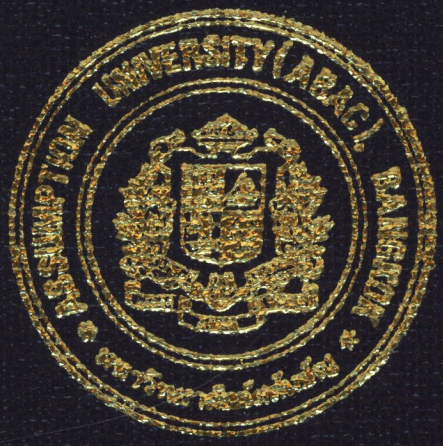

Funding Information System of Thana Finance Co., Ltd.

by

Ms. Chuenchit Trakarnratti

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

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
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Project Title	Funding Information System of Thana Finance Co., Ltd.
Name	Ms. Chuenchit Trakarnratti
Project Advisor	Air Marshal Dr. Chulit Meesajjee
Academic Year	July 21, 2002

The Graduate School of Assumption University has approved this final report of the three-credit course, CS 6998 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information Systems.

Approval Committee:

(Air Marshal Dr. Chulit Meesajjee)
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MUA Representative

July 21, 2002

ABSTRACT

Substance of the Project

The purpose of the whole process modification of the Funding Information System is to facilitate the process of Funding activities and to correspond with the revised practices by allowing own unit undertaking their originated transactions.

Critical Analysis Steps

(a) The Existing System

The existing system is based on manual with some computerized system. Most data are stored on paper with some kept in hard disk of responsible officer. It easily causes error-prone with high maintenance cost.

(b) The Proposed System

The proposed system will be centralized accounting system. All data are kept in the database server and able to share with predefined staff. It will reduce the number of administrative staffs, solve the problem of manual system and decrease the high maintenance cost.

(c) Cost Analysis & Cost Comparison

As illustrated in Figure 3.10., the investing cost of the proposed system shall be recovered in approximately 1 year 2 months.

(d) Project Evaluation

The achievement of the project has been evaluated by simulating the testing data, which been involved by all members of the project team.

Summary of Analysis

The testing result has been satisfactorily addressed all requirements, which will be brought to be beneficial for developing other information system.

ACKNOWLEDGEMENTS

Several people have made contributions to polish this project. The writer would like to acknowledge their efforts and thank them for their contributions.

At this time, she would like to extend her appreciation. First, she would like to specially thank Air Marshal Dr. Chulit Meesajjee, her project advisor, for his valuable suggestions and advice given thorough the process of preparation of this project. Second, she wants to thank Ms. Bunchongchit Junseetis, who support the information relating to the way in developing system.

She extends her special appreciation to Ms. Sasiwadee Kiaosangsong, Organization, Methods and Procedures Department Manager, Ms. Naiyana Noibanchong, system analyst, Organization, Methods and Procedures Department and Ms. Saowanee Soonthornswad, Funding (Back Office) Department Manager, Asia Credit Plc. for their timely assistance and information provided to her while carrying out the data collection required for her project.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

1.1 Background of the Project

Finance companies conduct similar business to that of commercial banking, as specified in the Act governing finance business. Finance companies as a whole play an important role for the Thai economy and are second only after commercial banks in terms of fund / deposit mobilization and lending to the private sector.

As for finance businesses, funding process acts as a major role in mobilizing funds either from public and financial institutions, which serves as the primary source of funds of the company to address the lending purpose. Other than the competition from the commercial banks, the competition among the finance companies themselves has also been intense since all have the identical target group of fund mobilization. Apart from the competition with the favorable interest rate, the appreciated fulfillment of customers' demands is the key concerned issue.

As aforementioned, the management of Thana Finance Co., Ltd. has decided to reengineer the organizational structure and employed the effective information system in order to enhance the efficiency and effectiveness of the company as a whole and be able to compete in the market.

One major affected change, which is introduced herein, is the modification of the funding process relating to both workflow process and relevant information system. The internal network has been suggested to implement information sharing and providing quick responses, while the working style would be shifted to computerized process.

1.2 Objectives of the Project

The broad aims of the modification through the information system of funding process are primarily to address the management's attitudes in relating to the organizational reengineering and enhance the efficiency of entire processes by employing the effective information system.

The details of in-dept specific objectives of modifying information system of funding process are descriptively provided below.

(1) Develop an in-house information system that results in increasing the efficiency of daily work process by eliminating the redundancy of activities.

(2) Speed up the process by reducing processing time either of each process from efficiency enhancement.

(3) Provide the on-line information, which reach the users' requirements as identified below:

   (a) Facilitate the supervisor to monitor the daily operation and ensure that controls are kept in place and the Company's policy has been strictly complied with.

   (b) Provide updated supporting information for users to deal with the current situations and to make the right decision.

   (c) Provide the managerial information to the management for their consideration and supervision.

(4) Restore online information in the computerized system that results in availability of information, which are ready to retrieve anytime.

(5) Generate the users' familiarity in utilizing the computerized system.

1.3 Scope of the Project

With reference to this project, we mentioned the change in one information system, which concerned the funding activities. The changes mentioned herein are covered 4 main sub-processes.

(1) Deposit & Withdrawal Process

(2) Information Maintaining Process

(3) Data Execution Process

(4) Interest Calculation & MIS Report Preparation Process

The contents of this report are beyond the process of installing the internal network. We are specifically concerned with the information system modification of funding activities. Currently, daily workflow process of funding activities has to deal with several departments and affected the cross-functional activities. The impact can be categorized based upon each phase of system development as follows:

At the Phase of System Analysis

(a) Funding – Front Office & Back Office: to list their requirements to correspond with the current practice.

(b) System Planning Department: to collect all users requirements and establish the system statements for Information Technology to design system and study the feasibility.

(c) Internal Audit Department (Computer Audit): to identify the internal control for the established system.

At the Phase of System Design

(a) System Planning Department: to collect input & output requirements, study the database requirement and then coordinate with Information Technology Department to design system.

(b) Information Technology Department: to design the system as requirements and develop the security control onto the system.

(c) Internal Audit Department (Computer Audit): to examine the adequacy of the internal control.

At the Phase of System Implementation

(a) Information Technology Department: to test and evaluate the performance of the system designed and finally to perform the data conversion.

(b) System Planning and Funding Department (Front & Back Office): to review and test the application of the system designed to ensure that it addresses all users requirements.

1.4 Deliverables

The success of this project brought on the program, which delivers the following characteristics:

(1) Develop user-friendly application, which allows responsible units to undertake their own transactions i.e. Front Office handles customer information in central database, Back Office proceeds and controls all funding transactions.

(2) Expedite the processing of funding through recording all required information in database.

(3) Interface applications with all determined users by restricting the authority of data access as user profile set up in order to facilitate any user to view the updated information for supporting their further actions.

(4) Provide improved monitoring and follow-up mechanisms for the irregular transactions.

(5) Generate appropriate control report as designed / required by the controller to strengthen the control of the firm.

(6) Reduce time proceeding for each order execution by eliminating the work flow process regarding the step of passing documents to Information Technology / Accounting Department to record the incurring transactions.

1.5 Project Plan

Based upon the resolution of the Executive Committee to change the organizational structure to correspond with decentralized management style, the Project Steering Committee has been directed to accomplish the core system development with the determined schedule. The specific working groups have been set up to carry out each project. With respect to the modification of Funding system, the achievement has been targeted to the end of year 2001 under the responsibility of the assigned staff below.

(1) Head of Resource Division – Project management

(2) Head of System Planning Department – Team Leader

(3) Head of Funding Department (Front & Back Office)

(4) Assigned staff from Information Technology Department

(5) Assigned staff from Computer Audit Department

The project has been originated by defining the direction of the project, setting up the working group and agreeing the workflow process. At the initial phase, the budget for the development has been proposed to the management to obtain their approval by having MIS Department to control the actual expenditure incurred and report to the management on a regular basis.

The project planning concerning the system development is categorized into three phases, system analysis, system design and system implementation. Each phase has

been broken down into activities by apportioning to the related responsible staff with the determined deadline planned as detailed provided in Gantt Chart.

After the accomplishment of the system, the next phase, undertaken by the Information Technology is the data conversion plan after satisfying the result of parallel running the system and then cut off the execution of previous system.

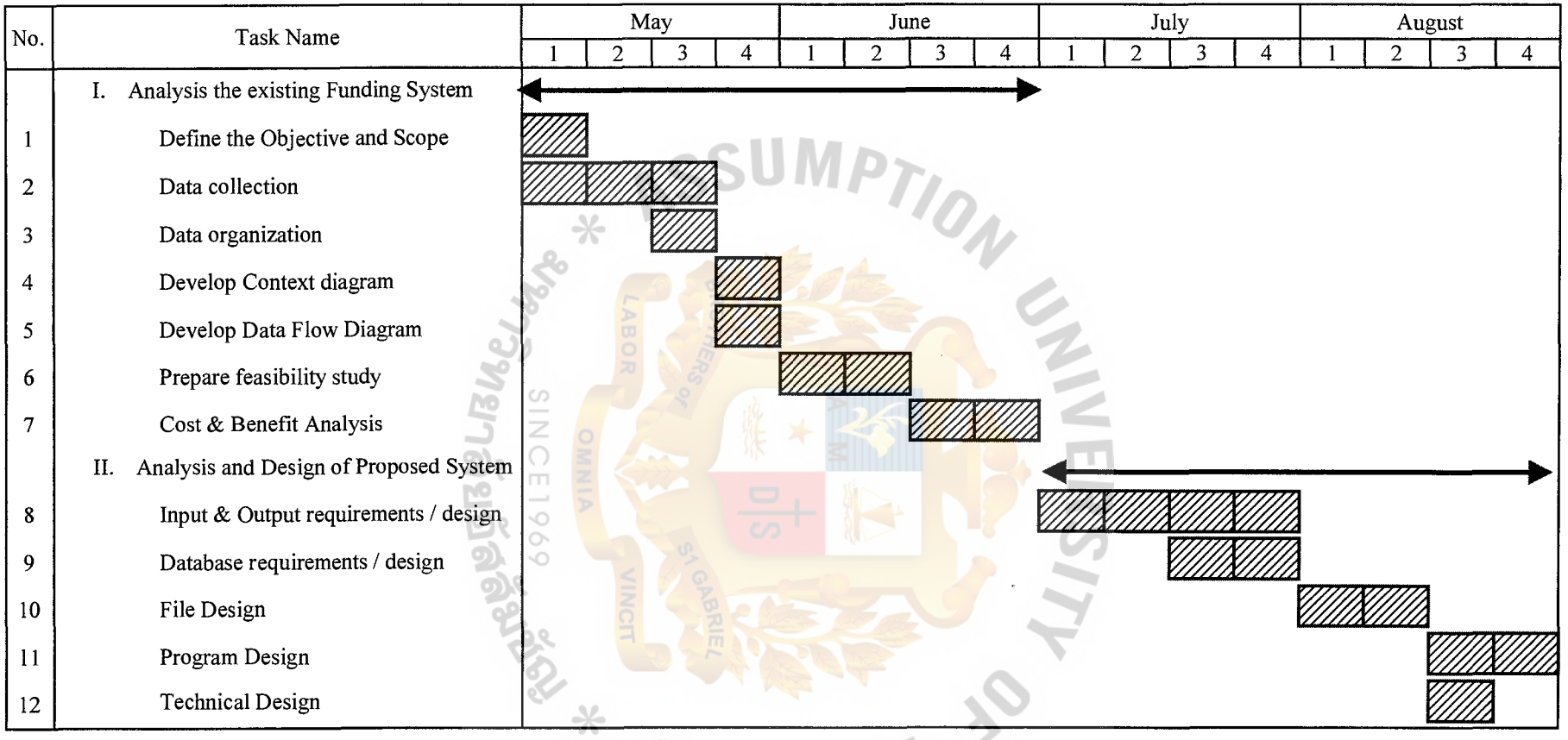


Figure 1.1. Project Planning of Modification of Funding Information System.

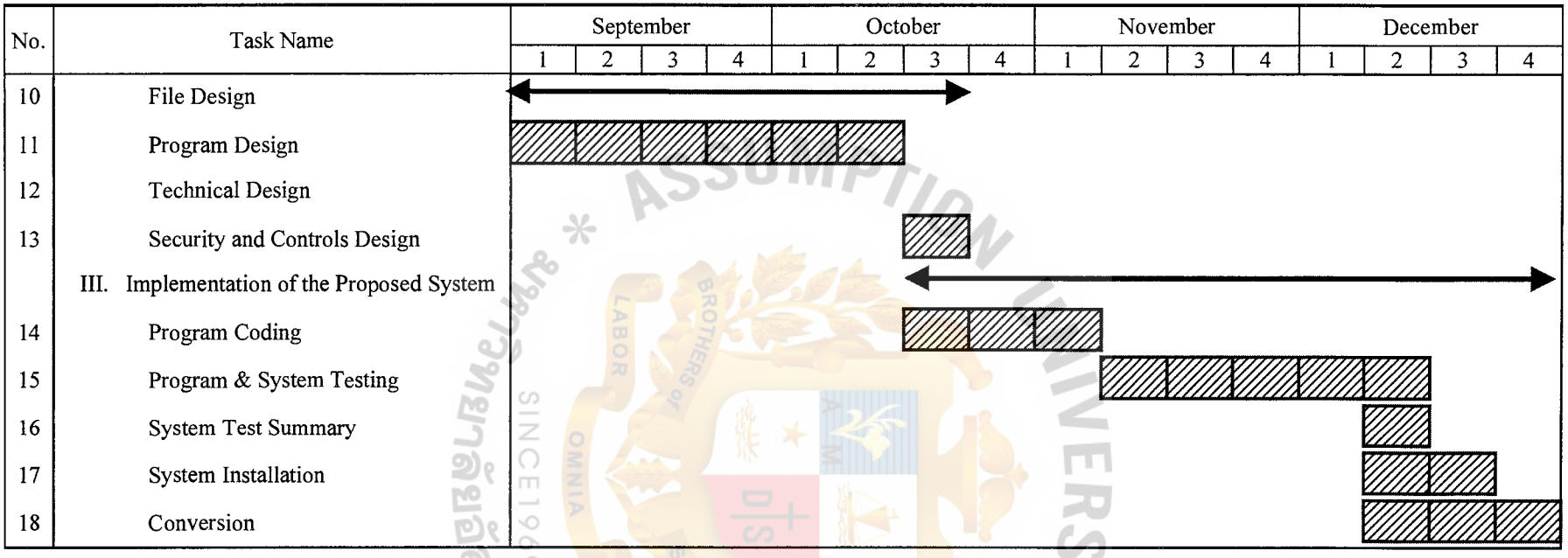


Figure 1.2. Project Planning of Modification of Funding Information System (continued).

II. THE EXISTING SYSTEM

2.1 Background of the Organization

Thana Finance Company Limited was founded in 1969. The primary objectives are lending and accepting deposits in the form of promissory notes issued to the public. In 1974, the registered capital was augmented to support the expansion of the Company's business. Thana Finance Company Limited is located at 9th – 10th Diethelm Tower A, 93/1 Wireless Road, Pathumwan, Bangkok.

The current organization structure of the Company, which is subjected to reengineering for enhancing the efficiency of the operation, consists of the following division with different responsibility.

(1) Commercial Business Division

This division is composed of three main commercial businesses, Credit Department, Funding Department and Treasury Department. The main responsibility of Credit Department is to solicit the customers for granting the short and long-term credits in local and foreign currencies through discounted cheque, promissory notes and other commercial papers. The type of granting loans includes project financing and guarantees and aval issuance. Meanwhile Funding Department has to take deposit through the issuance of promissory notes to support the fund requirement for loan granting. The main task of last department under this division, Treasury Department, is to perform the cash management.

(2) Advisory Division

All professional supporting functions, which comprise Legal Department, Technical Advisory, Internal Audit Department and Planning Department are under this structural line.

(3) Operation Division

This division line aggregates all support or backup departments, except Credit Administration Department, which is to be placed under Commercial Business Division. This division comprises Accounting Department, Information Technology Department, General Administration and Human Resource.

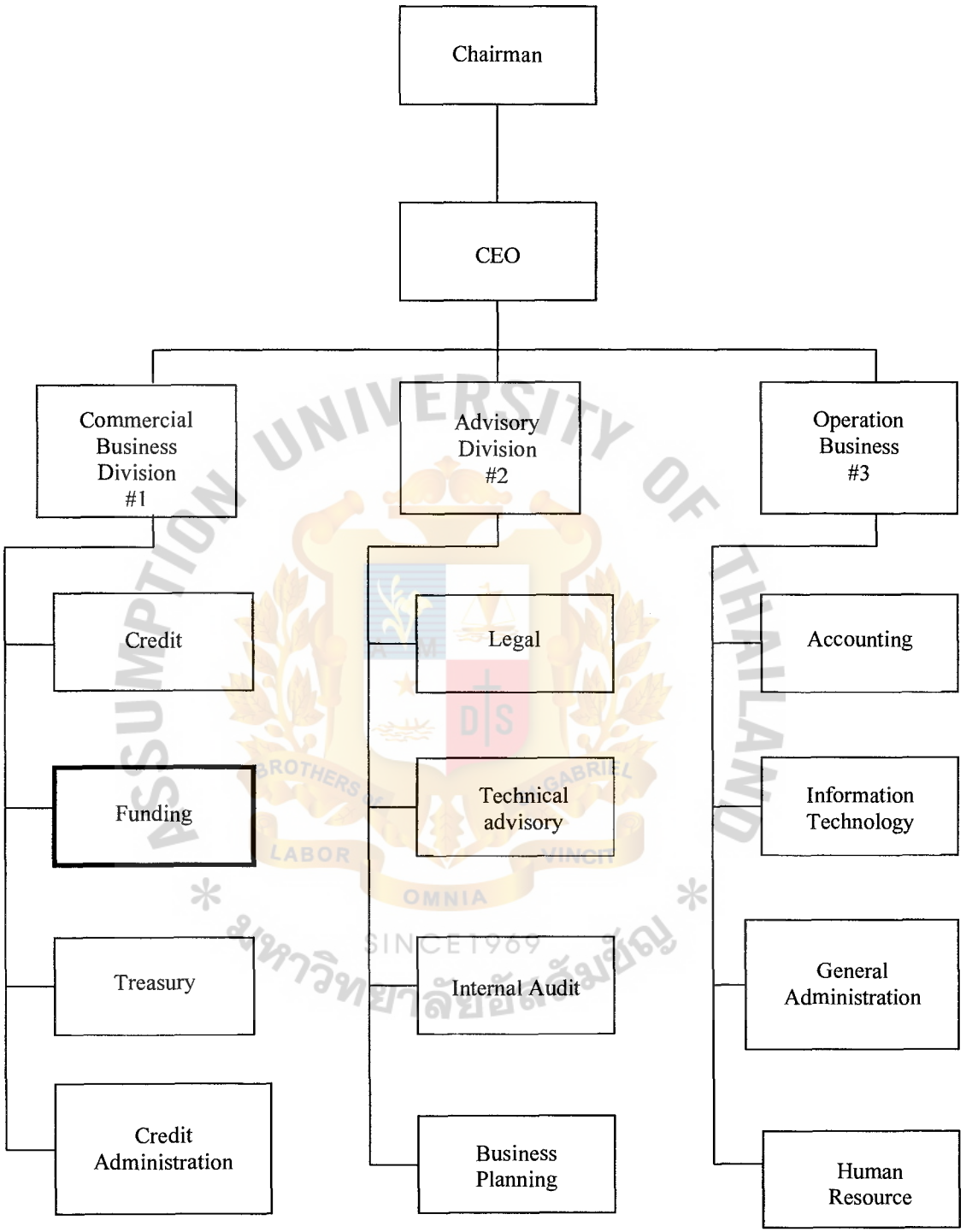


Figure 2.1. Existing Organization Chart of Thana Finance Co., Ltd.

The company has effected changes in its operational structure in order to enhance their efficiency so as to enable the Company to compete successfully and to meet customers' demand fully. The changes in the operational structure not only impact the internal structure of the Company but also the daily workflow process of each core department. In addition, the management style is also altered from the centralization to be decentralization. All departments would undertake their originated transactions instead of undertaking either by Information Technology or Accounting department as formerly performed according to the decentralization style.

The organizational structure has been reengineered according to the advice of one professional firm. The operational functions have been separated from the marketing functions and under the different reporting line. The revised organization chart is presented below.

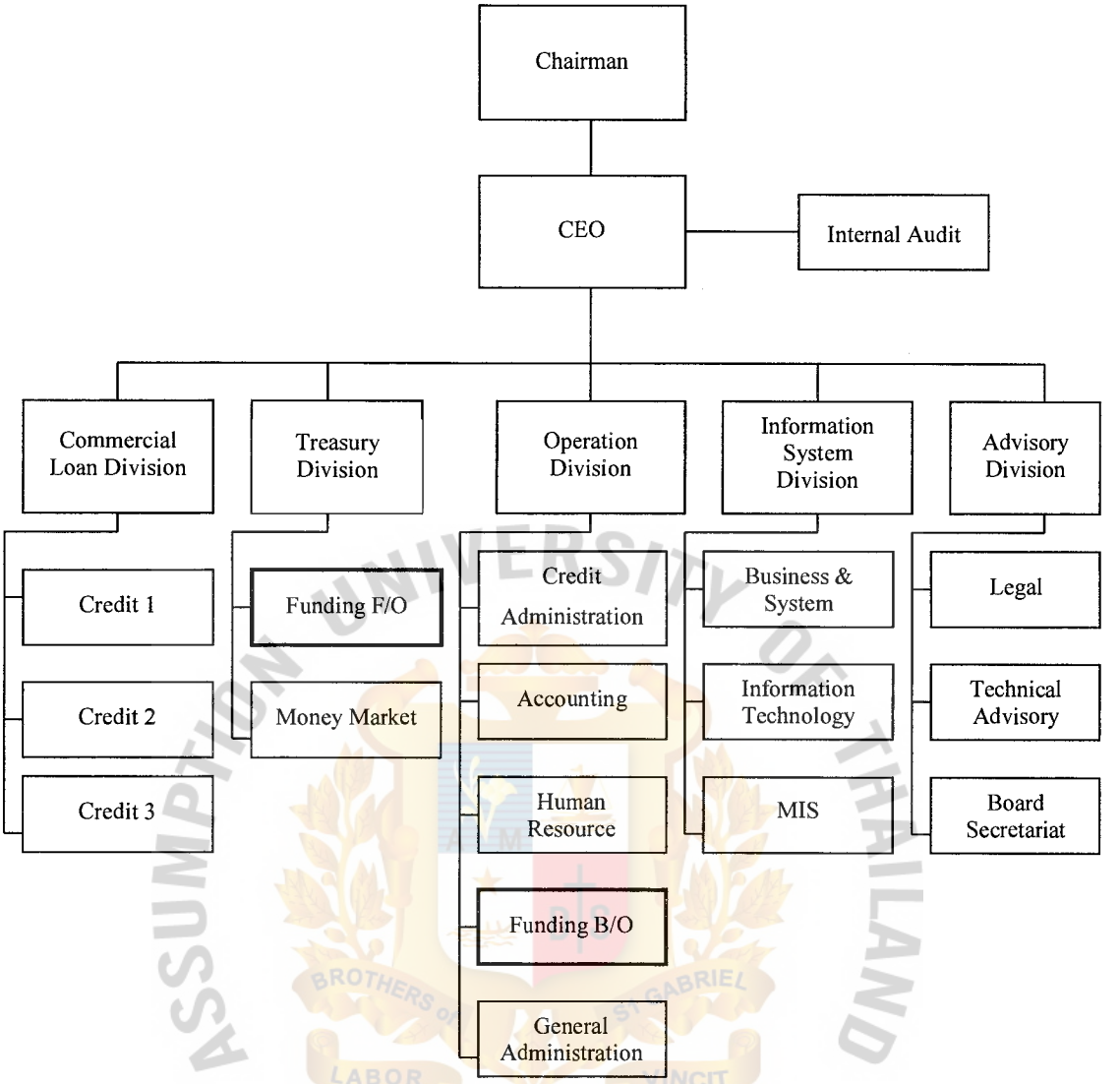


Figure 2.2. Revised Organization Chart of Thana Finance Co., Ltd.

The internal structures of certain departments have been revised to correspond to the current situation. Funding Department is one department, which got the impact from the change mentioned earlier. Currently, the daily operations have been split into two main processes. One is the marketing function – Front office, which solicits the new customers seeking, maintaining and monitoring customers. Another is the backup function – Back office, which supports all daily transactions in terms of recording, posting and controlling documents.

In order to correspond with structural change, the operational system has been modified to cope with the change in the daily workflow process and the responsible units. One major modified operational system, which we would like to introduce in this project is the project for modification the operational system of Funding department.

2.2 Current Problems and Areas for Improvement

According to the context diagram of existing system as illustrated in Figure 2.3, the transactions processing through the accounting system have required the task force from Information Technology Department. Meanwhile, the daily operation processes in relating to the promissory notes preparation and delivery to customers are undertaken by Funding Department (Back Office). Through this process, several deficiencies / problems are remarkable.

Current Problems

(1) With effect from the cross processing between the recording to the accounting system and the promissory notes operations, the late / incomplete recording as well as late correction can easily take place.

(2) Obtaining the customer's compliant is due to marketing officers of Funding Department (Front Officer), who initiates deals with the customers, and are unable to notify whether the customer's order sent to Back Office has been completely fulfilled within the customer's required timeframe.

(3) Lack of daily report for controlling the daily promissory notes generated, which facilitate to reconcile with the received order and the recording posted by Information Technology in order to ensure the correctness and completeness of promissory notes generation and the recording as well.

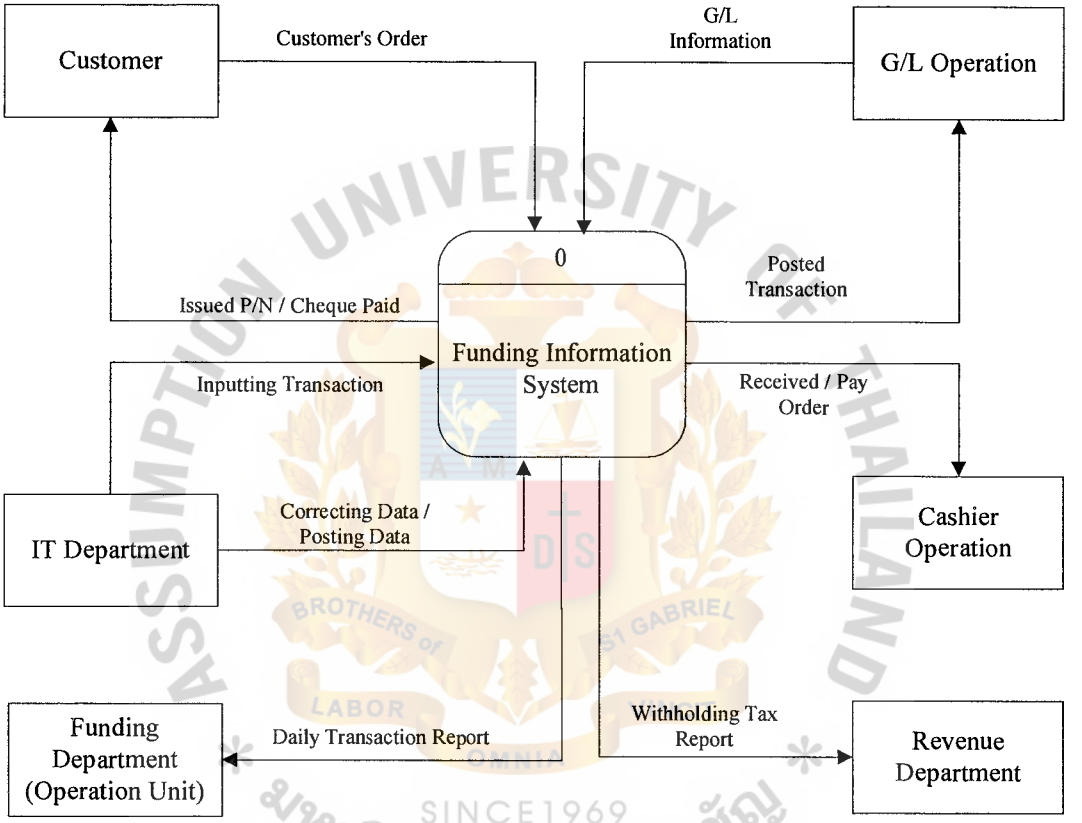


Figure 2.3. The Context Daigram of Existing Funding Information System.

(4) Wasting the cost of printed promissory notes when clerical errors incurred since the recording has been made with a typewriter in which errors are difficult to correct compared to preview via computer screen.

(5) Keeping duplicated documents within two departments, Funding (Back Office) for promissory notes operation and Information Technology for recording through accounting system. With this practice, it consumes great maintenance costs for wasting paper and keeping space.

(6) Creating redundant activities for promissory note operation undertaken by Funding Department (Back Office) in which identical information has to be repeatedly recorded in accounting system by Information Technology. In addition, the extending process from the cross business functions also causes inefficiency from forward and backward information for correction between Information Technology Department and Funding (Back Office).

(7) Certain ineffective manual practices exist. The manual checking of the offered interest rate easily causes error either with intention or without intention.

(8) Inability to promptly provide updated managerial information due to the lack of system update procedure. According to the current practice, the updated information are usually ready for utilization after two days processing, which includes both recording and validating process. In addition, the information has also not been online to facilitate the users such as the information relating to the details of customers, and then causes great consumption of paper base, which is not convenient for quick viewing.

Areas for Improvements

(1) The workflow processing has to be altered by eliminating the redundant activities in order to shorten the current process and speed up the operation. Funding (Back Office) Department will take responsibility in proceeding the transactions posting through accounting system instead of Information Technology Department as previous. With this improvement, several deficiencies mentioned above would cease.

(2) In order to facilitate the staff of Funding (Back Office) Department, who got less skillful in computerized system than that of Information Technology Department, current information system has to modify to lessen the complication and be user friendly. As for the system modification, the process of promissory notes operation as well as the transaction posting would also be amalgamated in order to eliminate the double entry, which easily causes clerical errors and increases the process of reconciliation for ensuring the consistency of these two sources.

2.3 Existing Computer System

As previously mentioned, the existing computer system is complicated and comfortable specifically to technical staff, who are keen on the work processing based upon the high level language of computerized program. The current system was designed by a professional company in 1988. According to that developing time, most developed programs were in the version that did not facilitate the non-technical officer. The constraints of the system were developed according to the Company's pre-defined requirements, which corresponded to the situation at that moment. The additional requirements would be on an ahoc modification from time to time. In case of contrasting with the developed program, unstructured applications would be used to

compensate. The specification of hardware requirement at that time was the fundamental personal computer with monochrome monitor, which was generally introduced within that period. The hardware has been considered to replace when the old ones were broken out from time to time.

As illustrated in Figure 2.4, no network linkage between each department. Each department has worked based upon its standalone computers. Meanwhile, all information recording into the accounting system are handled by Information Technology Department.

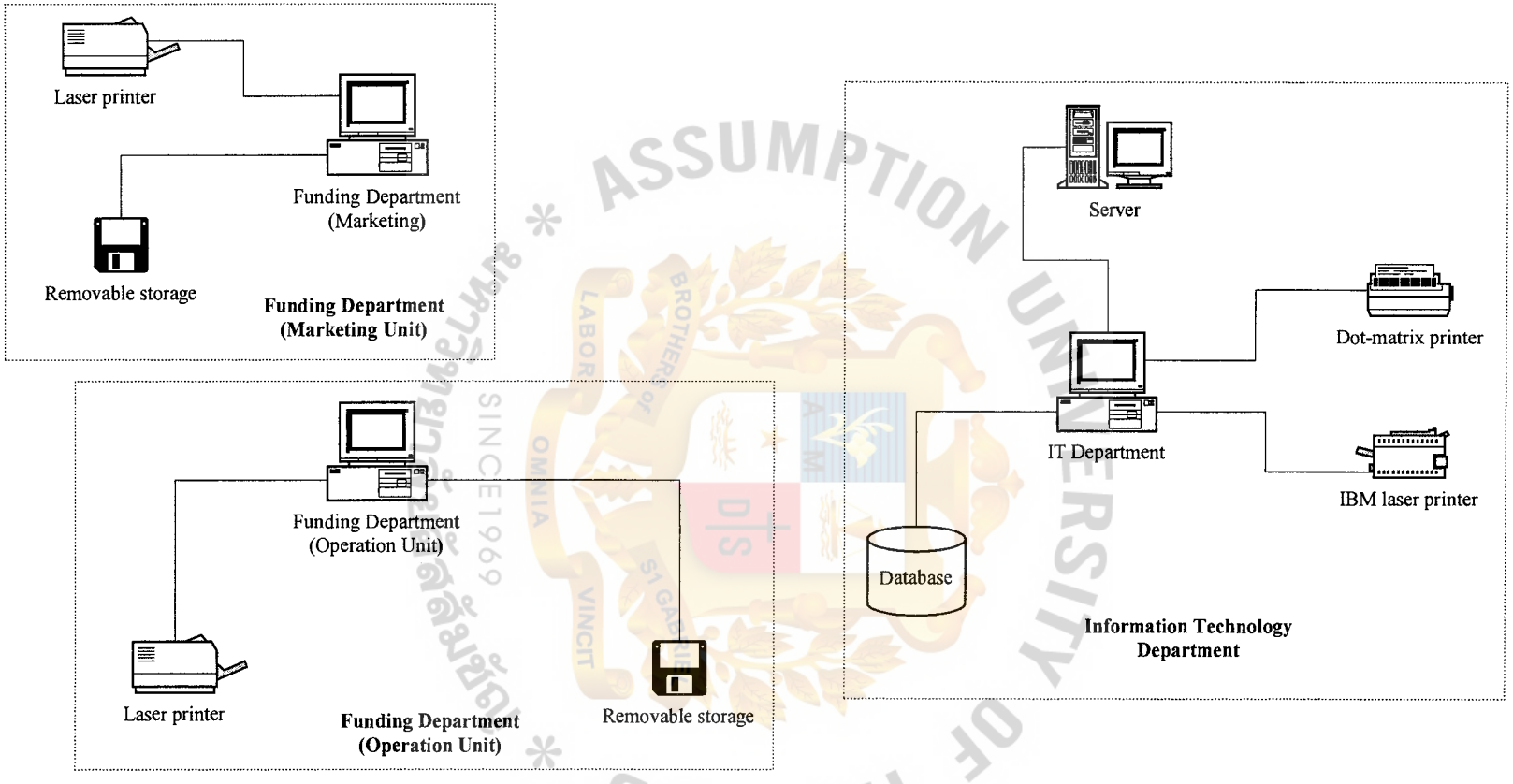


Figure 2.4. Physical Configuration of the Existing System.

III. THE PROPOSED SYSTEM

3.1 System Specification

In order to achieve the primary goal in relating to the reengineering organizational structure as well as minimization the deficient operations as mentioned in the previous chapter, the Company has proceeded to make studies on the development and improvement of the Company's operational systems. To develop the operational system, the Company has modified certain core applications of the Banking system including funding information system. With this modification, it can facilitate the various processes of funding activities and solve the problems occurring from existing manual system and some ineffective information system. This also will enhance the efficiency regarding the speed, accuracy and also reduction of duplicated works in many areas of current operation as well as enable staff to handle new businesses in future.

The details of desirable and achievable targets, which have been included in the new proposed system, should have the following components:

(1) Database redesigned both customer database and accounting information database, developed and converted to the high performance database server in order to share and be available for every responsible officer including marketing officers, financial staffs and management to online for providing information useful for decision making.

(2) Integrated Table of interest rate by converting from viewing effective interest rate through unstructured spreadsheet application to be built-in the system to let it pop-up with no manual input. This development mitigates the financial loss from offering the excessive interest rate with or without intention.

(3) Customer Status Database replacing the existing manual system to facilitate the marketing officers to systematically keep track of customer contact, notify and monitor the current status of customer whether it is under active or dormant status.

(4) Non-complicated information system developing to permit the responsible officers, who are keen on the nature of transactions, post the originated transactions through the accounting system by self with the verification of the authorized level. This firstly reduces the clerical errors from having unfamiliar staff to carry on the recording, secondly easily and quickly detect the errors with prompt correction and finally shorten the daily process by eliminating redundant activities and able to promptly provide the services to customers.

3.2 System Design

The aims of proposed / modified funding information system are to fully and promptly fulfill the customers' demands as well as to provide accurate information on a timely basis. In addition, the system designed will be user friendly to all related users for implementation.

The resolutions of the Executive Committee have unanimously concluded that the aforementioned objectives addressing in combination with the desirable target would require a much improved computer information system. The change of current processing required close examination of the types of data to be stored online to facilitate all users' requirements. The reasons for keeping customer base and accounting information online are to store the readily useful information for any purpose, for example, contact customers, make query for managing data, generate management reports, etc. The information of both customer base and related accounting

information database, in substance, is not substantially changed from the current system. The modification is proposed to facilitate the information viewing in form of online computerized system. It would be used by marketing officer to determine the relative success of customer gaining and of continuous contact. With regard to back office, it supports the prompt updating, detecting and correcting. The transactions would be stored and updated onto the relative files of information systems.

Figure 3.1 represents the network architecture of proposed system. This illustration shows the connectivity between the server and each department. In design, data flow diagram was used to determine both input and outputs. As funding information system, Figure 3.2 represents the context diagram of funding process. This diagram documents the eight types of information to be produced by the system, which are labeled as follows.

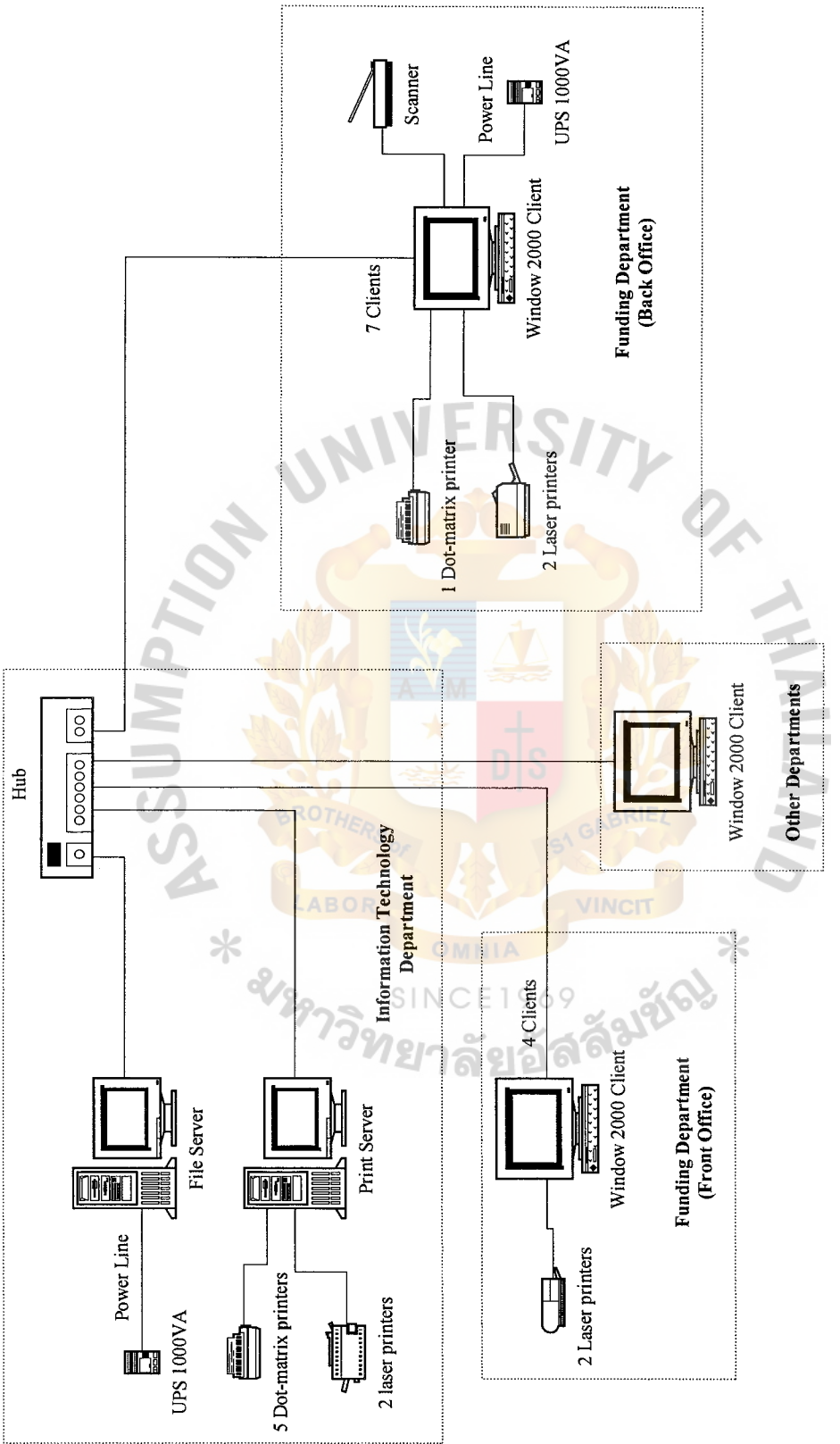


Figure 3.1. Network Architecture of Proposed Funding Information System (Intranet).

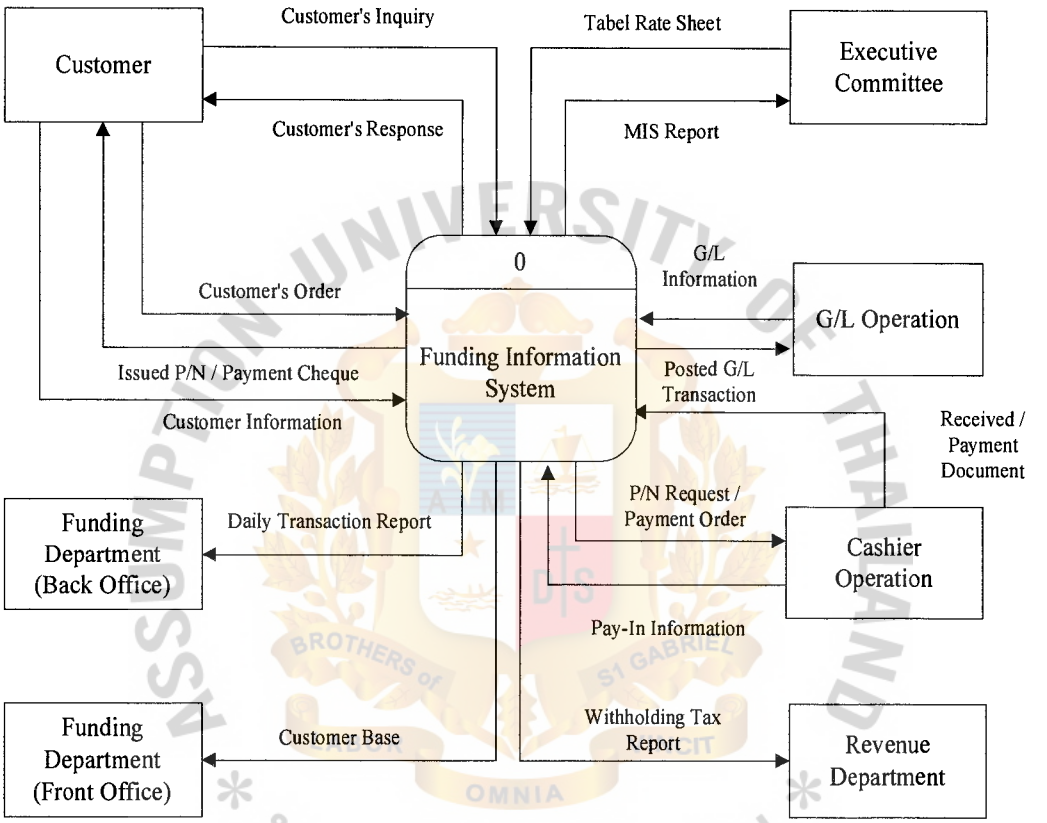


Figure 3.2. The Context Daigram of Proposed Funding Information System.

(1) Customer Base: showing the details of customers as contact list and the record controlling the completeness of minimum required documents;

(2) Document In / Out Transaction: showing the information after completing the promissory note operations either for deposit or withdrawal / rollover transaction;

(3) Issued P/N or Payment Cheque: Promissory note / Cheque issuance for fulfillment each inputted order;

(4) Pay-In Information: showing the details of incoming fund as base information for cashier operation for reconciling with physical fund;

(5) P/N Request / Payment Order: representing an order generating from the system to inform the receipt or request the payment;

(6) Withholding Tax Report: showing the whole withholding tax gathering from customers during the day for preparing the further payment to Revenue Department as schedule due;

(7) Daily Transaction Report: showing the daily transactions originated and passed through accounting system;

(8) MIS Report: showing the key information relating to funding activities to support the management's decision making;

Alternatives Proposal

According to the developing logical design, certain alternatives, which have capacity to achieve the defined requirements, are brought to project team member as well as Steering Committee's consideration. Besides, considering design alternatives at the uppermost levels of a system as shown by the context diagram and Level 0 of data flow diagram as presented in Figure 3.3 and Figure 3.4, respectively, various design possibilities can be shown at lower levels.

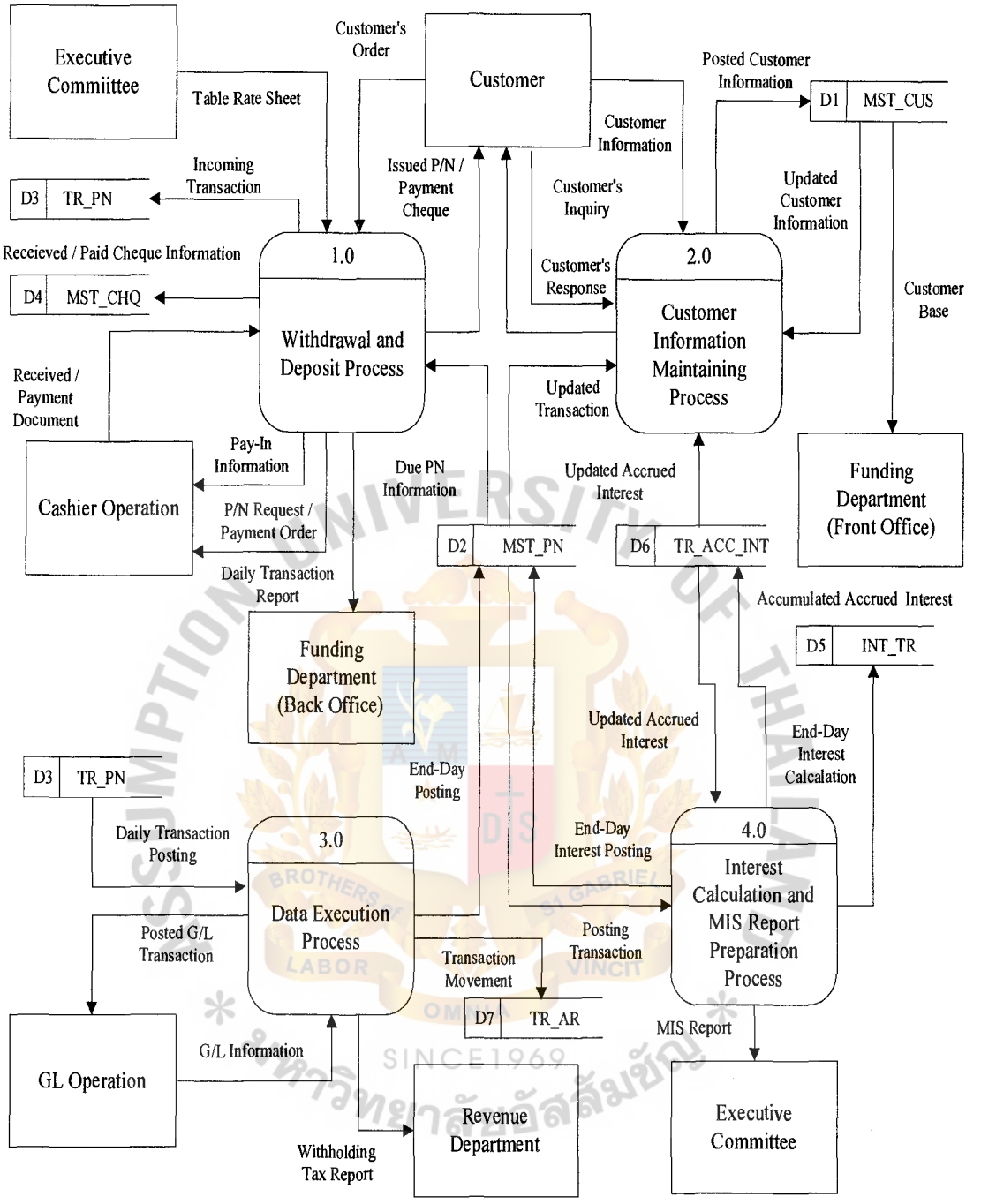


Figure 3.3. Level 0 Data Flow Diagram of Proposed Funding Information System.

In order to achieve the outputs shown by a high-level DFD, logical design has been developed in which the following processes have been included.

(1) Deposit and Withdrawal Process: This process allows customers to make a request in relating to deposit and / or withdrawal promissory notes. Level 1 of data flow diagram relating to this process is shown in Figure 3.3 below. This main process could be broken into two main subtasks.

   (a) Withdrawal process: This subtask starts with the process of making withdrawal request and ends up with the process of cheque payment.

   (b) Deposit process: This subtask starts with the process of making deposit request and ends up with the process of passing cheque through bank for clearing.

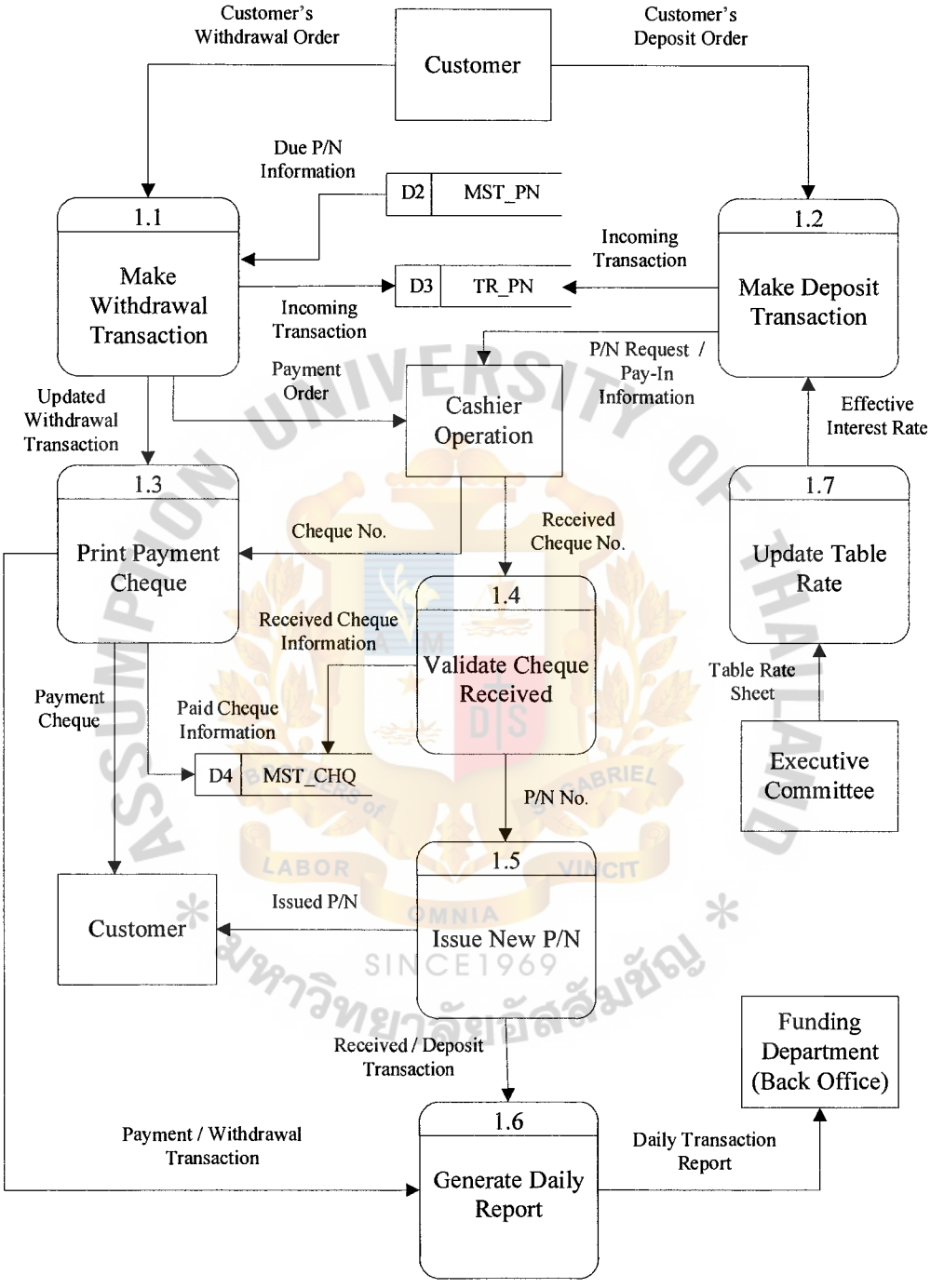


Figure 3.4. Level 1 Data Flow Diagram of Withdrawal and Deposit Process.

(2) Customer information maintaining process: This process covers the process of maintaining customer base, responding customer inquiry, calculating interest payment and verifying information / transaction. This process is created to support the marketing officer to provide the responses in whatever funding aspects to customers and management when needed. The related data flow diagram is shown in Figure 3.5. as below.

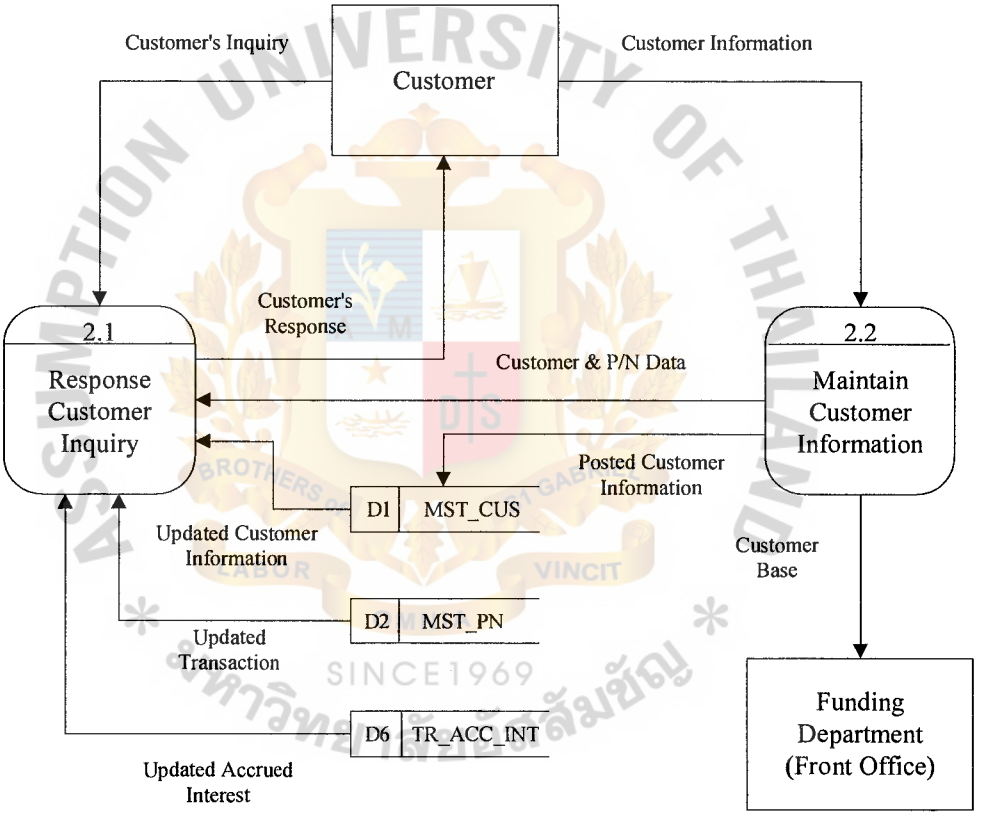


Figure 3.5. Level 2 Data Flow Diagram of Customer Information Maintaining Process.

(3) Data execution process: This process is designed for the purpose of generating the control report as well as preparing the financial reports. The related data flow diagram of Level 3 concerning this process is presented in Figure 3.6. below.

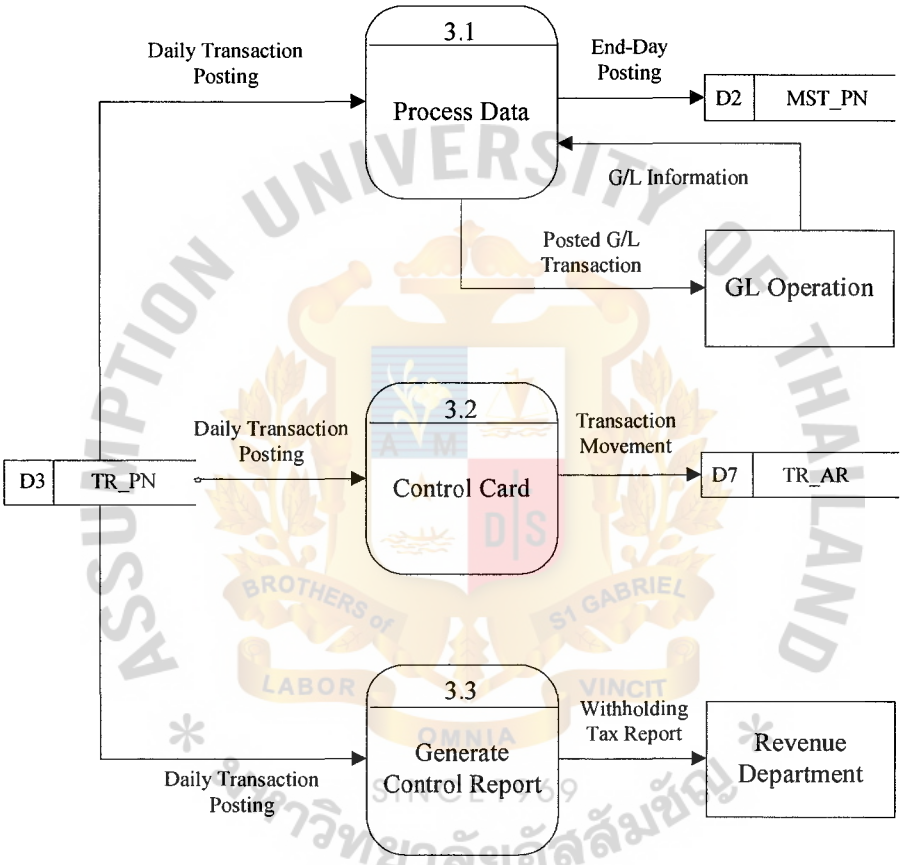


Figure 3.6. Level 3 Data Flow Diagram of Data Execution Process.

(4) Interest calculation and MIS report preparation process: This process includes the process of analyzing outstanding funding balance to support the interest expenses calculation and finally update into accounting system and prepare MIS reports. In Figure 3.7, this process illustrates the Level 4 of data flow diagram.

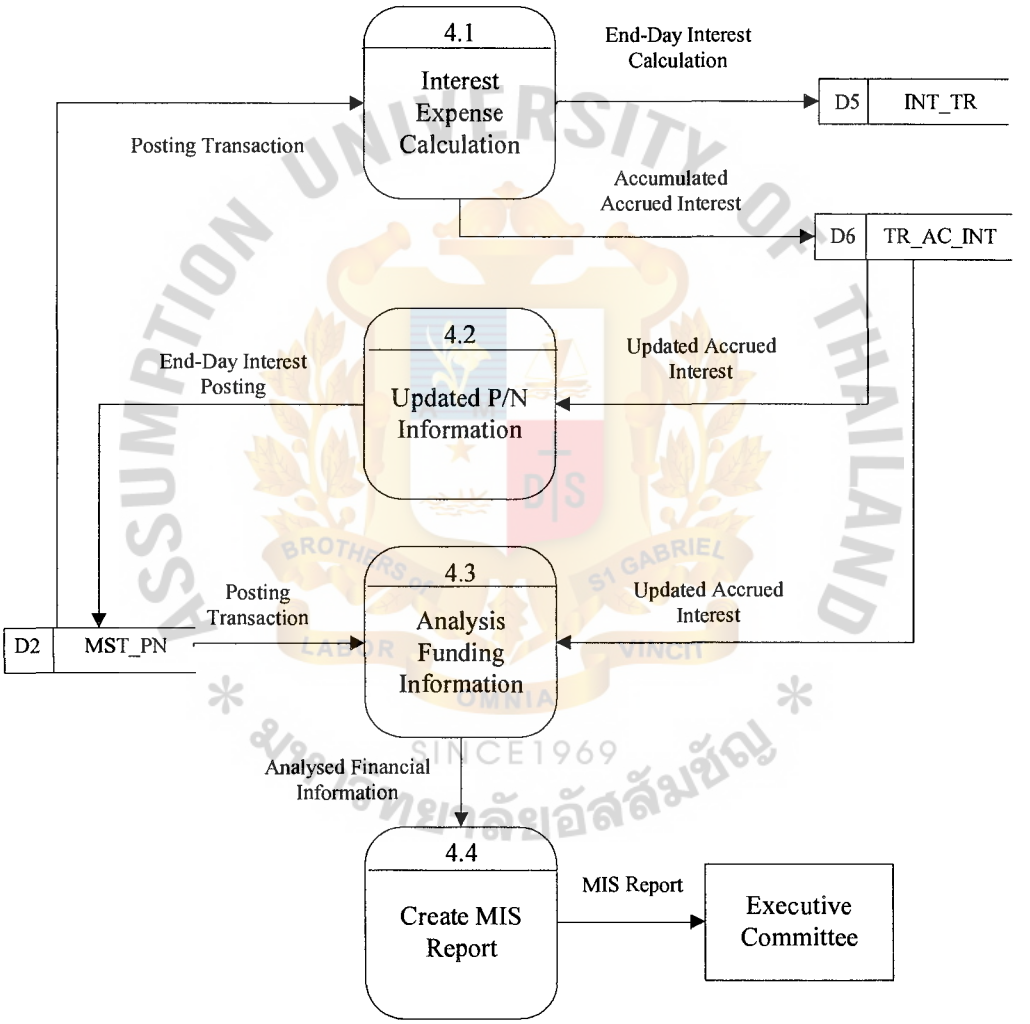


Figure 3.7. Level 4 Data Flow Diagram of Interest Calculation and MIS Report Preparation Process.

Structure Chart provides a detailed step of the internal process of Funding Information System. It shows an hierarchy of functions, where each function represents a process. The three functions of this system are making deposits, making withdrawal and making inquiry function. In support of these three functions, Structure Chart features data couples and flags to graphically illustrate which inputs are received by a process and which outputs are provided.

Figure 3.8. illustrates the Level 0 Structure Chart derived from the logically defined Funding Information System. By including several transactions within the area central transform. The structure of the central transform becomes more complex once decomposing each level of the system. The top-level defines the main processing function of a system.

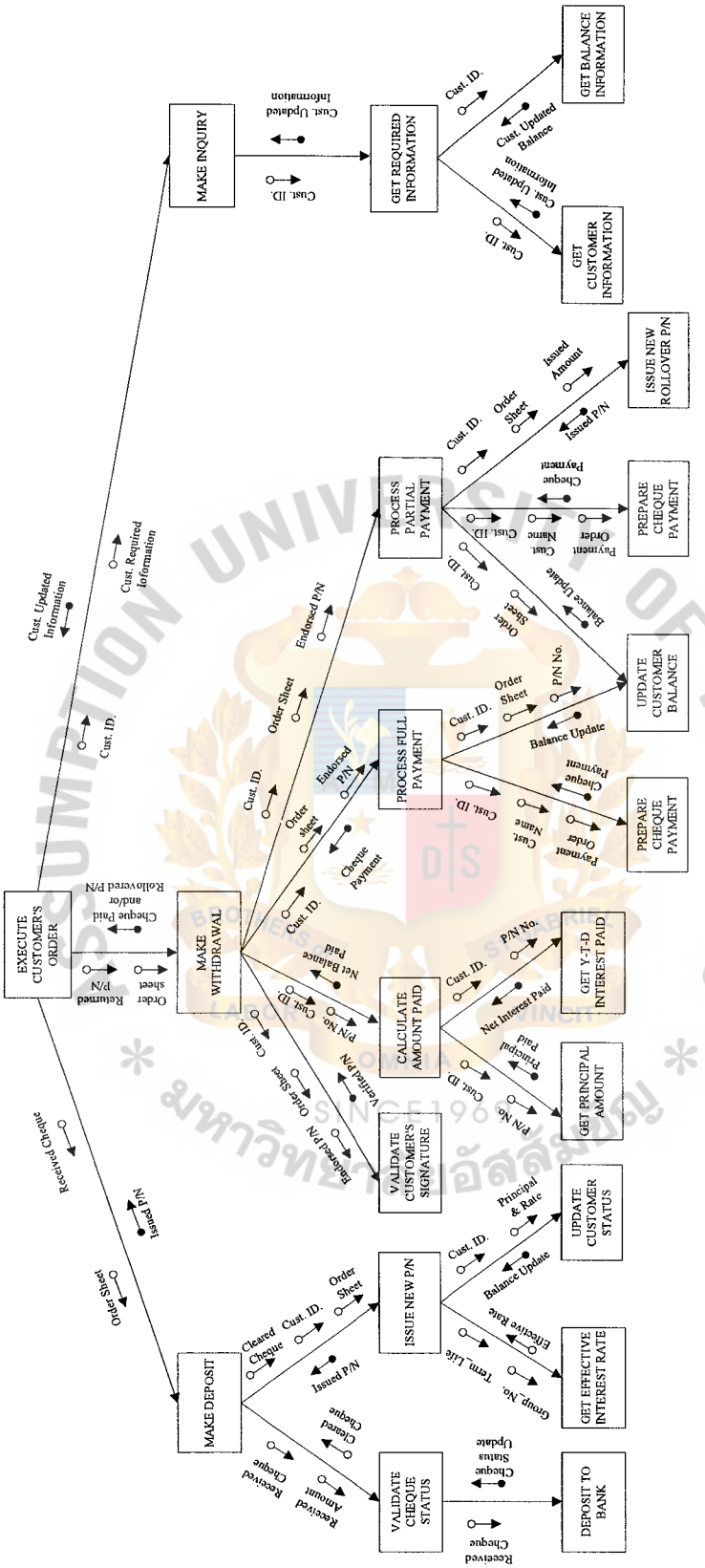
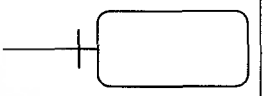
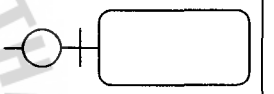
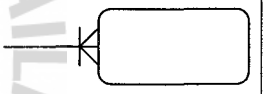
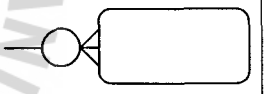
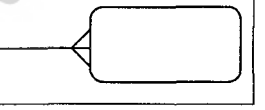


Figure 3.8. Level 0 Structure Chart of Funding Information System.

Figure 3.9. illustrates an Entity Relationship Diagram (ER Diagram) of Funding Information System. The meaning of the cardinality of a Relationship is provided in Table 3.1. ER Diagram is drawn to show the number of entity occurrence between entity sets. Besides entity occurrences, the attributes associated with each entity set are added to ER Diagram.

Table 3.1. Cardinality of a Relationship.

Cardinality Interpretation	Minimum Instances	Maximum Instances	Graphic Notation
Exactly one	1	1	
Zero or one	0	1	
One or more	1	many (>1)	
Zero, one or more	0	many (>1)	
More than one	>1	>1	

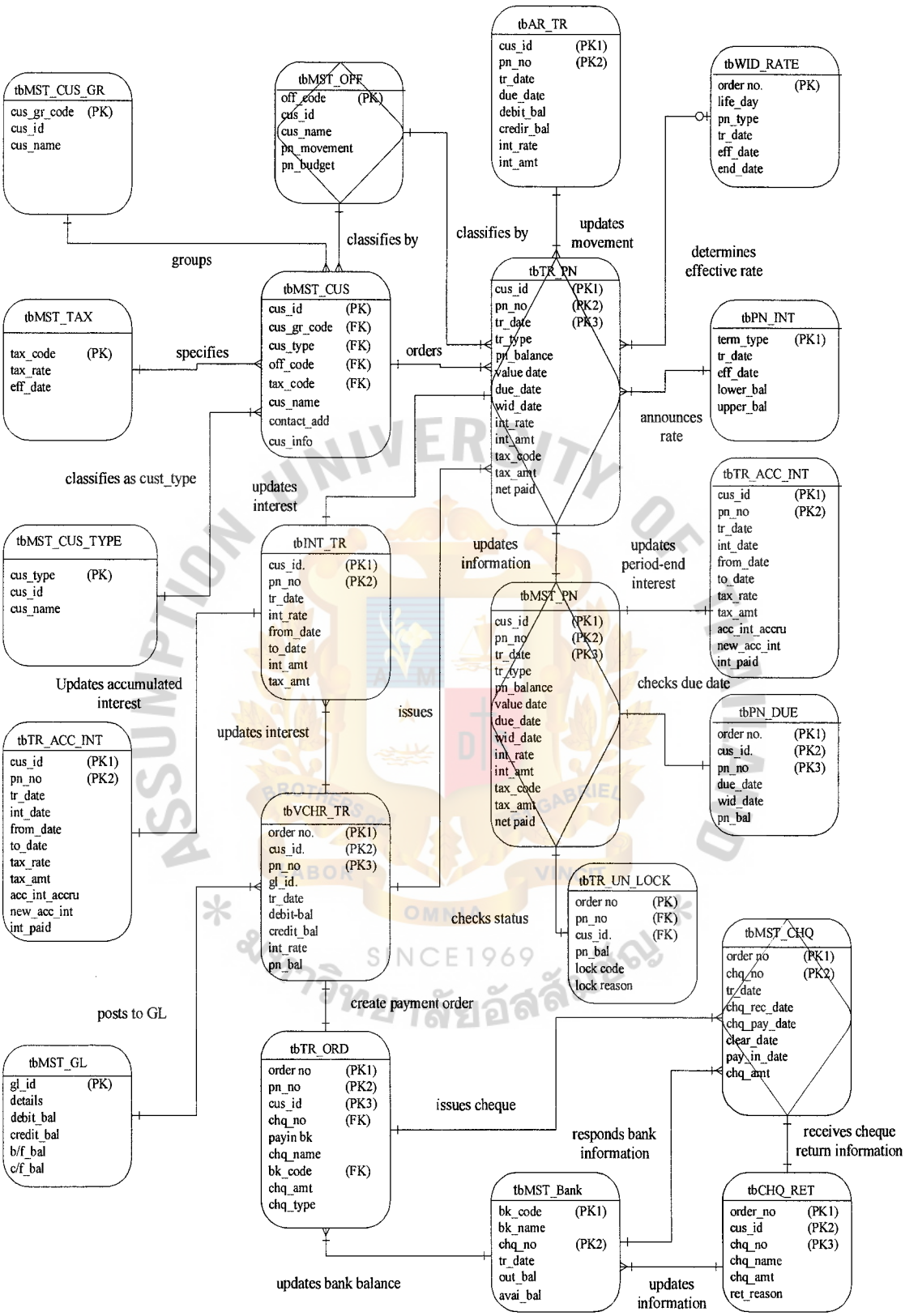


Figure 3.9. Entity Relationship of Database of Funding Information System.

3.3 Alternatives Evaluation

As for funding information system modification, three alternatives are proposed by system analyst, which are defined as follows:

(1) Entire outsource: Obtain servicing in developing system by a professional firm for entire system.

(2) Partial outsource: Obtain servicing in developing system by a professional firm specifically for the main processing, withdrawal & Deposit process and interest calculation process. Other than these, they would be additional developed by internal technical staff.

(3) In-house source: Develop / modify entire system by internal technical staff by establishing a project team to manage the accomplishment.

Once decision alternatives have been documented, the analysis team has designed major evaluation categories and selective criteria. There are four main criterions: technical feasibility, operational feasibility, economic feasibility and schedule feasibility. The following evaluation criterion are defined for each category.

(1) Technical criteria concerns the impact of each design alternatives, typically includes the Company's policy, standby personnel requirements, staff involvement / participation, capability to define additional requirements, Management controls and training.

(2) Operational criteria concerns how well the system is required once it becomes operational, mainly covers the performance of the system which consists of reliability, validity, accuracy, timeliness, capacity and throughput.

(3) Economic criteria concerns the cost of developing and operating new system. In addition, return on investment and payback are generally included.

(4) Schedule criteria concerns how long the requirements will be taken to design and implement.

The based score has been weighted according to its importance in management's viewpoint. Three of four criterions, technical criteria, operational criteria and economic criteria, are weighted fairly equally in importance at 30 percent for each. The components of technical criteria and operational criteria are also equal at 5 percent each since the management put the emphasis on the impact of development throughout the process starting from analysis process and ending at implementation process. The reason for scoring the technical criteria equally to the other two criterions is that the management have much more concern for the variable factors that may impact the operations since this is the first project changing to computerization. As for economic criteria, the return on investment is by far the most important under this criteria consideration. Meanwhile schedule criteria has been weighted at 10 percent due to the high awareness in the readiness period for implementation. Each evaluation criteria must be assessed subjectively, a summated scale is recommended to facilitate the assessment.

Very Poor	Poor	Fair	Good	Very Good
(1)	(2)	(3)	(4)	(5)

Table 3.2. Design Evaluation Solution.

Evaluation Criteria \ Design Alternatives	Weight	Alternative 1 Purchasing entire software	Alternative 2 Purchasing only main processes	Alternative 3 Developing with own efforts
Technical criteria	30			
Policy	(5)	Confidentiality of system flow as well as the operational process has to be delivered to outsider.	Partial system flow and operational process has to be publicized to outsider.	Confidentiality of system flow as well as the operational process is able to keep within the firm.
Standby staff	(5)	System facilitator will be standby for a certain period according to the visiting period.	No system facilitator standby. Only minor system, which develop internally, would have standby staff.	System facilitator is available for the entire period.
Staff involvement	(5)	Users involve only at the initial and end of process.	Users involve only at the initial and end of process except the internal development.	Users involve for entire process and are able to update the status of system development according to the regular meeting.
Possibility to modify additionally	(5)	Hardly request the additional modification. Only minor additional request is able to draw with the stated cost specifically during the developing process.	The minor additional modification for the main process could be requested during the analysis process.	Requests could be additional drawn at anytime even the system has been completed.
Management control	(5)	Difficult to control	Difficult to control during the phase of system developed by outsider.	Easy to control and always keep informing the status.
Training	(5)	One-time training arrangement.	One-time training arrangement for main processes.	Number of training course could be arranged based upon users' request.
Operational criteria	30			
Reliability	(5)	High	Moderate to High	Moderate
Validity	(5)	High	Moderate to High	Moderate
Accuracy	(5)	High	Moderate to High	Moderate
Timeliness	(5)	High	Moderate (require certain period of processing time)	Moderate (require certain period of processing time)
Capacity	(5)	High	Moderate to High	Moderate
Throughput	(5)	High	Moderate to High	Moderate to High

Table 3.2. Design Evaluation Solution (continued).

Evaluation Criteria \ Design Alternatives		Alternative 1 Purchasing entire software	Alternative 2 Purchasing only main processes	Alternative 3 Developing with own efforts
Economic criteria	Weight 30			
Developing	(4)	3.75 million Baht	2.18 million Baht	1.34 million Baht
Operation	(8)	150,000 Baht (1st year free facilitating cost)	232,500 Baht	107,540 Baht
Return on investment	(10)	3.34%	5.85%	6.60%
Payback period	(8)	Approximate 3 years	Approximate 2.25 years	Approximate 1.5 years
Schedule criteria	10	Ready to implement within 2 months	Ready to implement within 5 months	Ready to implement within 8 months

Table 3.3. Hardware and Software Platform.

Platform \ Design Alternatives	Alternative 1 Purchasing entire software	Alternative 2 Purchasing only main processes	Alternative 3 Developing with own efforts
Hardware platform:			
Server	Window 2000 Server	Window NT Server	Window NT Server
Workstation	Pentium, or higher PC Standard HDD 4GB or higher RAM 256 KB Network connection	Pentium, or higher PC Standard HDD 2GB or higher RAM 256 KB Network connection	486 Dx4-100, Pentium or higher PC Standard HDD 2GB or higher RAM 256 KB Network connection
Software platform:			
Operating System	Window NT 4.0 Server or Novell Netware 4.11 Microsoft Window 2000	Window NT 4.0 Microsoft Window 98	Window NT 4.0 Microsoft Window 98
Database	ORACLE, INFORMIX or others	ORACLE	ORACLE

Table 3.4. Design Evaluation Matrix.

Evaluation Criteria \ Design Alternatives		Alternative 1 Purchasing entire software		Alternative 2 Purchasing only main processes		Alternative 3 Developing with own efforts	
Technical criteria	Weight 30	Rating	Score	Rating	Score	Rating	Score
Policy	(5)	3	15	4	20	5	25
Standby staff requirement	(5)	4	20	3	15	5	25
Staff involvement	(5)	3	15	4	20	5	25
Possibility to modify additionally	(5)	4	20	4	20	5	25
Management control	(5)	3	15	4	20	5	25
Training	(5)	4	20	4	20	5	25
Operational criteria	30						
Reliability	(5)	5	25	4	20	3	15
Validity	(5)	5	25	4	20	3	15
Accuracy	(5)	5	25	4	20	4	20
Timeliness	(5)	5	25	3	15	3	15
Capacity	(5)	5	25	3	15	4	20
Throughput	(5)	5	25	4	20	4	20
Economic criteria	30						
Developing	(4)	3	12	4	16	5	20
Operation	(8)	4	32	3	24	4	32
Return on investment	(10)	3	30	4	40	5	50
Payback period	(8)	3	24	4	32	5	40
Schedule criteria	10	5	50	4	40	3	30
Total weighted score			81		75		85

3.4 Hardware and Software Requirement

Corresponding to the Management's resolution in utilizing computerized system, a certain number of workstations have been decided to purchase. To facilitate the maintenance process and be economic, the consideration to purchase personal computer

with huge lot has been taken. The responsibility to finalize the hardware and software requirements is assigned to system developer. The minimum computer configuration that is capable to completely respond to the proposed system and produce all system outputs has been initially defined by system developer. While system analyst has a duty to seek the optimum computer specification, which completely meets the predefined configuration. The hardware specification for the proposed funding information system is shown in the Tables 3.5.

Table 3.5. The Hardware Specification for Supporting Funding System.

Hardware	Specification
CPU	486 Dx4-100, Pentium, or higher
Cache	256 KB or higher
Memory	64 MB or higher
Hard Disk	2GB or higher
Floppy Drive	1.44 MB
Network Adapter	Ethernet 10-Base T
Display Adapter	SVGA card
Display Printer	14" monitor Dot Matrix, Ink Jet or Laser
UPS	Flipper 1000VA

As for the software development, the Executive Committee has granted the absolute resolution to modify / develop funding information system by the Company's own effort, referring to section 3.3. Other than the developed system, the software, which has capacity to interface with other terminal by employing intranet, is also required as mentioned in Table 3.6.

Table 3.6. The Software Specification for Supporting Funding System.

Software	Specification
Operating System	Microsoft Windows NT Server 4.0
Application Server	Microsoft Visual Studio
Database Server	ORACLE

Microsoft has provided a lot of software, which can transform a normal Intel-based PC server, Application Server and Database Server. The software is designed to integrate with Microsoft Windows NT Server.

The client machines should have specification higher than that, because it is sometimes used to run any other office automation software, such as word processing, for example. Therefore, in general standard, it should have hardware specification high enough to run Microsoft windows 2000 and Microsoft Office 2000. The hardware & software specifications for each client machine are shown in the Tables 3.7. and 3.8., respectively.

Table 3.7. The Hardware Specification for Each Client Machine.

Hardware	Specification
CPU	486 Dx4-100, Pentium, or higher
Cache	256 KB or higher
Memory	64 MB or higher
Hard Disk	2 GB or higher
Floppy Drive	1.44 MB
Network Adapter	Ethernet 10-Base T
Display Adapter	SVGA card
Display	14" SVGA monitor

Table 3.8. The Software Specification for Each Client Machine.

Software	Specification
Operating System	Microsoft Windows 2000 Professional Edition
Application Software	Microsoft Visual Studio

The Intranet system, however, does not use any network peripherals different than any other general Local Area Network (LAN).

3.5 Security and Control

The design of processing controls begins with the development of the logical design and is also required in the design of computer inputs, data temporary files & databases and computer programs. With the modification of the funding information system, the security and control, which have an involvement of EDP Audit Department

to review the adequacy to ascertain that each step in processing leads to correct results, have been listed by categories as follows:

(1) Source-Document Controls

(2) Input-Transmission Controls

(3) Output Controls

(4) Computer Program Controls

(5) Database Security

(6) Specific Lock Control Feature

Source-Document Controls

Source document control procedures exist for verifying all data that have been entered into processing and for recovering or checking in case the contents of data transmission are questioned. The existence of these controls is for the purpose of minimizing errors and omissions in entering data into processing, which are categorized below.

(a) **Source Document Design**: The design of source document for addressing the above objectives has to cover all following instances.

(1) Maintaining clear & consistent information

(2) Pre-numbering for controlling the completeness of data entering

(3) Presenting unique code or identifier for each type of transaction

(4) Showing cross-reference number for tracking between documents / transactions

(5) Identifying valid input codes, i.e. customer code, promissory note referring number

(b) **Source Document Control:** The segregation of duties between the custodian and the users of blank forms is required. Other than these, the following controls are presented.

(1) Well keeping blank forms in secure manner

(2) Authorizing the issuance of valuable blank forms required at least 2 appropriate officers

(3) Well clarifying work steps of data preparation and classifying the responsibility according to level of authority to be originating, authorizing and controlling

(4) Periodically physical checking the existence of valuable blank forms, i.e. blank promissory note and cheque, abd cross-checking with the control listing

(5) Defining the retention period of each source document as well as disposal procedure

(c) **Data Input Authorization Procedures:** The authorization process for appropriately entering data is maintained as follows:

(1) Establishing user level security: The user involvement in each area of designed applications including funding information system has to be pre-defined in order to set up the authority of relevant users to access to the system. As for the modified information system, the system configuration divided the level of user authority into three levels as follows:

(a) User Level Authorization: The authority would be distinguished as Inquiry, Insert, Delete, Correct. The authorizer level would has upper privilege comparing to operator level.

(b) Branch Level Authorization

(c) Menu Level Authorization

(2) Assigning & Presenting user ID code and terminal code for each entered transaction

(3) Developing authorizing procedures for both paper base and system base

Input-Transmission Controls

Input transmission controls are designed to verify that data inputted or read to processing from files are completely and correctly received by the system for early detecting and editing the errors. The following main controls exist:

(a) **File-balance controls**: To verify that data read from files are accurate and complete by employing the techniques prescribed below for each appropriate task.

(1) Turnaround transmittal documents i.e. the turnaround order sheet

(2) Batch control totals i.e. daily transactions recording

(3) Record counts i.e. new customer information entering

(4) Predetermined control total i.e. controlled dormant / inactive account balance

(b) **Data validating and edition controls**: To verify the appropriateness / reasonableness of data. The following techniques are implemented:

(1) Pop-up information i.e. responding the customer by computer once entering correct customer code.

(2) Presenting the name of recording field that is required to enter to minimize the errors / omission in entering. The incomplete data entering would not be authorized to post to processing.

(3) Displaying error message, which duplicates the inaccurate keyed information and separating these records to suspense file by ignoring the processing.

(4) Setting the efficient monitoring review of the records in suspense for correcting.

Output Controls

Similar to source-document and input-transmission controls, outputs controls are designed to verify that all data have been sent from processing and output materials cannot be obtained by authorized personnel. For security purposes, information must be classified as RESTRICTED, CONFIDENTIAL, INTERNAL or PUBLIC. The controls for distributing the information would be designed in accordance with the above criteria. The delivered information either in form of print-out report or display on screen is essential for the validating purpose, however, it has to be reached to the designated staff within the determined timeframe. The samples of reports generating for regularly verifying are as follows:

(a) Daily report, which is used for verifying the completeness and correctness of transaction proceedings of the day. These report types include the daily trial balance report. This report will show the summary of fund movement classified by G/L account, which has to be consistent with the daily deposit / withdrawal report and daily interest payment report as well.

(b) Daily exceptional / irregular report, i.e. the report presenting favorable interest rate offering, overdue promissory note report, etc. This report would facilitate the supervisor to monitor the regularity of transactions originated during the day and be able to provide prompt corrective actions once detecting any errors.

Other than the control of output review / verification, the following controls are also required.

(a) **Personal account code and password set up**: The setting up personal code is to identify the responsible user. Meanwhile, the password is assigned for security purpose. The user is given three attempts to enter a correct password. After three tests, the user password would be disabled. This methodology has also applied for controlling the correct entering key field such as customer code. The difference is the severity of excessive attempts. As for incorrect entering data apart from the password greater than three times, the user is returned to the main menu and allowed to log in again. With regard to password disability, the terminal is locked. To release lock, the request together with the reason has to be sent to system administrator to unlock terminal and reset the password to permit its use.

(b) **Access log to system creation**: The access log has to be created without the user's acknowledgement for monitoring the irregularities by system officer. The log contains the user's account code, the terminal code, the log in and log out time and the system access. In addition, the maintenance report presenting the attempts to access to system with invalid password greater than three times has also been required to regularly print out and validate the reasonableness as well.

Computer Program Control

Computer program controls set up for validating the accuracy of programmed procedures. Program controls mostly deal with verifying the accuracy of inputted data. In case of detecting errors or unusual conditions, the flags are designed to show up as part of program control such as invalid customer code, end of file, disagreed totals and

so forth. Another type of program control consists of messages that warn user of some impending danger.

Database Security

According to the system platform over the Oracle Database, the minimum required security controls have been completely embraced in respect of access controls, data corrupt / recovery and database backup / recovery.

Specific Lock Control Feature

The modified information system has initiated the features for locking the withdrawal for whatever purposes, i.e. pledge, freeze by regulators, decease of named customers, lost, etc. With this configuration, the designed system is able to lock or freeze the premature rollover in order to protect the release of such locked promissory notes with or without intention. The permission for releasing the lock is granted once having the authorization from authorized officer.

3.6 System Cost Analysis

(1) Costs of Existing System

Table 3.9. Existing System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Fixed Cost					
Standalone workstation 2 units @ 27,500	11,000.00	11,000.00	11,000.00	11,000.00	11,000.00
Electronic Typewriter 1 unit @ 22,500	4,500.00	4,500.00	4,500.00	4,500.00	4,500.00
Calculator 15 units @ 2,150	6,450.00	6,450.00	6,450.00	6,450.00	6,450.00
Laser printer 2 units @ 31,400	12,560.00	12,560.00	12,560.00	12,560.00	12,560.00
Total Fixed Cost	34,510.00	34,510.00	34,510.00	34,510.00	34,510.00
Operating Cost					
Salary Cost:					
Manager 1 person @ 40,000	40,000.00	46,000.00	52,900.00	60,835.00	69,960.25
Supervisor 2 persons @ 25,000	50,000.00	56,250.00	63,281.25	71,191.41	80,090.33
Staff:					
General officer 6 persons @ 15,000	90,000.00	99,000.00	108,900.00	119,790.00	131, 769.00
Cashier 2 persons @ 15,000	30,000.00	33,000.00	36,300.00	39,930.00	43,923.00
Inputter (IT staff) 2 persons @ 8,000	16,000.00	17,600.00	19,360.00	21,296.00	23,425.60
Checker (IT staff) 1 person @ 12,000	12,000.00	13,200.00	14,520.00	15,972.00	17,569.20
Clerk 2 persons @ 4,000	8,000.00	8,800.00	9,680.00	10,648.00	11,712.80
Dispatch officer 6 persons @ 7,000	42,000.00	46,200.00	50,820.00	55,902.00	61,492.20
Total monthly salary Cost	288,000.00	320,050.00	355,761.25	395,564.41	439,942.38
Total Annual Salary Cost	3,456,000.00	3,840,600.00	4,269,135.00	4,746,772.88	5,279,308.58
Office Supplies & Miscellaneous Cost:					
Stationary Per Annual	58,000.00	63,800.00	70,180.00	77,198.00	84,917.80
Paper Per Annual	150,000.00	165,000.00	181,500.00	199,650.00	219,615.00
Utility Per Annual	62,000.00	68,200.00	75,020.00	82,522.00	90,774.20
Miscellaneous Per Annual	4,500.00	4,950.00	5,445.00	5,989.50	6,588.45
Total Office Supplies & Miscellaneous Cost	274,500.00	301,950.00	332,145.00	365,359.50	401,895.45
Total Annual Operating Cost	3,730,500.00	4,142,550.00	4,601,280.00	5,112,132.38	5,681,204.03
Total Existing System Cost	3,765,010.00	4,177,060.00	4,635,790.00	5,146,642.38	5,715,714.03

Table 3.10. Five Years Accumulated Existing System Cost, Baht.

Year	Total Existing Cost	Accumulated Cost
1	3,765,010.00	3,765,010.00
2	4,177,060.00	7,942,070.00
3	4,635,790.00	12,577,860.00
4	5,146,642.38	17,724,502.38
5	5,715,714.03	23,440,216.41
Total	23,440,216.41	-

(2) Costs of Proposed System

Table 3.11. Proposed System Cost Analysis, Baht.

Cost items	Years				
	1	2	3	4	5
Fixed Cost					
Hardware Cost:					
UNIX Cost (sharing cost)	101,250.00	101,250.00	101,250.00	101,250.00	101,250.00
Computer Server Cost	24,150.00	24,150.00	24,150.00	24,150.00	24,150.00
Workstation Cost 11 units @ 27,500	60,500.00	60,500.00	60,500.00	60,500.00	60,500.00
UPS 1000VA	4,510.00	4,510.00	4,510.00	4,510.00	4,510.00
Scanner 1 unit @ 20,575	4,115.00	4,115.00	4,115.00	4,115.00	4,115.00
Laser printers 5 units @ 31,400	31,400.00	31,400.00	31,400.00	31,400.00	31,400.00
Total Hardware Cost	225,925.00	225,925.00	225,925.00	225,925.00	225,925.00
Maintenance Cost:					
Maintenance Cost	-	-	8,500.00	16,500.00	17,200.00
Total Maintenance Cost	-	-	8,500.00	16,500.00	17,200.00
Software Cost:					
Network Cost	6,578.00	6,578.00	6,578.00	6,578.00	6,578.00
Developing Cost:					
System Analyst 2 persons @ 35,000	70,000.00	-	-	-	-
Programmer 3 persons @ 30,000	90,000.00	-	-	-	-
Database Developer 1 person @ 25,000	25,000.00	-	-	-	-
Total Monthly Developing cost	185,000.00	-	-	-	-
Total Aggregated Developing Cost (80% of 8 months)	1,184,000.00	-	-	-	-
Total Software Cost	1,190,578.00	6,578.00	6,578.00	6,578.00	6,578.00

Table 3.11. Proposed System Cost Analysis, Baht (Continued).

Cost items	Years				
	1	2	3	4	5
Implementation Cost:					
Basic Training Cost	11,500.00	-	-	-	-
Set up Cost	24,500.00	-	-	-	-
Total Implementation Cost	36,000.00	-	-	-	-
Facilitating Cost:					
Facilitating Cost	84,000.00	16,800.00	4,200.00	1,680.00	840.00
Total Facilitating Cost	84,000.00	16,800.00	4,200.00	1,680.00	840.00
Office Equipment Cost:					
Calculator 5 Units @2,150	2,150.00	2,150.00	2,150.00	2,150.00	2,150.00
Total Office Equipment Cost	2,150.00	2,150.00	2,150.00	2,150.00	2,150.00
Total Fixed Cost	1,538,653.00	251,453.00	247,353.00	252,833.00	252,693.00
Operating Cost					
People-Ware Cost:					
Manager 1 person @40,000	40,000.00	46,000.00	52,900.00	60,835.00	69,960.25
Supervisor 2 persons @25,000	50,000.00	57,500.00	64,687.50	72,773.44	81,870.12
Staff:					
General Officer 2 persons @ 15,000	30,000.00	33,300.00	36,300.00	39,930.00	43,923.00
Cashier 2 persons @ 15,000	30,000.00	33,300.00	36,300.00	39,930.00	43,923.00
Inputter 2 persons @ 10,000	20,000.00	22,000.00	24,200.00	26,620.00	29,282.00
Checker 1 person @ 15,000	15,000.00	16,500.00	18,150.00	19,965.00	21,961.50
Messenger (out contract) 12,000 / month	12000.00	13,200.00	14,520.00	15,972.00	17,569.20
Clerk 1 person @ 4,000	4,000.00	4,400.00	4,840.00	5,324.00	5,856.40
Total Monthly Salary Cost	201,000.00	225,600.00	251,897.50	281,349.44	314,345.47
Total Annual Salary Cost	2,412,000.00	2,707,200.00	3,022,770.00	3,376,193.25	3,772,145.61
Office Supplies & Miscellaneous Cost:					
Stationary Per Annual	38,000.000	41,800.00	45,980.00	50,578.00	55,635.80
Paper Per Annual	60,000.00	66,000.00	72,600.00	79,860.00	87,846.00
Utility Per Annual	52,700.00	57,970.00	63,767.00	70,143.70	77,158.07
Miscellaneous Per Annual	4,500.00	4,950.00	5,445.00	5,989.50	6,588.45
Total Annual Office Supplies & Miscellaneous Cost	155,200.00	170,720.00	187,792.00	206,571.20	227,228.32
Total Operating Cost	2,567,200.00	2,877,920.00	3,210,562.00	3,582,764.45	3,999,373.93
Total Proposed System Cost	4,105,853.00	3,129,373.00	3,457,915.00	3,835,597.45	4,252,066.93

Table 3.12. Five Years Accumulated Proposed Cost, Baht.

Year	Total Proposed Cost	Accumulated Cost
1	4,150,853.00	4,105,853.00
2	3,129,373.00	7,235,226.00
3	3,457,915.00	10,693,141.00
4	3,835,597.45	14,528,738.45
5	4,252,066.93	18,780,805.38
Total	18,780,805.38	-

(3) The Comparison of the System Costs between Proposed System and Existing System

Table 3.13. The Comparison of the System Costs, Baht.

Year	Accumulated Existing Cost	Accumulated Proposed Cost
1	3,765,010.00	4,105,853.00
2	7,942,070.00	7,235,226.00
3	12,577,860.00	10,693,141.00
4	17,724,502.38	14,528,738.45
5	23,440,216.41	18,780,805.38

The analysis of developing cost comparing between the existing and proposed system is presented in Figure 3.10.

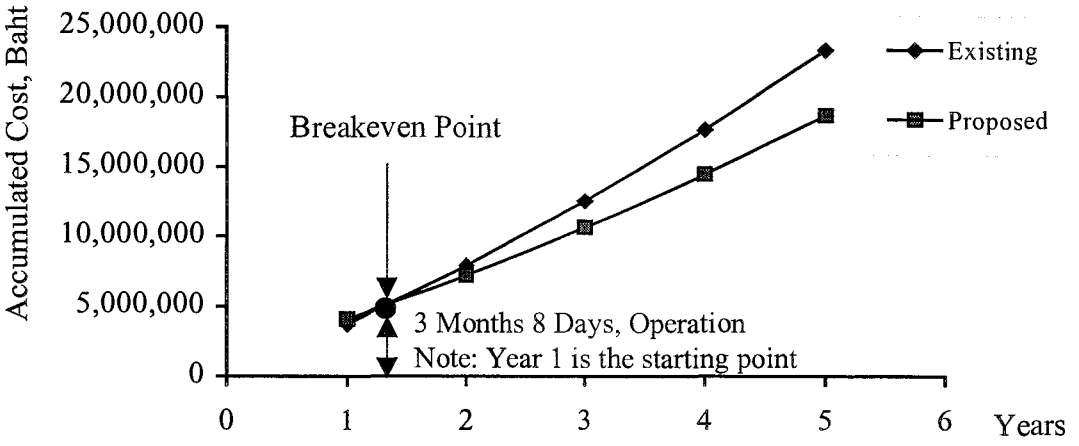


Figure 3.10. Cost Comparison between Existing System and Proposed System.

As per the result presented in Table 3.4, alternative 3 has been rated with weighted average score and had been selected as the best design. To support this decision, the costs and benefits have also been studied as the Management's main concentration. The costs concerned are associated with developing cost and operating cost. Meanwhile, the benefits involve the cost savings, cost avoidance, improved service level and improved information. Considering Figure 3.11 concerning the period that the cost of development has been fully recovered, which is approximately in 2 years.

Table 3.14. Project Cost and Benefit Spreadsheet, Baht.

Cash flow Description	Year Effective					
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cost						
Developing cost	2,351,665	0	0	0	0	0
Operation & maintenance cost	0	2,567,200	2,877,920	3,210,562	3,582,764	3,999,374
Discount factor for 9%	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Time-adjusted costs (adjusted to present value)	2,351,665	2,355,229	2,422,288	2,479,143	2,538,120	2,599,319
Cumulative time-adjusted costs over lifetime	2,351,665	4,706,894	7,129,182	9,608,325	12,146,445	14,745,764
Benefits derived from operation of new system						
Cost savings & avoidance	0	3,730,500	4,142,550	4,601,280	5,112,132	5,681,204
Improved service line	0	144,000	160,000	178,000	198,000	220,000
improved information	0	80,000	88,000	96,800	106,480	117,128
Discount factor for 9%	1.0000	0.9174	0.8417	0.7722	0.7084	0.6499
Time-adjusted benefits (current of present value)	0	3,627,982	3,695,438	3,765,228	3,837,265	3,911,503
Cumulative time-adjusted benefits over lifetime	0	3,627,982	7,323,420	11,088,648	14,925,913	18,837,416
Cumulative lifetime time-adjusted benefits – costs	-2,351,665	-1,078,913	194,238	1,480,323	2,779,467	4,091,652

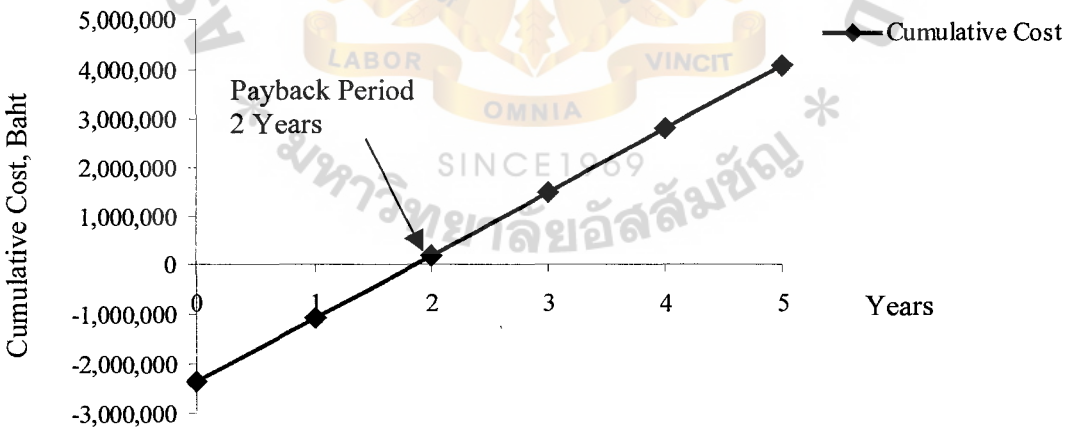


Figure 3.11. Payback Analysis.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

System Implementation is the planned and orderly conversion from a current existing system to the new proposed information system. The final design should be evaluated first with the involvement of related users to make sure that the new proposed system can meet the desired goals and objectives, and then the other remaining processes will be performed. The typical processes of the System Implementation are:

(1) Software development and installation into tested areas

(2) Hardware acquisition and installation

(3) System Testing

(4) Personnel training

(5) Acceptance Testing

(6) Conversion

(7) Documentation

Moreover, it also involves fine tuning system elements, in order to maximize the system efficiency and productivity.

(1) Software Installation

The developed system would be installed according to the completion of conversion process. Meanwhile, the other licensed office automation software has added-in the Microsoft Windows, which are acquired on together with the receipt of purchased hardware.

(2) Hardware Installation

According to the Cost / Benefit Analysis section in the Chapter 3, in order to establish the developed funding information system, only 64 MB

RAM and 2 GB hard disk are installed on the designed file server. The other client machines do not require any additional hardware installation.

(3) System Testing

System Testing carried on by assigned staff of System Planning Department, is initially arranged to minimize user resistance to new system from looping re-testing process. To fully understand the system and program specifications, the test team would trace to determine how instructions are executed. All specified instructions in the system have to be tested by a series of tests. There are three types of coverage, which must be achieved during system testing process. These types are sequential coverage, decision coverage and loop coverage. The details of testing execution would be beyond this project. During system testing process, documentation regarding the test results whether fail or succeed have been noted to provide the trail for system developer. Meanwhile, all changes made to the design have also been clearly documented for the purpose of further modification (if any) and maintenance. The substances of any changes are to make the system smoothly, correctly and completely run in accordance with the user requirements. The changes, which impacted to the pre-determined requirements, would obtain the authorization from all members of project team.

(4) Personnel Training

Converting to the new system necessitates that system users be trained and provided with adequate operational documentation, user manual that guides them through efficient using of the new system. The primary purpose of personnel training is to provide users the familiarity to hand-on

experience with the new developed system. During the phase of system analysis, system users have got an involvement in designing the functional process; and therefore, the fundamental understanding in relating to the workflow as well as the system flow has been required for sustaining the capability to identify the completeness of system fulfillment. The established training course would be arranged for the system users together with the developing team to go through the designed system step by step, primarily for understanding in order to be able to carry on the acceptance testing in the next phase. Partial system flow is interactive system such as the inquiry part, users are required to well understand the interaction between the users and system to avoid unnecessary interruption. The system analysts have been asked to standby to facilitate the users through the learning period until they become comfortable with the new system.

(5) Acceptance Testing

After thoroughly testing the new modified funding system, which has been initially tested by the developer and well understanding the system flow, a final system test in form of acceptance testing is needed to conduct. This task has system analysts, system users and computer auditors. The system analysts facilitate the completion of this task. The system analysts would communicate testing problems and issues with the project team members with the complete set of related documentation. Meanwhile, the system users hold the ultimate authority on whether or not a system is operating correctly, while designated computer auditors have been responsible for the adequacy of security and controls placed to this developed system.

The system test is done using the tested data that was developed earlier by the system analysts by covering all possible simulating cases. In addition, predefined software performance measures, i.e. processing speed, response time, error (rerun) rate, completeness of system and completeness of presented documentation, must be satisfied. Like system testing, the acceptance testing has continued the iteration until a successful test, which completely fulfilled users' requirements as well as adequately sustained controls, was experienced. The test carried on within this phase concentrates on system inputs and outputs like audit around the computer. This extensive test has to address three levels of acceptance testing: verification testing, validating testing and audit testing. As for the interactive part of system, system users are required to try out software directly and observe how the system responds in order to evaluate the result of entering data whether correct or not. Along with this testing, several reports, such as daily deposit & withdrawal transactions as well as related summary reports, are requested and compared with the processing result of the old system to verify the accuracy and completeness of system as well as the adequacy of controls placement.

(6) Conversion

Once the system test has got an acceptance test from all project team members, the process of system conversion has started. The system analysts have been responsible to develop a detailed conversion plan according to the design specifications of the new system. The instance of detailed plan covered the following headlines.

(a) Create the new database

One of the main factors in preparing the readiness to install the new system is to make database operational before the new system is installed. Due to the number of stored records is extensive, considerable time in preparation of the readiness of database is required. The first step of this task is to create the database relations – the relations needed to store customer base, promissory notes details / transactions, managerial and financial information. After this phase, the other summary reports as well as daily operational and governmental reports could be created during each related process.

During the phase of database creation and installation, there are several steps required to take consideration in advance, which are as follows:

(1) Design utility program to create relations of customer base, promissory notes base, managerial and financial information. Print a listing of contents of the old and the new files for comparing purpose to identify the difference and make the compatibility.

(2) Make modification to new files to make compatible to the old one.

As the minimum information requirements are essential to maintain in accordance with the regulators; and therefore, the new database has been created corresponding to the old one. The main difference between the new and old system is that the new database provided more buffer for storing useful information such as document

completion status, lock status together with related reason and etc. for controlling purpose.

(b) Operate the old system and new system in parallel

Parallel run of both the old and new systems are concurrently operated for at a least two-month period after acceptance test has been satisfied. The process of new system in this phase is based upon the actual information. Because the old system is largely manual and not demand on more computing resources, the decision to take parallel conversion is possible. This ensures that all major problems in the new system have been solved before the old system is discarded. Although the transition cost over parallel conversion is greater, the Steering Committee has unanimously granted the resolution to take this cost in order to minimize the risk of major flaws in the new system causing irreparable harm to the business. The steps, which required to take on this phase are as follows:

(1) Process customer base updating, deposit & withdrawal and analysis information using the old and the new system.

(2) Conduct the checking process to determine whether processes of customer base updating, deposit & withdrawal and analysis information are properly proceeded.

(3) Discard the old system after satisfying the result of the above checking.

(4) Classify dormant accounts from promissory notes master file.

(5) Conduct the checking process to verify whether the classification is successful.

(6) Print monthly deposit & withdrawal transactions report including monthly MIS reports and governmental reports as well and reset monthly totals to zero after carrying forward balance to plus in accumulated balances.

(7) Conduct the validating process to ensure the correctness of above processes.

(c) Conduct conversion

After satisfying the results of parallel run, the stored data would be placed to the genuine database. Meanwhile, the new system would be moved from tested area to real production area.

(d) Release the new funding information system

The new funding information system is announced that it is ready to put LIVE on together with abrupt cut over the old system.

(7) Documentation

All documentation relating to this project plan and its accomplishment as well as user manual / operating guideline would be well kept for further reference.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The proposed system is the first step towards computerization. The system development of Funding Department is served as pilot project to prepare the readiness for all operational staff relating to computerized familiarity. The enhancement of work efficiency would be a key aspect to encourage all operational staff to welcome computerized practice and the further expansion to other information systems.

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

Table 5.1. The Degree of Achievement of the Proposed System.

Process	Existing System	Proposed System
Deposit & Withdrawal Process	20 Minutes	10 Minutes
Inquiry Process	30 Minutes	5 Minutes
Payment Process	15 Minutes	2 Minutes
MIS Report Generation Process	1 Hour	5 Minutes
Total	2 Hours 5 Minutes	27 Minutes

(1) Deposit & Withdrawal Process: Time consumed for Deposit & Withdrawal Process dramatically decreases mainly from the reduction of the manual

current system spent time greatly from the reiterated checking process between operators of responsible unit and staff of IT Department.

(2) Inquiry Process: The less time consumption of Inquiry Process is from the disappearance of manual process by allowing system to generate the responses instead of manually performed as required for the existing system.

(3) Payment Process: Similarly to Deposit & Withdrawal process, the process is quicker from the shorter of retrieving and validating process. In addition, the shorter process of cheque preparation is also explicit from allowing the system to generate the cheque payment for transactions, which reduces time for manually validate and doubly checking the accuracy.

(4) MIS Report Generation Process: As Inquiry Process, processing time significantly diminish from permitting system auto-generating the required MIS report to replace the manual work performed.

Based upon the process of preparing this project, the writer has obtained an opportunity to propose the knowledge gained during study in the CIS program. The contribution made to this project is the involvement in assisting to adjust the main workflow process, define necessary security and controls and finally draw logical design. The beneficial factor learnt from this project apart from the knowledge employment is the experience gained and notified advantage of permitting all related users get an involvement in developing system. Other than reducing resistance, time and cost consumed for iteration process has also dramatically diminished due to the requirements been pre-defined and always been monitored for their accomplishment.

5.2 Recommendations

The success of first implementation towards the computerization of funding information system in relevant to the efficiency enhancement of operational workflow process and the availability of online information to support many cross functional businesses could gain the users' acceptance.

Other than the aforementioned factor, another key aspect, which could have an involvement in making the implementation successfully, is the permission given to operational staff to participate in developing process. It could assist in reducing the users' resistant and welcome to adjust their behavior and finally accept the changes toward to computerization. The reason is that the users feel that they are the one of the system owners and would like to have an involvement in making the success of this project implementation.

The next phase of the project, which recommended to further study, is the studying of employing E-commerce strategy by allowing customers to make their deposit and / or withdrawal orders as well as information inquiries via network. With this process, the studying in the methodology for authenticating the customers as well as securing the confidentiality of Company's information are the main aspects.

According to the success in developing the funding system, the expanded scope to develop the information system of other departments, could be easily taken place from the change acceptation gaining from operational staff. The result of this project could be used as based information for studying and developing other system development by sustaining some key information such as security controls as minimum control requirement, which be adjusted as appropriate corresponding with the current practices of their procedures. This could affect directly to the reduction of developing time for the development project of other information systems.

APPENDIX A

MENU DESIGN

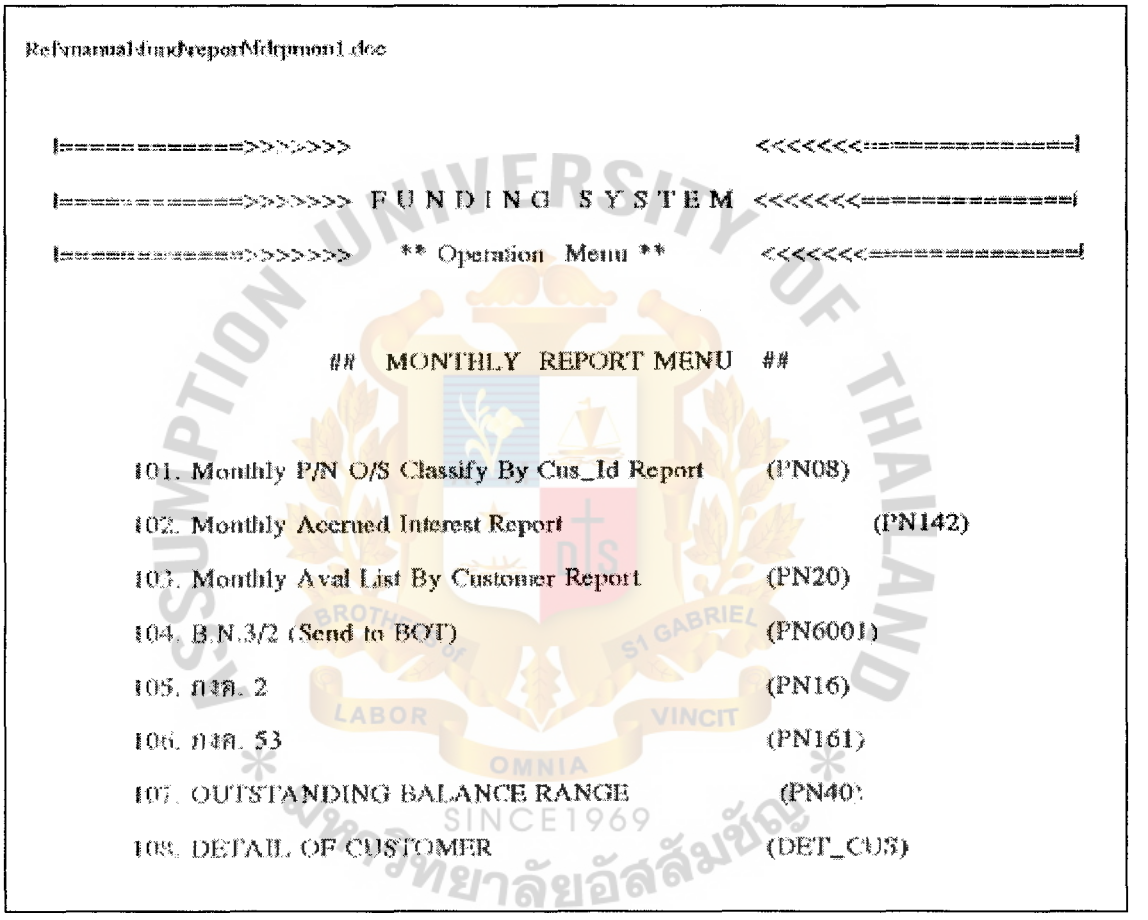


Figure A.1. Operator Menu: Monthly Report Menu.

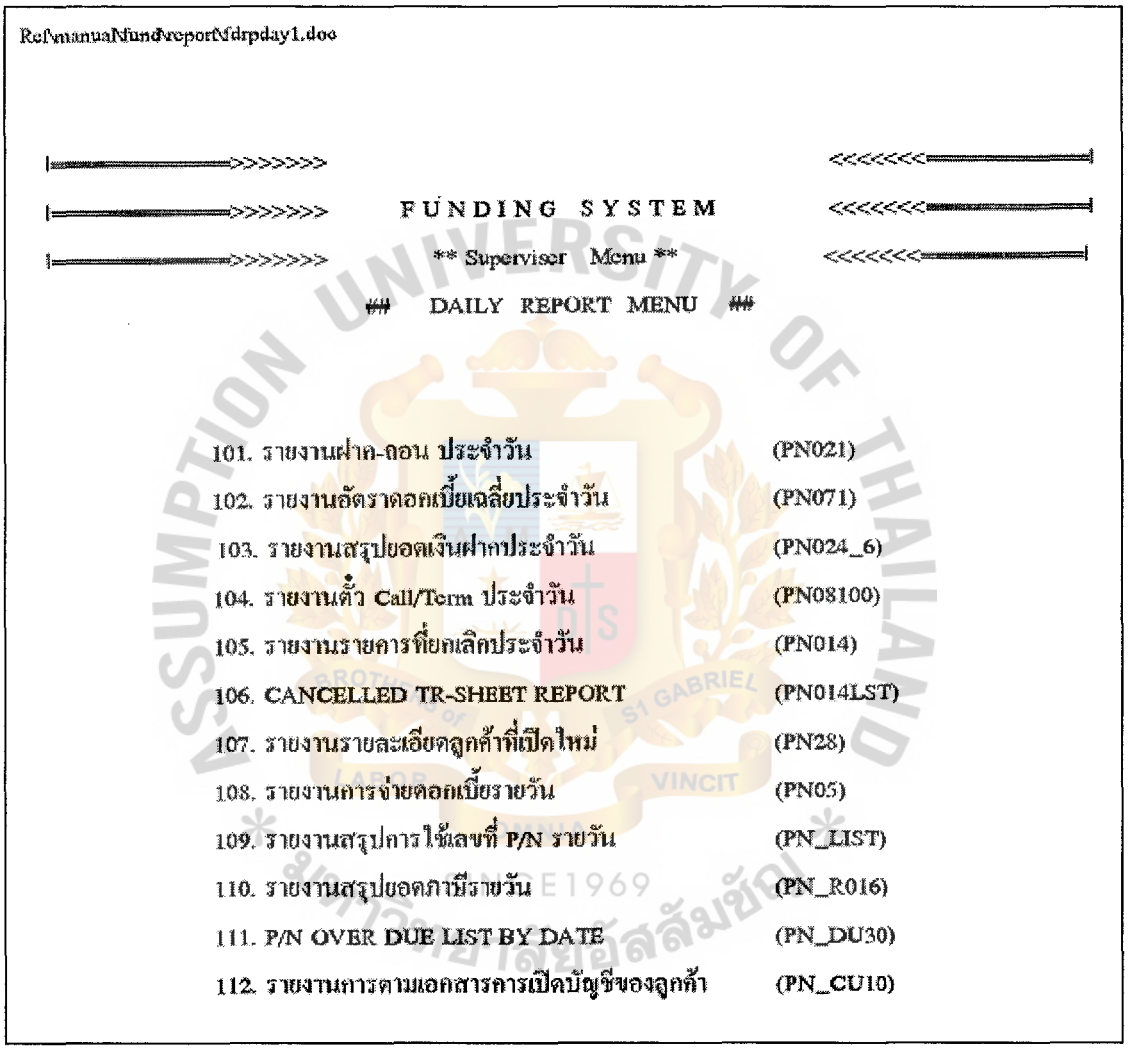


Figure A.2. Supervisor Menu: Daily Report Menu.

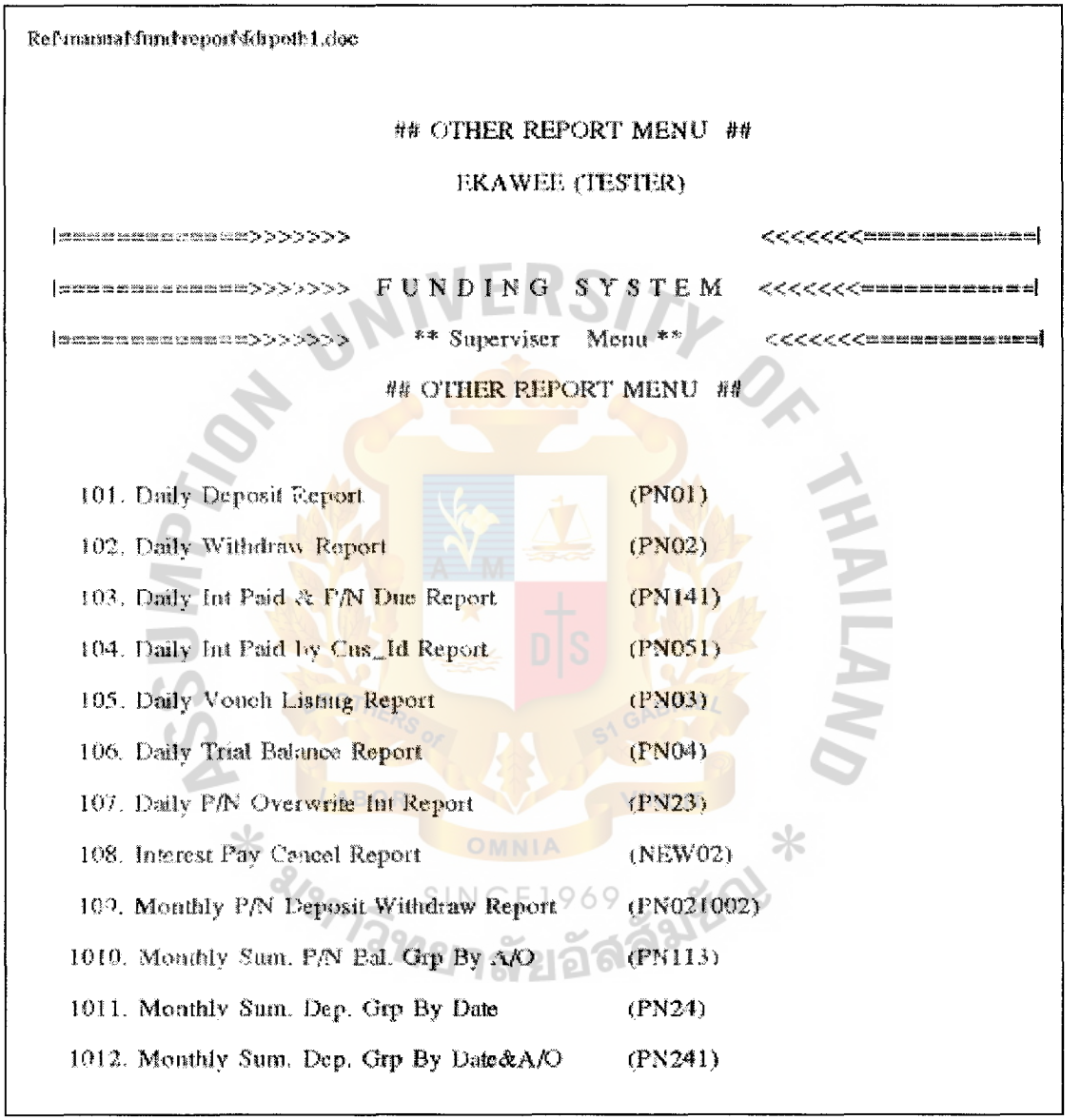


Figure A.3. Supervisor Menu: Monthly Report Menu.

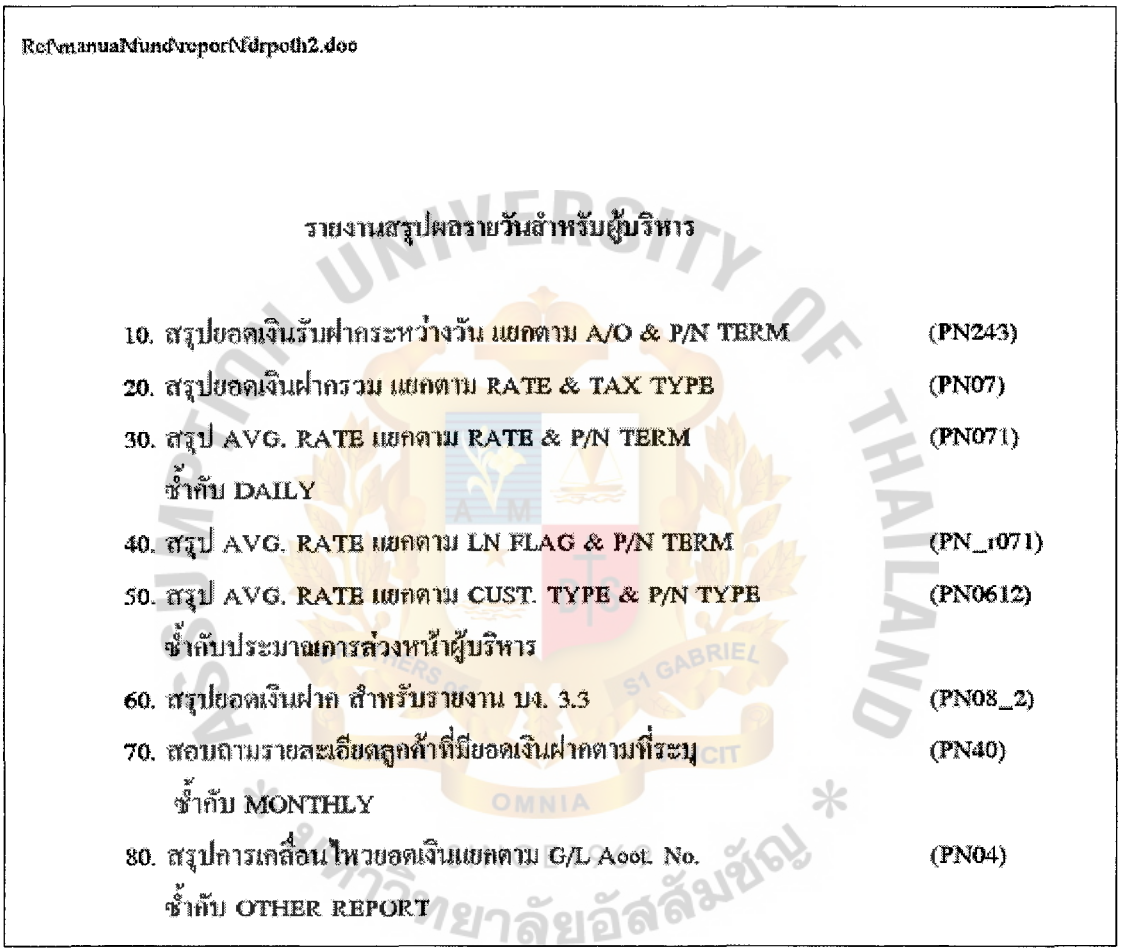


Figure A.4. Supervisor Menu: Other Report Menu.

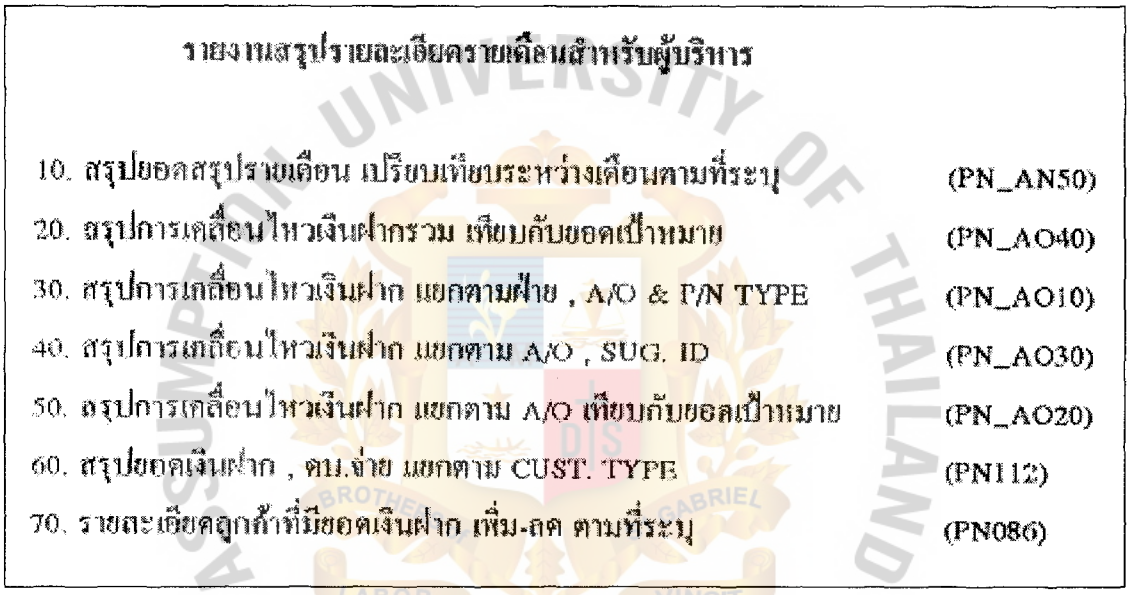


Figure A.5. Management Menu: Daily Managerial Report Menu.

Figure A.6. Management Menu: Monthly Forecasted Report Menu.

APPENDIX B

REPORT DESIGN

101. Daily Deposit Report (PN01)

pn01

Print on <T>ransaction o: _

<B>Effective Date

Transaction Date : 19/12/1995

AV (output/AV_4.lst)
19 Dec 1995 14:05:54

FUNDING FINANCE CO.,LTD.
รายงานฝากตั๋วสัญญาใช้เงินรายใบ
DATE : 19/12/1995

Report id : pn01
Page : 1

LN =: 1-4 ตั๋วเงินผู้ , 5-8 สรุป , [S,A-C] เงินผู้ถอนเงิน

ORDER NO	ACC.NO	CUSTOMER	PIN NO.	TERM	PERIOD-INT	AMOUNT	DUE DATE	RATE	NEW DEPOSIT	RENEW	NET AMOUNT	AVAL	LN	STAT	REMARK	USER
FOR VALUE DATE 19/12/1995																
PN9512190001	000088	สุรัตน์	0013067	03	01/31	600,000.00	19/03/1997	12.2500	600,000.00		600,000.00	6	A		ฝากใหม่เป็นเช็ค	EKAWEE
(TESTER)																
			0013068	CALL	01/31	500,000.00	01/01/2000	6.2500	500,000.00		500,000.00	6	A		ฝากใหม่เป็นเช็ค	EKAWEE
(TESTER)																
			0013069	99	00/00	1,000,000.00	19/03/1997	12.2500	1,000,000.00		1,000,000.00	5	A		ฝากใหม่เป็นเช็ค	EKAWEE
(TESTER)																
PN9512190003	000088	สุรัตน์	0013071	CALL	00/00	200,000.00	01/01/2000	6.2500	200,000.00		200,000.00	7	A		ฝากใหม่เป็นเช็ค	EKAWEE
(TESTER)																
PN9512190004	000105	ชวิพัฒ รัตนะ	0013074	CALL	01/31	100,000.00	01/01/2000	6.5000	100,000.00		100,000.00	6	A		ฝากใหม่เป็นเช็ค	EKAWEE
(TESTER)																
Total	4					2,400,000.00			2,400,000.00		2,400,000.00					
Grand Total	5					2,400,000.00			2,400,000.00		2,400,000.00					

Figure B.1. Daily Deposit Report.

102. Daily Withdraw Report (PN02)

pn02

Print On <T>ransaction or _

<E>ffective Date

TRANSACTION DATE : 19/12/1996

AV (output/AV_40.txt) บริษัทXXXXXXXXXXXXXXXXXX จำกัด Report id : pn02

25 Jan 1997 11:13:47 รายงานถอนตั๋วสัญญาใช้เงินรายวัน Page : 1

WITHDRAWAL DATE 25/01/1997

LN => 1-4 ตั๋วเงินกู้ , 5-8 ลงทุน , [9,A-C] เงินกู้สถาบัน

ORDER NO	ACC.NO	CUSTOMER	PAY NO.	DEPOSIT DATE	DUE DATE	PERIOD INT	AMOUNT	INT RATE	OVER RATE	INT AMOUNT	TAX AMOUNT	NET AMOUNT	RENEW	LN	STATUS	USER
FOR WITHDRAWAL DATE 25/01/1997																
FN9997012500	000009	คุณนันทนา รอดดี	0000012	09/01/1997	01/01/2000	00.00	1,000,000.00	6.2500		2,739.73	410.96	1,002,328.77		5	A	EKAWEE (TESTER)
TOTAL	1						1,000,000.00			2,739.73	410.96	1,002,328.77				
GRAND TOTAL	1						1,000,000.00			2,739.73	410.96	1,002,328.77				

Figure B.2. Daily Withdrawal Report.

103. รายงานสรุปยอดเงินฝากประจำวัน (PN024)

pn024

On Date : 19/12/1996

AV (output\AV_11.txt)
19 Dec 1996 11:34:11

บริษัท XXXXXXXXXXXXXXXXXX จำกัด
รายงานสรุปยอดเงินฝาก ประจำวัน
******* DAILY OF TO-DATE OUTSTANDING P/N BALANCE *******
AS OF 19/12/1996

Report Id : pn024
Page : 1

		OPENING BALANCE		DAILY DEPOSIT		DAILY WITHDRAWAL		DIFF BALANCE		ENDING BALANCE	
		COUNT	AMOUNT(BAHT)	COUNT	AMOUNT(BAHT)	COUNT	AMOUNT(BAHT)	COUNT	AMOUNT(BAHT)	COUNT	AMOUNT(BAHT)
FUNDS BORROWED-ON DEMAND	PERSONAL			2	700,000.00				700,000.00	2	700,000.00
FUNDS BORROWED-ONE YEAR OR LESS	PERSONAL			2	1,600,000.00				1,600,000.00	2	1,600,000.00
FUNDS BORROWED-ON DEMAND	CORPORATE										
FUNDS BORROWED-ONE YEAR OR LESS	CORPORATE										
Total		4	2,300,000.00		2,300,000.00			4	2,300,000.00		
FUNDS BORROWED-ON DEMAND	FINANCE										
FUNDS BORROWED-ONE YEAR OR LESS	FINANCE										
FUNDS BORROWED-ON DEMAND	BANK										
FUNDS BORROWED-ONE YEAR OR LESS	BANK										
Total											
**** CALL TOTAL ****				2	700,000.00				700,000.00	2	700,000.00
**** TERM TOTAL ****				2	1,600,000.00				1,600,000.00	2	1,600,000.00
**** GRAND TOTAL OF FUNDS BORROWS ****				4	2,300,000.00				2,300,000.00	4	2,300,000.00

Figure B.3. Daily Report of To-date Outstanding P/N Balance.

107. รายงานรายละเอียดลูกค้าที่เปิดใหม่ (PN28)

pn28

FROM CUS ID :000009 TO CUS ID : 001959

FROM ISSUE DATE < 19/12/1991 >

TO ISSUE DATE < 19/12/1996 >

AV (output/AV_16.txt) บริษัท XXXXXXXXXXXXXXXXXX จำกัด Report id : pn28

19 Dec 1996 11:34:53 รายงานการเปิดบัญชีลูกค้า Page : 1

CUS ID	CUSTOMER NAME / ADDRESS	TELEPHONE	A/O	ISSUE DATE	AMOUNT
001959	คุณ เสมอ น้อยมงคล และ/หรือ คุณวรรณา น้อยมงคล 413,415 ซ.บ้านมุ ถ.จรัลฯ 32 แขวงคีรีราช เขตบางกอกน้อย กรุงเทพ 10700	4352232	04001	26/07/1995	
	TOTAL : 1 รายการ				

Figure B.4. Daily Report of New Opening Account.

10. สรุปยอดเงินรับฝากระหว่างวัน แยกตาม A/O & P/N TERM (PN243)

pn243

From Date : 19/12/1996 To Date : 19/12/1996

AV (output/AV_41.txt) FUNDING FINANCE CO.,LTD. Report id : pn243

19 Dec 1996 14:28:36 รายงานสรุปยอดเงินฝาก ระหว่างวัน แยกตาม A/O & P/N TERM Page : 1

ระหว่างวันที่ 19/12/1996 ถึง 19/12/1996

รหัส	CALL	1	2	3	4	5	6	7	8	9	10	11	12	รวม
(Unit Thousand Bath)														
DEPARTMENT <040>														
04001 นางพิมพันธ์ ศรีสำราญ		900.00			1,600.00									2,500.00
Sub DEP : 1 รวม		900.00			1,600.00									2,500.00
รวม A/O : 1 รวม		900.00			1,600.00									2,500.00

Figure B.5. Summary Report of Deposit Categorized by A/O & P/N Term.

20. สรุปยอดเงินฝากรวม แยกตาม RATE & TAX TYPE

On Date : 19/12/1996

From Rate : _6.2500 To Rate : 12.2500

AV (output/AV_43.txt) FUNDING FINANCE CO.,LTD. Report id : pn07

19 Dec 1996 14:28:51 รายงานสรุปยอดเงินฝากรวม แยกตาม RATE & TAX TYPE Page : 1

AS OF DATE 19/December/1996

Int Rate	Counts	Individual	Corporate	Bank	Financial Inst.	Listed Association	Non-Listed Association	Non-Fee Association	Tax-Fee Bank	Tax-Fee Coporate	Total	Percent
6.2500	2	700,000.00									700,000.00	28.0000
6.5000	1		100,000.00								100,000.00	4.0000
6.7500	1	100,000.00									100,000.00	4.0000
12.2500	2	1,600,000.00									1,600,000.00	64.0000
Total	6	2,400,000.00	100,000.00								2,500,000.00	100.0000

Figure B.6. Summary Report of Deposit Categorized by Rate and Tax.

APPENDIX C

PROCESS SPECIFICATION

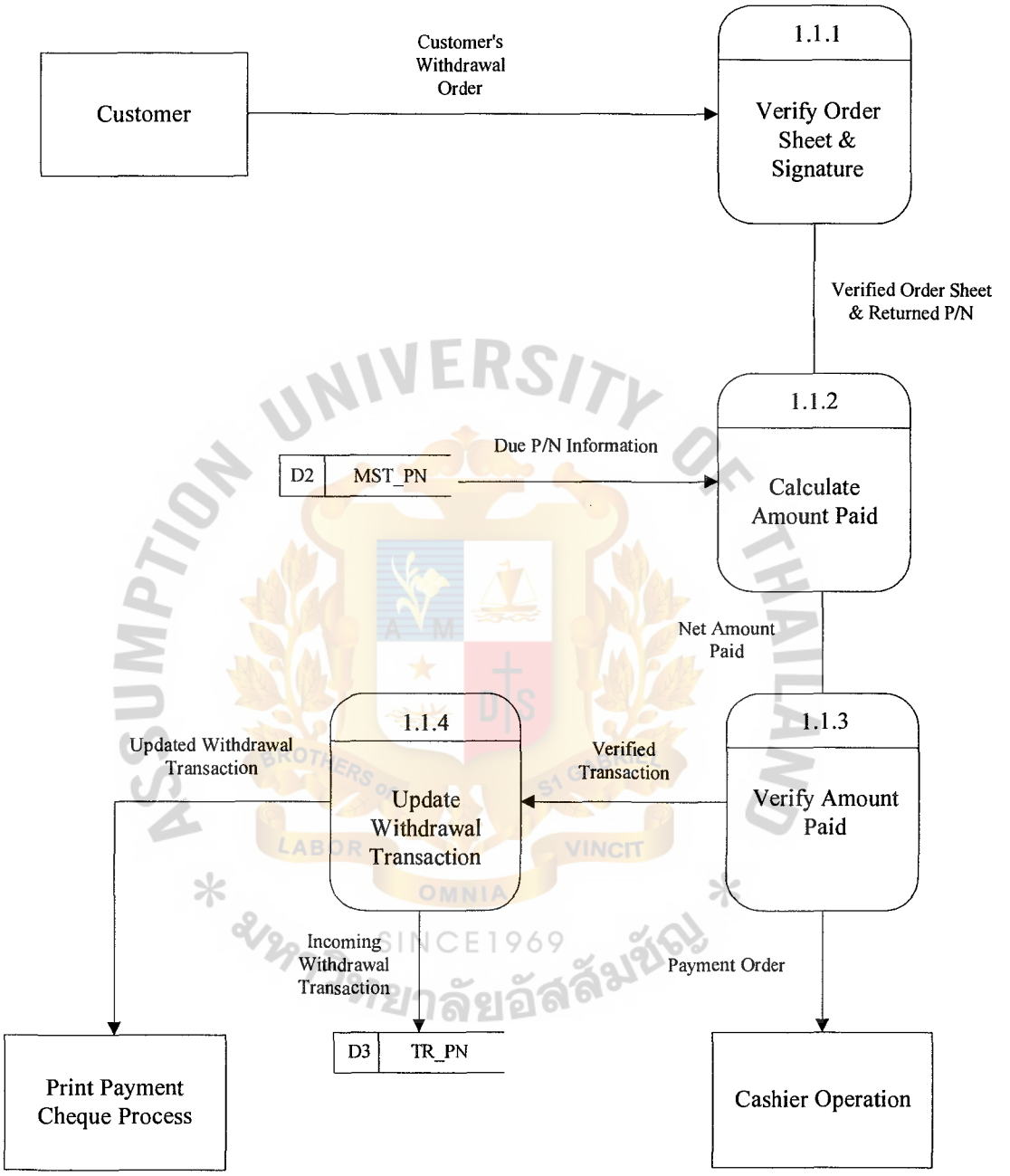


Figure C.1 Process Specification of Process 1.1.1: Withdrawal Process.

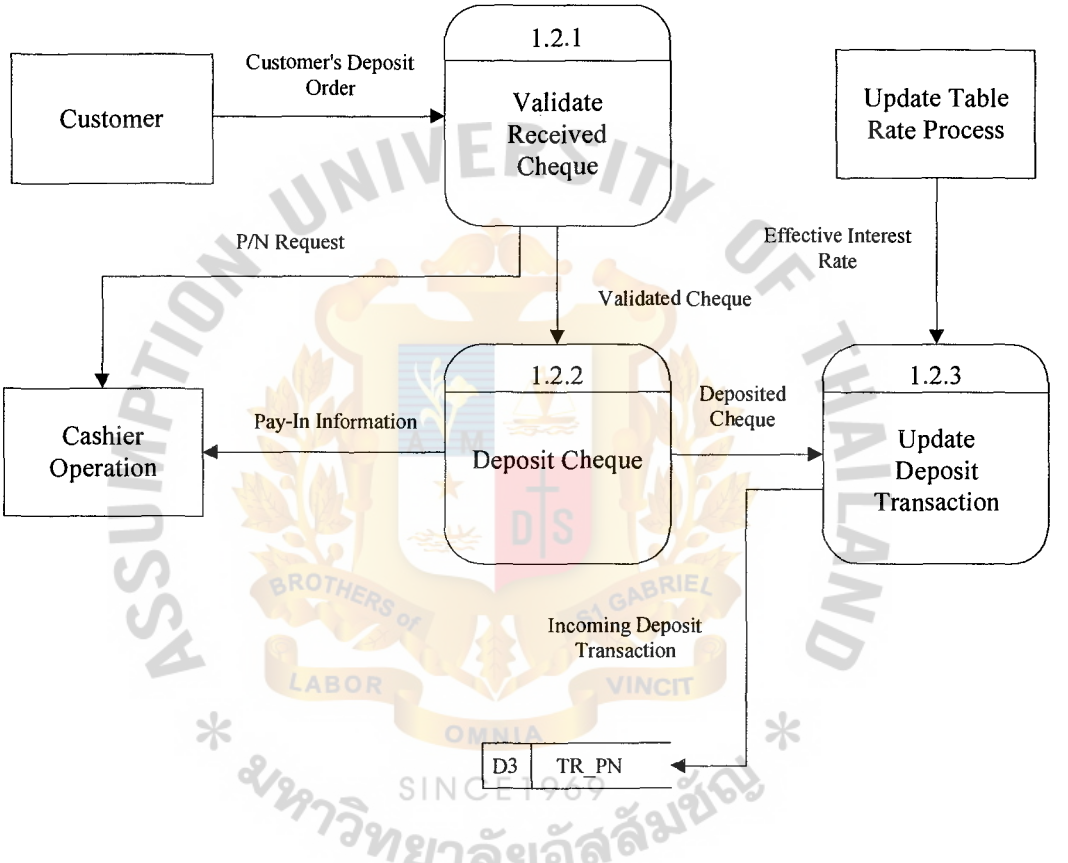


Figure C.2 Process Specification of Porcess 1.1.2: Deposit Process.

APPENDIX D

DATA DICTIONARY

DATA DICTIONARY

Data dictionary has documented to support the data flow diagram of the proposed funding information system. Followings are samples of data dictionary for main aspect concerning the key master / temporary files and the main relevant documents.

Master file

MST-CUS	=	1{cutomer_record}n
Customer_record	=	Customer_code + customer name and address + customer type + personnel information + customer type + customer group + account officer + customer status + pay type + status of document completion + update user + update date + (remark)
MST-PN	=	1{PN_record}n
PN_record	=	PN_no + customer code + [dep_order no | wid_order no] + [pay type | receive type] + account officer + PN type [Call | Term] + {term type} + tr_date + value_date + {due_date} + {wid_date} + balance + int_rate + int_amt + int_paid + int_acc + acc_int_accru + last_acc_date + last_gen_date + tax code + tax_amt + tax_paid + PN status + lock status + lock reason + {[Renew | Extend]} + update user + update date + (remark)
MST-CHQ	=	1{CHQ_record}n
CHQ_record	=	Order no + Order date + Customer code + [rec_Chq | pay_Chq] + Chq_no + [Chq_date | Chq rec_date] + Chq_name + [clear date | pay in date] + Chq_amt + Chq_acc_no + pay in bank + pay in branch + Chq_branch + Chq status + Chq status date + Chq payee + update user + update date + (remark)

Temporary File

TR-PN = 1{Temp_PN_record}n

Temp_PN_record = Order no + Order date + tr_code[0 = deposit | 1 = withdraw] + Customer code + PN no + PN type [Call | Term] + {term type} + tr_date + value_date + {due_date} + {wid_date} + balance + int_rate + int_amt + int_paid + tax rate + tax_amt + {[Renew | Extend]} + [rec_Chq | pay_Chq] + [pay_amt | rec_amt] + update user + update date + (remark)

Temp_acc_int = 1{acc_int record}n

Acc_int record = Customer_code + PN_no + balance + tr_date + value_date + due_date + from_date + to_date + int_paid + tax_paid + int_acc + acc_int_accru + new_acc_int + adj_int + update user + update date + (remark)

Documentation

Dep_Order sheet = Order no + Order date + customer code + PN amount + PN type [Call | Term {term type}] + int_rate [Normal | Special {authorizer}] value_date + {due_date} + rec_Chq information + Chq_no + Chq_date Chq rec_date + Chq_name + Chq_amt + Chq_acc_no + Chq_branch + Chq payee + account officer

Wid_Order sheet = Order no + Order date + customer code + PN no + PN amount + PN type [Call | Term {term type}] + int_rate + value_date + due_date + wid_date + int amount + tax rate + tax amount + net amount paid + pay type [payin | chq] + pay_Chq information + Chq_no + Chq_date + Chq_name + Chq_amt + Chq_acc_no + Chq_branch + account officer

Customer Data sheet = Customer code + customer name and address + contact address + group code + delivering type [walk in | messenger delivery] + account officer + presented documents

Table rate = Announce date + int_rate + effective date + term and conditions

Promissory note = PN no + customer code + customer name + PN type [call | term] + PN amount + value date + {due_date} + int_rate

BIBLIOGRAPHY

1. Cornes, Ralph. Business Systems Design and Development. NY: Prentice-Hall International, 1990.

2. Davis, William S. Business Systems Analysis and Design. California: Wadsworth, 1994.

3. Dennis, Alan and Wixom Haley Barbara. System Analysis and Design. NY: John Wiley & Sons, 2000.

4. Eliason, Alan L. Systems Development: Analysis, Design and Implementation. Boston: Little Brown, 1989.

5. FitzGerald, Jerry and Ardra F. FitzGerald. Fundamentals of System Analysis: Using Structured Analysis and Design Techniques, Third Edition. NY: John Wiley, 1987.

6. Greer, Tyson. Understanding Intranets. Washington: Microsoft Press, 1998.

7. Hodge, Bartow and James P. Clements. Business Systems Designs. Englewood Cliffs, New Jersey: Prentice-Hall, 1986.

8. Kendall, Kenneth E. and Julie E. Kendall. System Analysis and Design, Third Edition. NJ: Prentice-Hall, 1995.

9. Kosiur, David. Understanding Electronic Commerce. Washington: Microsoft Press, 1997.

10. Laudon, Kenneth C. and Jane Price Laudon. Management Information Systems: A Contemporary Perspective. NY: Macmillan, 1988.

11. Loomis, Mary E. S. Data Management and File Structures, Second Edition. London: Prentice-Hall International, 1989.

12. Trepper, Charles. E-Commerce Strategies. Washington: Microsoft Press, 2000.

13. Whitten, Jeffrey L., Lonnie D. Bentley, and Kevin C. Dittman. System Analysis and Design Methods, 5th Edition. NY: McGraw-Hill, 2001.