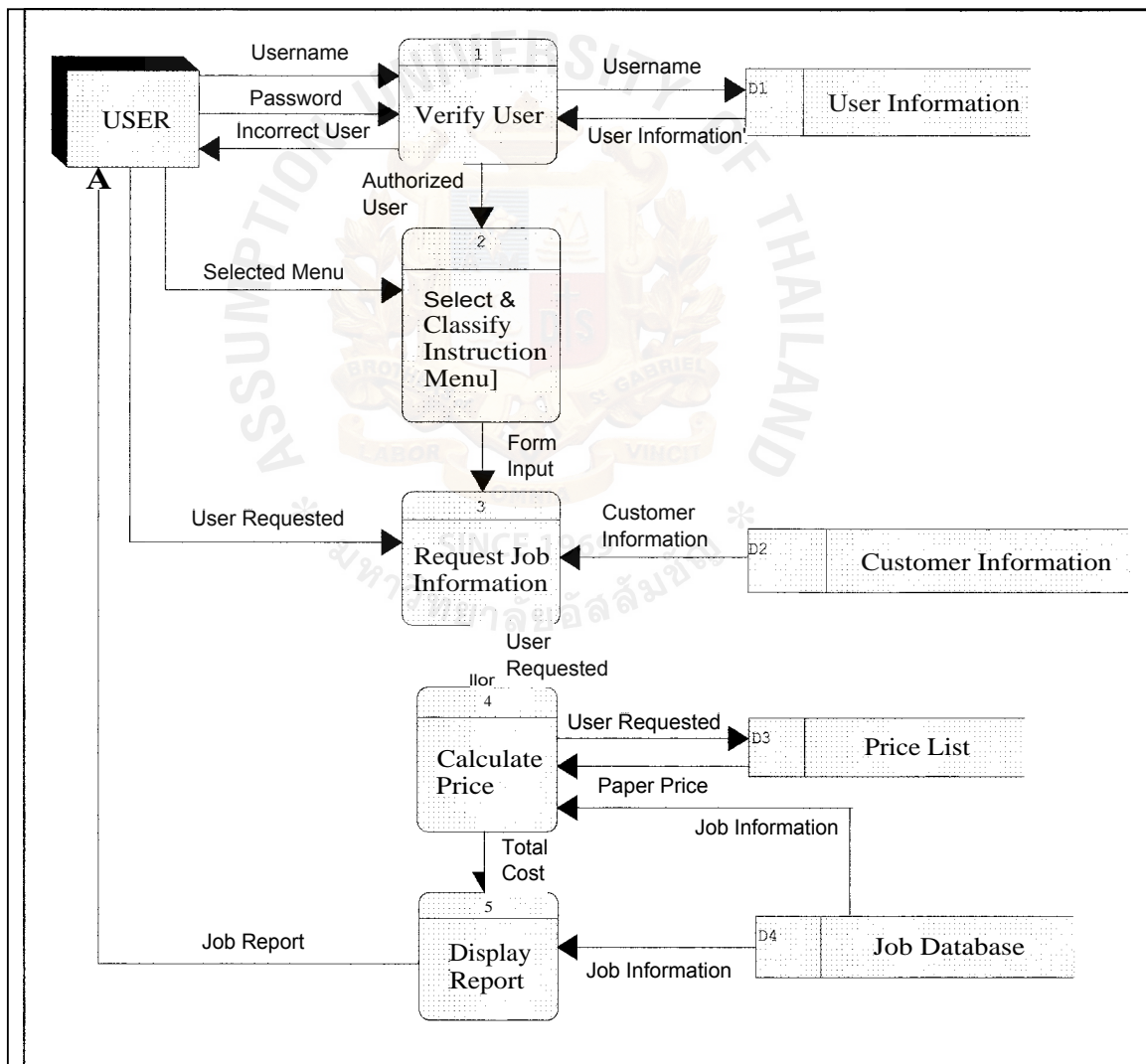


Figure 3.3. Data Flow Diagram of Proposed System.

(3) Data Flow Level 1: 1.0 Check Username and Password.

After the system icon on the desktop page is clicked, the quotation system will automatically operate by going to the input username and password screen. On this screen, the system will verify the validity of the username and password to the database. If the username and/or password do not match with the database, the system will deny beginning of the program.

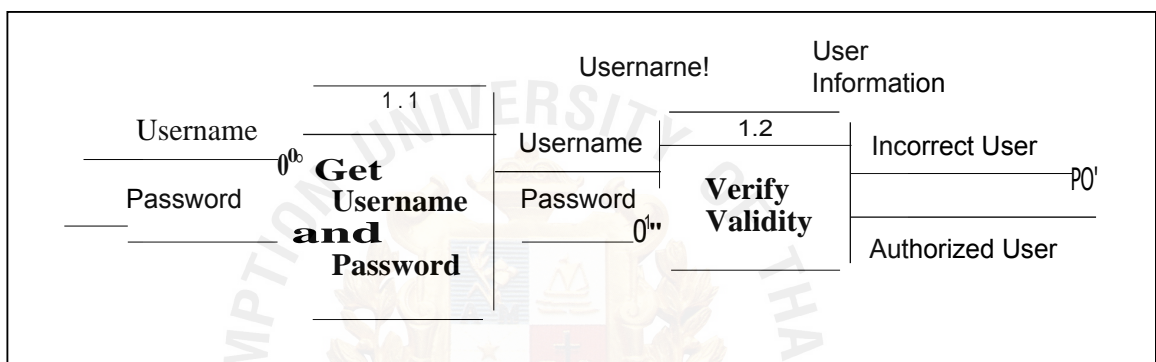


Figure 3.4. Data Flow Level 1: 1.0.

(4) Data Flow Level 1: 2.0 Select Menu.

After verification of the username and password, the system will show the main screen. On the main screen, there are 4 menus for the user to select.

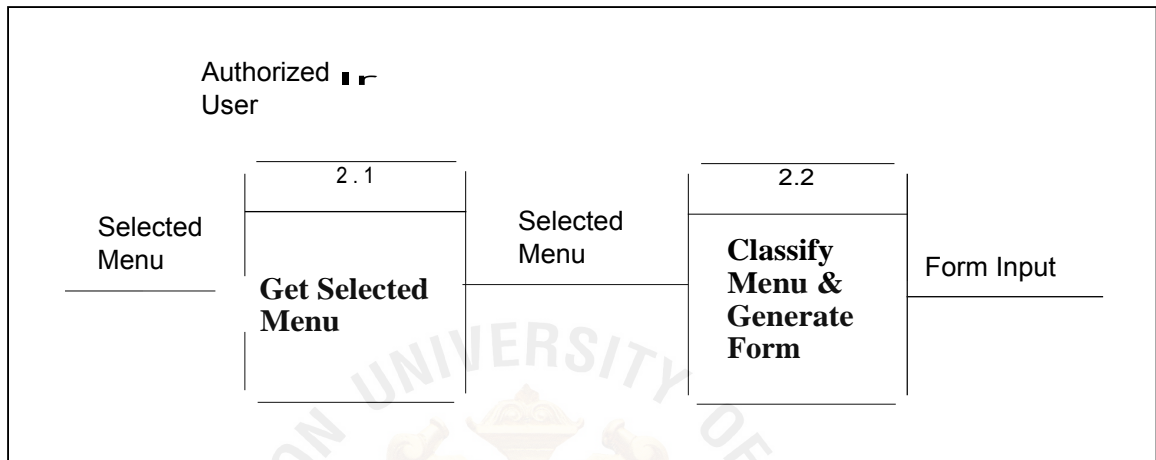


Figure 3.5. Data Flow Level 1: 2.0

(5) Data Flow Level 2: 2.2 Generate and Display Form.

The 4 menus that are shown on the menu bar in the main screen are the following:

(a) Program menu: In the program menu, there are 2 submenu pop ups.

They are;

- (1) Re-entry the System.
- (2) Exit Program.

(b) Screen menu: In the screen menu, there are 3 submenu pop ups. They are;

- (1) Identify Job Detail.
- (2) Add/Edit Customer Information.
- (3) Edit Paper Price.

- (c) Report menu: This menu will pop up a submenu. The submenu will ask the user to input the customer code and job code to be previewed or printed out.
- (d) User menu: This menu will pop up a submenu. The submenu will ask the user for add/edit username and/or password and classify the user authorization, which can classify 3 levels.

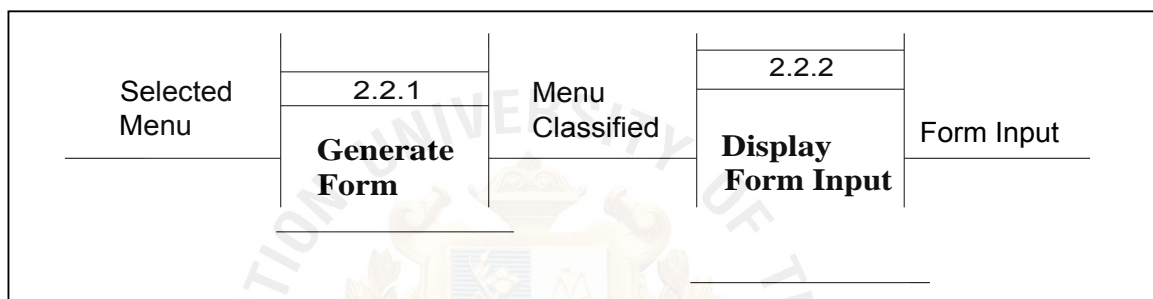


Figure 3.6. Data Flow Level 2: 2.2.

(6) Data Flow Level 1: 3.0 Input Information.

(a) Program menu.

In the program menu, there are 2 submenu pop ups. They are:

- (1) Re-entry the System: If the user selects this submenu, it will go to the input username and password again.
- (2) Exit Program: This submenu will exit the program.

(b) Screen menu.

In the screen menu, there are 3 submenu pop ups. They are:

- (1) Identify Job Detail: In this screen, there are 4 boxes. The user must input the date, customer code, job code and job name.

(a) **Input date:** The system will check the correctness of the input date. The input date must be present date; otherwise, the system will automatically correct the date to be present date.

(b) **Customer code:** The user has to fill the code of the customer, and then the system will verify the customer code in the database.

(1) If the input customer code matches with the existing code in the database, the screen will show the additional job details.

(2) If the input customer code does not match with the database, the customer information blank form will appear. The user has to fill the form, and the screen will return to Identify Job Detail screen.

Maximum 5 characters can define customer code as the acronym of the customer's company name.

(c) **Job code:** the next step is filling the job code and the screen will show additional job details. The system will verify the job code in the database.

(1) If the job code matches with the existing job code in the database, the existing job detail will show up. The user can edit the job detail as per the new information identify.



(2) If the job code is not match with the database, the blank form will appear and the user has to full fill the form.

Maximum 6 number and characters can define Job code.

Practically, the job code should use the customer code and 2 or 3 running number.

(2) Add/Edit customer information: In this screen, there is a box requested. The user has to fill the customer code in the box. Then the system will verify the customer code in the database.

- (a) If the input customer code is match with the existing code in the database, then the screen will appear the additional customer detail. The user can edit the customer information.
- (b) If the input customer code is not match with the database, the customer information blank form will appear. The user has to full fill the form.

(3) Edit paper price: In this submenu, the user can edit the price of the paper, which recommends updating at least once a month, by selecting the paper type and weight. Then fill the updated price and save.

(c) Report menu.

This menu is allowing the user to preview the result of the calculation one customer at a time but unlimit job as recorded in the database for specified customer. After full fill the customer code and job code to be view, the system will show the requested job with unit price and total price.

Note: the price excludes the value added tax (VAT) 7%.

(d) User menu.

This menu allows the user to add, edit and delete the username and/or password. The user has to fill the boxes and select the authorization level. There are 3 levels of authorization;

- (1) Level 1 is the highest level. Full authorization is provided in this level. Manager of higher levels are authorized for level 1. This level can change, update, add and delete all information.
- (2) Level 2 is the middle level. Sales persons or equivalent are authorized for this level. This level can add, edit and update the job information, customer information and paper price but cannot delete all information and get in the user menu.
- (3) Level 3 is the lowest level. This level can get in the report menu to view the result of the calculation. This level is approved for the general clerk.

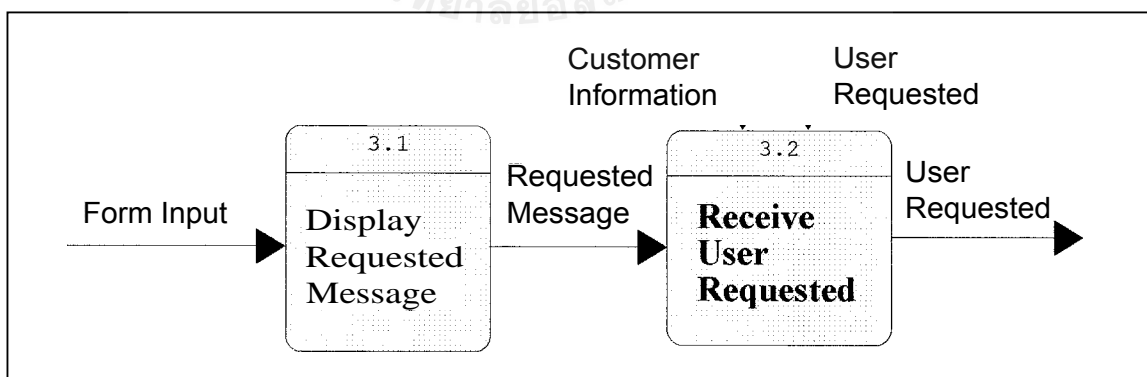


Figure 3.7. Data Flow Level 1: 3.0.

(7) Data Flow Level 1: 4.0 Calculate the Cost.

This level's duties are divided in 2 parts:

- (a) Take all the job information that is filled in the job detail form and kept in the database as designed in the Microsoft Access software.
- (b) The paper price in the database is used in the calculation part in the program.

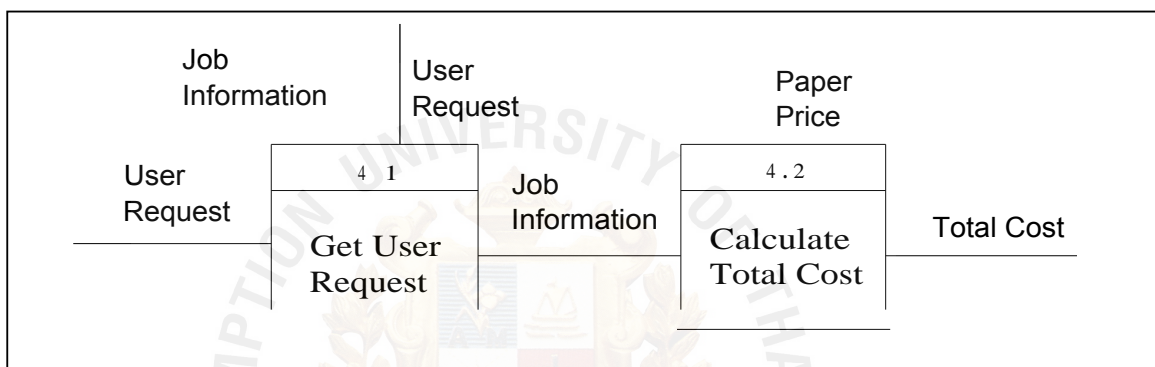


Figure 3.8. Data Flow Level 1: 4.0.

(8) Data Flow Level 2: 4.1 Record Job Information.

The proposed program will collect all information from the job detail form (date, customer code, job code, job title, size of job, type of paper, weight of paper, printing color, printing side, folding type, number of requirement and profit margin) and customer information (customer code, customer name, company name, company address, zip code, phone number, mobile phone number, fax number and e-mail address), in case the customer is new and then kept in the assigned field in the database.

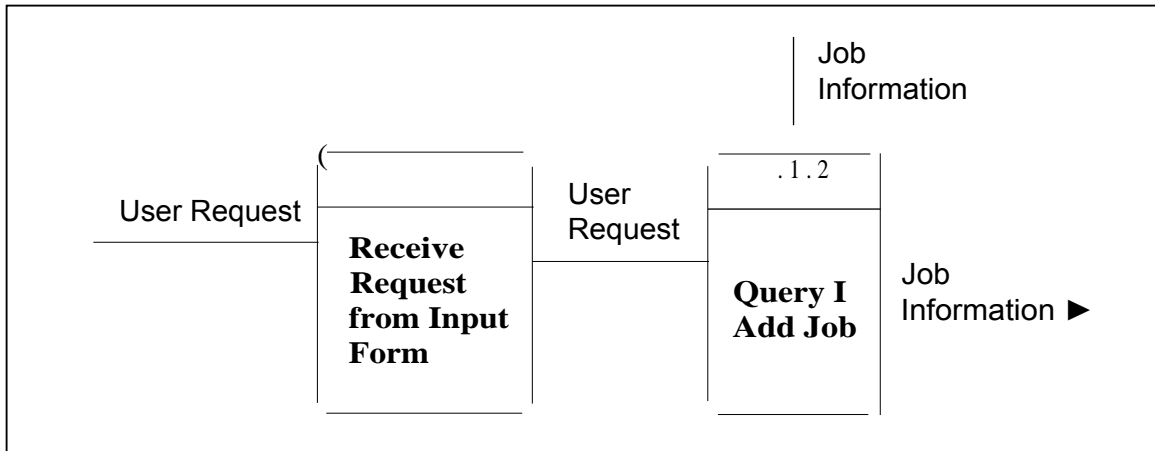


Figure 3.9. Data Flow Level 2: 4.1.

(9) Data Flow Level 2: 4.2 Collect information and Calculation.

This step will bring all the job information and paper price from the database in the formula. Then the calculating procedure is started to calculate the following:

- (a) Number of printing sheet.
- (b) Cost of paper.
- (c) Cost of plate.
- (d) Cost of printing.
- (e) Cost of folding.
- (f) Unit price.
- (g) Total price.

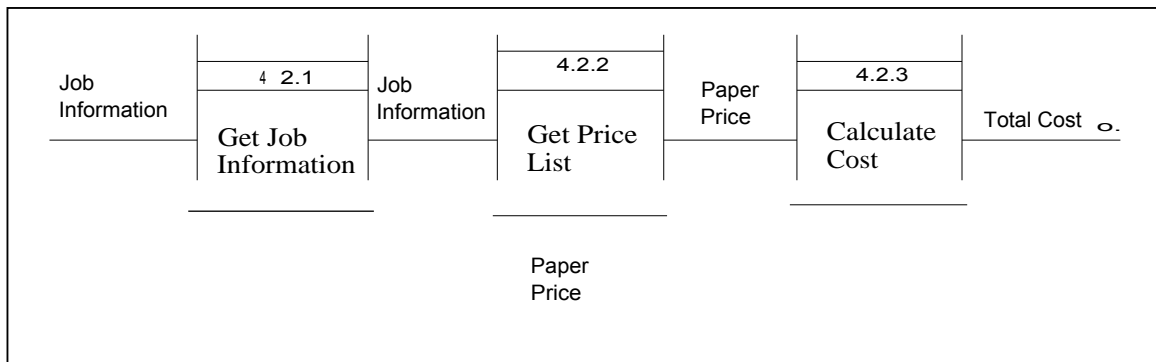


Figure 3.10. Data Flow Level 2: 4.2.

(10) Data Flow Level 1: 5.0 Generate Report.

In this level, the program will summarize the calculation result, both unit price and total price, and keep it in the database. The user can preview the report by specifying the customer code and job code. The customer can be specified one at a time but unlimited job can be previewed. The report will show the job information, unit price and total price. The user can print out the report by selecting the setting of the printer.

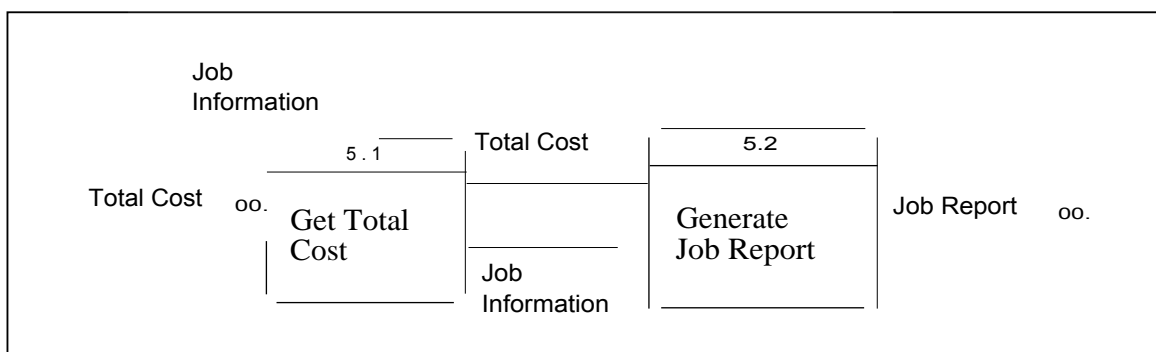


Figure 3.11. Data Flow Level 1: 5.0.

(11) Data Flow Level 2: 5.2 Show Report.

In this level, the program will classify the job. In case more than one job is required for preview or print, the program will arrange the sequence and show it on the preview page. The report will consist of job detail, number of printing, unit price, total price and grand total price.

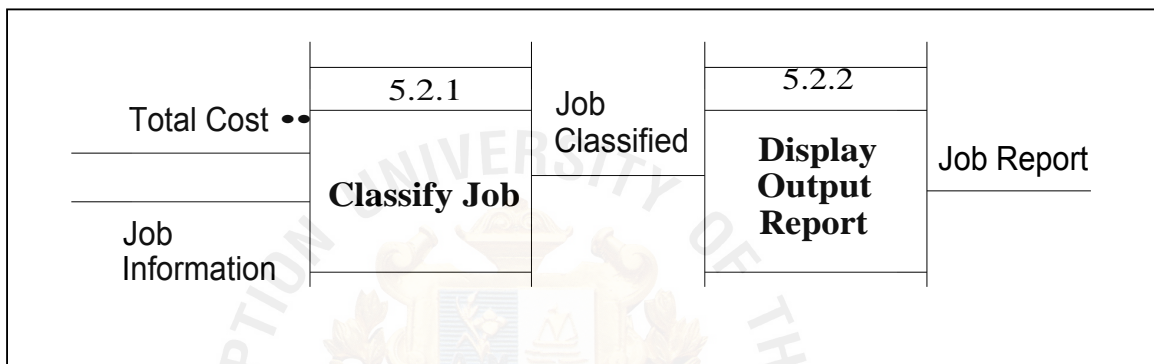


Figure 3.12. Data Flow Level 2: 5.2.

(12) Entity Relationship Diagram shows the relationship of each entity to the others. The proposed system is a ternary relationship, a simultaneous relationship among instances of three entity types. The center of the system is focuses on Job Entity. The relationship is explained in the diagram as follows:

(a) User : Job.

A user can generate 1 to many jobs. A job can be generated by a user.

(b) Customer : Job.

A customer can request for 1 to many jobs. A job can be requested by a customer.



(c) Calculated Record : Job

A calculated record can keep a job. A job can be kept by a calculated record.

(d) Paper List : Job

A paper type can use 1 to many jobs. A job can use only one paper type.

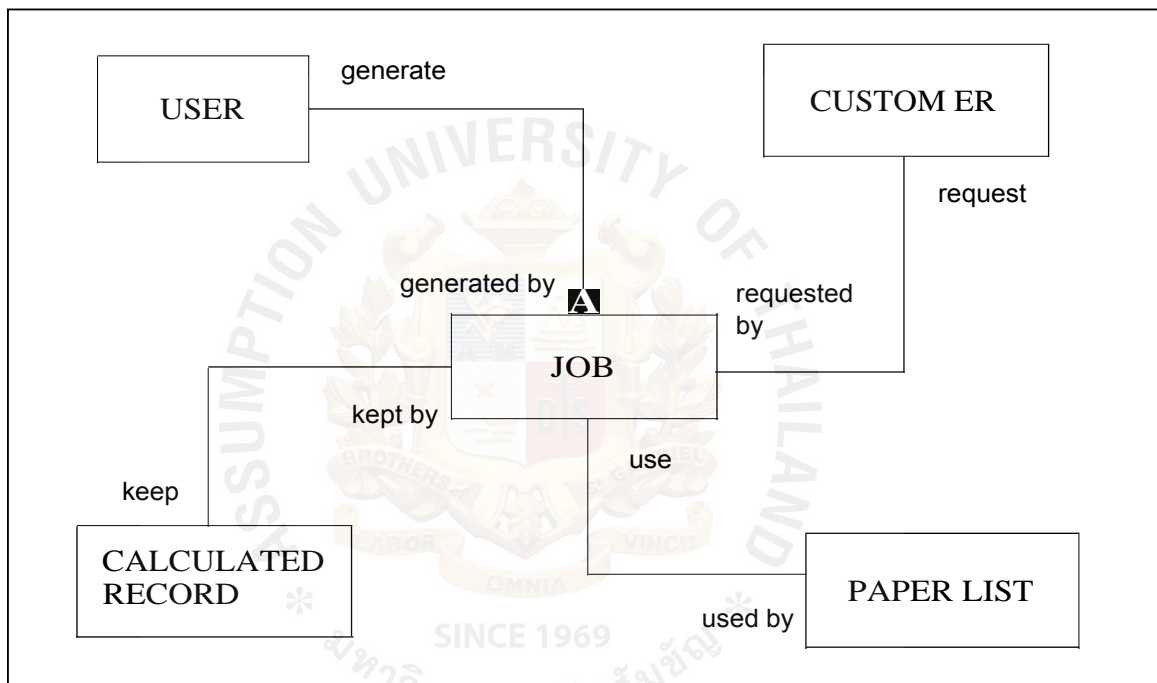


Figure 3.13. Entity Relationship Diagram.

### 3.5 Database Design

There are 5 tables in the database

(1) USER: Record user information to check accessing into the system. One user can generate 1 to many jobs.

- (a) User ID or User code, it can be number and/or character but not over 10 numbers and/or characters. Normally, the user code will be assigned automatically by the program.
- (b) Username is the name of user. Normally, the user code will be the first 3 characters of the name and the first 3 characters of the surname. The username will be assigned by the manager who is in level 1 of authorization.
- (c) Password is also the same as username but each user can assign it by him/her self. It can be number and/or character but not over 8 numbers and/or characters.
- (d) Name and Surname are the name and surname of each user.

All user information will be kept in the database. The authority people in level 1 can view, add or delete this information.

Table 3.1. User Table

NAME	TYPE	REMARK	DESCRIPTION
USER ID	VARCHAR(10)	NOT NULL	User Identity
USERNAME	VARCHAR(8)	NOT NULL	Username
PASSWORD	VARCHAR(8)	NOT NULL	Password
NAME	VARCHAR(25)	NOT NULL	Name of user
SURNAME	VARCHAR(25)	NOT NULL	Surname of user

(2) CUSTOMER : Record customer details. The details must consist of customer identification, company name, name of customer, customer's address, contact number of customer and may consist fax number or e-mail address.

Table 3.2. Customer Table.

NAME	TYPE	REMARK	DESCRIPTION
CUST ID	CHAR(5)	NOT NULL	Customer Identity
COMP NAME	CHAR(30)	NOT NULL	Company name
NAME	VARCHAR(25)	NOT NULL	Name of customer
ADDRESS	VARCHAR(60)	NOT NULL	Address of customer
TEL	VARCHAR(20)	NOT NULL	Contact number of customer
FAX	VARCHAR(10)		Fax number
E-MIL ADDRESS	VARCHAR(50)		E-mail address of customer

(3) **CALCULATED RECORD** : Record of the calculation result of the job must of consist customer identity, job identity, cost of paper, cost of printing, cost of plate, profit margin (0-999 %), unit price, net price, user identity and may consit cost of folding.

Table 3.3. Calculated Record Table.

NAME	TYPE	REMARK	DESCRIPTION
CUSTOMER ID	CHAR(5)	NOT NULL	Customer Identity
JOB ID	VARCHAR(6)	NOT NULL	Job Identity
PAP COST	NUMBER(4,2)	NOT NULL	Cost of Paper
PRC COST	NUMBER(6,2)	NOT NULL	Cost of Printing
PTC COST	NUMBER(6)	NOT NULL	Cost of Plate
FDC COST	NUMBER(5)		Cost of Fold
PROFIT	NUMBER(3)	NOT NULL	Profit Margin
JOB UNT	NUMBER(4,2)	NOT NULL	Unit Amount
JOB NET	NUMBER(6,2)	NOT NULL	Net Amount
USER ID	VARCHAR(10)	NOT NULL	User Identity

(4) PAPER LIST : Record type and price of paper must consist of paper ID, paper type, weight of paper, price of paper, updated price date and may consist type of paper page. The user must update the price at least once a month.

Table 3.4. Paper List Table.

NAME	TYPE	REMARK	DESCRIPTION
PAPER ID	CHAR(6)	NOT NULL	ID of product
PAPER-TYP	CHAR(6)	NOT NULL	Paper Type
PAPER WT	NUMBER(3)	NOT NULL	Weight of Paper
PAPER PP	NUMBER(1)		Type of Paper Page
PAPER PRC	NUMBER(4,2)	NOT NULL	Price of Paper
PRICE UPD	DATE	NOT NULL	Date of Paper's Price updated

(5) JOB : Record job information that customers require must consist of job ID, customer ID, job entry date, job description, size of job, number of color, paper ID, number of printing page, folding format, number of printing, and total price.

Table 3.5. Job Table.

NAME	TYPE	REMARK	DESCRIPTION
JOB ID	VARCHAR(6)	NOT NULL	Job Identity
CUST ID	CHAR(5)	NOT NULL	ID of Customer
JOB DATE	DATE	NOT NULL	Date of Job Entry
JOB DES	VARCHAR(100)	NOT NULL	Job Description
JOB SIZE	VARCHAR(2)	NOT NULL	Size of Job
JOB-COL	NUMBER( 1 )	NOT NULL	Number of Color
PAPER ID	CHAR(6)	NOT NULL	ID of Paper
PRT FOR	NUMBER(1)	NOT NULL	Number of Printing Page
FOL FOR	VARCHAR(6)	NOT NULL	Folding Format
JOB NUM	NUMBER(6)	NOTNULL	Number of Printing
TOTAL PRICE	NUMBER(7,2)	NOT NULL	Total Price of Job



### 3.6 User Interface Design and Steps of The Proposed System

The proposed system must be computerized and effective when it has to do outside service. Steps of the proposed system are the following:

- (1) User input username and password to the system.



Figure 3.14. Username and Password Screen.

(2) Select the menu from menu bar.

After login to the system, the main screen will be shown as below:



Figure 3.15. Main Menu Screen.

(a) If "Program" on menu bar is selected,

the program will show 2 submenus as shown below.

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Figure 3.16. Select "Program" Menu.

- (1) if "new entry" is selected, the screen will go to username and password.
- (2) if "quit" is selected, the program will quit.

(b) If "vretm" or "Screen" is selected, 3 submenu pop ups appear as shown below.

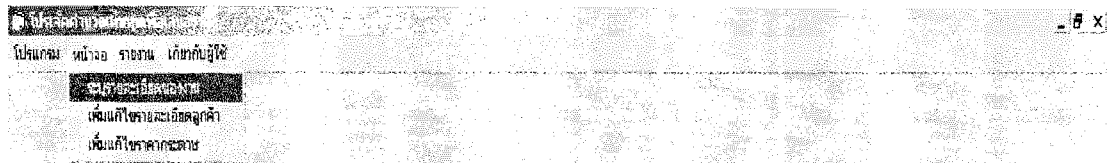


Figure 3.17. Select "Screen" Menu.

(1) if "5,1q,151Eldn'6EIWUONNT1-1 " or "Job Detail Identification" is

selected, the screen will appear as shown below. The user must input the detail in the box as required on the screen.

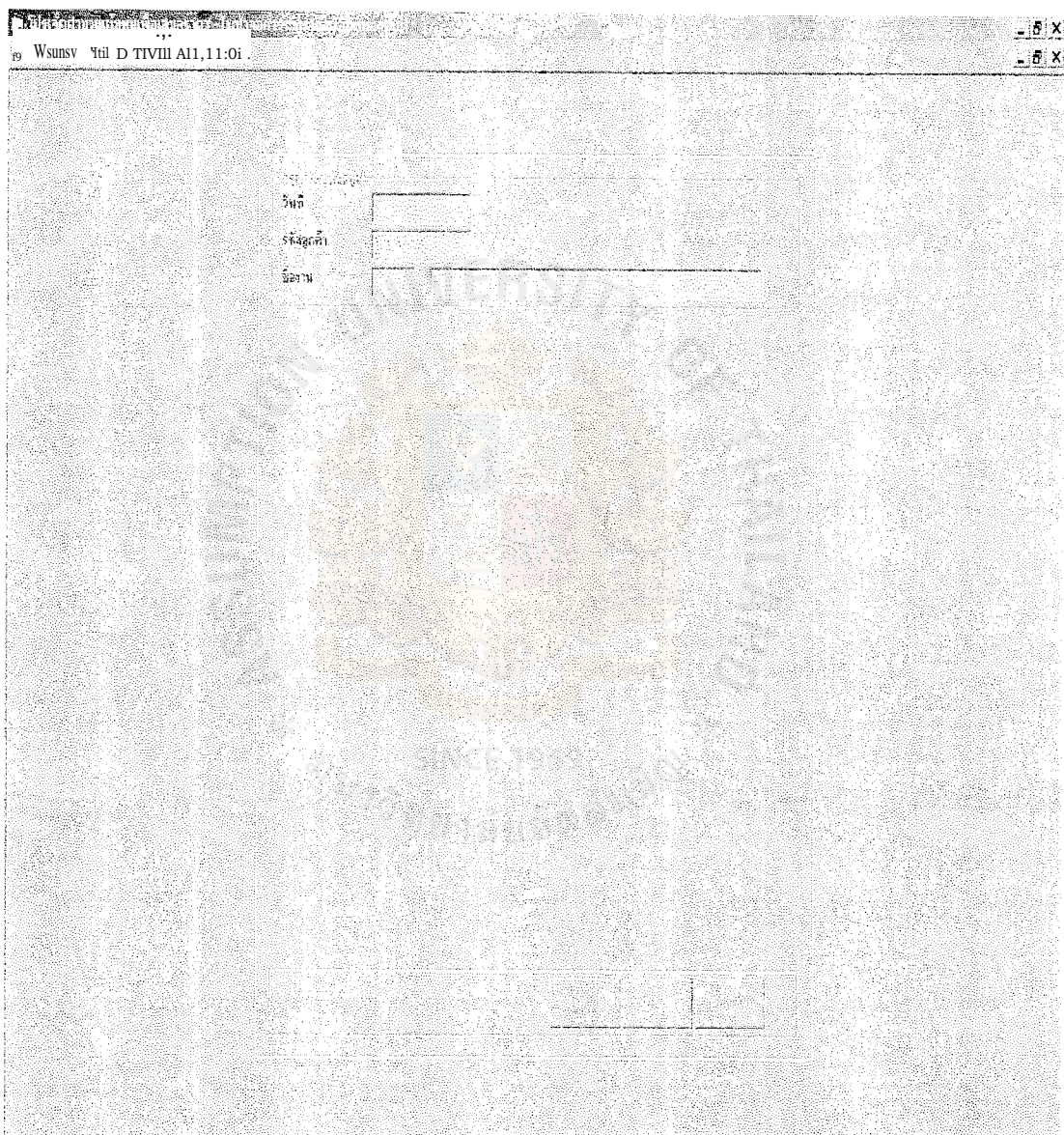


Figure 3.18. Select "Job Detail Identification" Menu.

- (a) Input date.
- (b) Input customer code.

If the customer is new, the customer detail screen will appear and the user must fill in the information.



\_ F x



Figure 3.19. Customer Detail Screen.



- (c) Input job code and job description.
- (d) Fill the job requirements.
- (e) Record the information.

X

The screenshot displays a 'Job Detail Screen' with the following fields and options:

- วันที่ (Date):** 28/10/2003
- รหัสลูกค้า (Customer Code):** 000
- ชื่องาน (Job Name):** test1
- ชื่อตำแหน่ง (Job Title):** sample1
- 1. รหัสของงาน (Job Code):** A2, A3, A4, A5
- 2. ชนิดของงาน (Job Type):**
  - ระยะเวลา (Duration): 2 ชั่วโมง (2 hours)
  - ระยะเวลา (Duration): 2 ชั่วโมง (2 hours)
- 3. จำนวนงาน (Job Quantity):** 85
- 4. จำนวนสินค้า (Number of Goods):** 4
- 5. รูปแบบการพิมพ์ (Print Format):** 2
- 6. รูปแบบการพิมพ์ (Print Format):**
  - ไม่พิมพ์ (Do not print)
  - รูปแบบที่ 1 (Format 1)
  - รูปแบบที่ 2 (Format 2)
  - รูปแบบที่ 3 (Format 3)
  - รูปแบบที่ 4 (Format 4)
- 7. จำนวนกระดาษที่ใช้พิมพ์ (Number of Paper Used):** 5,000
- 8. จำนวนเงิน (Amount):** 20.00

Buttons at the bottom: Save, Delete, Preview

Figure 3.20. Job Detail Screen.

(2) If "rfilltrit5man`6tmqnNi" or "Add/Edit Customer Detail"

submenu is selected, the screen will appear as shown in figure

3.12. The user must;

- (a) Input customer code.
- (b) Add or Edit customer information.
- (c) Record the information.

The screenshot shows a web application window titled "Customer Detail Screen for Edit". The form contains the following fields and values:

Field Label (Thai)	Value
รหัสลูกค้า (Customer Code)	itlm
ชื่อลูกค้า (Customer Name)	arthon yongrattanakul
ชื่อบริษัท/หน่วยงาน (Company/Agency Name)	zun noustra, co.,ltd
วันเดือนปีเกิด (Date of Birth)	15/2/22
รหัสประจำตัว (ID Number)	sfkxgjdjgk
รหัสประจำตัว (ID Number)	10260
โทรศัพท์มือถือ (Mobile Phone)	02-3310968
โทรศัพท์มือถือ (Mobile Phone)	01-G42K27
โทรศัพท์มือถือ (Mobile Phone)	02
อีเมล (Email)	kplkdrig,sidlg

At the bottom right of the form, there are two buttons: "Save" and "Delete".

Figure 3.21. Customer Detail Screen for Edit.

(3) If "utilwifinany" or "Edit Paper Price" submenu is selected,

the screen will be shown as in figure 3.13. The user must;

- (a) Select paper type.
- (b) Select paperweight.
- (c) Input paper price in baht/sheet.

N 11,1,11 w1...1 IV 1,1,111,1--



Figure 3.22. Edit Paper Price Screen.

(c) If "5101111" or "Report" on Menu bar is selected,

the screen will be shown as in figure 3.14. The user must;

- (1) Select customer code.

(2) Input job code to view.

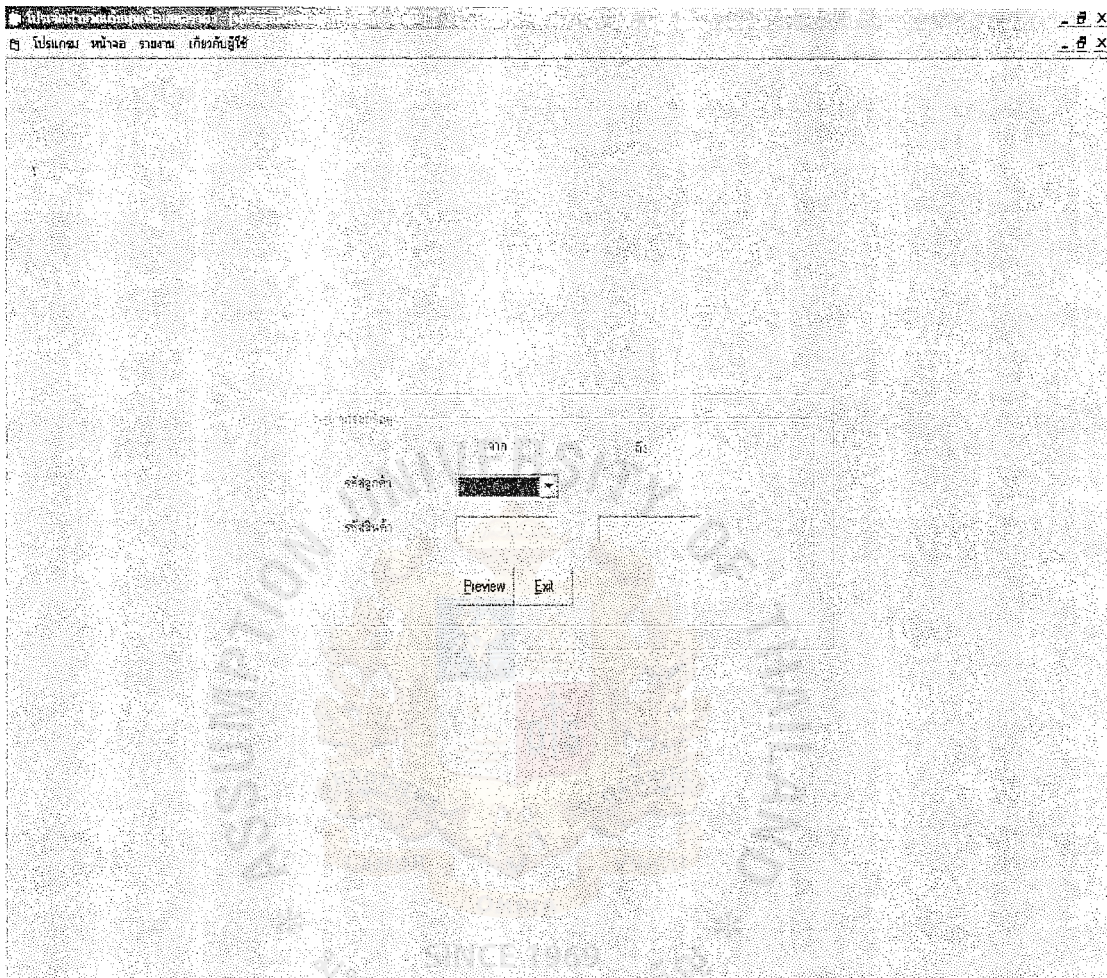


Figure 3.23. Select Report to Preview Screen.

After selecting "Preview", the screen will turn on the Report page, which runs on crystal report function. The report will show customer ID, customer name, job ID, job description (consists of type of paper, type of paper page, weight of paper, number of printing color, size of job, number of printing, number of printing side, folding type requirement,

price per unit and total price.) and grand total price. The Report page is shown below.

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				124,270.61

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Figure 3.24. Selected Report Preview Screen.



(d) If " tFientiii614" or "User on Menu bar is selected, the user must

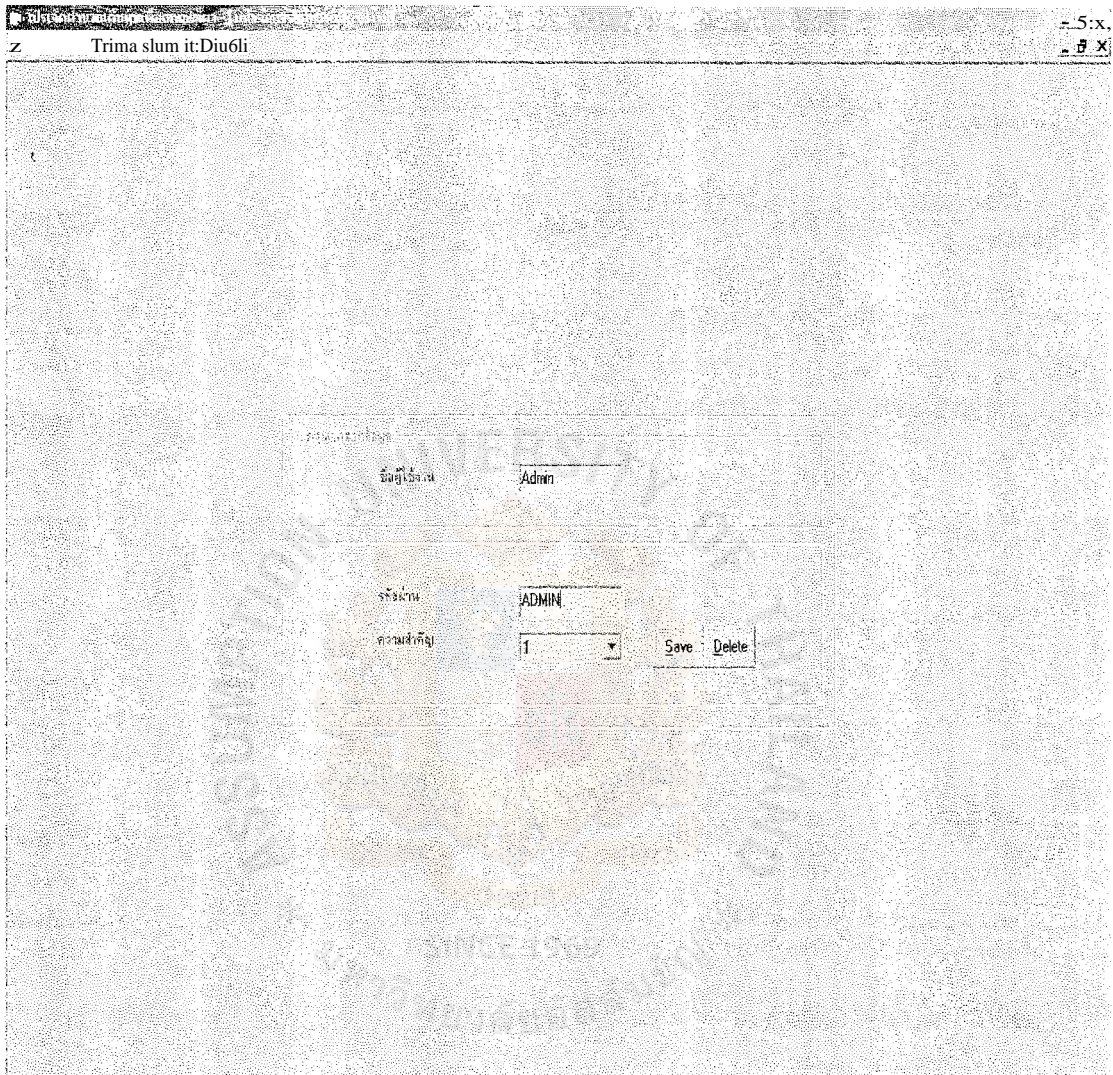


Figure 3.25. Select " User " Screen.

- (1) Input username.
- (2) Add or edit password.
- (3) Select important level.
- (4) Save or delete information.

(4) Save or delete information.

The menu " tiiti364,141" is proposed to be a security part of the system but it is not valid in this system. More authentication knowledge is required in developing this part of the program which is the next step to be developed.

### 3.7 Hardware and Software Requirements

The specification of the hardware and software can be summarized as follows:

(1) Hardware Requirement is the specification of the minimum qualification that

needs to comply with the system function. There are two criteria specification of the hardware requirement as shown in tables 3.6. and 3.7.

(a) The hardware requirements for user. The most necessary equipments as minimum requirements are shown below.

Table 3.6. Hardware Requirements for User.

USER	
TYPE	SPECIFICATION
CPU	Intel 486, Pentium or higher Memory 64 MB or higher Hard disk 200 MB or higher
Monitor	15" or higher
Mouse, Keyboard	Standard
Printer	Ink jet or Laser Printer



(b) The hardware requirements for developer. The most necessary equipments as minimum requirements are shown below. The requirements of the criteria higher than the user requirements are due to the speed and data processing.

Table 3.7. Hardware Requirement for Developer.

DEVELOPER	
TYPE	SPECIFICATION
CPU	Intel Pentium III or higher Memory 128 MB or higher Hard disk 10 GB or higher
Monitor	15" or higher
Mouse, Keyboard	Standard

(2) Software Requirement is the specification of the minimum qualification that needs to comply with the system function. There are two criteria specifications of the hardware requirement as shown below.

(a) The software requirements for user. The most necessary application software as minimum requirements are shown below.

Table 3.8. Software Requirements for User.

USER	
TYPE	SPECIFICATION
Operating System (OS)	Window 95, Window 98, Window ME, Window 2000 Professional, Window XP
Microsoft Office	Visual Basic, Access, Crystal Report, Word, Excel.

(b) The software requirements for developer. The most necessary softwares as minimum requirements are shown below. The requirements of the criteria higher than the user requirements are due to the function of use. The developer has to write sets of software, so the software must have ability in designing.

Table 3.9. Software Requirement for Developer.

DEVELOPER	
TYPE	SPECIFICATION
Operating System (OS)	Window 2000 Professional / Server
Design Tools	PhotoShop
Microsoft Office	Visual Basic, Access, Crystal Report, Word, Excel

## IV. EVALUATION AND IMPLEMENTATION

### 4.1 Evaluation

The purpose of evaluation is verification and validation of the proposed system. To evaluate the system, 10 jobs have been set to compare the accuracy and time consumption between the manual method and the computerized method. The following are the details of the sample jobs used for evaluation:

- (1) Art 2 side 85 g. 5000 sheets, 4 colors, 2 sides printing, size A4, fold to 3 parts.
- (2) Art 2 side 105 g. 3000 sheets, 2 colors, 1 side printing, size A5, not fold.
- (3) Art 2 side 120 g. 10000 sheets, 4 colors, 2 side printing, size A3, fold to half
- (4) Art 2 side 210 g. 30000 sheets, 4 colors, 1 side printing, size A2, not fold.
- (5) Art 1 side 260 g. 7000 sheets, 2 colors, 1 side printing, size A2, fold to half
- (6) Art 1 side 230 g. 20000 sheets, 1 color, 1 side printing, size A5, not fold.
- (7) Pound 55 g. 100000 sheets, 3 colors, 1 side printing, size A4, fold to 3 parts.
- (8) Pound 80 g. 400000 sheets, 3 colors, 2 side printing, size A3, fold to 6 parts.
- (9) Pound 120 g. 80000 sheets, 4 colors, 2 side printing, size A4, fold to 4 parts.
- (10) Pound 160 g. 55000 sheets, 1 color, 2 side printing, size A2, fold to 6 parts.

These 10 jobs represent all types of paper, weights of paper, colors of printing, folding types and numbers of printing. The results are shown below:

Table 4.1. Comparison of Calculation Result Between the Manual System and the Proposed Program.

ITEM	PRICE (baht/unit)		TIME (min.)	
	MANUAL	PROGRAM	MANUAL	PROGRAM
1	2.40	2.41	5	0.75
2	1.29	1.30	4.75	0.6
3	1.85	1.86	5	0.6
4	3.14	3.14	5.2	0.7
5	4.13	4.14	6	0.6
6	0.43	0.49	3	0.6
7	0.32	0.35	4	0.6
8	0.87	0.88	6.5	0.65
9	0.70	0.70	5	0.6
10	2.03	2.05	4	0.6

From the table above, 2 jobs are exactly calculated at the same price. Five jobs have a small difference of only 0.01 . The remaining 2 jobs have a difference of 0.02 satang. And only 1 job has a difference of 0.06 satang from the manual calculation.

The calculation by the proposed program has an accuracy of more than 98% compared to the manual calculation. The variation comes from the rounding of the decimal point in each calculation formula. This range of variation is acceptable because the profit margins cover the variation.

The graphs below show the comparison between price and time. The data come from Table 4.1. There is high accuracy in the proposed system compared to the existing system. Most of the prices are the same with just a few that have a small difference due to rounding of the decimal point in the calculating process.

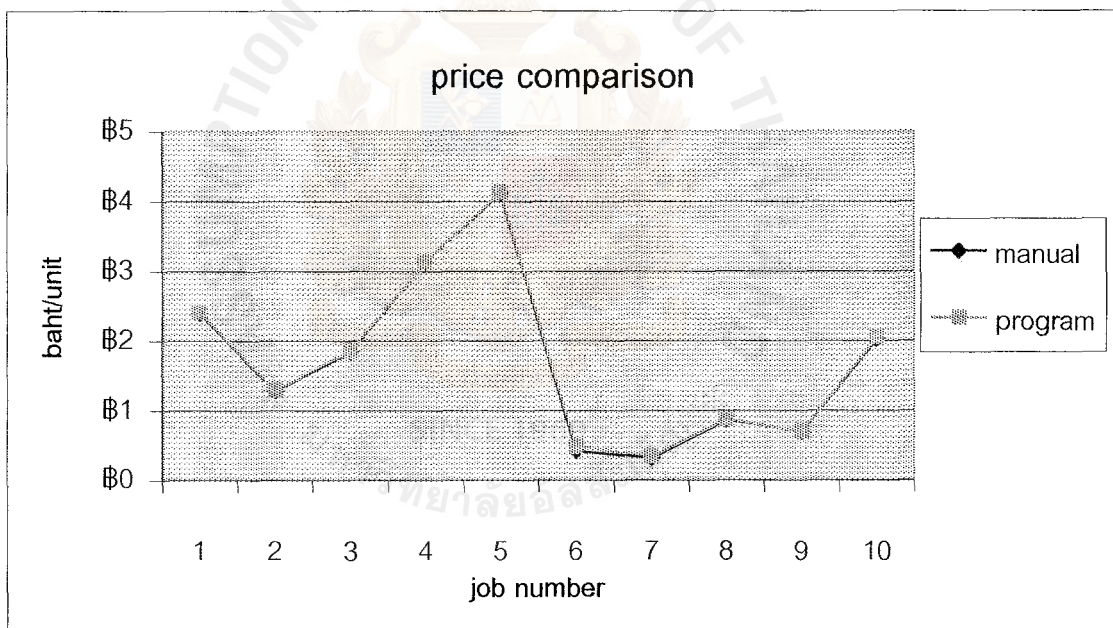


Figure 4.1. Comparison Graph of Price.

The outstanding difference is the time consumption. The manual calculation uses 5 minutes on average but the program uses less than a minute. The proposed system shows efficiency of time consumption in calculating a quotation job with the same information.

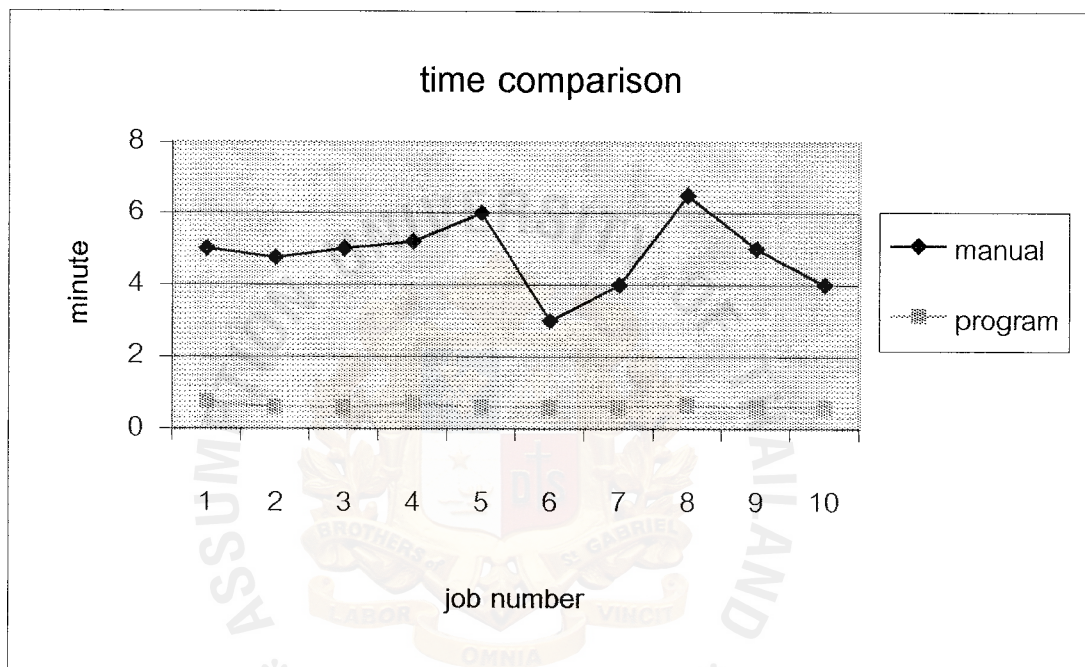


Figure 4.2. Comparison Graph of Time.

## 4.2 System Testing

The testing process can begin and proceed in parallel with the coding. A test case is a specific scenario of customer and job information and calculation, database, recording and reporting paths that represent a typical, critical or abnormal use of system. If the results of a test case do not compare favorably to the manual system, the error causing the problem must be found and fixed.



This cycle of finding problems, fixing errors, and rerunning test cases continues until no additional problems are found. Then system installation is performed.

- (1) For quotation system, there are 4 testing processes, input information testing, database testing, calculation testing and report testing.

**Input Information Testing:**

This testing is performed to test the receiving of information from customer, other necessary information and human errors also. The user interface is also tested to verify the effectiveness and understanding of user who operates the program.

- (2) Database Testing:

This system uses Microsoft Access as the database manager. To test the database working, testing scenario cases are tested. The number and correctness of transactions accessed to database is verified.

- (3) Calculation Testing:

The most important part of the system is the calculating process in system coding. The testing scenario was input and run to verify the correctness and reliability of the system compared to the result from manual calculation.

- (4) Report Testing:

This testing shows the detail of the job and result of calculation, so all the details and price have to match with the input information. The report must be printed as hard copy also.

Once the system tests have been completed satisfactorily testing the system with the designed model job will perform an acceptance testing, which is close to the real requirement from customer. The purpose of acceptance testing is for users to determine whether the system meets their requirements.

### **4.3 Implementation**

The purpose of system implementation is to develop and empower the employees in quotation ability. Customer's satisfaction and company's image are the by-products of the computerized quotation system development.

There are 6 major activities in implementing the new system. Coding, testing and installation are the first 3 phases that have to be preformed after technical design and prototype are approved. After installation has been completed, documentation, training and support are the last 3 phases performed in system implementation.

Coding is the process whereby physical design specifications are turned into working computer code. For coding process, the system uses VB (Visual basic) to generate working application. Once coding has begun, the testing process can begin.

The process of installation is to move from the current manual system to the new computerized system. There are 4 different theory approaches to installation.

- (1) Direct Installation: Changing over from the old system to the new one by turning off the old system when the new system is turned on.
- (2) Parallel Installation: Running the old system and the new system at the same time until management decides the old system can be turned off.
- (3) Single Location Installation: Trying out a new system at one site and using the experience to decide if and how the new system should be deployed throughout the organization.
- (4) Phased Installation: Changing the old system to the new system incrementally, starting with one or a few functional components and then gradually extending the installation to cover the whole new system.

Direct installation has been chosen to implement the automatic quotation system because the new system is not a complex system and the user interface is designed for easy use and understanding by the printing people.

#### 4.4 Cost - Benefit Analysis

The existing system is manual. The formula used to calculate is kept as a secret, so the calculation can be done only by the owner. Assuming that the revenue of the owner is 60000 baht/month, the cost of the manual system is shown in table 4.2. There is no investment in hardware or equipment because all of the hardware, for example a calculator, are existing equipments and the price is very cheap.

Table 4.2. Cost of Existing System.

Cost Item	months											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>Fixed cost</b>												
<b>Office Equipment cost</b>												
Calculators	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Fixed Cost</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Operating Cost</b>												
Average number of quotation (job)	40	40	40	40	40	40	40	40	40	40	40	40
Man Power	830	830	830	830	830	830	830	830	830	830	830	830
<b>Office Supplies&amp; Miscellaneous</b>												
Paper	8	8	8	8	8	8	8	8	8	8	8	8
Utility	10	10	10	10	10	10	10	10	10	10	10	10
Miscellaneous	50	50	50	50	50	50	50	50	50	50	50	50
<b>Total Office Supplies &amp; Miscellaneous Cost</b>	<b>68</b>	<b>68</b>	<b>68</b>	<b>68</b>	<b>68</b>	<b>68</b>	<b>68</b>	<b>68</b>	<b>68</b>	<b>68</b>	<b>68</b>	<b>68</b>
<b>Total Monthly Operating Cost</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>
<b>Total Manual System Cost</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>	<b>898</b>

This project is mostly invested in knowledge and books. Most of the expense is on books and for hiring the software expert as a program developer and consultant. Approximate cost for program development is 4000 bahts. The investment in equipments is not required because the existing computers and printer are used. Any trained operator, who has a lower salary than the printing owner, can operate the proposed program; that means a quotation can be made at a very low cost. The training is for training a clerk, salary 6000 bahts, and the owner. The training course and practice time took 2 hours, due to good design of user interface so that operation is easy to understand.

Table 4.3. Cost of the Proposed System.

Cost Items	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>Fixed Cost</b>												
<b>Hardware Cost</b>												
Computer	0	0	0	0	0	0	0	0	0	0	0	0
Printer	0	0	0	0	0	0	0	0	0	0	0	0
UPS	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Hardware Cost</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Software Development &amp; Training Cost</b>												
Software Development Cost	4000	0	0	0	0	0	0	0	0	0	0	0
Training Cost	550	0	0	0	0	0	0	0	0	0	0	0
<b>Total Software Development &amp; Training Cost</b>	<b>4550</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total Fixed Cost</b>	<b>4550</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Table 4.3. Cost of the Proposed System. (Continued)

Operating Cost												
Hardware Maintenance Cost	50	50	50	50	50	50	50	50	50	50	50	50
Man Power Cost	12	12	12	12	12	12	12	12	12	12	12	12
Office Supplies & Miscellaneous Cost	50	50	50	50	50	50	50	50	50	50	50	50
Total Operating Cost	112	112	112	112	112	112	112	112	112	112	112	112
Total Monthly Proposed System Cost	4662	112	112	112	112	112	112	112	112	112	112	112

The benefit and return is shown in calculation of Payback Period. The proposed system is proposed to pay back in a very short term, within 6 months, due to low investment, more effectiveness in equipment used time and very low operating cost.

Table 4.4. Payback Analysis of Proposed System.

Cost Item	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Development Cost	4550	0	0	0	0	0	0	0	0	0	0	0
Maintenance Cost	50	50	50	50	50	50	50	50	50	50	50	50
Operating Cost	62	62	62	62	62	62	62	62	62	62	62	62
Total Cost of Proposed System	4662	112	112	112	112	112	112	112	112	112	112	112
Total Cost of Manually System	898	898	898	898	898	898	898	898	898	898	898	898
Saving Cost	-3764	786	786	786	786	786	786	786	786	786	786	786
Cumulative Saving Cost						166	952	1738	2524	3310	4096	4882

The payback period is displayed as a graph in Figure 4.3 below. At the point of cumulative saving 0, the calculation results in 5 months and 24 days. After the 25<sup>th</sup> day, the company can save the total operating cost of making the quotation 786 baht a month. This saving is calculated based on the number of quotation of 40 jobs per month same as the existing system. If there are more customers and jobs to make the quotation, more saving and return will be obtained from the proposed system.

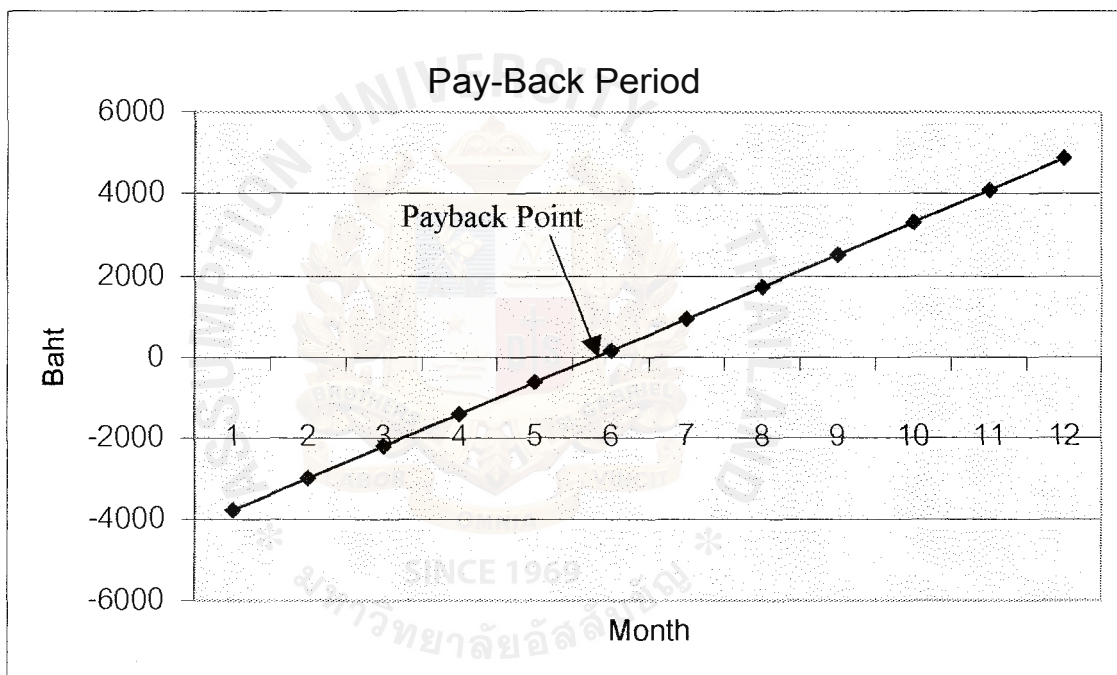


Figure 4.3. Payback Period Graph.

However, over the measurable benefit of the proposed system that is shown in the above table and figure, other benefits, that may be received from the computerized system, may be expressed in terms of competitive potential, customer service satisfaction, company image and employee development.

(1) Competitive Potential.

As shown in Figure 4.2, time use is much more effective. A lot of time can be saved in calculating the quotation; that means there is more time to do other things in production or customer service, making it more competitive to other printers, etc.

(2) Customer Service Satisfaction.

Fast response and accuracy in calculation make the first image satisfying to the customers. At present, printers are highly competitive in service, not only in price and quality of the product, but the face to face meeting that in making the quotation at that time with the technology on hand, helps a lot in closing the deal.

(3) Company Image.

First impression is an important thing in the business world. The technology presented to the customer is one of the best methods to make an impression. When meeting a customer with a notebook computer, computerized quotation helps to make the first good impression that leads to success in meeting.

The five new customers were impressed at the first meeting due to instant quotation and presentation. From these 5 new customers, jobs which can make 15,000 baht profit were obtained.

(4) Employee Development.

The new system can train the employees, so that they can develop their work ability. There is also increase in employees' self-confidence, which is a method of motivation, and also in loyalty to the organization.



## IV. CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusions

For the existing system, the owner himself does the quotations. All data and information record are kept on paper. To find the cost of paper is time consuming for checking the price list and calling the vendor for updated price list. Sometimes, outside quotation occurs without appointment, so that the quotation cannot be made because the price list of paper is not on hand. Another problem that occurs in the existing problem is human error in calculation, even though it happens once in a while.

The computerized quotation can provide more efficient calculation and eliminate human error. Installation of this quotation program and database in a notebook computer provides convenience in quotation anywhere anytime. The computerized system also makes customers impressed and increase the image of the company due to fast responsiveness and technological use. The equipment is more efficient with no cost of investment. Another benefit is it increases company's competitive potential that will lead to more customers and increased profitability. In terms of employee development, the easy to understand user interface design, can improve employee-working ability and motivate them to develop themselves to be valuable employees.

The most measurable benefits from the computerized system are the cost and time savings. Time reduction is the result of automatic calculation. Cost saving is the result of the much more lower operating cost, as mentioned in the previous chapter.

This developed automatic quotation system complies to the scope and objectives of the project. The new system can replace the manual quotation completely with the lowest investment and fast payback period.

## 5.2 Recommendations

This project is the initial developing software. It can calculate simple type of printing jobs, with a little diversity in printing. There are paper box or packaging printing, folder printing, envelope printing, special color, additional hot stamp, folding types, special size printing, etc. If it is necessary to cover all kinds of quotation in printing industry, the programmer who wants to develop the software will have to study to cover:

- (1) Layout calculation for all kinds of shapes and designs.

Because of diverse shape in printing, such as paper box, brochure, etc., layout calculation is very important. The calculation must have ability to calculate the number and position of job in each printed paper. If the position and number of job in the printed paper can be stipulated at the highest value, the lowest cost can be calculated.

- (2) Type of printing calculation for all kinds of printing types.

As mentioned above, printing job is not limited to A2, A3, A4, or A5 size, print 1 or 2 side and 1 — 4 colors printing. There are a lot of types of printing job at present. For example, there are paper box (which requires information in shape, size, adhesive or not adhesive, type surface coating, special color, hot stamp, etc.), book (which requires information in number of page, type of cover paper, type of inside paper, type of binding, other special requirement, etc.), etc. All the information must be considered for correct calculation, which is very complicated calculation.

- (3) Database design for various types of printing media.

The printing, especially Offset printing, has a lot of media used at the present time. It can be divided into two major types, paper and synthetic paper for

the graphic designer to use in designation. Paper is made from natural pulp (such as card board paper, art paper, pound or type writer paper) and the synthetic paper is made from various sources, for example PVC, PE, YUPO, etc.

- (4) User interface design for all kinds of printing type.

When the requirement of printing job is increased, complication of calculation and information are also increased. The user interface must be designed to cover all kinds of printing type, requirements, paper types, etc.

- (5) System security or authentication of the system.

This is one of the most important parts in any program. The security system must be designed to protect unauthorized people and level of user should be divided to limit the number of people who can approach important data.

- (6) Network operation.

At this time, the stand alone system covers the user requirements. In the future, the organization may be expanded. The number of sale persons increases, and the network has been implemented. Program developers may be required to create the networking system operation, and all of the parts in the automatic quotation system may be redesigned to support the growth of the organization.

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