THE DEVELOPMENT OF A PROTOTYPE WEB-BASED INVESTMENT INFORMATION SUPPORT SYSTEM IN FOOD MANUFACTURING BUSINESS

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THE DEVELOPMENT OF A PROTOTYPE WEB-BASED INVESTMENT INFORMATION SUPPORT SYSTEM IN FOOD MANUFACTURING BUSINESS

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ABSTRACT

The main objective of this study was to design and develop a prototype web-based application containing basic investment information and capital investment estimation in the food manufacturing business for assisting in making decisions and economic evaluations before investment decisions. In addition, the system also calculates the return on investment and payback period.

The application was designed and developed using relational database model. Microsoft Access 2000 is used as a database management system. Microsoft Visual Studio.net is manipulated as the graphic user interface design tool. ASP.net technologies are applied as the program development tool and Information Internet Server is utilised as web server.

The system consists of two parts which are the web application and the application server. The Web application is used to retrieve and display information. Application server identifies the types of user before entering into the system and also allows administrators to manage data in the database system. Both the information retrieval and data management system are activated on the screen of the web browser.

A questionnaire was used to measure user satisfaction in the design of the interface, the application of the system, the calculation of the system, and overall satisfaction. The average results of the questionnaire fell into the "Good" level indicating that users were satisfied with the investment support system in food manufacturing business through Internet. It can be concluded that the objectives of the system developed were attained.

KEY WORDS : WEB-BASED / INVESTMENT / FOOD /MANUFACTURING / BUSINESS

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การพัฒนาระบบสารสนเทศสำหรับการสนับสนุนการลงทุนบนเว็บต้นแบบของธุรกิจอุตสาหกรรมอาหาร (THE DEVELOPMENT OF A PROTOTYPE WEB-BASED INVESTMENT INFORMATION SUPPORT SYSTEM IN FOOD MANUFACTURING BUSINESS)

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บทคัดย่อ

วัตถุประสงค์ของการศึกษานี้เพื่อออกแบบ และพัฒนาต้นแบบของเว็บเบสแอพลิเคชั่นที่ประกอบด้วยข้อมูลการลงทุนเบื้องต้น และการประมาณต้นทุนในการลงทุนในธุรกิจอุตสาหกรรมอาหารเพื่อช่วยในการตัดสินใจ และประเมินผลทางด้านเศรษฐศาสตร์ก่อนการลงทุน อีกทั้งระบบยังคำนวณอัตราการคืนทุน (ROI) และระยะเวลาคืนทุนอีกด้วย

ระบบนี้ถูกออกแบบและพัฒนาโดยใช้ฐานข้อมูลเชิงสัมพันธ์โดยใช้ Microsoft Access 2000 สำหรับการจัดการฐานข้อมูล, Microsoft Visual Studio.net เป็นเครื่องมือในการออกแบบหน้าจอ, ASP.net เป็นเครื่องมือในการพัฒนาโปรแกรม และ Information Internet Server เป็น Web Server

ระบบประกอบด้วยสองส่วน ได้แก่ Web Application และ Application Server ซึ่ง Web Application นี้เป็นส่วนของการสืบค้นและการแสดงข้อมูล ส่วน Application Server เป็นส่วนที่บ่งชี้ประเภทของผู้ใช้ก่อนการเข้าใช้งานระบบ โดยให้ผู้ดูแลระบบ (Administrator) สามารถบริหารจัดการฐานข้อมูลของระบบได้ ซึ่งการสืบค้นข้อมูลรวมทั้งการบริหารจัดการฐานข้อมูลสามารถกระทำผ่านทาง Web Browser

จากการใช้แบบสอบถามเพื่อวัดความพึงพอใจของผู้ใช้ในด้านการออกแบบหน้าจอ, การทำงานของระบบ , การคำนวณ และความพึงพอใจโดยรวม พบว่าในทุกด้านผู้ใช้มีความพึงพอใจต่อระบบสนับสนุนการลงทุนบนเว็บสำหรับธุรกิจอุตสาหกรรมอาหารโดยเฉลี่ยอยู่ในเกณฑ์ดี ซึ่งสามารถสรุปได้ว่าการพัฒนาระบบนี้สำเร็จตรงตามวัตถุประสงค์

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CHAPTER I
INTRODUCTION

1.1 Background and Problems

The technical role of a food factory is to convert the farmer's raw material into a stable, palatable and directly usable food product. The economic role of a food factory is to add value to raw products; to benefit investors; to create jobs for managers, workers and farmers; and to provide business for suppliers and manufacturers of ingredients, packaging materials and equipment.

Effective project management will ensure that the plant is complete on time and on budget and that the plant is built in accordance with specifications and good sanitary practices, before launching the business. Most Investors have little experience or the qualifications necessary to estimate or analyze alternatives in estimating the cost of an investment project. Investors need to know about information of their business such as rough process, approximate equipment costs and concise total cost estimation to assist in investment decisions and to help investors in their economic evaluation of an investment in a food manufacturing business.

Nowadays the internet has an important role in our society. People can reach information easily. The correct and update information is necessary for the best decision. Information technology is used for managing valuable data for decision making. Therefore, to solve the problem, instead of finding other resource or consulting with consultants, one decides to develop a web-based investment support system to help investment decisions and economical estimation of their food manufacturing business.

1.2 Objectives

1.2.1 To analyze, design, and develop a prototype of web-based investment information support system for food manufacturing business to assist in investment decisions.

1.2.2 To help users in their economic evaluation of an investment in a food manufacturing business.

1.3 Scopes of Study

The scopes of study are following:

1.3.1 To study and analyze capital investment information for a food manufacturing business.

1.3.2 To design and develop a prototype of web-based application using Microsoft Access 2000, ASP.net and VB.net

1.3.3 To estimate the total capital; civil works costs, electrical and mechanical works costs, engineering and project control costs, equipment list and costs, operation costs, utilities requirement, as well as process description.

1.4 Expected Results

1.4.1 A prototype of web-based application to assist in investment decisions and to help users in their economic evaluation of an investment in a food manufacturing business.

1.4.2 Capital investment information of a food manufacturing business to assist decision-making support before an investment.

1.4.3 Automatic cost estimation performed by the system.

CHAPTER II
LITERATURE REVIEW

2.1 Economical Estimates of Food Manufacturing

Manufacturing operations generally transform some tangible inputs or raw materials into some tangible output. Figure 2.1 shows this input/output viewpoint. (4),(6)

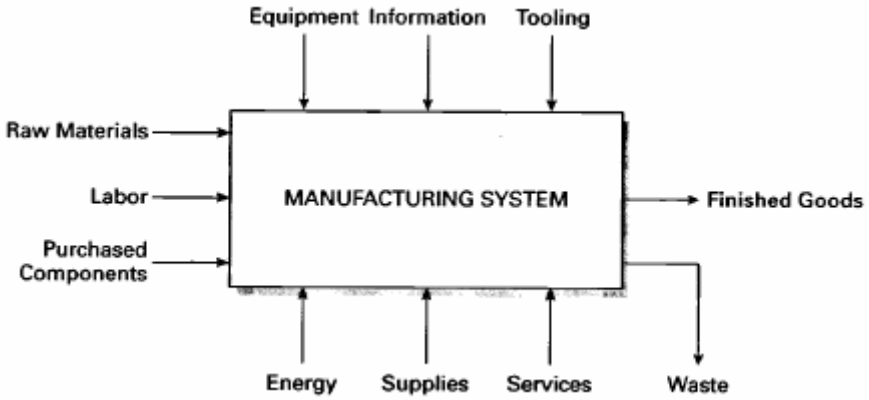

Figure 2.1 Input–output model of a manufacturing system (6)

The evaluation of a manufacturing project must begin by examining the economic context in which the plant will exist throughout its lifetime. Next, the study must define the technology-the types and sizes of required equipment, its prices, its efficiencies, its energy consumptions, and the work force needed for its operation. (4)

2.1.1 Feasibility Survey

A budget can greatly enhance chances of success by helping estimate future needs and plan profits, spending and overall cash flow. A budget allows perceiving problems before they occur and alter plans to prevent those problems. In business, budgets help determine how much money you have and how you will use it, and help you decide whether you have enough money to achieve your financial goals. (9)

A budget will indicate; the cash required for necessary labor and/or materials, total start-up costs, day-to-day maintenance costs, revenues needed to support business operations, and expected profit. (13)

In order to specify any work and design in details, the technical and economic factors of the proposed process should be firstly examined. The various reactions and physical processes involved must be considered, as well as the existing and potential market conditions for the particular product. A preliminary survey of this type gives an indication of the probable success of the project and also shows what additional information is necessary to give a complete evaluation. The list of items that should be considered in making a feasibility survey as follows :

1) Raw materials (availability, quantities, qualities, costs)
2) Thermodynamics and kinetics of chemical reactions involved (equilibrium, yields, rates, optimum conditions)
3) Facilities and equipment available at present
4) Facilities and equipment which must be purchased
5) Estimation of production costs and total investment
6) Profits (probable and optimum, per pound of product and per year, return on investment)
7) Materials of construction
8) Safety considerations
9) Markets (present and future supply and demand, present uses, new uses, present buying habits, price range for products and by-products, character, location, and number of possible customers)

10) Competition (overall production statistics, comparison of various manufacturing process, product specifications of competitors)
11) Properties of products (chemical and physical properties, specifications, impurities, effects of storage)
12) Sales and sales service (method of selling and distributing, advertising required, technical services required)
13) Shipping restrictions and containers
14) Plant location
15) Patent situation and legal restrictions

The purchased cost of each piece of process equipment may now be estimated from published cost data or from appropriate manufactures' bulletins. Regardless of the source, the published purchased-cost data must always be correct to the current cost index.

The goal of a "plant design" is to develop and present a complete plant that can operate on an effective industrial basis. To achieve this goal, we must be able to combine many separate units or pieces of equipment into one smoothly operating plant. If the final plant is to be successful, each piece of equipment, therefore, is an essential part of a plant design. (9)

2.1.2 Objective of Investments

The primary objective of capital investment is to maximize profit within a planning horizon. Given the difficulty and uncertainty involved in estimating benefits and costs, and in choosing an appropriate time frame and a minimum attractive rate of return, factors other than maximization of profit must be considered in the selection of capital projects. Social, political, and environmental concerns as well as economic factors may be significant in influencing project selection.(2)

Once the objective of profit maximization is accepted, imperfect though it may be, a decision criterion reflecting the stated objective may be established for the economic evaluation of proposed capital projects. An investment decision criterion

consists of two elements: a merit measure and a set of decision rules associated with this measure.

A systematic approach for economic evaluation of independent project involves the following step:

- Generate a set of investment projects for consideration.
- Establish the planning horizon for economic study.
- Develop the cash flow profile for each project.
- Specify the minimum attractive rate of return.
- Examine the objective and merit measures.
- Establish the criteria for accepting or rejecting a proposal.
- Perform sensitivity analysis.
- Accept or reject a proposal.

2.1.3 Capital Investment

The total capital investment comprises the fixed-capital investment in the plant and equipment, including the necessary investment for auxiliaries, and nonmanufacturing facilities, plus the working capital investment (8). Figure 2.2 illustrates capital inputs and outputs for an industrial operation using a tree growth analogy, depicting as the trunk the total capital investment.

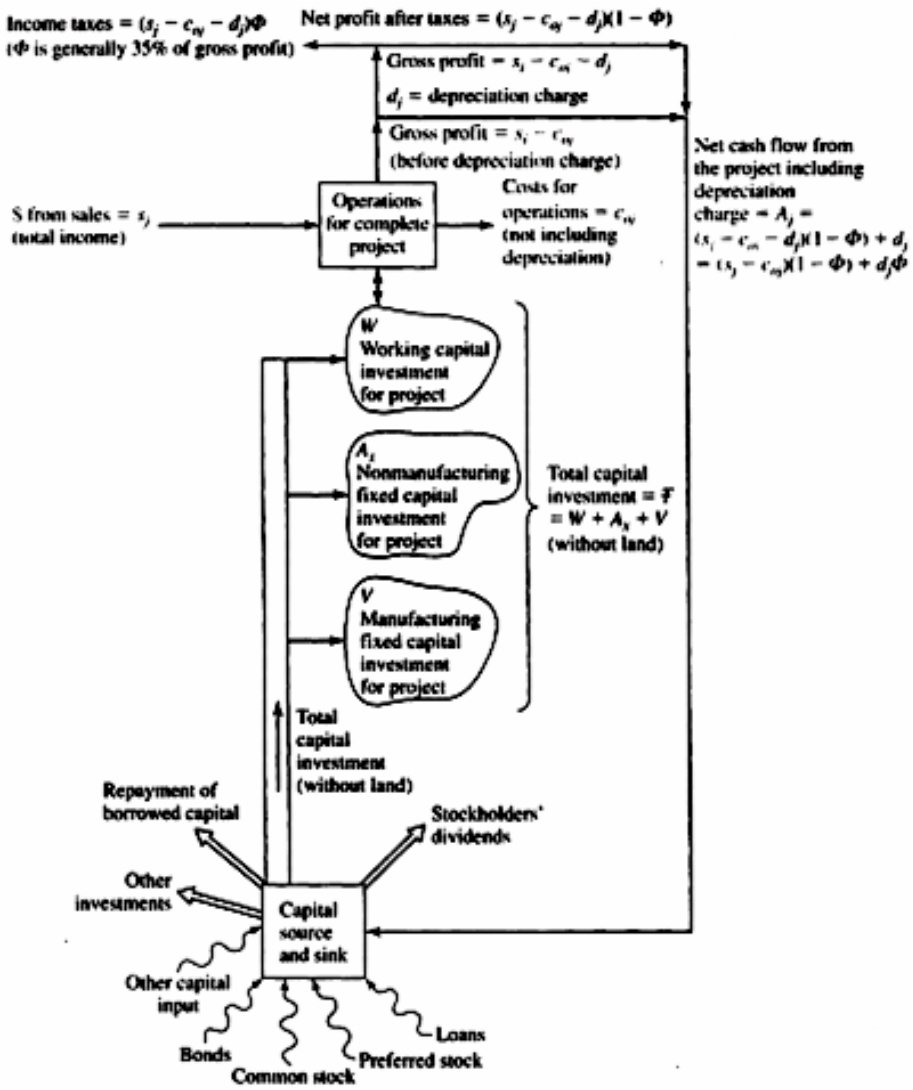

Figure 2.2 Tree diagram showing cash flow for industrial operations

2.1.3.1 Fixed-Capital Investment

The fixed-capital portion may be future subdivide into *manufacturing fixed-capital investment*, also known as *direct cost*, and *nonmanufacturing fixed-capital investment,* also known as *indirect cost*. (8)

Manufacturing fixed-capital investment represents the capital necessary for the installed process equipment with all auxiliaries that are needed for complete process operation. Expenses for piping, instruments, insulation, foundations, and site preparation are typical examples of costs included in the manufacturing fixed-capital investment.

The capital required for construction overhead and for all plant components that are not directly related to the process operation is designated as the *non-manufacturing fixed-capital investment*. These plant components include the land, processing buildings, administrative, and other offices, warehouses, laboratories, transportation, shipping, and receiving facilities, utility and waste-disposal facilities, shops, and other permanent parts of the plant. The *construction overhead cost* consists of field-office and supervision expenses, home-office fees, and contingencies. In some cases, construction overhead is proportioned between manufacturing and non-manufacturing fixed-capital investment. (8)

2.1.3.2 Working Capital

The working capital for an industrial plant consists of the total amount of money invested in.

1) Raw materials and supplies carried in stock.
2) Finished products in stock and semi-finished products in the process of being manufactured.
3) Accounts receivable.
4) Cash kept on hand for monthly payment of operating expenses, such as salaries, wages, and raw-material purchases.
5) Accounts payable.
6) Taxes payable.

The raw-materials inventory included in working capital usually amounts to a 1-month supply of the raw materials valued at delivered prices. Finished products in stock and semi-finished products have a value approximately equal to the total manufacturing cost for 1 month's production. Because credit terms extended to customers are usually based on an allowable 30-day payment period, the working capital required for accounts receivable ordinarily amounts to the production cost for 1 month of operation. (8),(9)

2.1.4 Estimation of Capital Investment

Most estimates of capital investment are based on the cost of the equipment required. Table 2.1 provides a checklist of items for a new facility and is an invaluable aid in making a complete estimation of the fixed-capital investment. (8)

Table 2.1 Breakdown of fixed-capital investment items

Direct costs
1. Purchased equipment
All equipment listed on a complete flowsheet
Spare parts and noninstalled equipment spares
Surplus equipment, supplies, and equipment allowance
Inflation cost allowance
Freight charges
Taxes, insurance, duties
Allowance for modifications during start-up
2. Purchased-equipment installation
Installation of all equipment listed on complete flowsheet
Structural supports
Equipment insulation and painting
3. Instrumentation and controls
Purchase, installation, calibration, computer control with supportive software
4. Piping
Process piping utilization suitable structural materials
Pipe hangers, fitting, valves
Insulation

Table 2.1 Breakdown of fixed-capital investment items (Continued)

5. Electrical systems

   Electrical equipment switches, motors, conduit, wire, fittings, feeders, grounding, instrument and control wiring, lighting, panels

6. Buildings (Including services)

   Process buildings – substructures, superstructures, platforms, supports, stairways, ladders, access ways, cranes, monorails, hoists, elevators

   Auxiliary buildings – Administration and office, medical or dispensary, cafeteria, garage, product warehouse, parts warehouse, guard and safety, fire station, change house, personnel building, shipping office and platform, research laboratory, control laboratory

   Maintenance shops – electric, piping, sheet metal, machine, welding, carpentry, instrument

   Building services – plumbing, heating, ventilation, dust collection, air conditioning, building lighting, elevators, escalators, telephones, intercommunication systems, painting, sprinkler systems, fire alarm

7. Yard Improvements

   Site development – site clearing, grading, roads, walkways, railroads, fences, parking areas, wharves and piers, recreational facilities, landscaping

8. Service facilities

   Utilities – steam, water, power, refrigeration, compressed air, fuel, waste disposal

   Facilities – boiler plant incinerator, river intake, water treatment, cooling towers, water storage, electric substation, refrigeration plant, air

Table 2.1 Breakdown of fixed-capital investment items (Continued)

plant, fuel storage, waste disposal plant, environment controls, fire protection

Nonprocess equipment – office furniture& equipment, cafeteria equipment, Safety & medical equipment, shop equipment, laboratory equipment, garage equipment, shelves, bins, pallets, housekeeping equipment, fire extinguishers, hose, fire engine

Distribution and packaging – raw material and product storage and handling equipment, product packaging equipment, loading station

9. Land

Surveys and fees

Property cost

Indirect costs

1. Engineering and supervision

Engineering costs – administrative, process, design and general engineering, computer graphics, cost engineering, procuring, expediting, communication, scale models, consultant fees

Engineering supervision and inspection

2. Contractor's fees
3. Contingency

2.1.5 Methods for Estimation Capital Investment

Various methods can be employed for estimating capital investment. The choice of any one method depends upon the amount of detailed information available and the accuracy desired. Estimating by percentage of delivered-equipment cost is one method and commonly used for preliminary and study estimates. This is summarized in the following cost equation:

$$C_n = \sum(E + f_1E + f_2E + f_3E + ... + f_nE)$$

Where C_n is the new capital investment, E the delivered purchased equipment cost, and $f_1, f_2, \ldots, f_n$ are multiplying factors for piping, electrical, indirect cost, etc.

Typical factors for the components of the capital cost are given in Table 2.2. These can be used to make an approximate estimate of capital cost using equipment cost data published in the literature. The contribution of each of these items to the total capital cost is calculated by multiplying the total purchased equipment by an appropriate factor. (9)

Table 2.2 Typical factors for estimation of project fixed capital cost

Item	Process type		
	Fluid	Fluids-solids	Solids
1. Major equipment, total purchase cost	PCE	PCE	PCE
f1 Equipment installation	0.40	0.45	0.50
f2 Piping	0.70	0.45	0.20
f3 Instrumentation	0.20	0.15	0.10
f4 Electrical	0.10	0.10	0.10
f5 Buildings, process	0.15	0.10	0.10
*f6 Utilities	0.50	0.45	0.25
*f7 Storages	0.15	0.20	0.25
*f8 Site development	0.05	0.05	0.05
*f9 Auxiliary buildings	0.15	0.20	0.30

Table 2.2 Typical factors for estimation of project fixed capital cost (Continued)

2. Total physical plant cost (PPC)			
PPC = PCE (1 + f1 +……...…+ f9)			
= PCE x	3.40	3.15	2.80
f10 Design and Engineering	0.30	0.25	0.20
f11 Contractor's fee	0.05	0.05	0.05
f12 Contingency	0.10	0.10	0.10
Fixed capital = PPC (1 + f10 + f11 + f12)			
= PPC x	1.45	1.40	1.35

* Omitted for minor extensions or additions to existing sites. (9)

2.1.6 Estimation of Total Product Cost

Determination of the necessary capital investment is only one part of a complete cost estimate. Another equally important part is the estimation of costs for operating the plant and selling the products. These costs can be grouped under the general heading of *total product cost*. The latter, in turn, is generally divided into the categories of *manufacturing costs* and *general expenses*. Manufacturing costs are also known as operating or production costs. Further subdivision of the manufacturing costs is somewhat dependent upon the interpretation of direct and indirect costs. (9)

An estimate of the operating costs, the cost of producing the product, is divided into two groups.

1) *Fixed costs* (maintenance, operating labor, laboratory costs, supervision, plant overheads, capital charges, rates, insurance, etc.)

2) *Variable Costs* (raw materials, miscellaneous operating materials, utilities, shipping and packaging)

The costs listed above are the direct costs of producing the product at the plant site.

Accuracy is as important in estimating total product cost as it is in estimating capital investment costs. The largest sources of error in total-product-cost estimation are overlooking elements of cost. A tabular form is very useful for estimating total product cost and constitutes a valuable checklist to preclude omissions. Figure 2.3 provides a suggested checklist which is typical of the costs involved in chemical processing operations. (9)

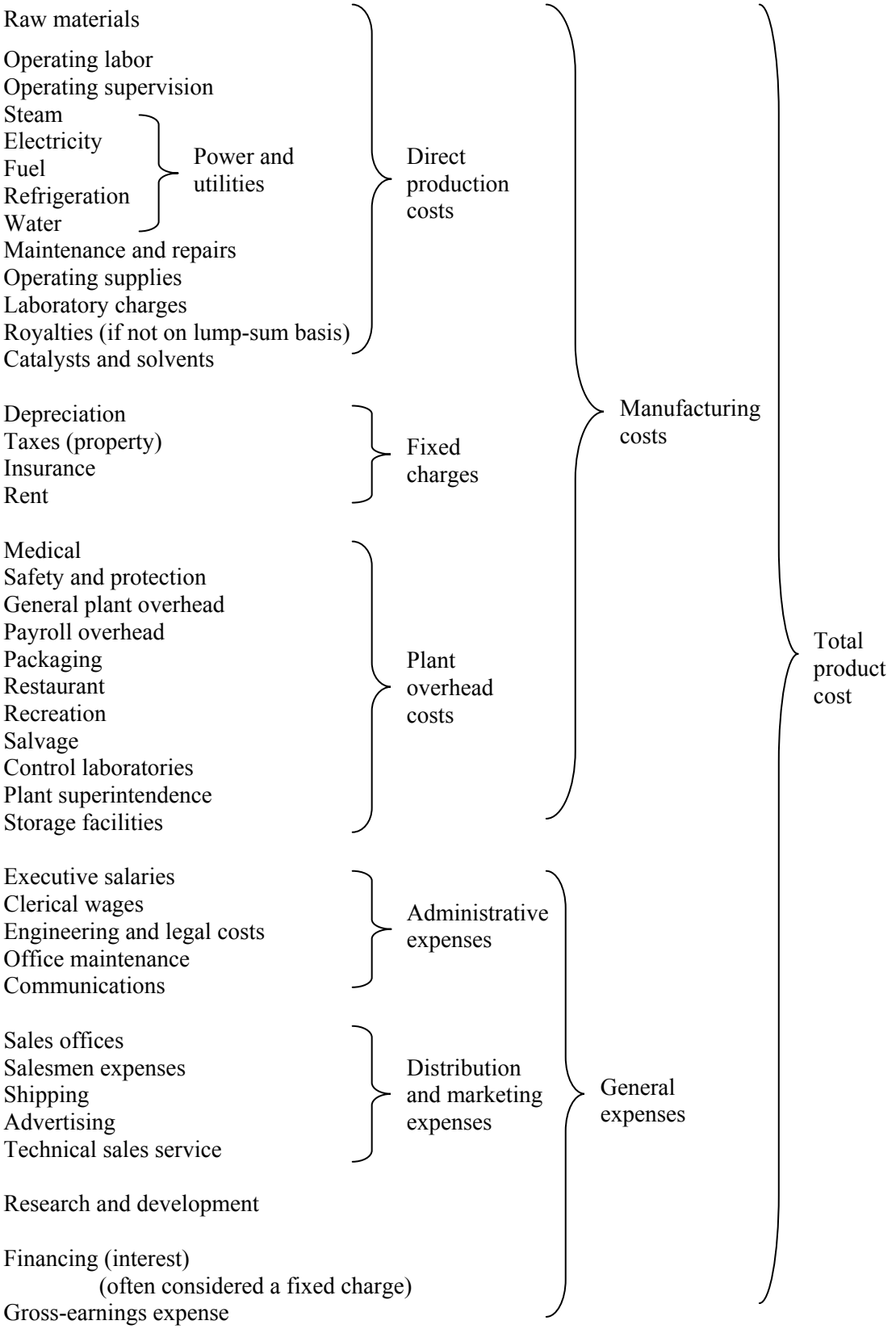

Figure 2.3 Costs involved in total product cost for a typical chemical process plant.(8)

2.1.6.1 Manufacturing Costs

The importance of design in determining manufacturing costs as well as life cycle costs for products. Concurrent engineering relies on computer integrated manufacturing as one of the tools necessary to succeed. Product cost estimation at an early stage is important, for decision-makers to assess the impact of the design choices they have to make. Jo, et al (3). reinforce this view, with a description of how the cost estimation model for concurrent engineering should function. They emphasize that the cost estimator should construct cost models that can derive meaningful manufacturing cost estimates based on the collected data. This data should include the predicted costs of material, machining, overhead, testing, assembly and other related drivers. They acknowledge that traditional cost estimating models are not structured adequately to support concurrent engineering. The uncertainty of information at the early stage of process planning hinders the accuracy of the estimates, which limits the accuracy of the early design cost. (3)

All expenses directly connected with the manufacturing operation or the physical equipment of process plant itself are included in the manufacturing costs. These expenses, as considered here, are divided into three classifications as follows: 1) variable production costs, 2) fixed charges, and 3) plant overhead costs.

Variable production costs include expenses directly associated with the manufacturing operation. This type of cost involve expenditures for raw materials (including transportation, unloading, etc.,) ; direct operating labor; supervisory and clerical labor directly connected with the manufacturing operation; plant maintenance and repairs; operating supplier; power; utilities; royalties; and catalysts.

It should be recognized that some of the variable costs listed here as part of the direct production costs have an element of fixed cost in them. For instance, maintenance and repair decreases, but not directly, with production level because a maintenance and repair cost still occurs when the process plant is shut down.

Fixed charges are expenses which remain practically constant from year to year and do not vary widely with change in product rate. Depreciation,

property taxes, insurance, and rent require expenditures that can be classified as fixed charges.

Plant-overhead costs are for hospital and medical services; general plant maintenance and overhead; safety services; payroll overhead including pensions, vacation allowances, social security, and life insurance; packaging, restaurant and recreation facilities, salvage services, control laboratories, property protection, plant superintendence, warehouse and storage facilities, and special employee benefits. These costs are similar to the basic fixed charges in that they do not very widely with charges in production rate.(8)

2.1.6.2 General Expenses

In addition to the manufacturing costs, other general expenses are involved in any company's operations. These general expenses may be classified as 1) administrative expenses, 2) distribution and marketing expenses, 3) research and development expenses, 4) financing expenses, and 5) gross-earnings expenses. (9)

Administrative expenses include costs for executive and clerical wages, office supplies, engineering and legal expenses, upkeep on office buildings, and general communications.

Distribution and marketing expenses are cost incurred in the process of selling and distributing the various products. These costs include expenditures for material handling, containers, shipping, sales offices, salesmen, technical sales service, and advertising.

Research and development expenses are incurred by any progressive concern which wishes to remain in a competitive industrial position. These costs are for salaries, wages, special equipment, research facilities, and consultant fees relate to developing new ideas or improved processes.

Financing expenses include the extra costs involved in procuring the money necessary for the capital investment. Financing expenses is usually limited to interest on borrowed money, and this expense is sometimes listed as a fixed charge.

Gross-earning expenses are based on income-tax laws. These expenses are a direct function of the gross earnings made by all the various interests held by the particular company. Because these costs depend on the company-wide pictures, they are often not included in predesign or preliminary cost-estimation figures for a single plant, and the probable returns are reported as the gross earnings obtainable with the given plant design. However, when considering net profits, the expenses due to income taxes are extremely important, and this cost must be included as a special type of general expense.

Table 2.3 Estimation of Total Product Cost (8),(15)

I. Manufacturing Costs

A. Variable Production Costs (about 66% of the total product cost)
- Raw Materials -- calculated
- Operating Labor -- estimated
- Supervision -- estimated
- Utilities -- calculated
- Maintenance and Repairs – 2 - 10% of Fixed Capital Investment (FCI)
- Operating Supplies – 10 – 20% of Maintenance and Repairs costs, or 0.5 – 1% of FCI
- Laboratory Costs – 10 - 20% of Operating Labor
- Patents and Royalties – 0 – 6% of total product cost

B. Fixed Charges (10-20% of the total product cost)
- Depreciation -- 6.67% of FCI
- Local Taxes – 1 - 4% of FCI
- Insurance – 0.4 - 1% of FCI
- Rent -- None

C. Plant Overhead Costs – 50 - 70% of Operating Labor, Supervision, and Maintenance or 5 – 15% of total product cost

II. General Expense (15-20% of the total product cost)

A. Administrative costs – 2 - 5% of total product cost
B. Distribution and marketing costs – 2 - 20% of total product cost
C. Research and development costs – 3 - 5% of total product cost

III. Total Product Cost = Sum of I + II above

2.1.7 Economic Evaluation of Investment

The primary purpose of investing capital in plants and equipment is to earn an amount of money that exceeds the investment (5). The importance or value of such an investment is measured by the "return". Return can be expressed in many ways, the most common being: 1) Payback period, 2) Return on investment, and 3) Net present value

- Payback period is the number of years required to recover the first cost or initial investment.

- Return on investment (ROI) is one of several approaches to building a financial business case. The term means that decision makers evaluate the investment potential by comparing the magnitude and timing of expected gains to the investment costs. (11)

- Net present value (NPV) is used to calculate the present value of future cash flows with the investment outlay required to implement the project. (1)

2.2 Related Research

Costs estimation have been performed and published by many organizations. The results of an estimate can differ because of different work scopes, different labor force costs, different money values because of inflation, different oversight costs, the specific contaminated materials involved, the waste stream and peripheral costs associated with that type of waste, or applicable environmental compliance requirements. Some of the divergence in costs however, cannot be easily explained; this lack of consistency prohibits direct estimating by measuring standard quantities such as initial capital cost, facility size (megawatts), square footage of facilities, or volumes of waste streams.(16)

Costs estimation for shrimp part in this research, some data is received from Laitram Machinery USA. which is the leading manufacturer of seafood processing equipment. One provides the information about a complete shrimp peeling line. It would be approximately $300,000 plus shipping and installation would be included. If you would need more capacity in the future, you could add another peeling machine to

the system at a price of $75,000. This would then allow you to do approximately 1,000 kg per hour.

From early report, there is no estimation of first-invested cost in web-based system form, but it is also reported that there is a computation form which have not been completed due to insufficient information under estimation. For example

Totally Integrated Manufacturing Cost Estimating System (TIMCES)

This article reviews some of the computerized cost estimating packages, and then provides a frame work for a proposed computer integrated manufacturing cost estimating system (10). This system incorporates automated generation of a cost estimated using design inputs. The methodology consists of the following major steps:

- Material cost estimating: Measure shape and volume of material using inputs from design drawings and bills of material; Identify the material prices from accounting records, vendors and surveys; Find value of salvaged material; Choose material cost policy (LIFO/FIFO); and tabulate total cost of material.
- Labor cost estimating: Identify operation from production plan, machine selection, process sequence, and material requirements; Determine labor time from motion and time studies, work standards, and man-hour reports; Identify hourly reports from accounting records, personnel data; Get overhead costs; Tabulate total labor costs.
- Cost of machinery and tools: Determine investment necessary for tools; Evaluate tooling combinations and choose one with least cost.
- Cost of operations: Use part design, production plans, material specifications, tooling specifications, and standard time sheets to calculate the setup-, cycle-, and maintenance times for each operation in each of the categories labor, material and tooling
- Overhead cost: allocated using standard labor hours, labor dollars or prime cost ratio.
- Cost of Product is calculated as the sum of all the above elements.

This model proposes to use much of the detailed costing methodology common to manufacturing cost models. It is a well structured approach, except for the retention of standard costing methods for allocation of overhead costs. The model hopes to integrate information from the following databases: CAD, planning, material costs, labor costs, operation costs, overhead costs, and product costs. In this, it has a lot in common with the area of interest of this research proposal. At this time, there has been no published work suggesting any further developments on this framework. Their model still falls short of detailing how they propose to integrate all of these databases, and whether they will be able to use existing databases (as opposed to data structured specifically for the system). They do not provide a specific manufacturing domain for the system, but the limited descriptions of the manufacturing system imply conventional machining operations. Another limitation of the paper is that they do not provide any detail of how the search process for information will be carried out. They do make note that they intend to use dBase IV database management software, and C language for programming.

ChemEng Economic Calculator v1.0

ChemEng Economic Calculator v1.0 is mainly made to do the basic method of estimating the chemical total plant cost, but the total plant cost of proposed plant can be estimated from the total cost of a similar reference plant using:

$$C/Cr = (S/Sr)^{n}$$

“n” is usually in the rang 0.4 – 0.8

The equipment costs can be estimated as well as the total plant cost. They use any historical data similar to the proposed plant to determine the exponents that correlate each of the categories, using capacity as a measure of scale (14).

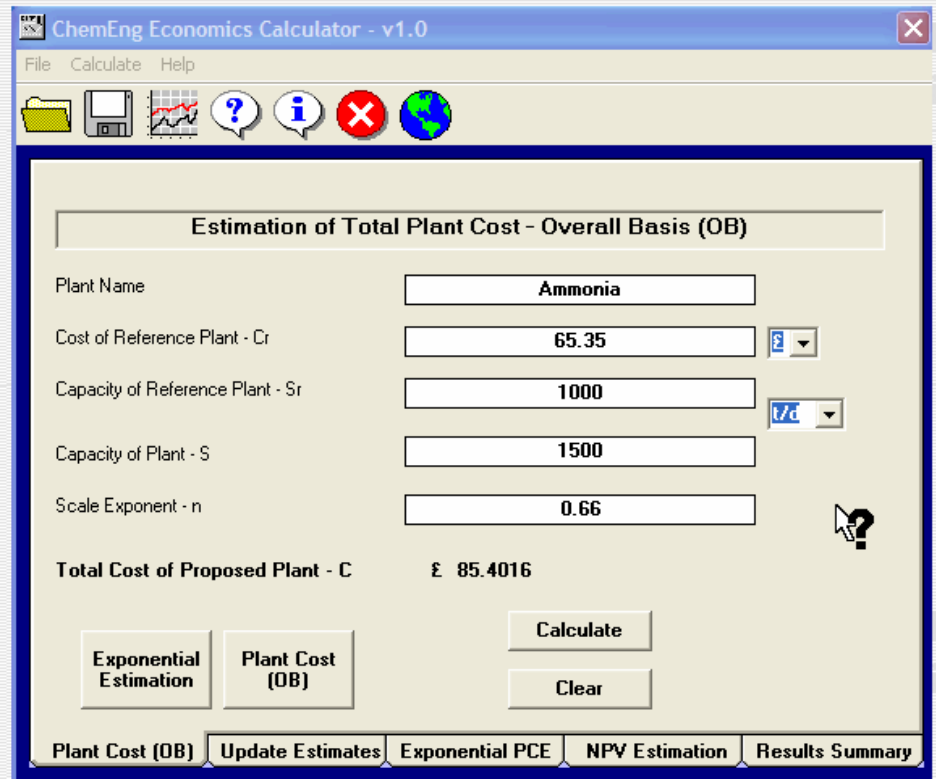

Figure 2.4 Display ChemEng Economic Calculator v1.0 program

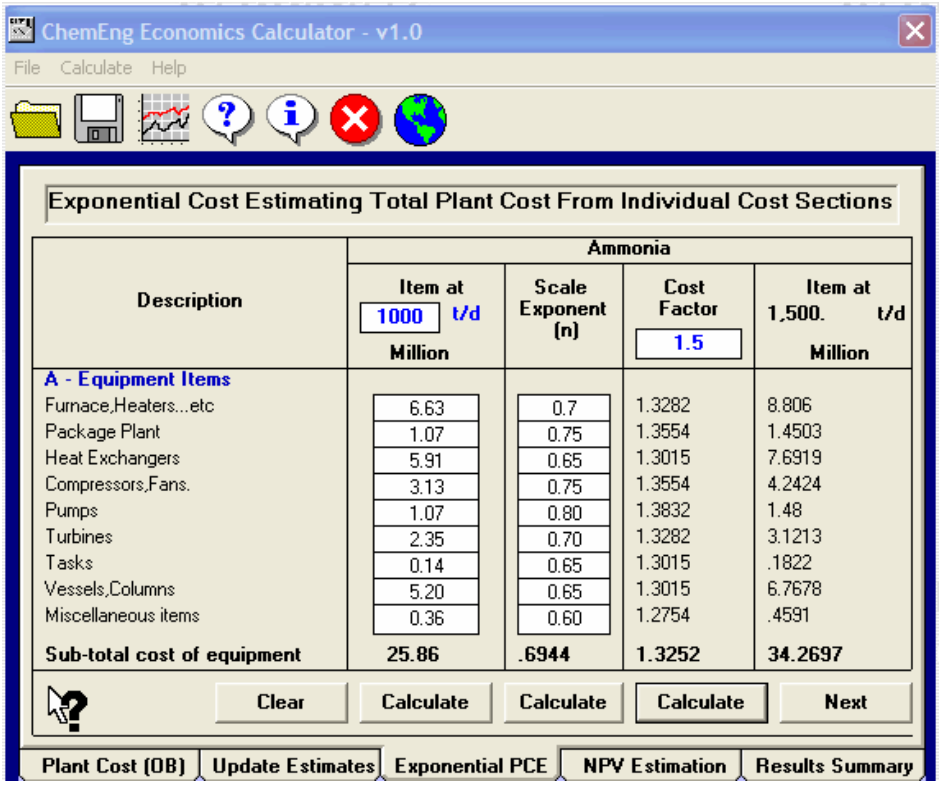

Figure 2.4 Display ChemEng Economic Calculator v1.0 program (Continued)

CHAPTER III
MATERIALS AND METHODS

3.1 Research Methodology

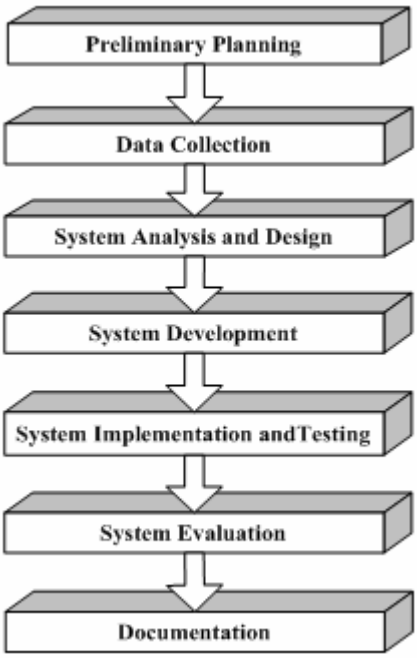

Figure 3.1 Step of Research Methodology

3.1.1 Preliminary Planning

This step collects information to identify problems, objectives of study, scopes of study, and goal.

3.1.2 Data Collection

This step collects data from each of the following factories; fruits, vegetables, dairy, seafood, and meat factories. The data of factories are collected from books, documents, internet, and interview. The data of factories include:

- Total capital cost
- Cost of civil, electrical and mechanical works
- Equipment list and costs
- Utilities requirement (e.g. fuel, water)
- Operating costs, including raw material and labor
- Plant layout drawing
- Process description

3.1.3 System Analysis and Design

The analysis phase consists of conducting a preliminary investigation and performing detailed analysis activities. This step is to analyze information from collected data for design structure charts, data flow diagrams, and entity-relationship diagrams.

In structured analysis and design, an entity-relationship diagram (ERD) is a tool that graphically represents the associations between entities in the project. A data flow diagram (DFD) is a tool that graphically represents the flow of data (input or output of data or information) in a system. The step of design as follows;

- Database

Information needs of decision-makers and the environmental factors are continuously changing; therefore this system goes through continuous updating data. Microsoft Access 2000 is used for building database management system.

- User interface

Microsoft Visual Studio .NET is chosen as a web page building tool. In particular, a dialog manager, which is a gateway interface between database and web database application, is built using ASP.net.

Output design displayed on screen consists of information about capital investment of chose plant by user. This information is one part of decision-making support before an investment. The list of menus that should be displayed as follows;

- Economic consideration page
- Plant layout page
- Equipment cost page
- Plant cost page
- Operation cost page
- Utilities requirement page
- Process description page

3.1.4 System Development

The web database and web application will be developed according to the system specification derived from the previous step.

3.1.5 System Implementation and Testing

After the development phase is completed, the system will be installed and tested. If an error is founded, it will be corrected in this step. Links between each of the web pages will be checked. Dead links must be repaired or changed in order to have smooth and rapid links.

3.1.6 System Evaluation

Evaluation of the system is performed to identify its strengths and weaknesses. Main criteria for the evaluation are: ease of use, suitability of information formats, operational efficiency, and opinions and attitudes of users toward the system. This will be done by the professionals who have knowledge in project management field or in food factory field.

3.1.7 Documentation

This procedure will conclude the study, gather developing results, and generate research document. Any suggestion for further research will also be included.

3.2 Research Tools

3.2.1 Hardware

CPU	:	Pentium IV 2.2 GHz
RAM	:	256 MB
Hard disk	:	40 GB
Peripherals	:	Monitor, Keyboard, Mouse, CD-ROM Drive, Diskette and Printer

3.2.2 Software

Operating system	:	Microsoft Windows XP® Professional Edition
Database	:	Microsoft Access 2000
Web server	:	Microsoft Internet Information Server 5.1
Web browser	:	Microsoft Internet Explorer 5.01
Application tool	:	ASP .NET
		VB .NET
		Microsoft Visual Studio .NET
Image maker	:	Adobe Photoshop 7.0
		Visio 2003

3.3 Research Plan

Task	Month					
	1	2	3	4	5	6
1. Preliminary Planning						
2. Data Collection						
3. System Analysis and Design						
4. System Development						
5. Implementation and Testing						
6. System Evaluation						
7. Documentation						

CHAPTER IV
RESULTS

In this chapter, it is divided into four parts: the system design, the database design, the user interface design and the evaluation.

4.1 The System Design

4.1.1 Data Flow Diagrams

4.1.1.1 Context Diagram

The context diagram of a web-based information system in food manufacturing business is the main process, which control the others process on this system for working properly as shown in Figure 4.1

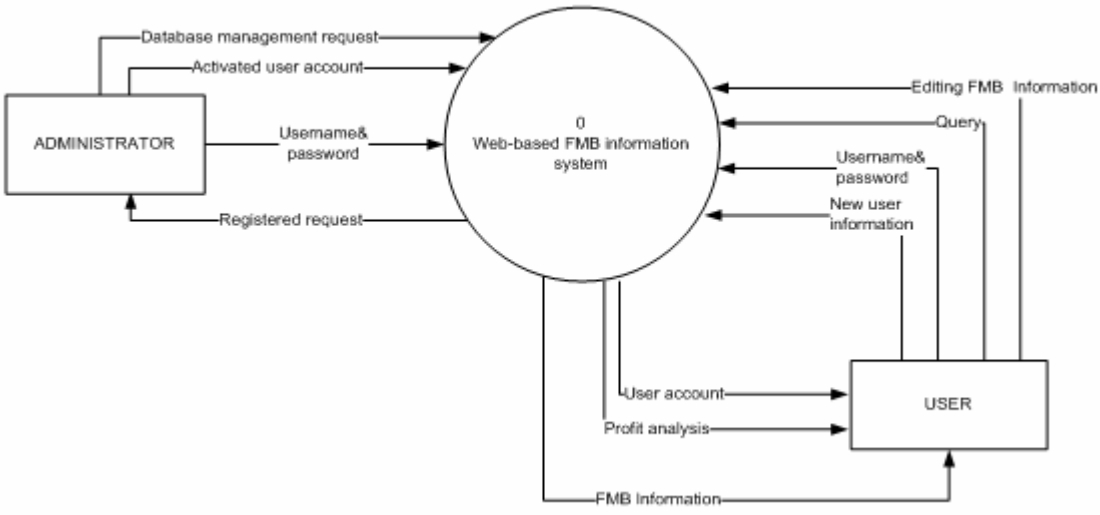

Figure 4.1 Context diagram of system

4.1.1.2 Data Flow Diagram level 0

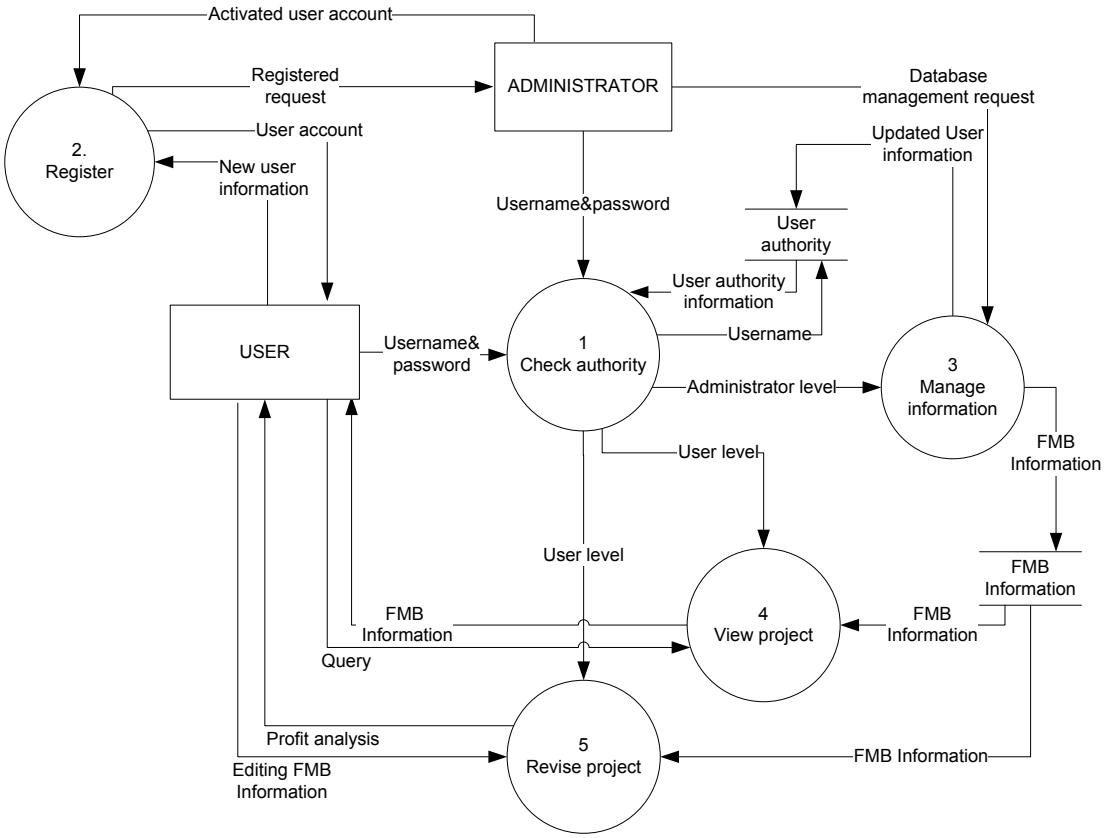

Figure 4.2 Data Flow Diagram Level 0 of system

Process 1: Check Authority Process

"Check Authority" is a process for checking the authority of user. This process will receive user name and password from the user for comparing user information with user authority database. If the user is the administrator of the system, he will able to manage the information described in process 3. If the user is a member of the system, he will able to view or revise project. If not, the new user must register described in process 2.

Process 2: Register Process

"Register" is a process for registering a new user. The user can get registered in this process by filling data in 'Register' form. After registering, the system will store the user information on the database.

Process 3: Manage Information Process

"Manage Information" is a process for managing all information of this system. After checking authority in process 1, the administrator can login to the system and fully manage the database.

Process 4: View Project Process

"View Project**"** is a process for retrieving investment information for food manufacturing business. The user can select a topic of plant name in the system and view the plant information.

Process 5: Revise Project Process

"Revise Project**"** is a process for retrieving information and allowing the user to edit cost and data of the plant that he chooses.

4.1.1.3 Data Flow Diagram level 1

Process 1: Check Authority Process

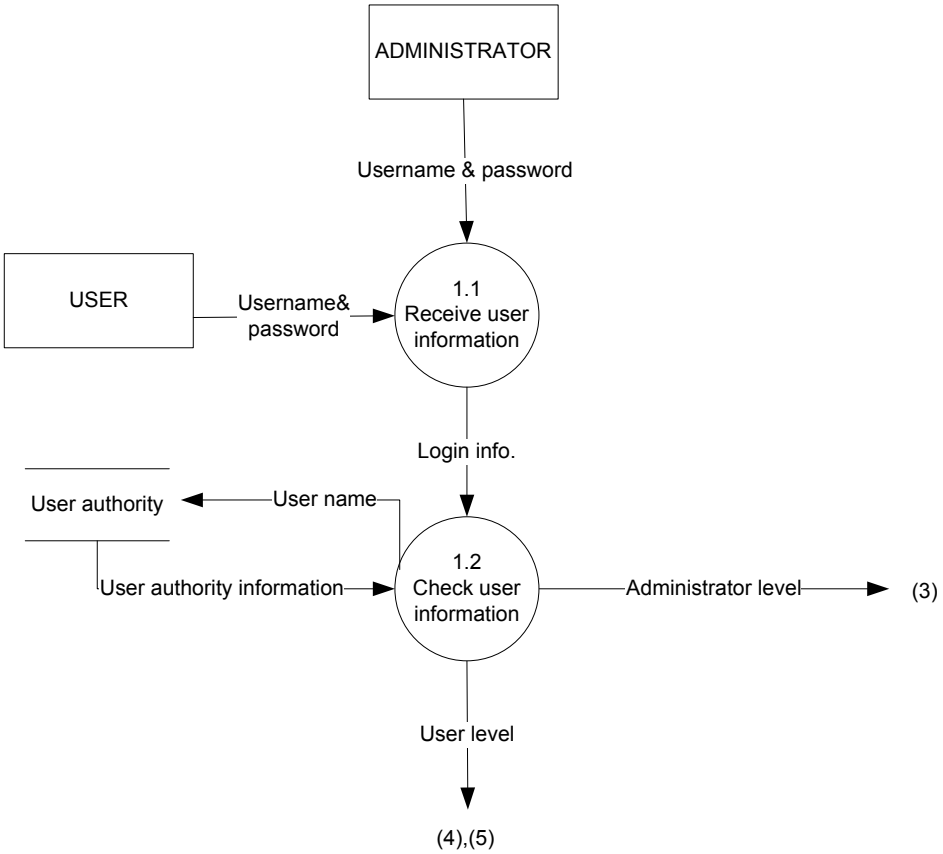

Figure 4.3 Data Flow Diagram Level 1 of Check Authority

Process 1.1: Receive User Information Process

"Receive User Information" is a process for receiving user name and password. After that, the system will send data to process 1.2.

Process 1.2: Check User Information Process

"Check User Information" is a process which receives from process 1.1 to compare the information with user authority database. If user has an authority, he will be able to view and revise each factory data. If user has not an authority, the system will show error message.

Process 3: Manage Information

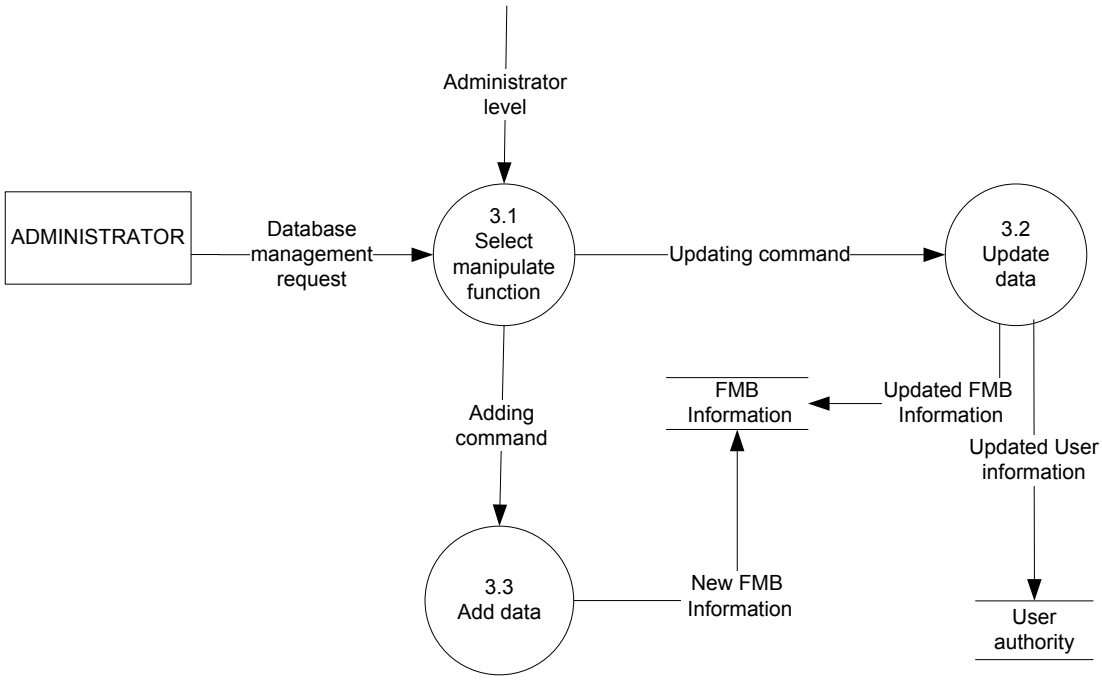

Figure 4.4 Data Flow Diagram Level 1 of Manage Information

Process 3.1: Select Manipulate Function Process

"Select Manipulate Function" is a process for allowing the administrator to select functions for managing database.

Process 3.2: Update Data Process

"Update Data" is a process for allowing the administrator to update database. After that, the system will store the updated data on the database.

Process 3.2: Add Data Process

"Add Data" is a process for allowing the administrator to add on database. After that, the system will store the added data on the database.

Process 4: View Project Process

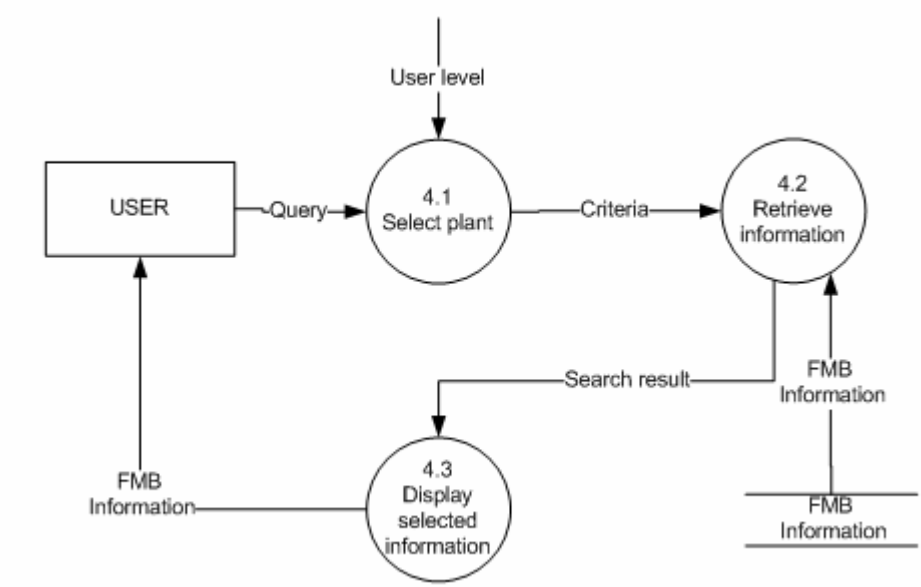

Figure 4.5 Data Flow Diagram Level 1 of View Project

Process 4.1: Select Factory Process

"Select Factory" is a process for allowing the user passed login to select a topic of factory name in the system. This process will show the topic for the user to select.

Process 4.2: Retrieve Information Process

"Retrieve Information**"** is a process for finding the information referring to the user. This process will retrieve the information from the database and send result to process 4.3.

Process 4.3: Display Selected Information Process

"Display Selected Information**"** is a process for generating retrieved information from process 4.2.

Process 5: Revise Project Process

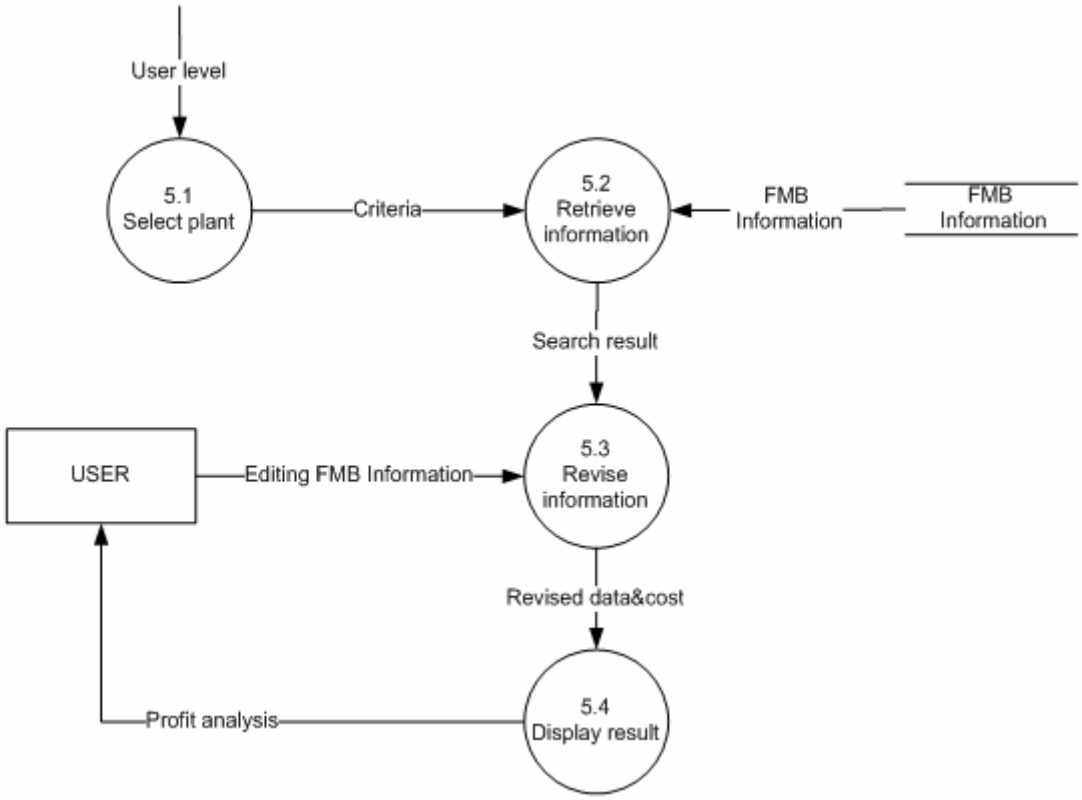

Figure 4.6 Data Flow Diagram Level 1 of Revise Project

Process 5.1: Select Factory Process

"Select Factory" is a process for allowing the user passed login to select a topic of factory name in the system. This process will show the topic for the user to select.

Process 5.2: Retrieve Information Process

"Retrieve Information**"** is a process for finding the plant topic referring to the user. This process will retrieve and show the information from the database.

Process 5.3: Revise Information Process

"Revise Information**"** is a process for allowing the user revised cost and data by oneself. This process will receive the data that the user input into the system to calculate result and display in process 5.4.

Process 5.4: Display Result Process

"Display Result" is a process for generating calculated result from process 5.3. An ultimate outcome is the profit analysis plan for his project.

4.1.2 Interface Structure Diagram

The level of authorization is divided into 2 levels: which are user and administrator. If they input a corrected username and password of administrator, they will be able to add and update both factory data and user data. There are shown in Figure 4.7.

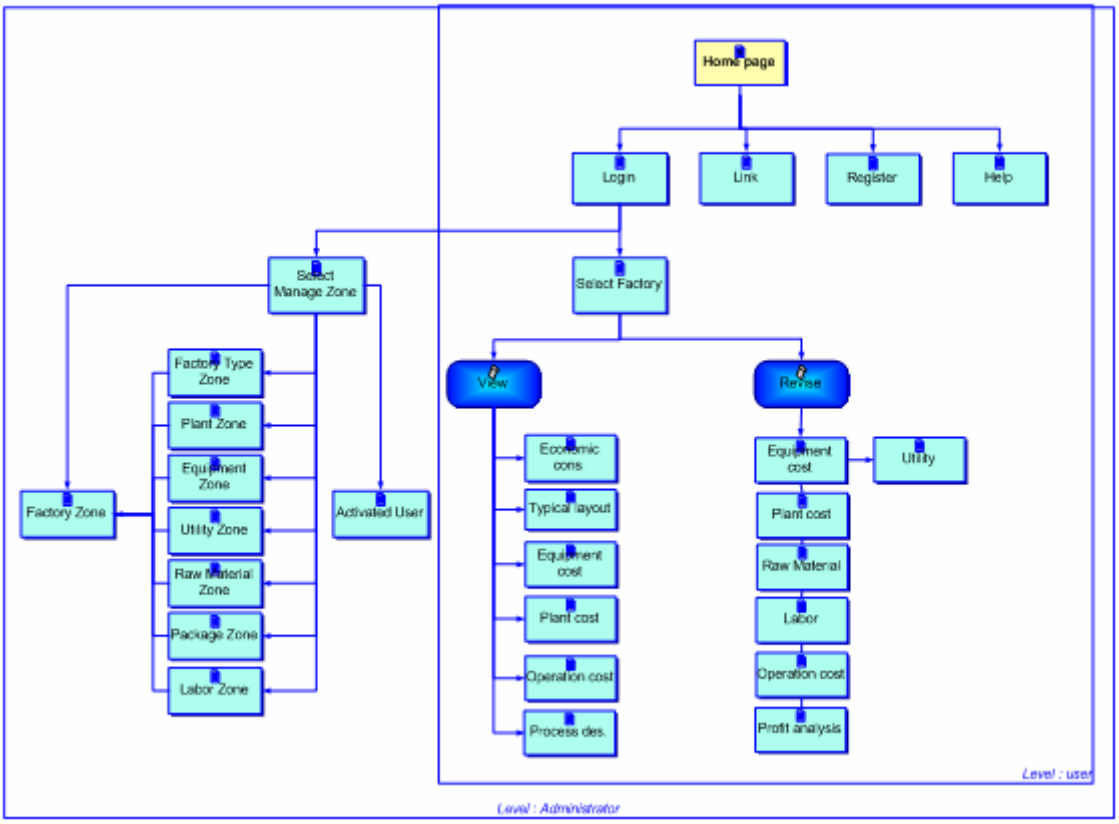

Figure 4.7 Interface Structure Diagram of Web-based Investment Support System

4.2 The Database Design

4.2.1 Entity Relationship Model (ER-Diagram)

After the modified structure for web-based investment support system has been completed, the Entity Relationship (ER) Model is used to model the database.

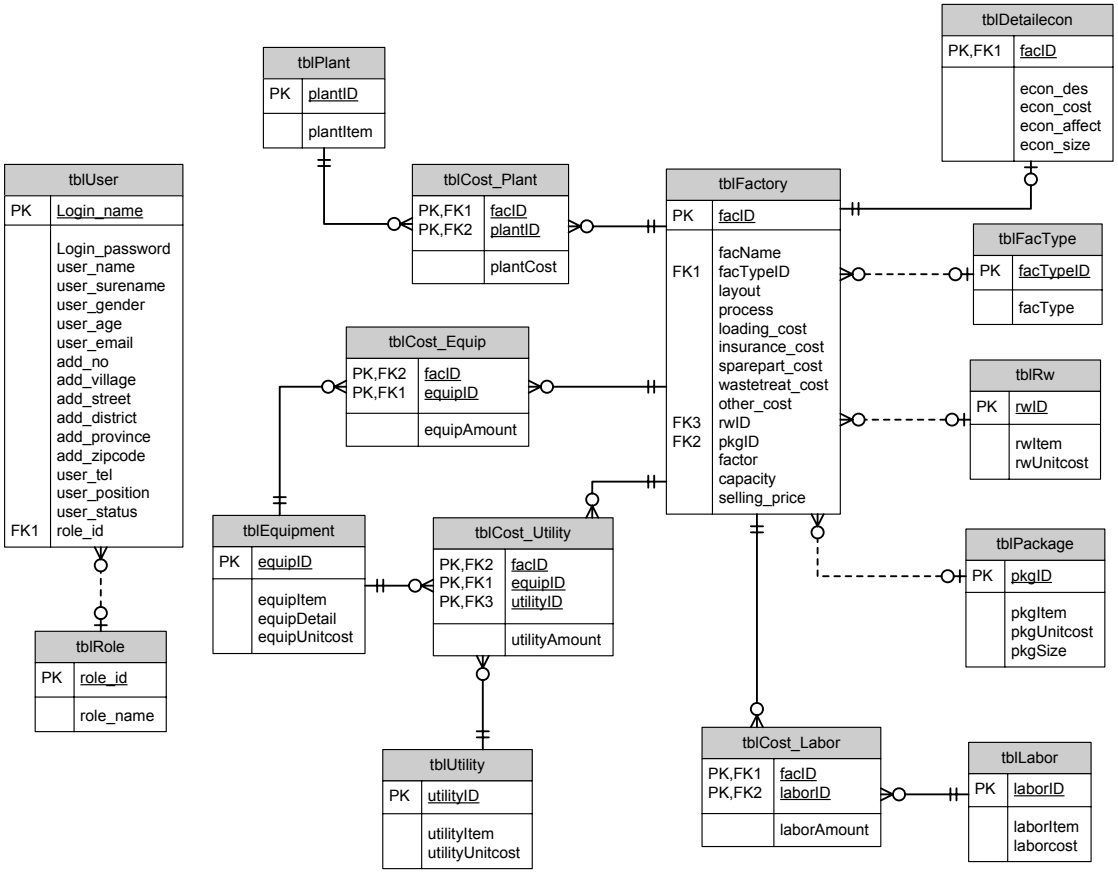

Figure 4.8 Entity Relationship Diagram of Web-based Investment Support System

4.2.2 Data Dictionary

Table 4.1 Structure of tblFactory table

No	Fields Name	Data Type	Size	Key	Definition
1.	facID	Text	3	PK	Factory code
2.	facName	Text	50		Factory name
3.	facTypeID	Text	3	FK	Code of factory type
4.	layout	Text	255		Layout plan
5.	process	Memo			Process description
6.	loading_cost	Number	Long Int.		Loading cost
7.	insurance_cost	Number	Long Int.		Insurance cost
8.	sparepart_cost	Number	Long Int.		Spare part cost
9.	wastetreat_cost	Number	Long Int.		Waste treatment cost
10.	other_cost	Number	Long Int.		Other cost
11.	rwID	Text	4	FK	Raw material code
12.	pkgID	Text	3	FK	Package code
13.	factor	Number	Decimal		Factor for calculate
14.	capacity	Number	Long Int.		Capacity (kg/year)
15.	sell_price	Number	Long Int.		Sell price of product (baht/kg)

Table 4.2 Structure of tblFacType table

No	Fields Name	Data Type	Size	Key	Definition
1.	facTypeID	Text	3	PK	Code of factory type
2.	facType	Text	50		Factory type

Table 4.3 Structure of tblDetailecon table

No	Fields Name	Data Type	Size	Key	Definition
1.	econID	Text	3	PK	Code of economic detail
2.	econ_des	Memo			Economic detail1
3.	econ_cost	Memo			Economic detail2
4.	econ_affect	Memo			Key factors for profit
5.	econ_size	Memo			Size building

Table 4.4 Structure of tblPlant table

No	Fields Name	Data Type	Size	Key	Definition
1.	plantID	Text	3	PK	Code of fixed capital cost items
2.	plantItem	Text	70		Items of fixed capital cost

Table 4.5 Structure of tblCost_plant table

No	Fields Name	Data Type	Size	Key	Definition
1.	facID	Text	3	PK, FK	Factory code
2.	plantID	Text	3	PK, FK	Code of fixed capital cost items
3.	plantCost	Number	Long Int.		Fixed Cost of the plant

Table 4.6 Structure of tblEquipment table

No	Fields Name	Data Type	Size	Key	Definition
1.	equipID	Text	3	PK	Equipment code
2.	equipItem	Text	50		Equipment name
3.	equipDetail	Text	50		Equipment detail
4.	equipUnitcost	Number	Long Int.		Unit cost of equipment

Table 4.7 Structure of tblCost_equip table

No	Fields Name	Data Type	Size	Key	Definition
1.	facID	Text	3	PK,FK	Factory code
2.	equipID	Text	3	PK,FK	Equipment code
3.	equipAmount	Text	3		Amount of equipment

Table 4.8 Structure of tblUtility table

No	Fields Name	Data Type	Size	Key	Definition
1.	utilityID	Text	3	PK	Utility code
2.	utilityItem	Text	50		Utility name
3.	utilityUnitcost	Number	Single		Unit cost of utility

Table 4.9 Structure of tblCost_utility table

No	Fields Name	Data Type	Size	Key	Definition
1.	facID	Text	3	PK,FK	Factory code
2.	equipID	Text	3	PK,FK	Equipment code
3.	utilityID	Text	3	PK,FK	Utility code
4.	utilityAmount	Number	Single		Amount of utility

Table 4.10 Structure of tblLabor table

No	Fields Name	Data Type	Size	Key	Definition
1.	laborID	Text	3	PK	Labor code
2.	laborItem	Text	50		Labor name
3.	laborcost	Number	Long Int.		Salary of labor

Table 4.11 Structure of tblCost_labor table

No	Fields Name	Data Type	Size	Key	Definition
1.	facID	Text	3	PK,FK	Factory code
2.	laborID	Text	3	PK,FK	Labor code
3.	laborAmount	Number	Long Int.		Amount of labor

Table 4.12 Structure of tblRw table

No	Fields Name	Data Type	Size	Key	Definition
1.	rwID	Text	4	PK	Raw material code
2.	rwItem	Text	50		Raw material name
3.	rwUnitcost	Number	Single		Unit cost of raw material

Table 4.13 Structure of tblPackage table

No	Fields Name	Data Type	Size	Key	Definition
1.	pkgID	Text	3	PK	Package code
2.	pkgItem	Text	50		Package name
3.	pkgUnitcost	Number	Single		Unit cost of package
4.	pkgSize	Number	Single		Size of package

Table 4.14 Structure of tblRole table

No	Fields Name	Data Type	Size	Key	Definition
1.	role_id	Text	1	PK,FK	Role code
2.	role_name	Text	20		Role name

Table 4.15 Structure of tblUser table

No	Fields Name	Data Type	Size	Key	Definition
1.	Login_name	Text	10	PK	Username for login
2.	Login_password	Text	10		Password for login
3.	user_name	Text	10		First name
4.	user_surname	Text	20		Surname
5.	user_gender	Text	1		Gender
6.	user_age	Text	2		Age
7.	user_email	Text	30		Email
8.	add_no	Text	10		A number of address
9.	add_village	Text	25		Village
10.	add_street	Text	25		Street
11.	add_district	Text	25		District
12.	add_province	Text	25		Province
13.	add_zipcode	Text	5		Zip code
14.	user_tel	Text	10		Telephone number
15.	user_position	Text	25		User position
16.	user_status	Yes/No			User status
17.	role_id	Text	1	FK	Role code

4.3 The System Evaluation

The experienced computer users and the professionals who have knowledge in project management field or in food factory field are predominately target group. The evaluation of the system is conducted by them consist of seven professionals. The questionnaire asks respondents to rate their overall level of satisfaction on a four level; excellent, good, fair, and poor. It is shown at the Appendix A. The followings are the results of evaluation.

Table 4.16 Questionnaire results from usage testing (7 professionals)

Questionnaire List	Excellent	Good	Fair	Poor
1. System Interface				
1.1 Screen interface outlook	2	4	1	-
1.2 Font color and font size	2	5	-	-
1.3 Appropriateness and convenience of buttons or menus	2	3	2	-
2. System Performance				
2.1 Speed of display	5	2	-	-
2.2 Completeness of various data presented for supporting the investment decision	-	5	2	-
2.3 Application to the evaluations of an investment	-	6	1	-
2.4 Application to decision making process	-	6	1	-
2.5 Simplicity of the use of the system	2	5	-	-
3. Calculation				
3.1 Calculation conveniences	4	3	-	-
3.2 The rapidity of calculation and report	2	5	-	-
4. Satisfaction				
Satisfaction to the system	-	7	-	-

The users have some suggestions that are useful in further development as follows:

- Should have various factory sizes (small, medium, and large size).
- Should have various brand name of equipment.
- Should include saving and print report function.
- Should include process chart in the process descriptions
- Should be more functions increased for editing the recalculated data when ROI value is significantly unacceptable.

CHAPTER V
DISSCUSSION

Although there are a lot of investors who need to know and learn information about their business before deciding to invest, there only have a few consultants providing investment information in food factory field. Therefore, the system is also developed to support them to receive information about the capital investment and profitability analysis.

5.1 Importance of Information Technology in Food Manufacturing Business

Food manufacturing business is different from other business because it has shelf life and it is also easily perishable. The good planning can bring better marketing and business results. Therefore, investors interested in food manufacturing should learn what the fundamental investment information is and the return on their marketing investments before launching their business. In order to, they can make informed decisions to achieve their business objectives. Because of the good planning brings better marketing and business results.

The result of the study could attain the goal which is to develop a prototype web-based investment information support system in food manufacturing business. The application allows users to retrieve the information about investment in food manufacturing business to assist them in making decisions and economic evaluation.

The rapid growth of the Internet has opened new opportunities for collecting and distributing information worldwide. Users can retrieve information more conveniently and rapidly via the internet. They can use information and knowledge to be a supporting tool for analyzing investment plan.

The system consists of an investment plan that is calculation of the total investment of the project. The investment plan includes listing and evaluating all

assets necessary to the initial phase of the project. It is important to provide detailed information in this listing. The system will give you some indication of your business's ability to create the resources necessary for expansion and can also predict your business's cash flow budget. The primary purpose of using a cash flow budget is to predict your business's ability to take in more cash than to pay out.

The goal of the study is to create the prototype of web-based investment information support system in food manufacturing. Therefore, if one desires to use the system in further, he should improve it. The estimation of any capital investment largely works and it is necessary to have team work to survey, gather and analyze information. For running in the system, there are mainly three persons relating this system. First, marketing expert collects all information from each part of department to offer graphic designer so that he creates the actual drawings and/or layout for the project and designs the overall system interface for system requirement. Last, programmer is the person who develops workable system which is derived from the screen interface outlook received from graphic designer.

The system is also developed for user friendly interface and easily to understand, but inexperienced users should learn systematically before using it. They can view information on their interested business by selecting View button. For experienced users, they can create their project and correct investment data such as amount of equipment and labor, and so on by selecting Revise button. Data of investment displayed to users will be changed. Furthermore, the system will also calculate profitability analysis, payback period, and return of investment.

5.2 The System Development

The system is developed by using ASP.net technology, and designed interface by Microsoft Visual Studio.net. For database management system uses Microsoft Access.

ASP.net is a tool that is used for developing program. It uses to interactive between web application and web database.

Microsoft Visual Studio.net is another application program that is used for developing interface of program. It provides necessary many tools for developing graphical application such as forms and controls.

Microsoft Access is an application program, which is suitable to create and manage relational database. The two primary advantages of choosing Microsoft Access is quick development and ease to use for database design.

5.3 The System Evaluation

After the development phase is completed, system testing is done for debugging error, and system evaluation is done for system performance.

The experienced computer users and the professionals who have knowledge in project management field or in food factory field are predominately the targeted group in the evaluation as they are most likely to adopt this application, thus, they would be better suited for evaluating the importance of presented perspectives.

The questionnaire was aimed to investigate the quality and the usability of the application. The result of system evaluation by measuring users satisfaction level is divided into four parts; system interface, system performance, calculation and satisfaction. There are four levels to evaluate; excellent, good, fair, and poor.

After summarizing the evaluation results of all respondents: overall, the satisfaction is at the “good” level. Consequently it indicates that users are satisfied with the investment support system in food manufacturing business through Internet.

In system performance part, there is only a response which was satisfied at fair level with completeness of various data presented, application to the investment evaluations and decision making process for supporting the investment decision. Consequently it is recommended that the system should provide more information such as sensitivity analysis and SWOT analysis.

Moreover, it is also suggested to improve more the system abilities. Apparently, the system should have various options; alternative brand name of equipments, various factory sizes. These will help make decision more effectively.

5.4 Advantages

Data standard in this study is efficient enough to bring the following remarkable advantages of the developed system;

- The system provides fundamental investment information for new investor such as the total capital estimation, necessary equipment in process, and process description. Users can make preliminary plan before the start of their construction works.
- If users input the cost data, the system will be able to automatically calculate profitability analysis; payback period, and return on investment.
- This prototype is web-based architecture. It can support unlimited users and can be accessible from anywhere and at anytime through the Web.
- It can reduce the working time by collecting data from several data resource at once to support investment decision.
- The system provides the administrative functions to administrate users. The input and update of data also can be managed by the administrative functions. Administrator can manage projects through the Web.

5.5 Limitations

There are some limitations of this prototype as below;

- Inexperienced users should learn seriously the system before using it to reduce making the mistakes which may result from the system or themselves.
- The system does not compute depreciation charge and net present value (NPV).
- Each factory lacks alternative brand name of equipment to suit user requirement.
- The system does not include saving and print report function for user convenience.
- Because there are related factors, each factory would have only a specific raw material.
- The system should provide more information such as sensitivity analysis and SWOT analysis.
- There should include process chart in the process descriptions

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The result of the study could achieve the goal to develop the prototype of a web-based investment information support system in food manufacturing business to collect investment information, which is a part to support decision making process before investing in food manufacturing. The system is used when people are interested in studying or evaluating the investment in their project.

The system consists of two parts; web application and application server. Web application is used for retrieving data and presenting data about investment. It provides the investors with the capital investment information to evaluate the return on investment from their business. Application server is used for designing and developing database system for administrator to add and update data on the site and this real-time data management can bring the reduction of time.

The system is developed by ASP.net technology and designed interface by Microsoft Visual Studio.net. Information Internet Server is used as the web server. Microsoft Access 2000 is used for database management system. The security systems are application security and database security. Application security is to protect the program by setting application password. Database security is to protect database from unauthorized users by setting user-login. Only authorized users can have access to the program by using only correct username and password.

In the evaluation of a prototype web-based investment information support system in food manufacturing business (Table 4.16), it was done by the target group consisting of seven persons as the professionals who have knowledge in project management field or in food factory field. It can summarize that the user satisfaction

level with system interface, system performance, calculation, and satisfaction is averagely good. From the evaluation, it is conclude that the system is capable of being applied in their business operation to assist them in making decision and economic evaluation about an investment in a food manufacturing business.

6.2 Recommendation

The following recommendations are obtained from the users for improvement in further study.

- The system should have various factory sizes (small, medium, and large size) to support investment decision.
- One of the suggestions from the users is to expand more the knowledge for selecting the equipment by extending it to more equipment brand name and more size.
- There should be more functions increased for reverse-calculate the return on investment based on the budget or other criteria which is the user provides the system.
- The system should be developed to adapt to the diversity of other products.

REFERENCES

1. Alan Dennis, and Barbara H., *System Analysis and Design*. U.S.A. : John Wiley & Sons, Inc., 2000
2. Au T,Au TP. *Engineering Economics for Capital Investment Analysis*. Englewood Cliffs, New Jerey : Prentice-Hall, Inc.,1992
3. Jo, H. H., Parsaei, H. R., and Sullivan, W. G. Principles of Concurrent Engineering. *Concurrent Engineering: Contemporary issues and modern design tools*. London: Chapman and Hall, 1993.
4. James B. and Dilworth, *Production and Operations Management : Manufacturing and Nonmanufacturing*, New York : Random House, 1989
5. J. Valentas, Leon Levine and J. Peter Clark, *Food Processing Operations and Scale-up.* New York : Dekker, 1991
6. K. Ulrich and S. Eppinger, *Product Design and Development*, Second Edition, Boston : McGraw-Hill, 2000
7. Ryle Miller and Ethel B. Miller**,** *Manual of Economic Analysis of Chemical Processes: Feasibility studies in refinery and petrochemical processes*, New York : McGraw-Hill, 1981
8. Peters, M.S. and Timmerhaus, K.D., *Plant Design and Economics for Chemical Engineers*, New York : McGraw-Hill, 2002
9. R.K. Sinnott , *Chemical Engineers Volume 6*, 3rd Ed., Oxford : Butterworth-Heinemann, 1984
10. Wong, J. P., Imam, I. N., Khosravi-Kamrani, A., Parsaei, H. R., and Tayyari, F. A Totally Integrated Manufacturing Cost Estimating System (TIMCES). *Economics of Advanced Manufacturing Systems* (eds. Parsaei, H. R. & Mital,A.). London: Chapman-Hall, 1992. 201-224.
11. A Solution Matrix Ltd**.** Return on Investment [Online]: 2004. Available from: http://www.solutionmatrix.com/roigo.html

12. ASP.net . Why ASP.net [Online]; 2004. Available from: http://asp.net/whitepaper/whyaspnet.aspx?tabindex=0&tabid=1

13. Basic Budget for profit planning. [Online]: 2004. Available from: http://www.sba.gov/library/pubs/fm-8.pdf

14. Khaled Aljundi. ChemEng Economic Calculator v1.0 [Online]; 2004. Available from: http://www.webbusterz.com

15. Fixed Capital Cost -- A Preliminary Estimate [Online]; 2004. Available from: http://cheme.cornell.edu/courses/cheme462/Syllabus/Costing/Costingdata.html

16. Thowmas S. LaGuardia. Decommissioning Cost Estimates and Schedule [Online]; 2004. Available from: http://www.asme.org/pro_dev/D&D/Ch12.pdf

APPENDIX

APPENDIX A
QUESTIONNAIRE

Questionnaire for a prototype web-based investment information support system in food manufacturing business

Name Mr./Mrs./Miss _____ Age_____

Profession_____

Education : O Bachelor O Master

O Doctor O Other ……

กรุณาใส่เครื่องหมาย X ในช่องว่าง

Questionnaire List	Excellent	Good	Fair	Poor
1. System Interface 1.1 รูปแบบหน้าจอในการนำเสนอมีความเหมาะสมเพียงใด 1.2 สีและขนาดของตัวอักษรที่ใช้มีความเหมาะสมเพียงใด 1.3 ปุ่ม / เมนูต่างๆที่ปรากฏบนหน้าจอมีความเหมาะสมและสะดวกต่อการใช้งานเพียงใด				
2. System Performance 2.1 การแสดงข้อมูลมีความรวดเร็วเพียงใด 2.2 ข้อมูลที่นำเสนอในการสนับสนุนด้านการลงทุนนี้มีความสมบูรณ์เพียงใด 2.3 สามารถใช้ในการประเมินผลการลงทุนได้เพียงใด 2.4 ช่วยผู้ประกอบการตัดสินใจในการลงทุนได้ดีเพียงใด 2.5 เป็นระบบที่ง่ายในการใช้งานมากน้อยเพียงใด				
3. Calculation 3.1 ช่วยอำนวยความสะดวกในการคำนวณ (Calculation conveniences) 3.2 การคำนวณ และการแสดงผลฯ ได้รวดเร็วเพียงใด				
4. Satisfaction โดยรวมแล้วท่านมีความพึงพอใจต่อระบบเพียงใด				

The suggestion ……..

Questionnaire for a prototype web-based investment information support system in food manufacturing business

Name Mr./Mrs./Miss Wichein Phachayamai Age 43

Profession: Management Consultant (Qualine Management Co.,Ltd.)

Education : O Bachelor ⊗ Master

O Doctor O Other ……

กรุณาใส่เครื่องหมาย X ในช่องว่าง

Questionnaire List	Excellen	Good	Fair	Poor
1. System Interface				
1.1 รูปแบบหน้าจอในการนำเสนอมีความเหมาะสมเพียงใด		X		
1.2 สีและขนาดของตัวอักษรที่ใช้มีความเหมาะสมเพียงใด		X		
1.3 ปุ่ม / เมนูต่างๆที่ปรากฏบนหน้าจอมีความเหมาะสมและสะดวกต่อการใช้ งานเพียงใด			X	
2. System Performance				
2.1 การแสดงข้อมูลมีความรวดเร็วเพียงใด		X		
2.2 ข้อมูลที่นำเสนอในการสนับสนุนด้านการลงทุนนี้มีความสมบูรณ์เพียงใด		X		
2.3 สามารถใช้ในการประเมินผลการลงทุนได้เพียงใด		X		
2.4 ช่วยผู้ประกอบการตัดสินใจในการลงทุนได้ดีเพียงใด		X		
2.5 เป็นระบบที่ง่ายในการใช้งานมากน้อยเพียงใด		X		
3. Calculation				
3.1 ช่วยอำนวยความสะดวกในการคำนวณ (Calculation conveniences)	X			
3.2 การคำนวณ และการแสดงผลฯ ได้รวดเร็วเพียงใด		X		
4. Satisfaction				
โดยรวมแล้วท่านมีความพึงพอใจต่อระบบเพียงใด		X		

The suggestion

- ควรเพิ่มฟังก์ชั่นในการ Save และ Print ข้อมูล
- ควรเพิ่มเมนูในการย้อนกลับไปแก้ไขข้อมูลที่คิดคำนวณใหม่ หลังจากที่ค่า ROI ไม่เป็นไปตามที่ต้องการ เพื่อให้กลับไปแก้ไขได้ทันที
- ผู้ลงทุนนอกจากสนใจ ค่า ROI แล้ว อาจสนใจ NPV , IRR , Break Even Point และอาจต้องการเรื่อง Sensitivity Analysis เพื่อช่วยในเรื่องการลงทุน
- น่าจะลองไปนำเสนอ สสว , ISMED , BSID , NEC , BOC ที่กรมส่งเสริมฯ เพื่อให้มีการนำไปใช้ได้จริงๆ

Questionnaire for a prototype web-based investment information support system in food manufacturing business

Name Mr./Mrs./Miss Waressara Weerawat Age 32

Profession: Lecturer (Industrial Engineering)

Education: O Bachelor O Master

⊗ Doctor O Other ……

กรุณาใส่เครื่องหมาย X ในช่องว่าง

Questionnaire List	Excellent	Good	Fair	Poor
1. System Interface				
1.1 รูปแบบหน้าจอในการนำเสนอมีความเหมาะสมเพียงใด	X			
1.2 สีและขนาดของตัวอักษรที่ใช้มีความเหมาะสมเพียงใด	X			
1.3 ปุ่ม / เมนูต่างๆที่ปรากฏบนหน้าจอมีความเหมาะสมและสะดวกต่อการใช้งานเพียงใด	X			
2. System Performance				
2.1 การแสดงข้อมูลมีความรวดเร็วเพียงใด	X			
2.2 ข้อมูลที่นำเสนอในการสนับสนุนด้านการลงทุนนี้มีความสมบูรณ์เพียงใด		X		
2.3 สามารถใช้ในการประเมินผลการลงทุนได้เพียงใด		X		
2.4 ช่วยผู้ประกอบการตัดสินใจในการลงทุนได้ดีเพียงใด		X		
2.5 เป็นระบบที่ง่ายในการใช้งานมากน้อยเพียงใด		X		
3. Calculation				
3.1 ช่วยอำนวยความสะดวกในการคำนวณ (Calculation conveniences)	X			
3.2 การคำนวณ และการแสดงผลฯ ได้รวดเร็วเพียงใด	X			
4. Satisfaction				
โดยรวมแล้วท่านมีความพึงพอใจต่อระบบเพียงใด		X		

The suggestion

โดยรวมอยู่ในเกณฑ์ดี แต่ควรมี print report เพื่ออำนวยความสะดวกให้กับผู้ที่ใช้โปรแกรมนี้

Questionnaire for a prototype web-based investment information support system in food manufacturing business

Name Mr./Mrs./Miss Konglit Hunchangsith Age 33

Profession: Lecturer (Computer Engineering)

Education: O Bachelor ⊗ Master

O Doctor O Other ……

กรุณาใส่เครื่องหมาย X ในช่องว่าง

Questionnaire List	Excellent	Good	Fair	Poor
1. System Interface				
1.1 รูปแบบหน้าจอในการนำเสนอมีความเหมาะสมเพียงใด		X		
1.2 สีและขนาดของตัวอักษรที่ใช้มีความเหมาะสมเพียงใด		X		
1.3 ปุ่ม / เมนูต่างๆที่ปรากฏบนหน้าจอมีความเหมาะสมและสะดวกต่อการใช้งานเพียงใด		X		
2. System Performance				
2.1 การแสดงข้อมูลมีความรวดเร็วเพียงใด	X			
2.2 ข้อมูลที่นำเสนอในการสนับสนุนด้านการลงทุนนี้มีความสมบูรณ์เพียงใด			X	
2.3 สามารถใช้ในการประเมินผลการลงทุนได้เพียงใด			X	
2.4 ช่วยผู้ประกอบการตัดสินใจในการลงทุนได้ดีเพียงใด			X	
2.5 เป็นระบบที่ง่ายในการใช้งานมากน้อยเพียงใด		X		
3. Calculation				
3.1 ช่วยอำนวยความสะดวกในการคำนวณ (Calculation conveniences)		X		
3.2 การคำนวณ และการแสดงผลฯ ได้รวดเร็วเพียงใด		X		
4. Satisfaction				
โดยรวมแล้วท่านมีความพึงพอใจต่อระบบเพียงใด		X		

The suggestion

1. น่าจะมีบทความรู้เบื้องต้น (ภาพรวม) ของธุรกิจนั้นๆด้วย
2. ทำตัวอย่างธุรกิจหลายตัวอย่างเลยอาจทำให้รายละเอียดในแต่ละธุรกิจน้อยไป
3. ควรมี site map

Questionnaire for a prototype web-based investment information support system in food manufacturing business

Name Mr./Mrs./Miss Suntaree Vara-ubol Age 32

Profession: Lecturer (Food Science and Technology)

Education: O Bachelor O Master

⊗ Doctor O Other ……

กรุณาใส่เครื่องหมาย X ในช่องว่าง

Questionnaire List	Excellent	Good	Fair	Poor
1. System Interface				
1.1 รูปแบบหน้าจอในการนำเสนอมีความเหมาะสมเพียงใด		X		
1.2 สีและขนาดของตัวอักษรที่ใช้มีความเหมาะสมเพียงใด		X		
1.3 ปุ่ม / เมนูต่างๆที่ปรากฏบนหน้าจอมีความเหมาะสมและสะดวกต่อการใช้งานเพียงใด		X		
2. System Performance				
2.1 การแสดงข้อมูลมีความรวดเร็วเพียงใด	X			
2.2 ข้อมูลที่นำเสนอในการสนับสนุนด้านการลงทุนนี้มีความสมบูรณ์เพียงใด			X	
2.3 สามารถใช้ในการประเมินผลการลงทุนได้เพียงใด		X		
2.4 ช่วยผู้ประกอบการตัดสินใจในการลงทุนได้ดีเพียงใด		X		
2.5 เป็นระบบที่ง่ายในการใช้งานมากน้อยเพียงใด	X			
3. Calculation				
3.1 ช่วยอำนวยความสะดวกในการคำนวณ (Calculation conveniences)	X			
3.2 การคำนวณ และการแสดงผลฯ ได้รวดเร็วเพียงใด	X			
4. Satisfaction				
โดยรวมแล้วท่านมีความพึงพอใจต่อระบบเพียงใด		X		

The suggestion

- สีเข้มเกินไปเล็กน้อย น่าจะปรับสีให้สดใสขึ้น
- เครื่องมือ / อุปกรณ์ต่างๆที่แสดง ควรมีให้เลือกหลากหลายยี่ห้อ หรือหลายขนาด

Questionnaire for a prototype web-based investment information support system in food manufacturing business

Name Mr./Mrs./Miss Yongyut Watanavanich Age 51

Profession: Lecturer (Chemical Engineering)

Education: ⊗ Bachelor O Master

O Doctor O Other ……

กรุณาใส่เครื่องหมาย X ในช่องว่าง

Questionnaire List	Excellent	Good	Fair	Poor
1. System Interface				
1.1 รูปแบบหน้าจอในการนำเสนอมีความเหมาะสมเพียงใด		X		
1.2 สีและขนาดของตัวอักษรที่ใช้มีความเหมาะสมเพียงใด		X		
1.3 ปุ่ม / เมนูต่างๆที่ปรากฏบนหน้าจอมีความเหมาะสมและสะดวกต่อการใช้งานเพียงใด	X			
2. System Performance				
2.1 การแสดงข้อมูลมีความรวดเร็วเพียงใด	X			
2.2 ข้อมูลที่นำเสนอในการสนับสนุนด้านการลงทุนนี้มีความสมบูรณ์เพียงใด		X		
2.3 สามารถใช้ในการประเมินผลการลงทุนได้เพียงใด		X		
2.4 ช่วยผู้ประกอบการตัดสินใจในการลงทุนได้ดีเพียงใด		X		
2.5 เป็นระบบที่ง่ายในการใช้งานมากน้อยเพียงใด		X		
3. Calculation				
3.1 ช่วยอำนวยความสะดวกในการคำนวณ (Calculation conveniences)		X		
3.2 การคำนวณ และการแสดงผลฯ ได้รวดเร็วเพียงใด		X		
4. Satisfaction				
โดยรวมแล้วท่านมีความพึงพอใจต่อระบบเพียงใด		X		

The suggestion

The process descriptions should include process chart.

Questionnaire for a prototype web-based investment information support system in food manufacturing business

Name Mr./Mrs./Miss Sekchai Sodsai Age 28

Profession: Research & Development (RTD coffee)

Education : ⊗ Bachelor O Master

O Doctor O Other ……

กรุณาใส่เครื่องหมาย X ในช่องว่าง

Questionnaire List	Excellent	Good	Fair	Poor
1. System Interface				
1.1 รูปแบบหน้าจอในการนำเสนอมีความเหมาะสมเพียงใด	X			
1.2 สีและขนาดของตัวอักษรที่ใช้มีความเหมาะสมเพียงใด	X			
1.3 ปุ่ม / เมนูต่างๆที่ปรากฏบนหน้าจอมีความเหมาะสมและสะดวกต่อการใช้งานเพียงใด		X		
2. System Performance				
2.1 การแสดงข้อมูลมีความรวดเร็วเพียงใด	X			
2.2 ข้อมูลที่นำเสนอในการสนับสนุนด้านการลงทุนนี้มีความสมบูรณ์เพียงใด		X		
2.3 สามารถใช้ในการประเมินผลการลงทุนได้เพียงใด		X		
2.4 ช่วยผู้ประกอบการตัดสินใจในการลงทุนได้ดีเพียงใด		X		
2.5 เป็นระบบที่ง่ายในการใช้งานมากน้อยเพียงใด	X			
3. Calculation				
3.1 ช่วยอำนวยความสะดวกในการคำนวณ (Calculation conveniences)	X			
3.2 การคำนวณ และการแสดงผลฯ ได้รวดเร็วเพียงใด		X		
4. Satisfaction				
โดยรวมแล้วท่านมีความพึงพอใจต่อระบบเพียงใด		X		

The suggestion

1. ระบบน่าสนใจดี และช่วยเป็น guideline สำหรับเริ่มต้นในการทำธุรกิจที่สนใจได้ แต่ข้อมูลยังไม่มากพอ น่าจะมีขนาด (size) ของโรงงานให้เลือกที่หลากหลาย
2. ควรมีการวิเคราะห์ SWOT Analysis

Questionnaire for a prototype web-based investment information support system in food manufacturing business

Name Mr./Mrs./Miss เกศสุดา เหลืองธีรภาพ Age 30

Profession: จนท.วิชาการ (สถาบันวิจัยและพัฒนาอุตสาหกรรม)

Education : O Bachelor ⊗ Master

O Doctor O Other ……

กรุณาใส่เครื่องหมาย X ในช่องว่าง

Questionnaire List	Excellent	Good	Fair	Poor
1. System Interface				
1.1 รูปแบบหน้าจอในการนำเสนอมีความเหมาะสมเพียงใด			X	
1.2 สีและขนาดของตัวอักษรที่ใช้มีความเหมาะสมเพียงใด		X		
1.3 ปุ่ม / เมนูต่างๆที่ปรากฏบนหน้าจอมีความเหมาะสมและสะดวกต่อการใช้งานเพียงใด			X	
2. System Performance				
2.1 การแสดงข้อมูลมีความรวดเร็วเพียงใด		X		
2.2 ข้อมูลที่นำเสนอในการสนับสนุนด้านการลงทุนนี้มีความสมบูรณ์เพียงใด		X		
2.3 สามารถใช้ในการประเมินผลการลงทุนได้เพียงใด		X		
2.4 ช่วยผู้ประกอบการตัดสินใจในการลงทุนได้ดีเพียงใด		X		
2.5 เป็นระบบที่ง่ายในการใช้งานมากน้อยเพียงใด		X		
3. Calculation				
3.1 ช่วยอำนวยความสะดวกในการคำนวณ (Calculation conveniences)		X		
3.2 การคำนวณ และการแสดงผลฯ ได้รวดเร็วเพียงใด		X		
4. Satisfaction				
โดยรวมแล้วท่านมีความพึงพอใจต่อระบบเพียงใด		X		

The suggestion

- ในด้าน System Interface ควรปรับลดจำนวนตัวอักษรให้น้อยลง อาจทำเป็นลักษณะของหัวข้อแล้วให้คลิกเข้าไปอ่านอีกที น่าจะทำให้หน้าเวบดูไม่แน่นจนเกินไป
- ในด้าน System Performance นั้นโดยรวมแล้วเห็นว่าอยู่ในเกณฑ์ดี สามารถช่วย support การตัดสินใจก่อนการลงทุนได้

APPENDIX B
USER INTERFACE

A prototype web-based investment information support system in food manufacturing business is divided into two major parts:

- Web application
- Application server

Before using system, all users have to enter their user name and password. If not, the registration is necessary for new user as shown in Figure B.2.

If user has an authority, the system will go to screen Figure B.4 for select factory to view/revise its. In addition, if user has an authority of administrator, the system will go to screen Figure B.5 for manage information.

If user doesn't have an authority, the system will go to screen of error message as shown in Figure B.3.

Figure B.1 Screen : Main Page

Figure B.2 Screen : Register

Figure B.3 Screen : Message Alert (Register Complete)

Figure B.4 Screen : Login and Password Correct (User)

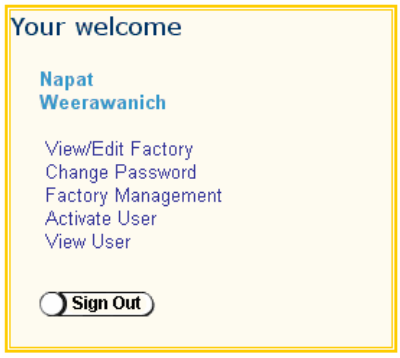

Figure B.5 Screen : Login and Password Correct (Administrator)

Figure B.6 Screen : Message Alert (Login and Password Incorrect)

If user forget password, he will able to receive new password by entering his email address as shown in Figure B.7. Furthermore, if he gets unsatisfied password, he will also able to change password as shown in Figure B.8.

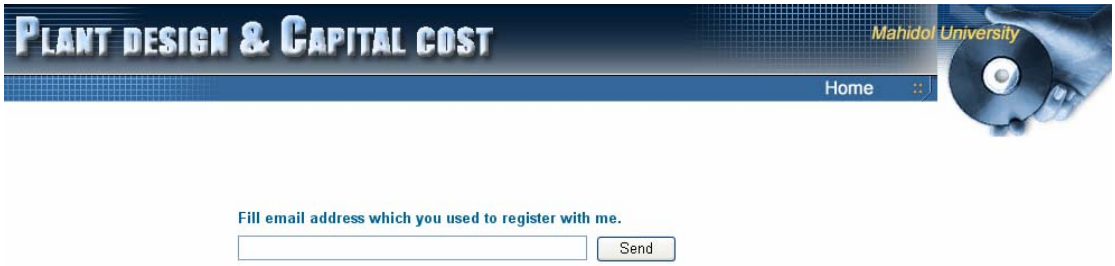

Figure B.7 Screen : Forgot Password

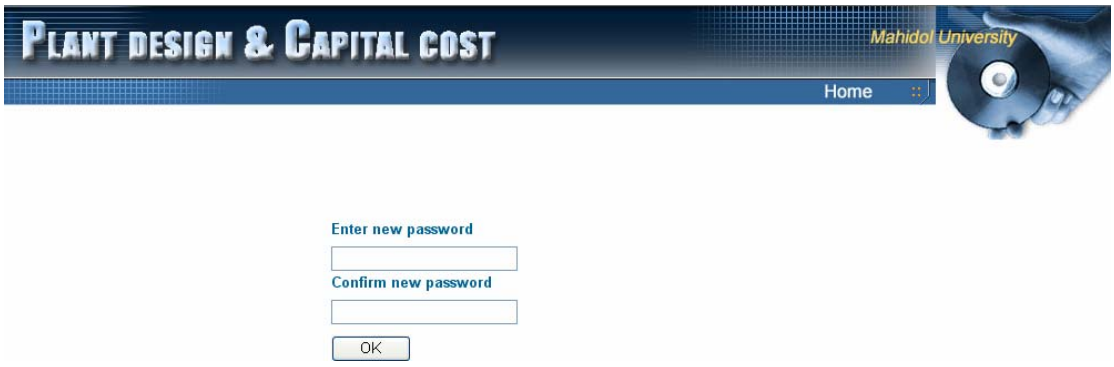

Figure B.8 Screen : Change Password

1. Web application

This part consists of factory's information and static data.

1.1 The factory's information

The factory's information, which provides the investors with the capital investment information to evaluate the return on investment from their business, is divided View and Revise sections.

Figure B.9 Screen : Select Factory Name

- **View :** View is a process for allowing the user to select factory name in the system and retrieve its. There are six menus as follow;
  1) Economic Considerations
  2) Typical Layout
  3) Equipment Cost
  4) Plant Cost
  5) Operating Cost
  6) Process

1) Economic Considerations : The Economic Considerations section will provide an order of magnitude of the unit cost of the plant described. This section also includes key profitability factors, size of the plant, selling price of the product, utilization of plant capacity, the hourly raw materials consumption rate and the production capacity.

Figure B.10 Screen : Economic Considerations

2) Typical Layout : The Layout drawing will display a set of equipment which established.

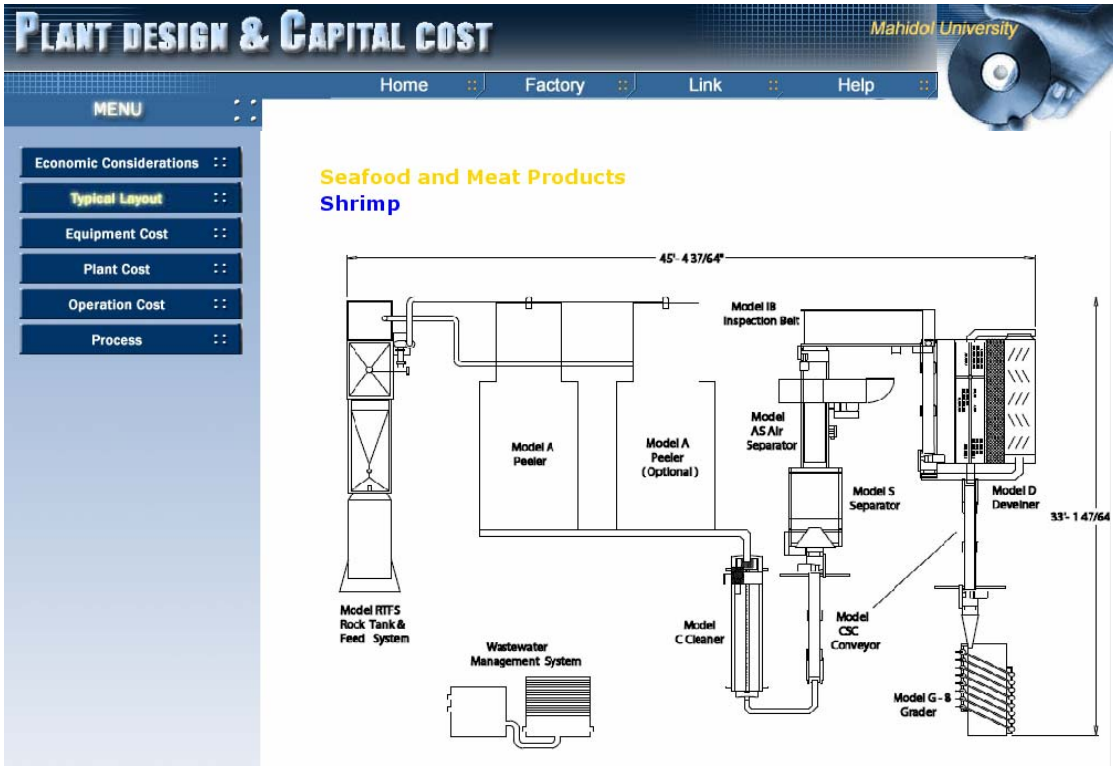

Figure B.11 Screen : Typical Layout

3) Equipment Cost : To display equipment lists and utilities (water, fuel, steam, etc.) which is used in the plant.

Figure B.12 Screen : Equipment Cost

4) Plant Cost : To display the estimation of fixed capital investment.

Figure B.13 Screen : Plant Cost

5) Operating Cost : The data in the Operating Cost section is meant to give an indication, in baht/unit weight or volume of product, of all direct manufacturing costs. The units cost for raw materials, packaging materials, chemicals and utilities.

Figure B.14 Screen : Operation Cost

6) Process : To explain rough process description.

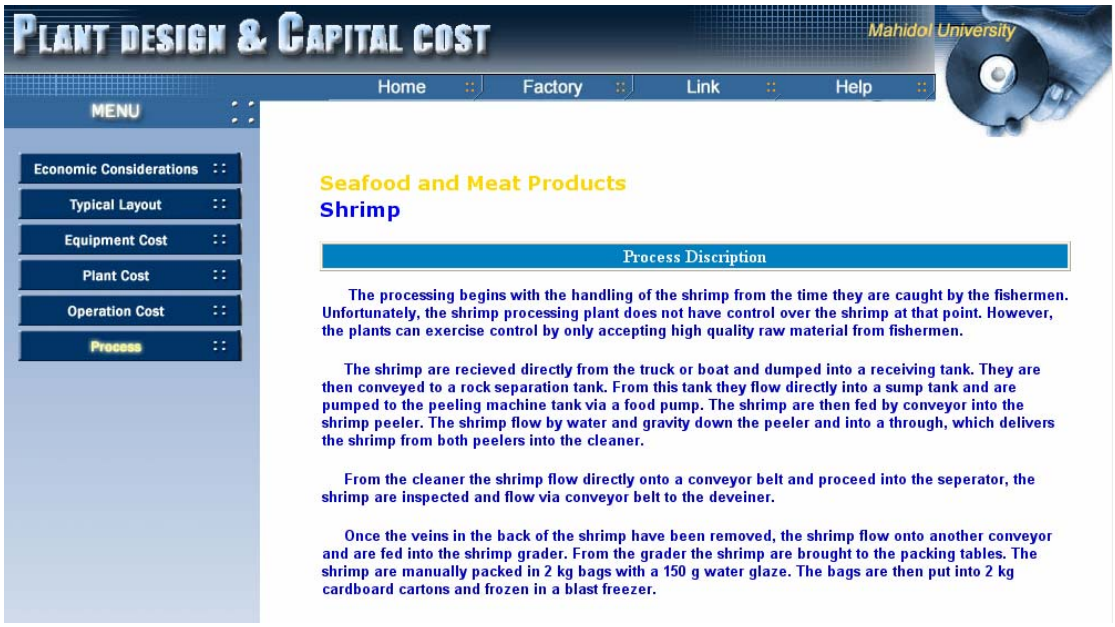

Figure B.15 Screen : Process Description

- **Revise :** Revise contains all the factors necessary to compute the total investment cost which can be updated by the user. They help the user to create the main steps of the capital investment to make a final decision. This part provides six main steps as follow;

Step 1 Equipment Cost

Form the equipment lists which is provided by the system, you can change the total number of each item in the space provided. Furthermore, you can add both items of required equipment by clicking on "Add Item" button and equipment's utility by select "View Utility" for entering the number of utilities you use to calculate the "total utilities cost/year". After calculating "Equipment Cost" you can click on "Next button" to continue.

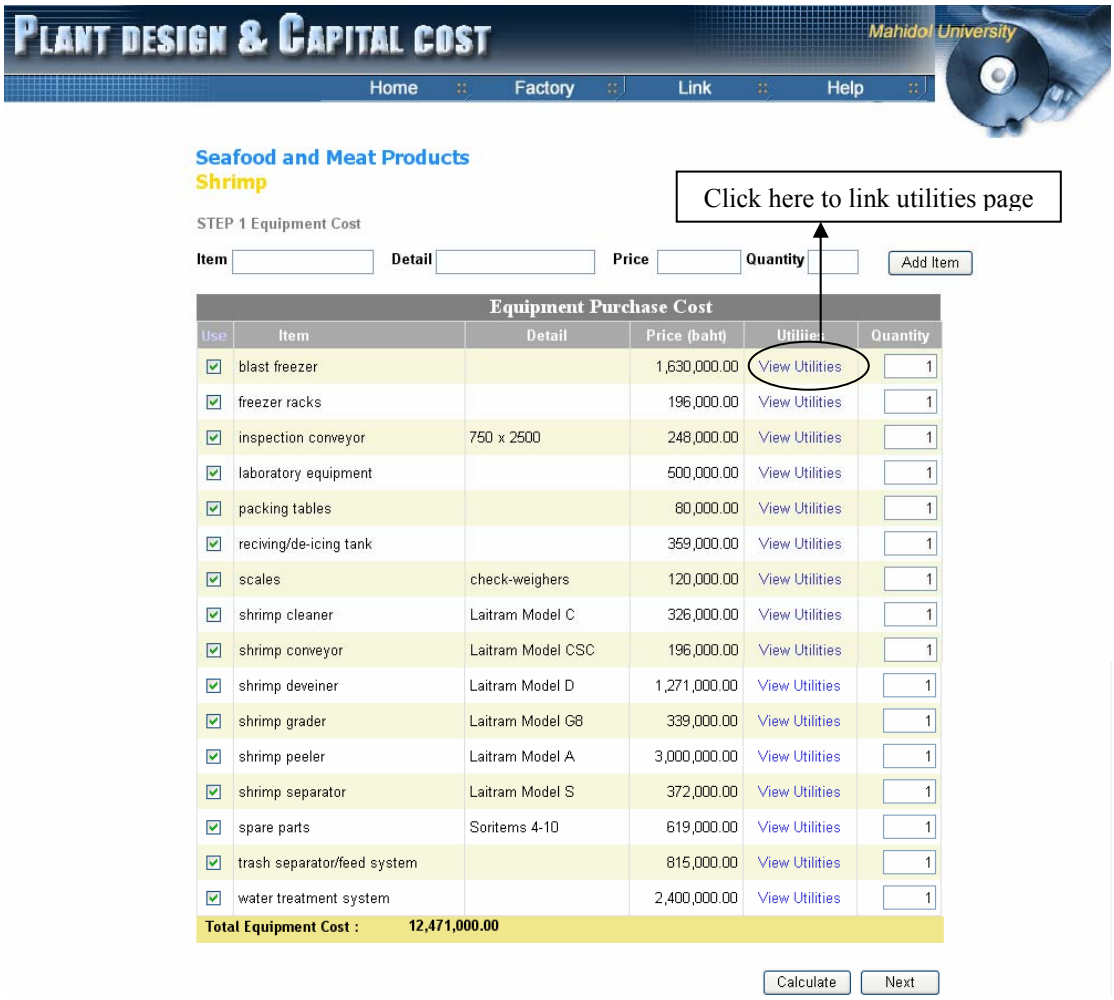

Figure B.16 Screen : Equipment Cost (Revise Zone)

Figure B.17 Screen : Utilities (Revise Zone)

Step 2 Plant Cost

The Plant Cost display approximate the cost of civil, process, mechanical, electrical, engineering and project control work. You can change cost of each item. The system will sum the costs of fixed capital investment and display this in the total plant cost when you click on "Calculate button".

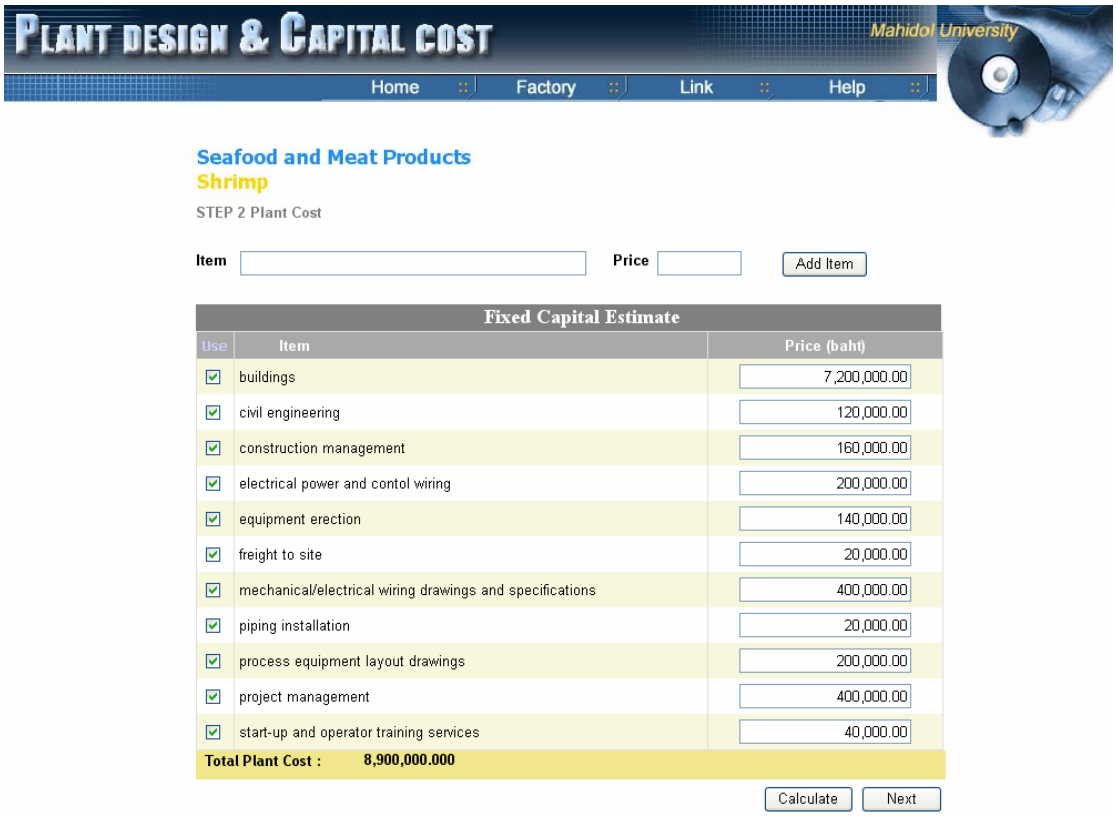

Figure B.18 Screen : Plant Cost (Revise Zone)

Step 3 Labor

This is a part of operating cost. You can enter the amount of labor in the space provided so that the system will calculate the total labor cost baht per year.

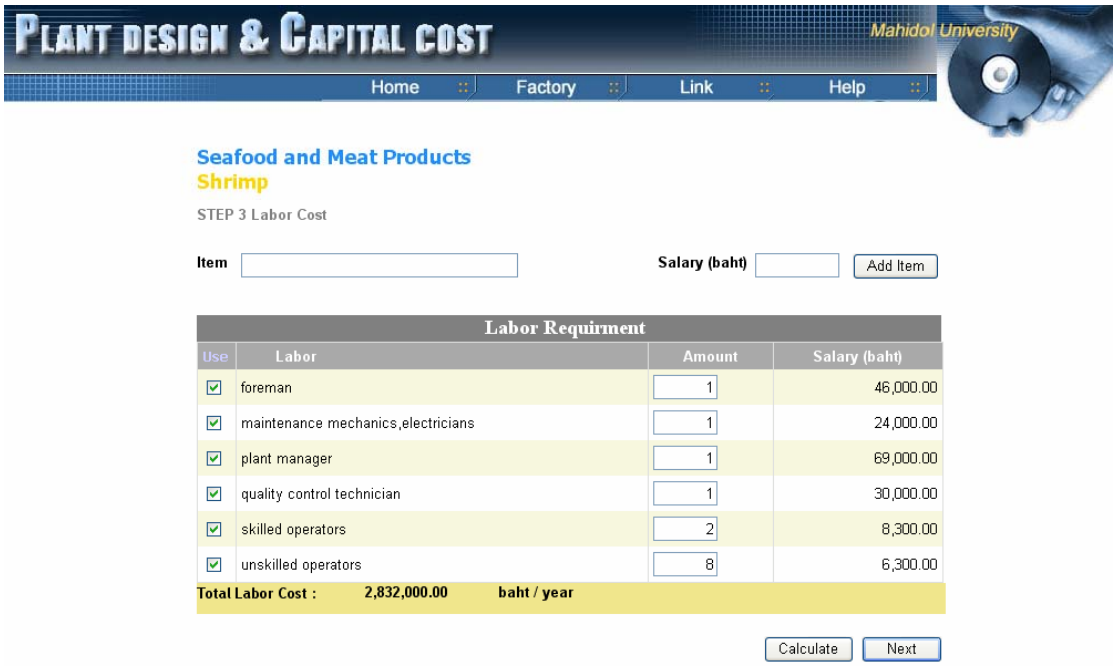

Figure B.19 Screen : Labor Cost (Revise Zone)

Step 4 Raw Material

You can enter the consumption per hour of raw material or capacity, the system will then calculate the total annual raw materials cost.

Figure B.20 Screen : Raw Material Cost (Revise Zone)

Step 5 Operating Cost

The total annual cost of labor, raw material and utilities will be included in this section to calculate the "total operating cost".

Figure B.21 Screen : Operating Cost (Revise Zone)

Step 6 Profitability Analysis

The System will display a complete table of final results. You can set the capacity, the selling price and "Tax Rate %" in order to calculate total cost, rate of return on investment (ROI) and Payback Period.

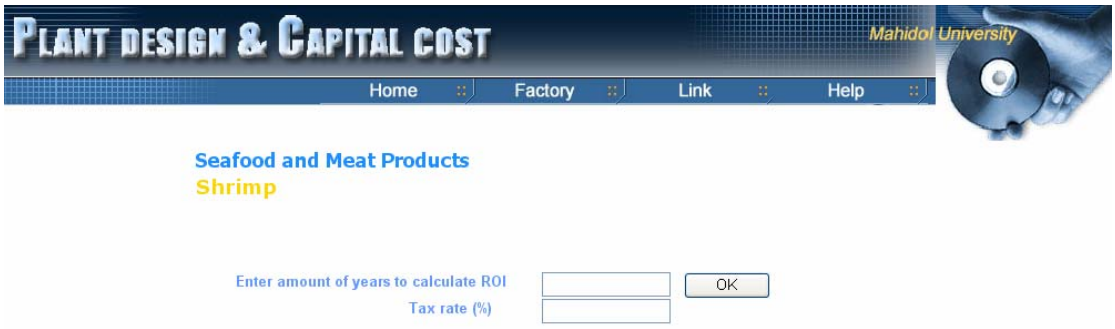

Figure B.22 Screen : Input Amount of Years and Tax

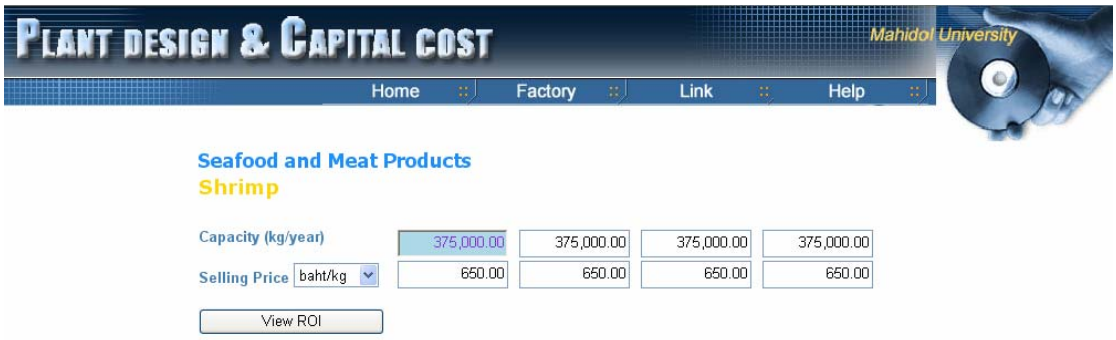

Figure B.23 Screen : Input Capacity

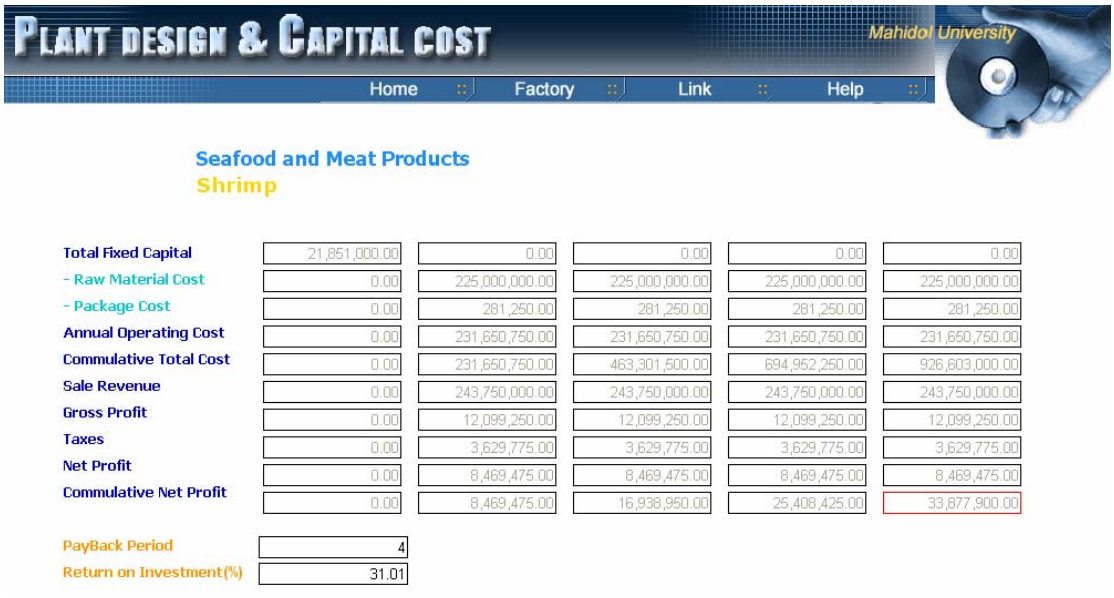

Figure B.24 Screen : Profitability Analysis

1.2 The static data

The static data consists of two main parts; Link and Help as shown in Figure B.25 and Figure B.26.

Figure B.25 Screen : Link

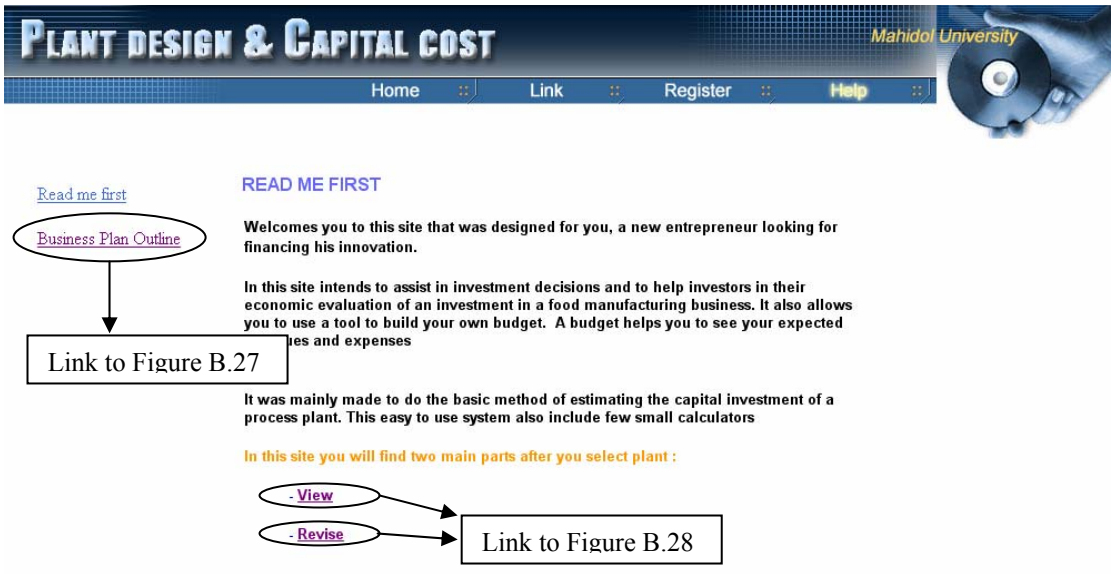

Figure B.26 Screen : Help (Read Me First)

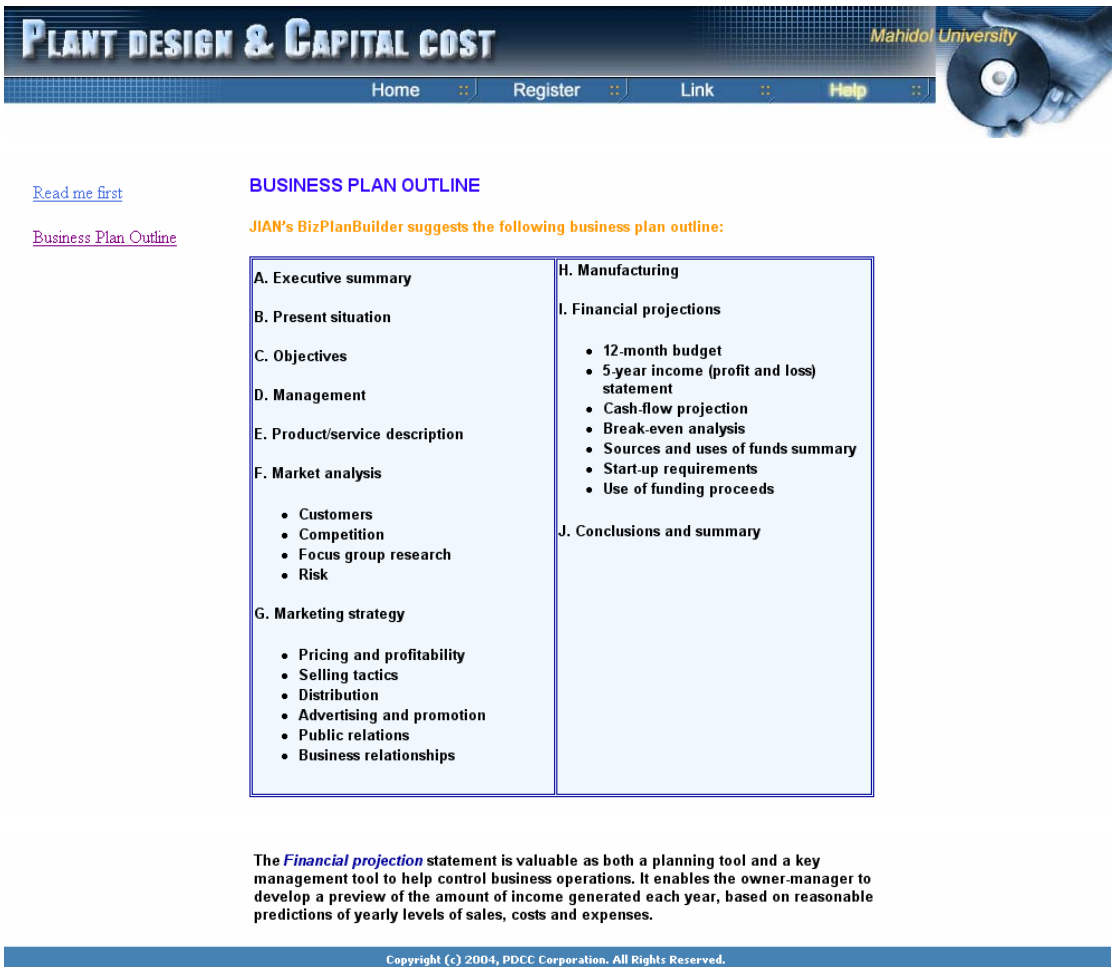

Figure B.27 Screen : Business Plan Outline

Figure B.28 Screen : Help (View/Revise)

2. Application server

This part provides administrator to manage factory data and activate new members who use the system through the site.

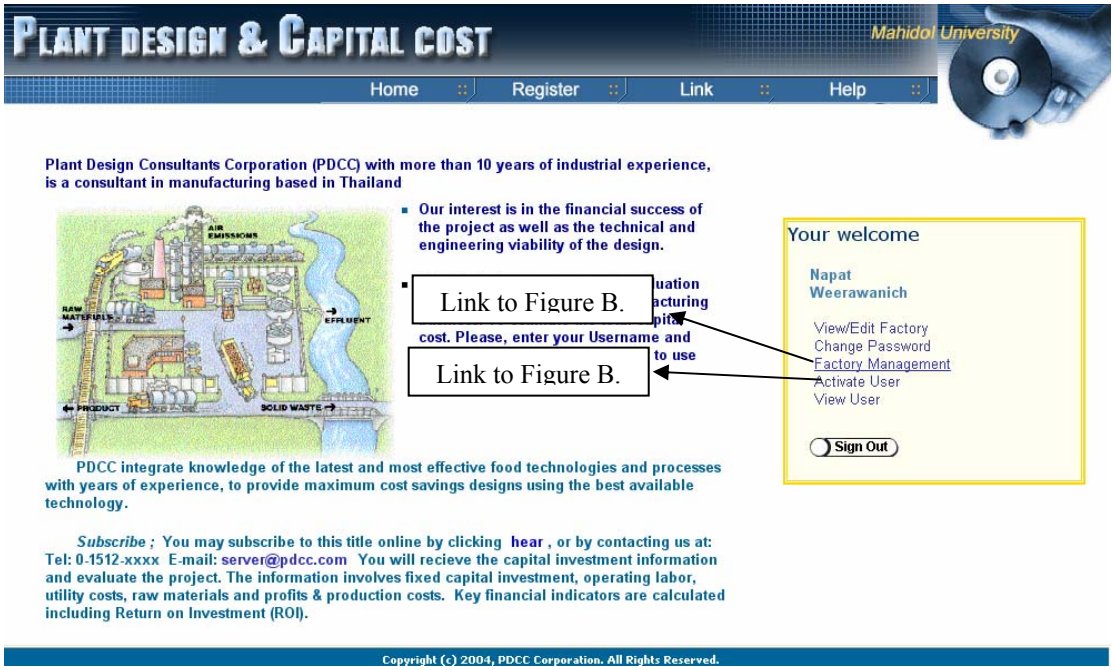

Figure B.29 Screen : Main Page for Administrator

When administrator selects “Activate User” link, the system will go to screen for manage new user as shown in Figure B.30.

Figure B.30 Screen : Activated User

When administrator selects “Factory Management” link, the system will go to main screen for manage factory data as shown in Figure B.31.

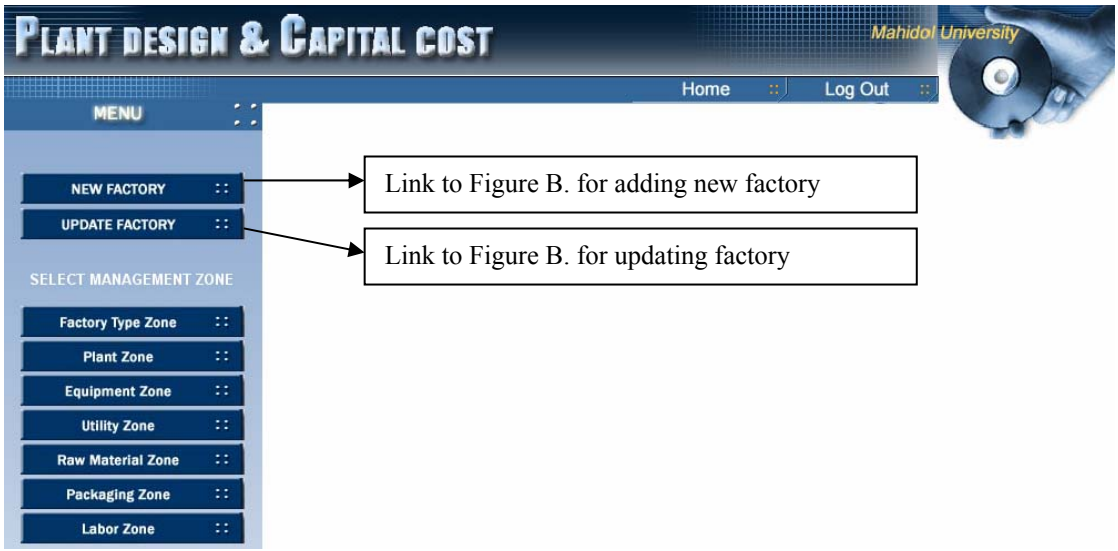

Figure B.31 Screen : Manage Function Menu of the System

In this part consists of nine zones as follow;

1) New Factory

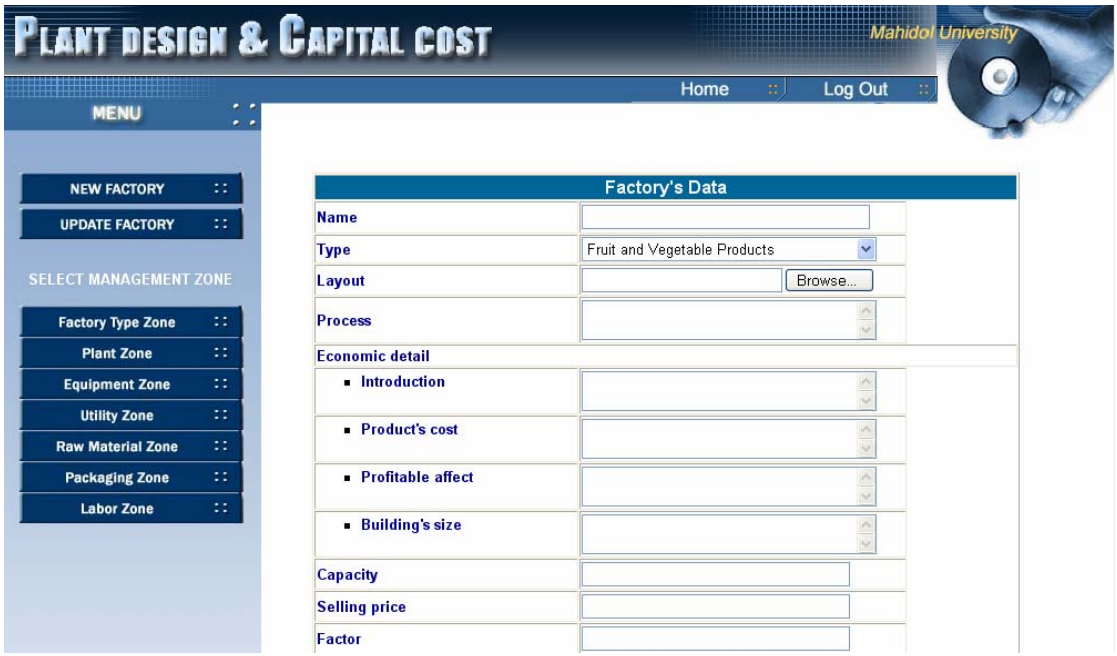

Figure B.32 Screen : Add New Factory Form

2) Update Factory

Figure B.33 Screen : Select Factory Name for Update

Figure B.34 Screen : Update Factory Form

3) Factory Type Zone

Figure B.35 Screen : Manage Factory Type Zone

4) Plant Zone

Figure B.36 Screen : Manage Plant Zone

5) Equipment Zone

Figure B.37 Screen : Manage Equipment Zone

6) Utility Zone

Figure B.38 Screen : Manage Utility Zone

7) Raw Material Zone

Figure B.39 Screen : Manage Raw Material Zone

8) Package Zone

Figure B.40 Screen : Manage Package Zone

9) Labor Zone

Figure B.41

BIOGRAPHY

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