



Collateral Information System for
Radanakosin Bank

by

Mr. Ekasit Ransuwiro

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
in Computer Information Systems
Assumption University

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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.

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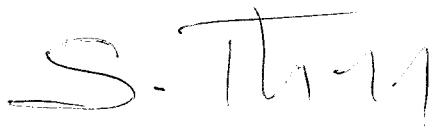
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ABSTRACT

This system development project covers the analysis and the design of the Collateral Information System. The system is developed based on the environment of the banking business. The scope of this project emphasizes on the working process of all departments that usually require collateral information for their working process. As the volume of collateral information keeps growing everyday, it would be better to computerize the data storage methodologies, in order to be able to work more efficiently. The study of this project begins with users' requirement analysis, as well as the analysis of the current working process. Dataflow diagram is drawn to provide a clearer viewpoint for the current system, and to facilitate the current system analysis. The new system is carefully designed and constructed with the aim to solve the uncovered problems, which are uncovered during the current system analysis. Database is designed and normalized into the third normal form. Input screen will be designed and developed so that it is very easy for the users to use the system. Report is designed and developed so that it is very easy for the users to understand, and use the information that is obtained from such a report. Furthermore, such a report should also cover all relevant information that is needed by the bank's officers.

The system is developed with the use of Microsoft Access 2000. Input screen is developed the form of Graphical User Interface (GUI). GUI can provide the user-friendly input screen for the developed system. With GUI, it will be very easy for the users to use the system for their working process.

Payback analysis and net present value are prepared to facilitate the cost comparison. Payback analysis can inform the management team about the amount of time that the developed system requires, in order to recoup all development costs. Net

present value can provide the information about the value of the developed system at this present time, as compared to the development cost.

The developed system is tested continuously to make sure that it can work smoothly. The proposed system will be run in parallel with the existing (manual) system, till the users gain more confidence in the new system. As soon as the users feel confidence in the developed system, it will be only the developed system that is used for the work processing.

Training would be organized to make sure that the users would be able to use the developed system in the correct way. User's manual will be provided and distributed to all users for their future references.



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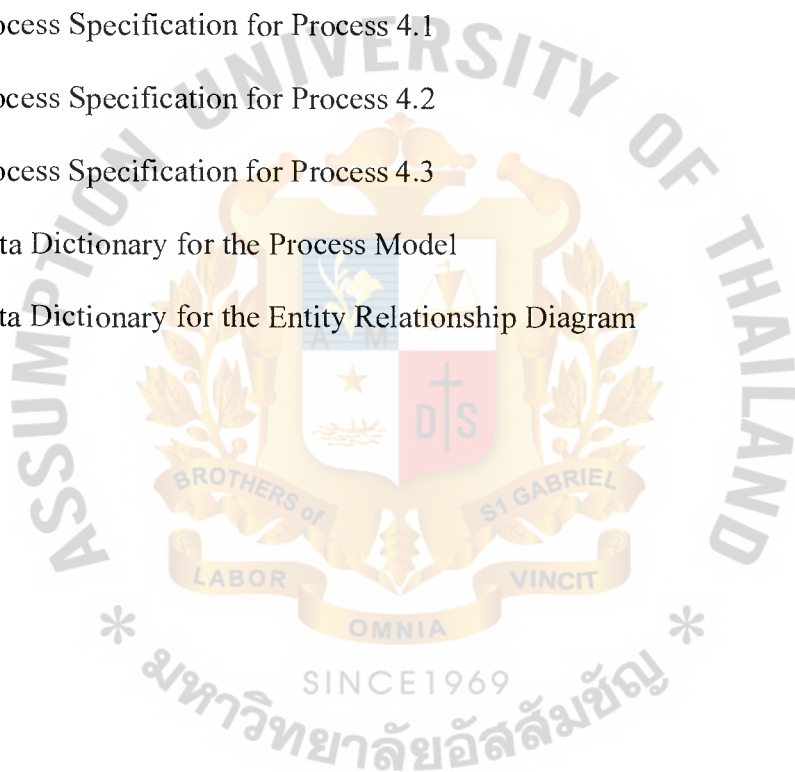
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I. INTRODUCTION

1.1 Background of the project

As the normal business of the banks, loan granting is done on a regular basis. In order to grant any loan to their customers, banks' officers usually require some collateral to guarantee the loan repayment of their customers. Theoretically, collateral is one element of the 6 Cs of credit analysis factors. These collaterals may take the form of personal guarantee, land, building, securities, etc. Practically, the collateral-information is very important for the credit officers of the banks. Collateral information is usually utilized by many bank officers, e.g. credit officers, collection officers, legal officers, risk analysts, etc. Currently, the collateral-detail is kept manually and the bank officers have to spend a considerable amount of time on acquiring some collateral information. Furthermore, bank officers have to unnecessarily spend a considerable amount of time on finding some documents, instead of doing some other analytical work. This is not an efficient working manner.

1.2 Objectives of the Project

After the discussion with the bank officers concerning the current working process, it can be found that there are many working difficulties facing the bank officers. As a result, this project was prepared to solve the aforesaid difficulties. The current working process will be analyzed in detail. The proposed system will be developed with the appropriate database management system, e.g. Microsoft Visual Basic, Microsoft-Access, Microsoft FoxPro, etc. After the database and the proposed system have been completely developed, the author does hope that the efficient working process would be achieved, and the bank's officers should spend less time on finding some collateral information. Also, it should be convenient for the bank officers

to access, update, insert, or delete any records in the developed database. Anyway, there will be the security control for performing any action on the developed database. That is, only the authorized officers would be able to access, update, insert, or delete any records in the developed database. Furthermore, the user-interface, which is used for performing any action on the developed database, will be designed with the aim of providing the user-friendliness, as well as the convenience of usage. Finally, the bank officers should enjoy and be willing to use such a developed system.

1.3 Scope of the Project

Basically, the scope of this project is all the working processes that require access to the collateral database. All departments and divisions, that need to utilize the collateral information, will be included in the scope of this project. These departments include Account Team, Appraisal Team, Credit Assessment Team, and Custodian Team. For a clearer explanation, you can see Figure 3.1 for the Context Diagram.

1.4 Deliverables

There will be many deliverables to be delivered after completing this project. Firstly, the database, which is to be used for keeping record of the collateral information, will be developed on the selected database management system, e.g. Microsoft Visual Basic, Microsoft Access, Microsoft FoxPro, etc. Secondly, the user-interface will be designed to enhance user-friendliness. The prototype of such a user-interface will be developed. The user-interface would provide users with the convenience of interacting with the proposed database. Finally, there should be an improvement in the working process of the bank. The operation cost (e.g. cost of working paper, cost of labor, etc.) is expected to reduce.

1.5 Project Plan (Gantt Chart)

The project is planned to start on October 1st, 2000, and to complete on January 31st, 2001. There are many tasks to be performed, in order to complete this project. Generally speaking, these tasks include system analysis, system design, system implementation, documentation, and training. Different amount of time is required to be spent on performing each different task. For a clearer explanation, please see Gantt Chart on Figure 1.1.



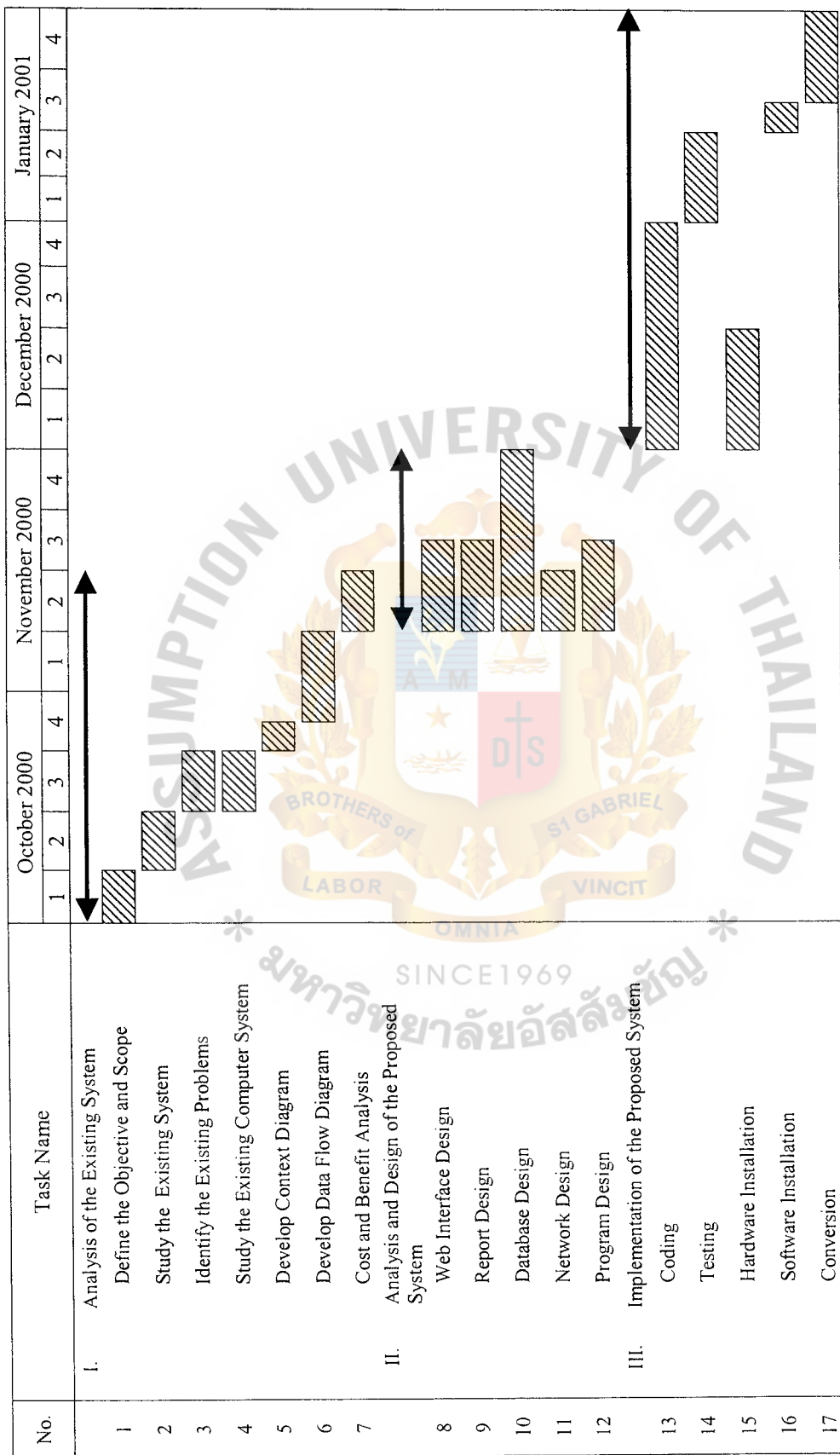


Figure 1.1. Project Plan of Collateral Information System.

II. THE EXISTING SYSTEM

2.1 Background of the Company

Radanakosin Bank Public Company Limited was granted permission by the Ministry of Finance to commence its operation on July 17th, 1990 – with the registered capital of 150 million baht.

In 1998, the bank experienced an economic and financial crisis, which is continued from the year 1997. The situation was difficult for the bank, as well as other financial institutions. On September 20th, 1998, the Bank of Thailand interfered with the bank's operation by ordering a nomination of a new board of directors and management, writing down the equity from 3,000.00 million baht to 2.14 million baht, and devaluing the par value from 10,000 million baht and selling the bank to the Financial Institution Development Fund.

All of the commercial bank's operation was adversely affected by the economic and financial downturn. Banks faced with deteriorating loan quality that resulted in the rapid rise of non-performing loans and the loss of public confidence in financial institutions. Topped with the government respective regulatory, all commercial banks were obliged to set up huge amount of reserve for possible loan losses. The Bank of Thailand also urged all commercial banks to increase their capital to meet the capital-to-risk-assets ratio requirement as set by the Bank of Thailand. These pressures had a debilitating impact on the commercial bank's operation. Therefore, the commercial bank sector operating result did not turn out to be satisfactory and the Radanakosin Bank Public Company's operating result was in the same direction as others.

Despite the diminishing public savings due to the severe economic plunge, the banks were able to increase the deposits from 17,300.00 million baht in 1998 to 25,302 million baht in 1999. The deposit increase was the result of new services that the bank

offered to accommodate customers. The bank also regained public confidence after the Financial Institution Development Fund became the major shareholder and the management has been changed.

The bank did not expect a sharp rise in loan growth due to economic decline, the diminishing investment in various economic sectors and prolonged high interest rates. The bank has slowed down while applying more restrictive measures in extending loan. The increase in loan value was due to the gradual draw-down of loans that were previously approved.

Radanakosin Bank (Plc.) Co., Ltd. had been in operation for 10 years already. There are many changes and developments including the increase of new financial services to accommodate and respond to customers' demands. The bank recognized the positive responses it has had from the public, so it has returned the benefit to the society. It has participated in important social contribution, such as granting of scholarship and charity donations. Due to the significant changes within the bank plus changes from the external and internal factors, such as the unfavorable economic climate, intense competition among financial institutions, change of shareholder structure and management, the bank has its internal reorganization, i.e. organizational restructuring and improvement on quality of service through its technology development which can be outlined as follows:

(1) The Organization

The bank divides its operation into 4 principle divisions: Corporate Bank Division, Retail Bank Division, Private Bank Division, and Supporting Division (or Bank-Wide Service Division). After the intervention by the Bank of Thailand, the bank had the organization restructured to increase the

working efficiency, especially in the loan extension and management section, by setting up additional working groups:

- (a) Credit Control Group: responsible for reviewing credit analysis reports and follow up on repayment of loan.
- (b) Asset Management Group: an independent working group separated from the credit approval function, responsible for restructuring problem loans and following up on the debtors' repayment after loan restructuring.
- (c) Internal Control Group: responsibilities include all loan review to ensure that the extension of loans is carried out according to the Bank of Thailand's and the Bank's own regulations. The Internal Control Group is also in charge of drafting all the bank's internal rules and regulations.

For more information about the organization's structure, you can view the organization's structure in Figure 2.1.

(2) Services*

Providing quality services to clients has always been a priority to the bank. ATM units have been installed at all branches to accommodate clients on cash withdrawal. The Telephone Banking service offers facilities on an inquiry of account balance, interest rate, fund transfer by telephone. The bank also provides services on public utility payment, fund transfer, and introduces new financial products, adding more alternative for customers in saving, such Tax-free deposit account, i.e. current deposit, saving deposit, fixed deposit into one account. With automatic transferring of fund from saving account to current accounts, the bank will approve the highest amount

of overdraft equivalent to the balance in the fixed deposit account to cover any shortfalls in the saving accounts. The Auto Banking also provides effective fund management with maximum returns to customers.

(3) Personnel

The bank recognizes that high-quality services would be derived from high-quality personnel. As a result, the bank emphasizes on personnel development by organizing training courses both in-house, and outside the bank. The internal curriculums are: Leadership School, Branch School, Service plus, Loan Recovery System (or the so-called “Implement KO System”) and preparation for the Y2K Compliance. The bank also emphasizes on the quality of staff more than the quantity and this will help the bank to cut down personnel expenses.

At the end of 1998, the bank had a total of 630 employees, compared to 469 in the year 1997.

(4) Development of Information Technology

The bank has developed the information network in the head office by installing Switch Hub and has planned to develop the communication network between the head office and branches, which will serve as the base in modernizing the working system. The automation system will be applied while the manual process will be reduced.

(5) Y2K Compliance

The bank has given priority attention to the Y2K Compliance. Therefore, it has appointed a working committee, a Y2K team, to outline the Contingency Plan, and a coordinating committee for the year 2000 project. The Y2K Team has set out plans, allocated resources, controlled and

followed up the outcome closely. In 1999, the bank assigned Deloitte & Touche Consultant to check and examine the bank's preparation and readiness for the Y2K Project. The bank also consults with experts from ALLTEL company, which programmed the system, to advise on the bank's system testing.

The bank has planned the 5-solution steps for the year 2000, i.e. problem study, problem estimation, problem solving system, testing and implementation. All steps have been put to monthly testing and evaluation. The latest evaluation proved that about 90% of the system problems have been solved for the year 2000. This will enable the bank to render complete service within April of 1999.

(6) Complying with the Government's Policy

The bank has a policy to focus on extending loans to important economic sectors and government support sectors such as export and commercial industries. The bank has granted financial assistance to small and medium enterprise to be in line with the Bank of Thailand's policy. It has outlined the regulations and criteria for loan extension to small and medium enterprise. With the bank's new product, "Small Business Lending", it pays attention to granting credit facilities to small and medium entrepreneurs who have accounts with the bank.

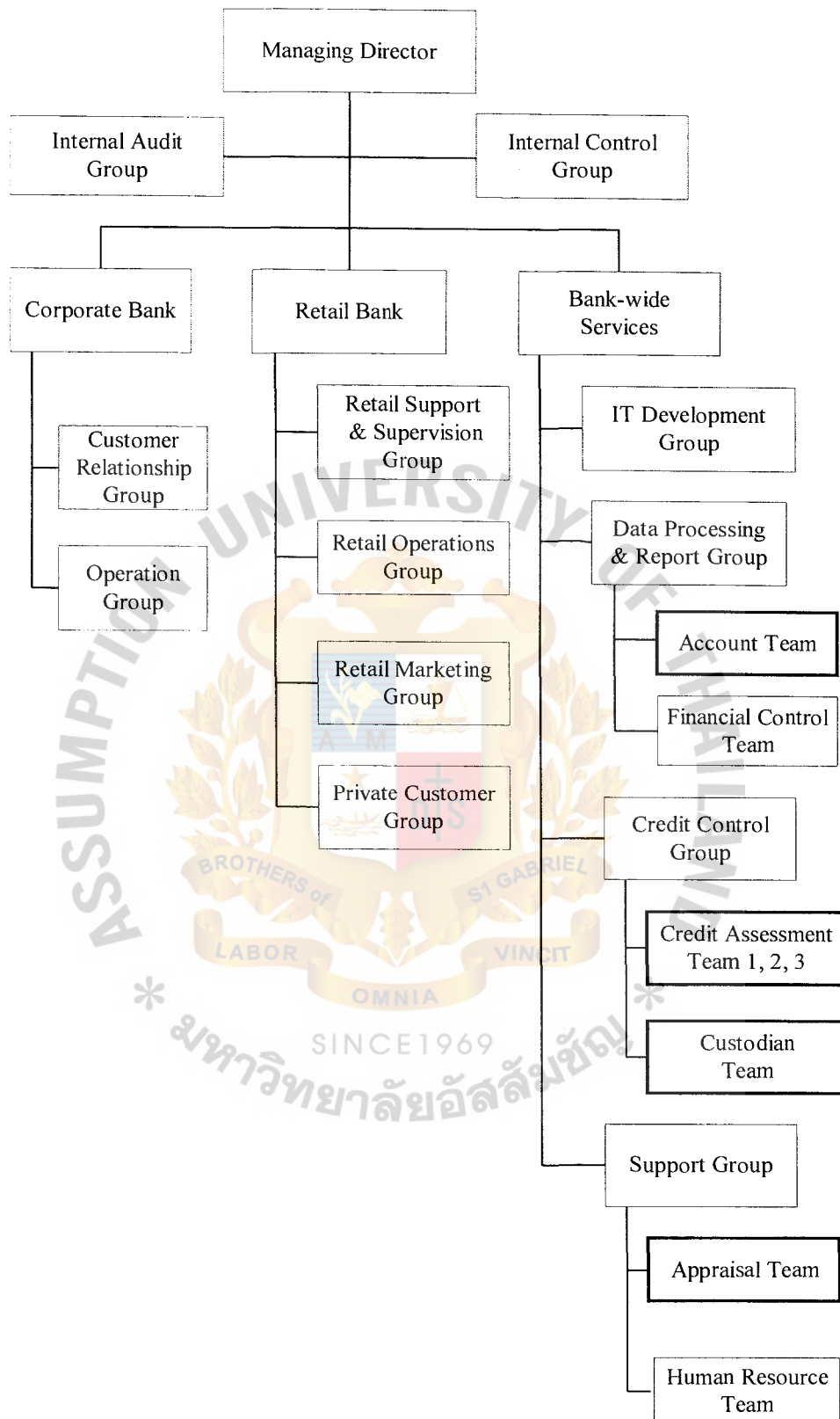
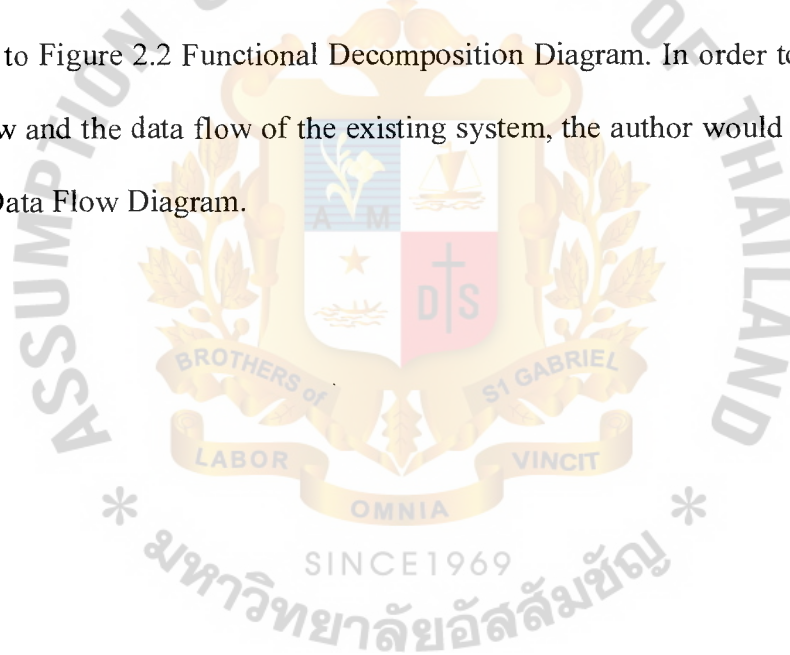


Figure 2.1. Organizational Structure of Radanakosin Bank.

2.2 Existing Business Functions

Currently, collateral information is kept manually. All collateral information is created in the form of Microsoft Word documents. These documents are also printed in the form of A4 paper, and kept in the file cabinet. The record of collateral information is currently being kept in the book. All collateral information can be accessed manually. Each department can perform any action on any collateral information separately. All bank officers are capable of updating the collateral information. All departments have a full authorization to perform any action on the collateral information. For a better understanding of the current working process of the studied system, the author would like to refer to Figure 2.2 Functional Decomposition Diagram. In order to acknowledge the workflow and the data flow of the existing system, the author would like to refer to Figure 2.3 Data Flow Diagram.



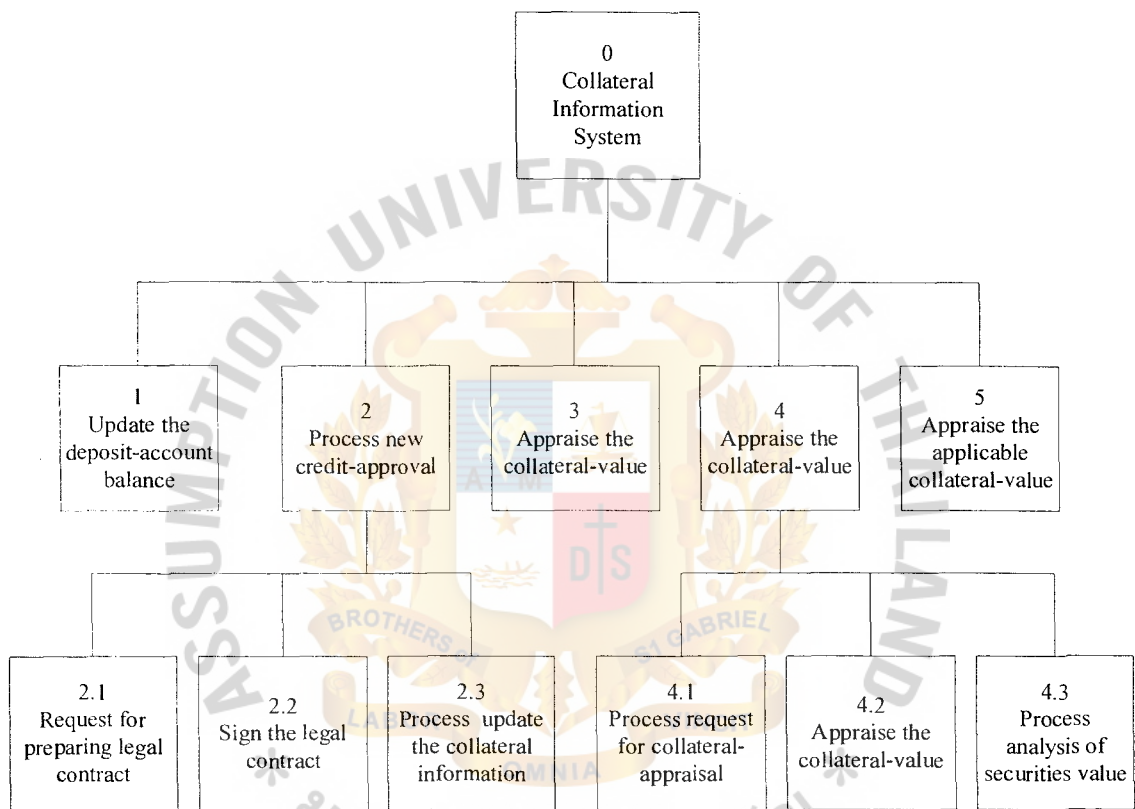


Figure 2.2. Functional Decomposition Diagram.

Figure 2.3. Data Flow Diagram for the Existing Business System.

2.3 Current Problems and Area for Improvement

2.3.1 Current Problems

After discussing with the bank officers who usually require the collateral information for their work, the author has uncovered many problems concerning the current working process. These problems have to be solved as soon as possible, so that the work efficiency can be enhanced. For clearer explanation, these problems are listed as follows:

(1) Low working efficiency

Currently, the bank officer has to spend a considerable amount of time on finding the required collateral information. When a bank officer wants to get any collateral document, he/she has to find it manually. Also, the amount of work that the bank officers can perform over a period of time is very little. For this reason, work efficiency is being negatively affected. This is a critical problem of the current manual system.

(2) Information loss

Currently, collateral information is in the form of printed paper. Also, it is being kept in the unsafe file cabinet. As the author has already mentioned in the introduction part, currently, there are many bank officers who can access the collateral information. The resulting problem is that some printed papers containing collateral information may be lost, with or without intention. If the paper were lost, it would be very difficult to find the one who will be responsible for this loss.

(3) Inconsistent collateral information

Currently, it is very difficult for the bank officers to find out the required collateral information because it is not well organized. The

collateral information are independently kept by many different teams. The author found that sometimes users may get different information on the same collateral, if they access the collateral information stored by different teams. For this reason, it can be said that the collateral information sometimes lacks data consistency. By data consistency, the author means that the same collateral must contain the same information, no matter where it is being retrieved.

(4) Error data

Currently, there are no standard rules and procedures for controlling the action to be performed on the collateral information. Sometimes, the data that is input to the collateral database may contain some errors. In this case, even if the collateral information can be captured on a timely basis, the captured information may be useless due to some errors attached.

(5) Redundancy of collateral information

Currently, the collateral information is being independently kept by many different teams. Sometimes, the same collateral information may be kept by different teams unnecessarily. This creates the situation called redundancy problem. This could also result in the updating problem. That is, the user cannot completely update the collateral information at one time. At the time that one user updates the collateral information, the other user who is also keeping that same collateral information may not acknowledge this update action. The problem is that user may get the outdated collateral information, if he/she accesses the collateral information that has not been updated yet. This is a serious problem of the bank.

2.3.2 Area for Improvement

After acknowledging the problems of the current system, the author has found that there are some areas for improvement. The areas for improving the current working process can be described as follows:

(1) Improvement on collateral information storage

The collateral information should be maintained by only one team. In this case, the author found that the Custodian Team is the most suitable one. All types of collateral information should be kept and maintained by the Custodian Team. The collateral information should be classified into many different groups, such as property, land, deposit accounts, securities, etc. By this, it will be easier for the bank officers to find any required collateral information. Also, the bank officers would be able to spend less time on finding the required collateral information.

(2) Improvement on the collateral information integrity

Since all collateral information will be maintained by only one team, only the team that will be responsible for updating the collateral information. As a result, the same collateral will always contain the same information, and the integrity problem can be completely solved. Whenever the bank officers access the collateral database, they will always be able to obtain the same collateral information, no matter where they access such a collateral database.

(3) Improvement on the process of updating the collateral information

Since the collateral information will be maintained by only one team, the same collateral information can be completely updated at only one time. That is, the collateral information can be completely updated by only

accessing the collateral database, which will be kept and maintained by the Custodian Team. There is no need to worry about the outdated collateral information anymore.

(4) Improvement on collateral information access

Since the collateral information will be classified into different groups, the collateral information can be found easily. The user will be able to spend less amount of time on finding out the required collateral information. As a result, work efficiency can be continuously improved. Since the user interface of the system will be designed to be so user-friendly, the users will be able to learn how to use the developed system within a very short period of time.



III. THE PROPOSED SYSTEM

3.1 System Specification (Users' Requirement)

This part is prepared for describing the system specification (users' requirements) of the new developed system. System specification has to be determined before the new system can be designed and developed. Users' requirement analysis is prepared to make sure that the developed system will be designed in such a way that the user will be pleased to use it. User's requirements can be divided into three different levels, according to their priority. These levels include Essential requirement, Desirable requirement, and Nice-to-have requirement. These requirements can be explained in details as follows:

Essential Requirements

- (1) It should be possible for the authorized bank officer to update any collateral information on a timely basis.
- (2) It should only be the authorized bank officers who can access the collateral database, and retrieve the collateral information
- (3) It should only be the authorized bank officers who can perform any action on the collateral database.
- (4) It should be possible for the users to print any report that contains collateral information on a timely basis.
- (5) In the case that there is an illegal operation on the collateral database, it should be possible to track the one who has to be responsible for such an illegal operation.

Desirable Requirements

- (1) The user-interface should be designed in such a way that it is not too complicated for the users to input any collateral information into the developed system's database.
- (2) The printed report should be in the size of A4. A4 is the standard size for documentation.
- (3) The printed report should be well organized so that it is not too complicated to read and understand.
- (4) It should be possible for the user to view the report, which is to be printed by the users.
- (5) It should be possible for the bank officers to print any selected group of collateral information.

Nice-to-have Requirements

- (1) The input screen and the printed report should be designed to have soft-tone color, e.g. light blue, light green, light yellow, etc. Soft color is preferred because it is better for the human eyes.
- (2) The printed report should consist of only plain text. The font to be used should be easy for reading.
- (3) The printed report should have a suitable left-margin space, so that holes can be punched and it can be easily kept in the file folder.

To facilitate the comparison among the three candidate solutions, Table 3.1 and Table 3.2 are prepared to indicate if each candidate solutions can meet each users' requirement or not. Table 3.3 and Table 3.4 are prepared to provide a side-by-side comparison of the different characteristics for the three candidate solutions.

Table 3.1. Users' Requirement Analysis for Three Candidate Solutions.

Requirement	Category	No.1	No.2	No.3
It should be possible for the authorized bank officer to update any collateral information on a timely basis.	Essential	Yes	Yes	Yes
It should be only the authorized bank officers who can access to the collateral database, and retrieve the collateral information.	Essential	Yes	Yes	Yes
It should be only the authorized bank officers who can perform any action on the collateral database.	Essential	Yes	Yes	Yes
It should be possible for the users to print the report that contains collateral information on a timely basis.	Essential	Yes	Yes	Yes
In the case that there is an illegal operation on the collateral's database, it should be possible to track the one who has to be responsible for such an illegal operation.	Essential	Yes	Yes	Yes
The user-interface should be designed in such a way that it is not too complicated for the users to input any collateral information into the developed system's database	Desirable	Yes	Yes	Yes
The printed report should be in the size of A4. A4 is the standard size for documentation.	Desirable	Yes	Yes	Yes
The printed report should be well organized so that it is not too complicated to read and understand.	Desirable	Yes	Yes	Yes
It should be possible for the user to view the report, which is to be printed by the users.	Desirable	Yes	Yes	Yes
It should be possible for the bank officers to print any selected group of collateral information.	Desirable	Yes	Yes	Yes

Table 3.1. Users' Requirement Analysis for Three Candidate Solutions (Continued).

Requirement	Category	No.1	No.2	No.3
The input screen and the printed report should be designed to have soft-tone color, e.g. light blue, light yellow, and etc. Soft-tone color is preferred because it is better for the human eyes.	Nice-to-have	Yes	Yes	Yes
The printed report should consist of only plain text. The font to be used should be easy for reading.	Nice-to-have	Yes	Yes	Yes
The printed report should have a suitable left-margin space, so that a hole can be punched and it can be easily kept in the file folder easily.	Nice-to-have	Yes	Yes	Yes



Table 3.2. Candidate System Matrix.

Characteristics	Candidate No.1	Candidate No.2	Candidate No.3
Portion of System Computerized	Collateral information, e.g. appraisal value, appraisal date, and collateral owner. The information concerning customers, e.g. loan type, collateral details, and etc.	Collateral information, e.g. appraisal value, appraisal date, and collateral owner. The information concerning customers, e.g. loan type, collateral's details, and etc.	Collateral information, e.g. appraisal value, appraisal date, and collateral owner. The information concerning customers, e.g. loan type, collateral details, and etc.
Benefits	This candidate solution can be implemented quite quickly. User-friendly interface can also be developed by this candidate solution.	This candidate solution can be implemented very quickly. User-interface can also be developed to be in a user-friendly fashion.	By this candidate solution, user-interface can be developed to be user-friendly.
Servers and Workstation	Technical architecture dictates HP NetServer LH3, 128 MB, with Pentium III 500.	Technical architecture dictates HP NetServer LH3, 128 MB, with Pentium III 500.	Technical architecture dictates HP NetServer LH3, 128 MB, with Pentium III 500.
Software Tools Needed	Microsoft Visual Basic	Microsoft Access	Microsoft Visual
Application Software	Package Solution	Package Solution	Package Solution
Method of Data Processing	Client/ Server	Client/ Server	Client/ Server
Output Devices and Implementation	15" Monitor, Hewlett Packard Laser Jet 11000	15" Monitor, Hewlett Packard Laser Jet 11000	15" Monitor, Hewlett Packard Laser Jet 11000
Output Devices and Implementation	15" Monitor, Hewlett Packard Laser Jet 11000	15" Monitor, Hewlett Packard Laser Jet 11000	15" Monitor, Hewlett Packard Laser Jet 11000

3.2 System Design

3.2.1 Process Description

Figure 3.1 shows the Context Diagram. Subsequent figures show the processes: Figure 3.2 for Level 0 Data Flow Diagram, Figure 3.3 for Level 1 of Process 1.0, Figure 3.4 for Level 1 of Process 2.0, Figure 3.5 Level 1 of Process 3.0, and Figure 3.6 Level 1 of Process 4.0. The explanation of each process is described as follows:

- (1) Calculate Applicable Appraisal-Value: Practically, the appraisal-value cannot be immediately used to represent the collateral-value. The value, which can be used to represent the collateral-value, is the applicable-value. That is why the bank officer needs to calculate the applicable collateral-value. After acknowledging the re-appraisal of the collateral-value, the applicable appraisal-value must be calculated. The first step of calculating the applicable collateral-value is to classify the collateral into a specific type. Then, the applicable rate, which will be specified by the Bank of Thailand, will be applied to each specific collateral value. This applicable appraisal-value will be used for preparing a report to be sent to the Bank of Thailand, as well as to the Stock Exchange of Thailand.
 - (a) Acknowledge the new collateral-value: This is the process of acknowledging the new collateral-value. After acknowledging the new collateral-value, there will be some processes to be done with such a value, e.g. calculate the applicable-value, etc.
 - (b) Classify the collateral into a specific type: Each collateral has to be classified into each specific type. The benefit of this process is to be easier for performing some other processes that require accessing the collateral information.

- (c) Apply formula for calculating applicable collateral-value: This is the process of multiplying the applicable rate to the appraisal-value. The applicable rate will be specified by the Bank of Thailand. Applicable collateral-value is the collateral value that can actually be used for analyzing the credit-worthiness of each customer.
- (2) Appraise the Collateral-Value: The credit officers of the Credit Assessment Team usually require the appraisal officers to perform their tasks. Sometimes, there is a need to re-appraise the collateral-value. In this case, the credit officers have to request the Custodian Team for processing the collateral-appraisal. As soon as receiving the request for collateral-appraisal, the officer of the Custodian Team has to register such a request before any other task can be performed. After that, the collateral will be classified into each type. If the collateral is in the form of deposit-account, the interest will be calculated and added to the current balance. If the requested collateral is not in the type of deposit account, such a collateral-request will be sent to the Appraisal Team. After that, the appraisal officer of the Appraisal Team will appraise the collateral-value, and send the new appraisal-value back to the Custodian Team in the form of collateral-appraisal report. Then, the officer of the Custodian Team will transfer such a new collateral-appraisal report to the credit officer, or the accounting officers, who request for such a collateral-appraisal. At the same time, the officer of the Custodian Team will also update the collateral database.
- (a) Register the request for collateral-appraisal: This is the process of registering the collateral. After receiving the request for collateral-

appraisal, such a collateral-request has to be registered for later reference.

- (b) Determine the type of collateral: This is the process of determining the type of each collateral. The collateral may be classified into building, land, deposit account, security, personal guarantee, etc.
- (c) Prepare collateral-appraisal request form: This process concerns about preparing the collateral-appraisal request form, which is to be sent to the Appraisal Team.
- (d) Appraise the collateral-value: This process is to be done by the officers of the Appraisal Team. Different appraisal method will be applied to each different type of collateral.
- (e) Prepare the collateral appraisal-value report: After finishing appraising the collateral-value, the officers of the Appraisal Team have to prepare collateral appraisal-value report. Such a report will be sent back to the officers of the Custodian Team.
- (f) Check the period of deposit: In case of deposit account, the first step of calculating the collateral-value is to check the deposit period. Deposit period may be 3 months, 6 months, 12 months, etc.
- (g) Calculate interest: This is the process of calculating the interest amount for each deposit-account collateral. Such interest amount can be calculated by the following method

$$\text{Principal} * \text{Interest rate} * (\text{number of days}/365)$$

- (h) Update the collateral-value: This is a process of updating the collateral-value, which is stored in the database. This process has to be performed after re-appraising the collateral-value.

- (3) Sign the Legal Contract: After the authorized officers have already approved the credit-request, credit officer will inform the custodian officer about such a new credit-request approval. At the same time, the credit officer will request the custodian officer to prepare the legal contract. Such a legal contract is to be signed by the bank officer and the customer (borrower), before the customer (borrower) can withdraw any borrowed money from the bank.
- (a) Register the request for preparing the legal contract: This is the process of registering the request for preparing the legal contract. This is done for later reference.
 - (b) Prepare the legal contract: This is the process of preparing (writing) the legal contract, which is to be signed by the customers (borrowers) and the bank officer. This process is to be done after registering the request for preparing the legal contract.
 - (c) Sign the legal contract: This is the process of signing the legal contract. This process has to be jointly performed by the bank officers and the customers.
 - (d) Update the collateral database: This is the addition of the new collateral information, which is the result of new credit-approval, to the collateral database.
- (4) Request for collateral-value: When the credit officers are to perform their work, they usually need to know the collateral information, e.g. collateral owners, collateral amount, collateral value, etc. When the credit officers need to know the collateral-value, they will send the request to the Custodian Team. Upon receipt of such a request, the officers of the Custodian Team

have to register such a request, for later reference. After that, the custodian officers will access the collateral database, retrieve the requested collateral-value, and prepare the collateral-value report. The collateral-value report will be sent to Credit Assessment Team, Account Team, Bank of Thailand, and Stock Exchange of Thailand.

- (a) Register the collateral-value request: This is the process of registering the request for collateral-value. This process has to be done before any other process can be done. This process is done for later reference.
- (b) Access to collateral database: This is the process of accessing the collateral database, and retrieving the collateral information. The required collateral-information can be accessed through the collateral code.
- (c) Prepare the collateral-value report: This is the process of preparing the collateral-value report, which is to be sent to the team requesting such a collateral-value. This report usually contains the relevant collateral information, e.g. collateral type, collateral owner, collateral amount, collateral value, etc.

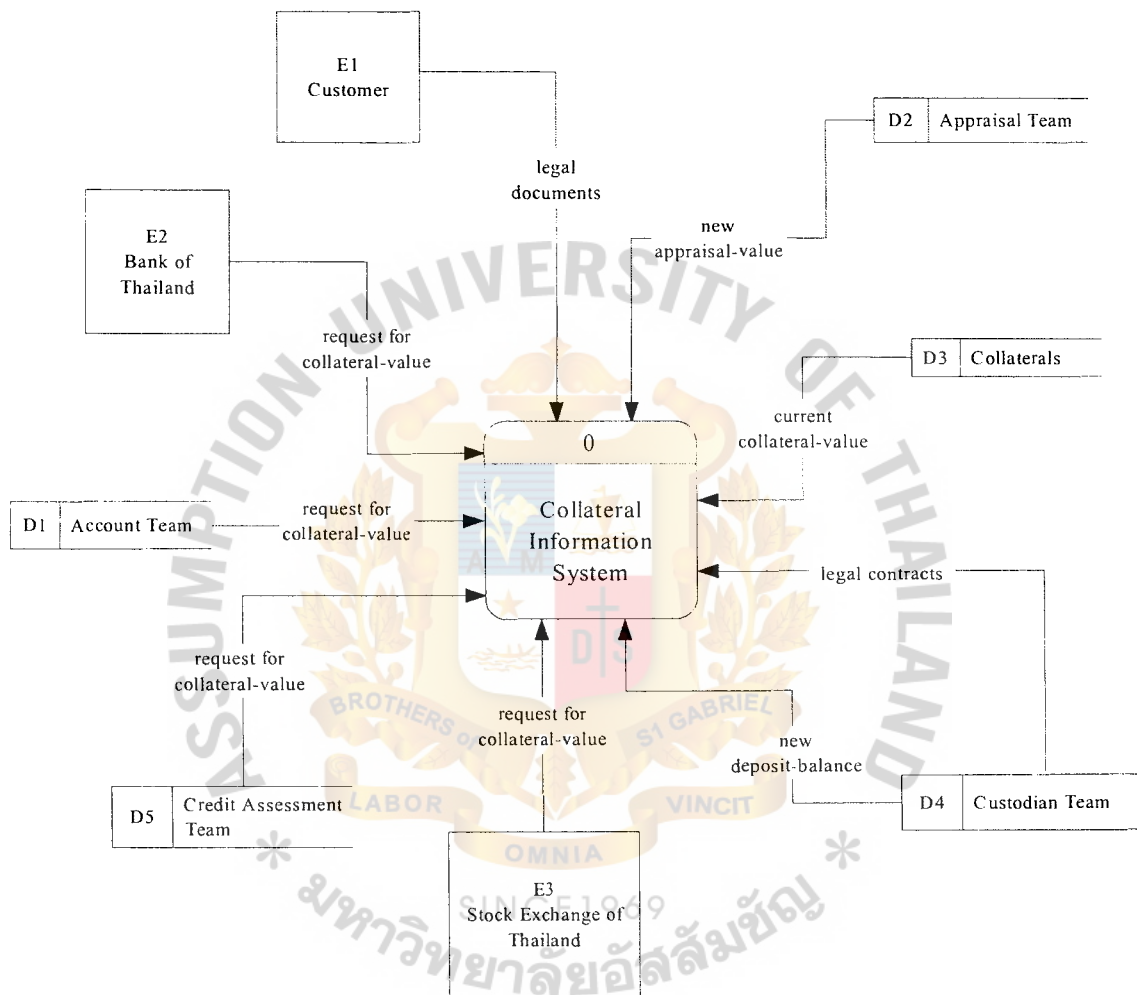


Figure 3.1. Context Diagram.

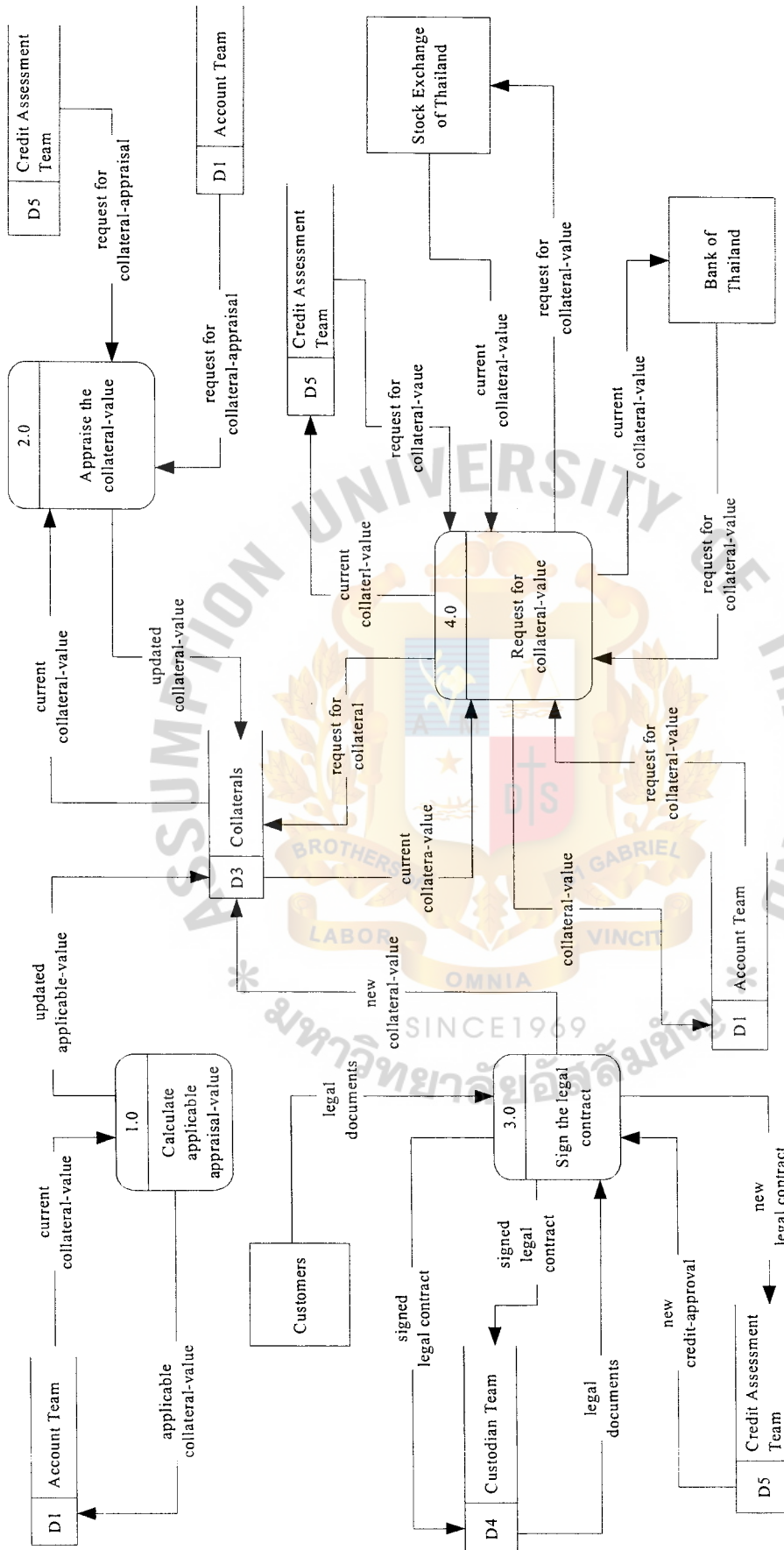


Figure 3.2. Level 0 Data Flow Diagram of the Proposed System.

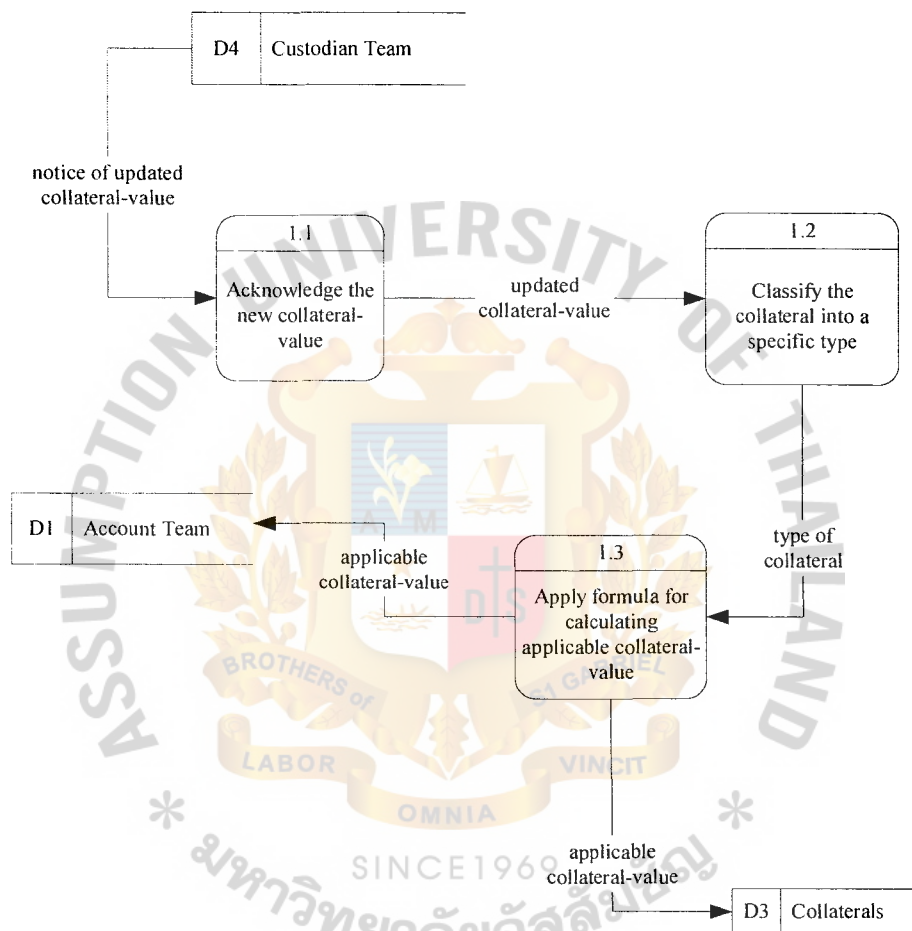


Figure 3.3. Level 1 of Process 1 Calculate the Applicable Appraisal-value.

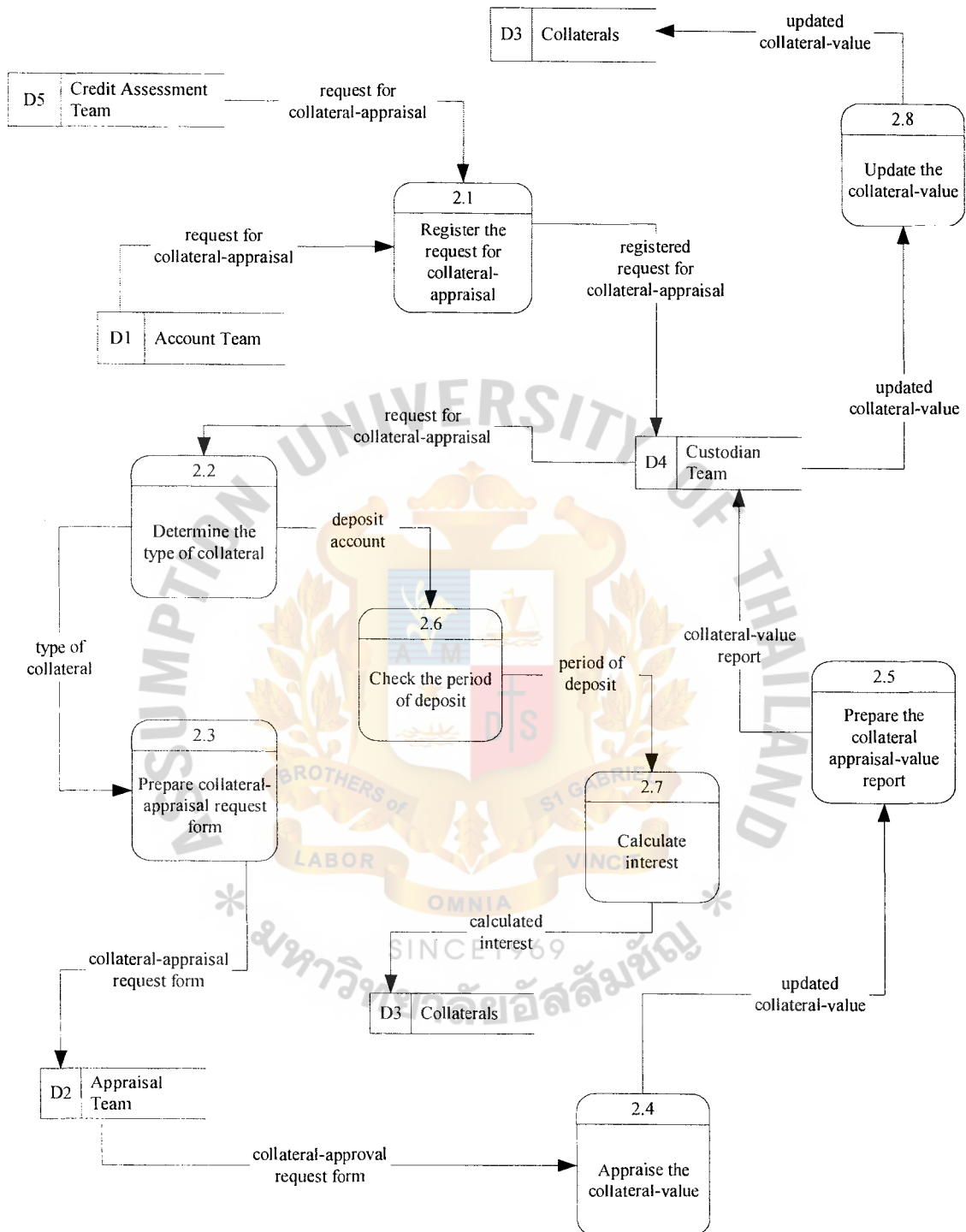


Figure 3.4. Level 1 of Process 2 Appraise the Collateral-value.

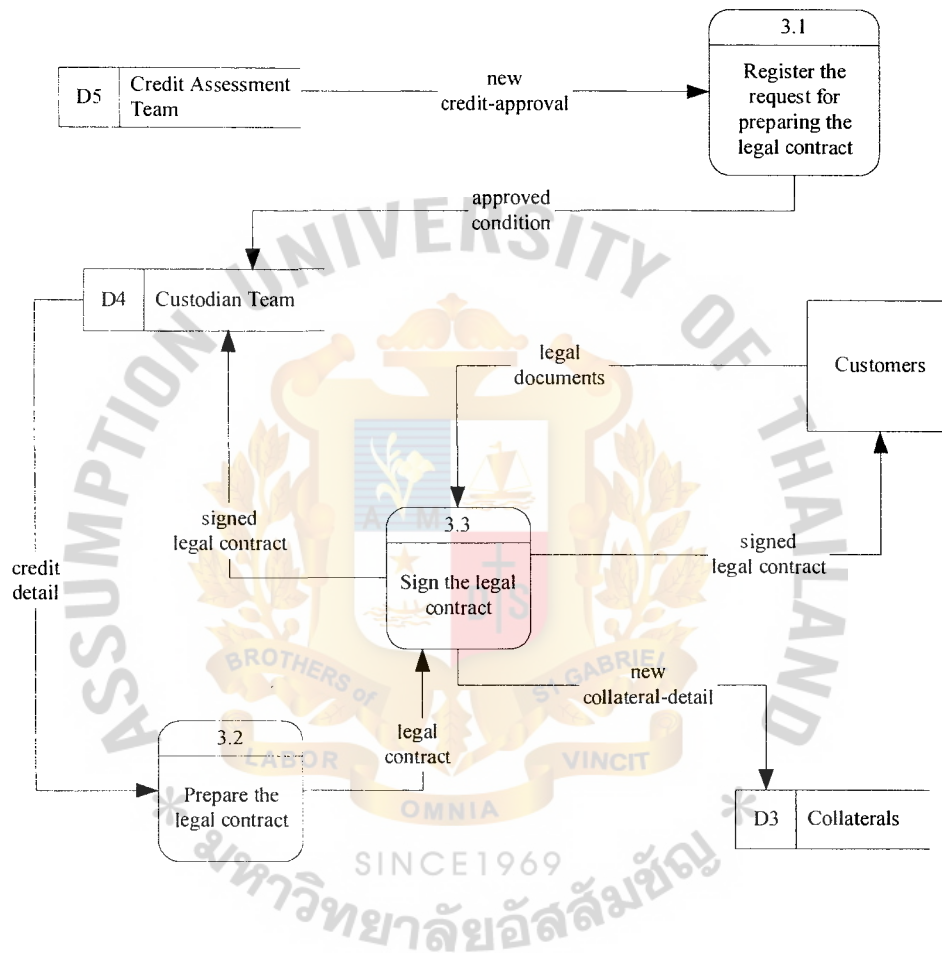


Figure 3.5. Level 1 of Process 3 Sign the Legal Contract.

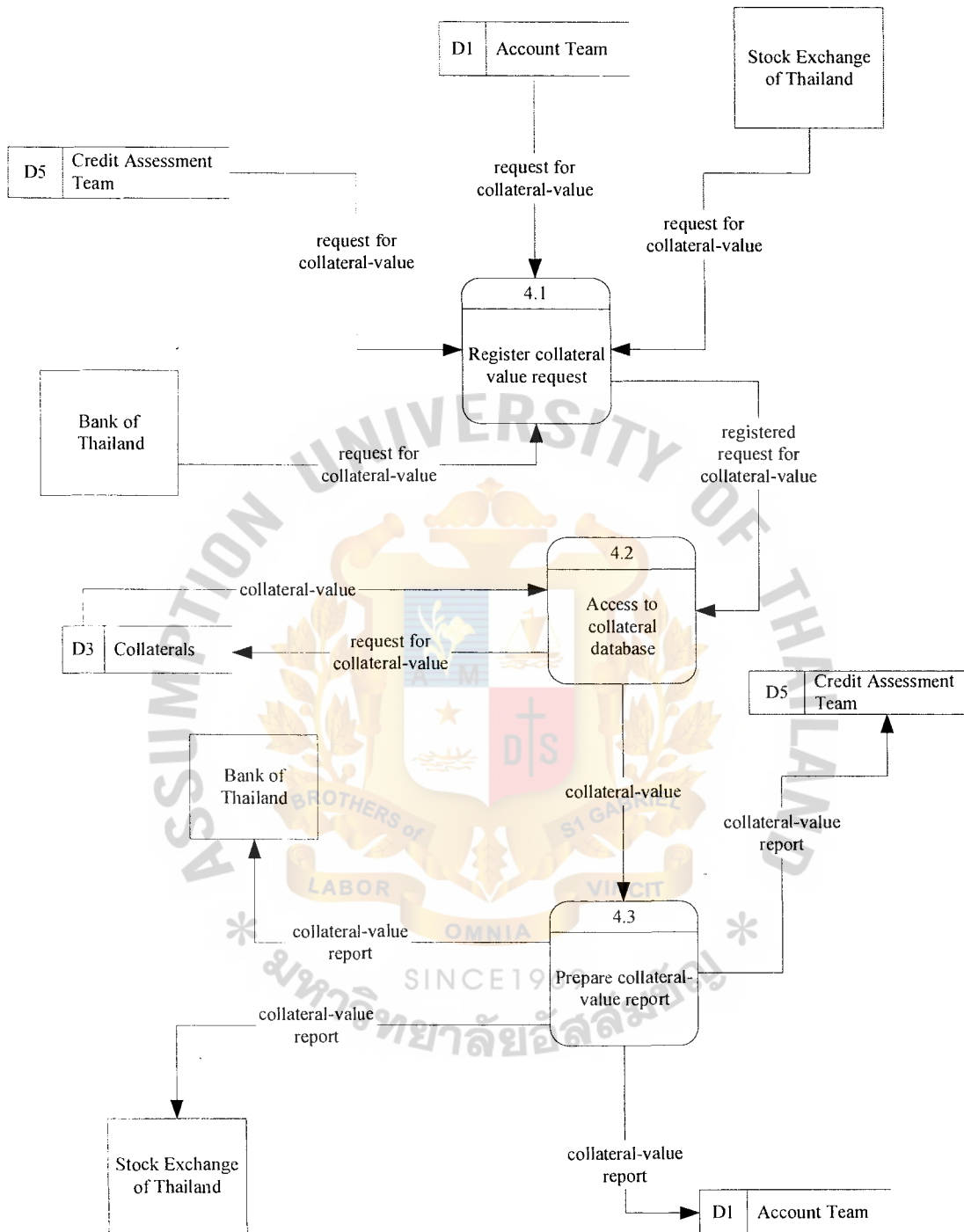


Figure 3.6. Level 1 of Process 4 Request for Collateral-value.

3.2.2 Entity Relationship Diagram

Data modeling is a technique for organizing and documenting a system's data. Data modeling is sometimes called database modeling because a data model is usually implemented as a database. It is sometimes called information modeling. The most frequently used technique for data modeling is Entity Relationship Diagram (ERD). Entity Relationship Diagram depicts data in terms of the entities and relationships described by the data. An entity is something about which we want to store data. And entity is a class of persons, places, objects, events, or concepts about which we need to capture and store data. A relationship is a natural business association that exists between one or more entities. The relationship may represent an event that links the entities or merely a logical affinity that exists between entities.

In order to reduce data redundancy and to ensure good management of the database for the Collateral Information System, the Entity Relationship Diagram will be normalized into the Third Normal Form (3NF). Normalization is a process of simplifying between data elements in a record. Through normalization process, a collection of data in a record structure will be replaced by successful record structures that are simpler, more predictable, and therefore more manageable. Normalization is applied for the proposed system in order to organize data attributes, so that they are grouped to form stable, flexible, and adaptive entities. The First Normal Form (1NF) eliminates repeating groups or attributes that have more than one value for a single instance of the entity. For Second Normal Form (2NF), every non-key attribute is fully dependent on the primary key. Third Normal Form (3NF) will be achieved if every non-key attribute is non transitively dependent on the primary key. Entity Relationship Diagram for the proposed system will be represented in 3 levels, including Context Data Model (see Figure 3.7 Context Entity Relationship Diagram for the Proposed System),

Key-based Data Model (see Figure 3.8 Key-based Entity Relationship Diagram for the Proposed System), and Fully-attributed Data Model (see Figure 3.9 Fully-attribute Entity Relationship Diagram for the Proposed System).



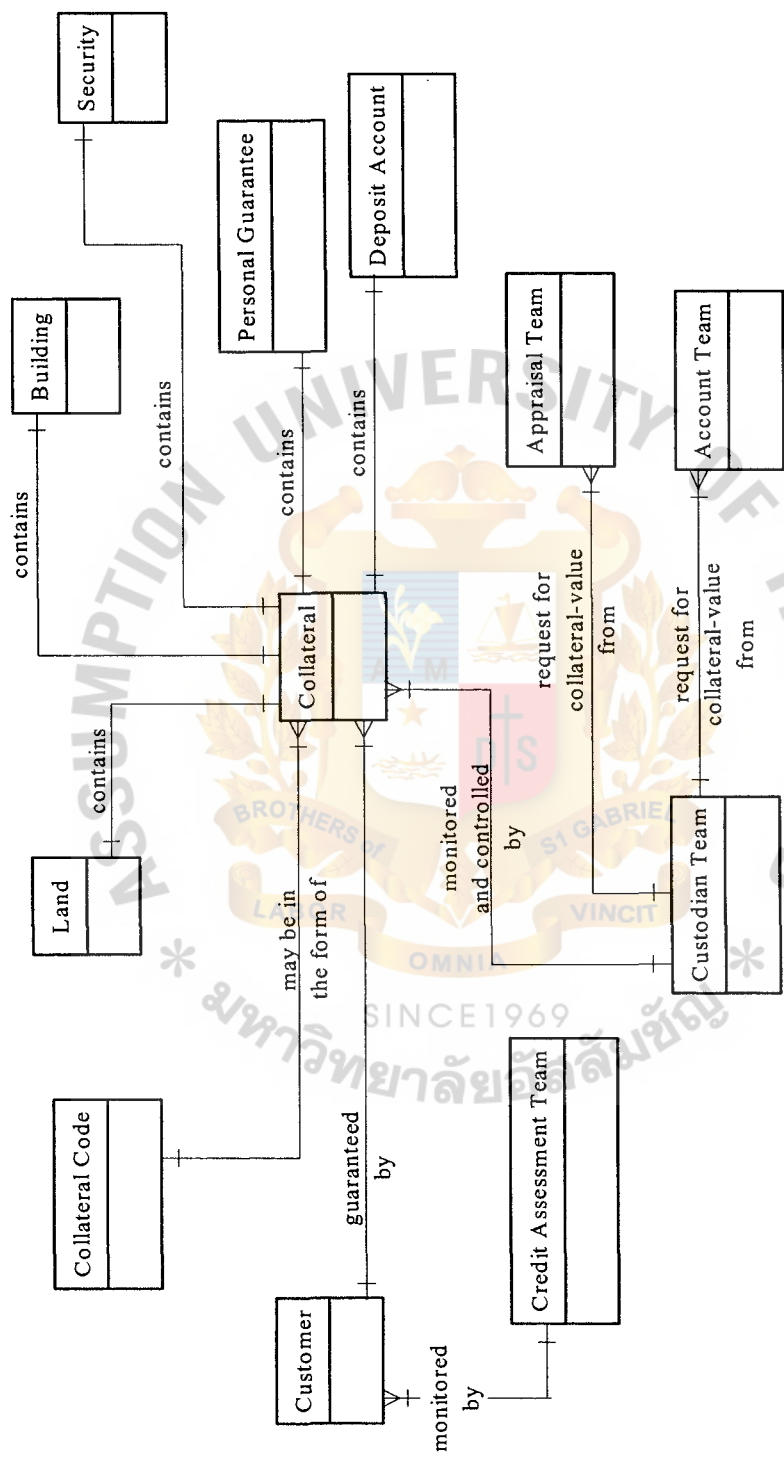


Figure 3.7. Context Entity Relationship Diagram for the Proposed System.

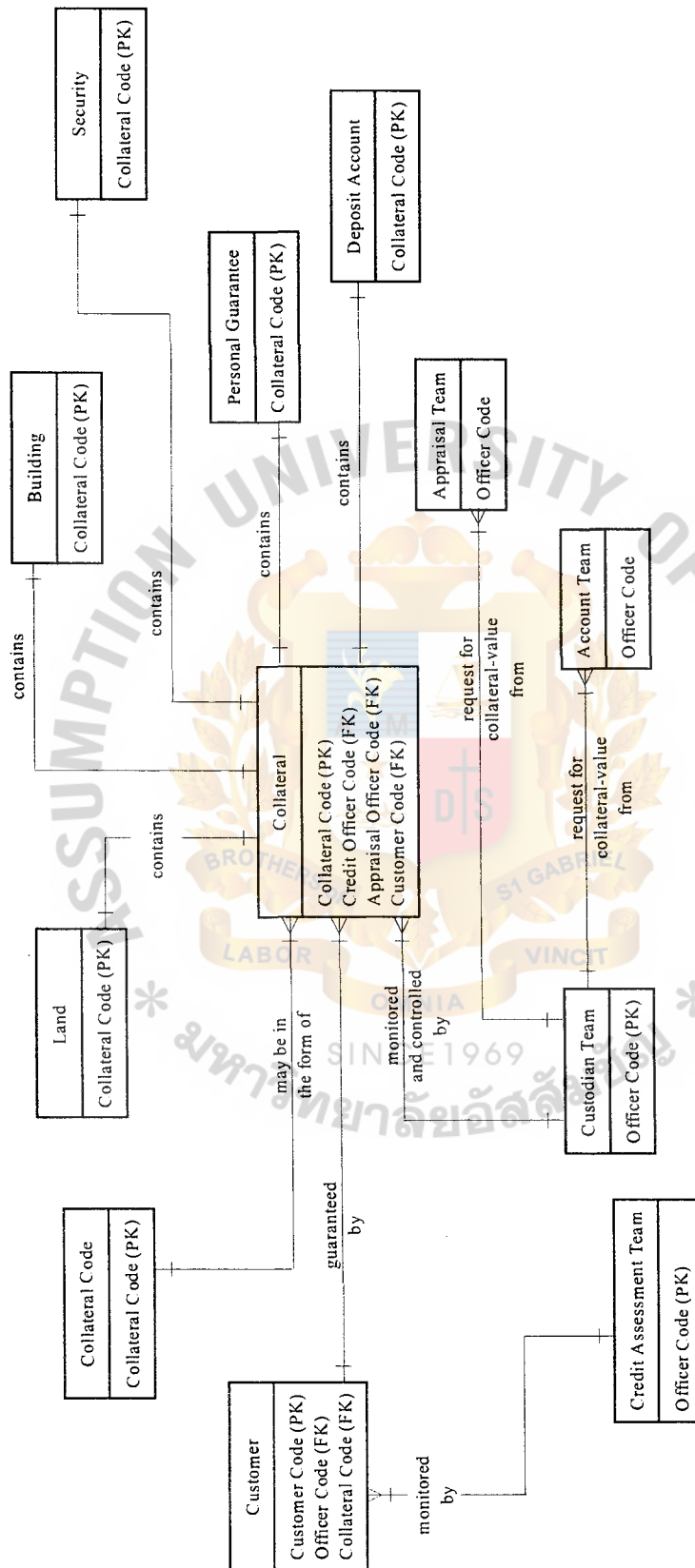


Figure 3.8. Key-Based Entity Relationship Diagram for the Proposed System.

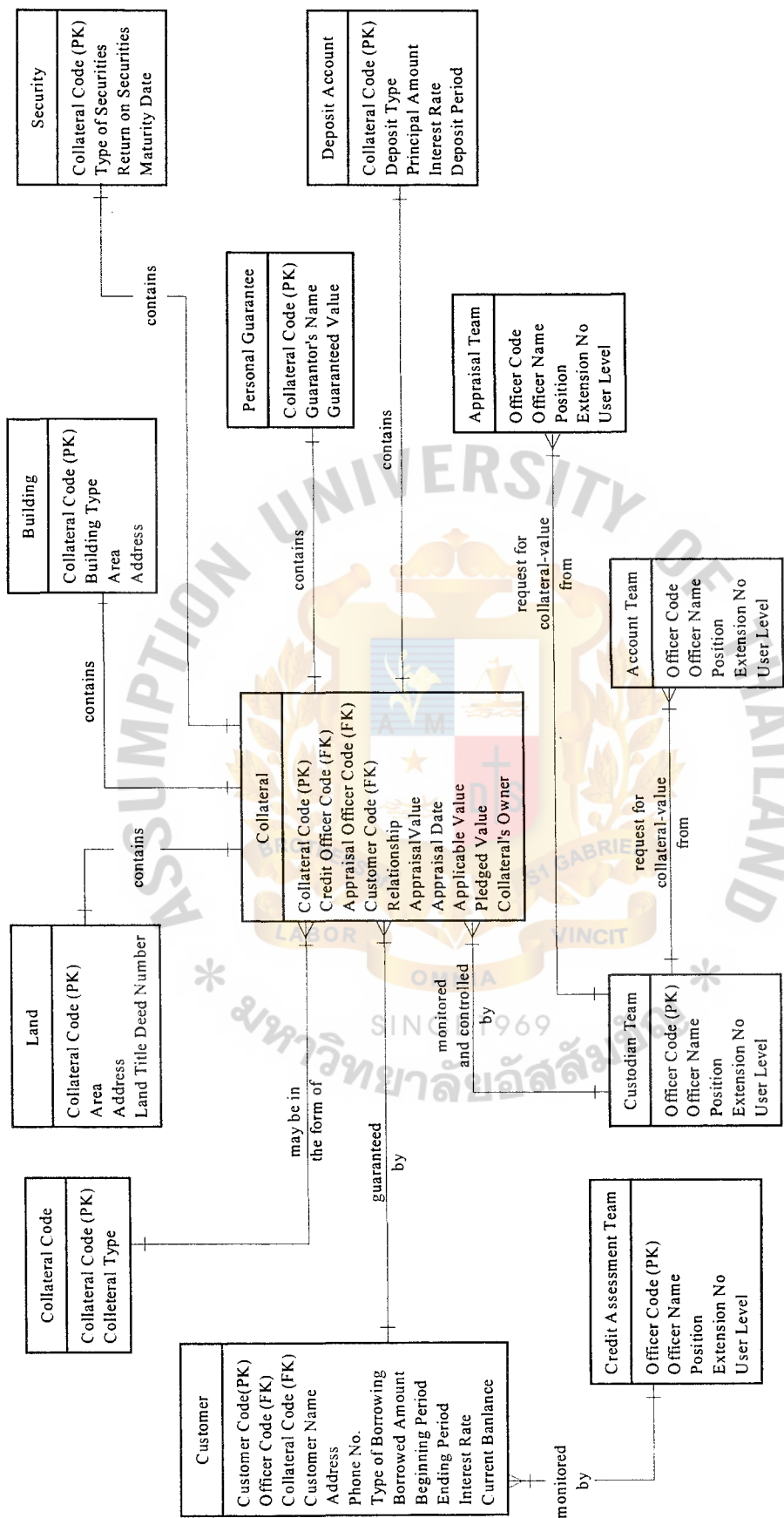


Figure 3.9. Fully-Attribute Entity Relationship Diagram for the Proposed System.

3.2.3 Input Design

Input screens are designed to be graphical user interface (GUI). They are designed to be easy and convenient for all users to use the developed system. All input screen designs are presented in Appendix A. The descriptions of all input screen designs are as follows.

Figure A.1 Login Screen: This is the figure showing the screen for logging into the collateral information system. The user has to key in his/her user name and the relevant password, in order to be able to access the collateral information system.

Figure A.2 Collateral Information Inquiry: This figure represents the screen for inquiring the collateral information through collateral ID. After logging into the system, if the user is at the inquiry level, his/her screen will automatically show this screen.

Figure A.3 Administration Menu: This figure shows the screen for selecting the action to be taken. Two actions are available, including “Administer Collateral Information”, and “Administer User Information”.

Figure A.4 Administer User Information: This figure shows the screen to be used for selecting the action to be performed on the user's information.

Figure A.5 Add User Information: This figure presents the screen for adding the user's information.

Figure A.6 Update User Information: This figure represents the screen for updating the user's information.

Figure A.7 Delete User Information: This figure represents the screen for deleting user's information.

Figure A.8 Administer Collateral Information: This figure shows the screen for selecting the action to be performed on the collateral information. These actions include addition, update, deletion, and inquiry.

Figure A.9 Add Collateral Information: This figure shows the screen to be used for selecting the type of collateral that the user wants to add information. These types of collateral include land, building, security, deposit account, and personal guarantee.

Figure A.10 Add Collateral Information-Land: This figure shows the screen to be used for adding collateral information, which is in the form of land.

Figure A.11 Add Collateral Information-Building: This figure shows the screen to be used for adding collateral information, which is in the form of building.

Figure A.12 Add Collateral Information-Security: This figure shows the screen to be used for adding collateral information, which is in the form of security.

Figure A.13 Add Collateral Information-Deposit Account: This figure shows the screen to be used for adding collateral information, which is in the form of deposit account.

Figure A.14 Add Collateral Information-Personal Guarantee: This figure shows the screen to be used for adding collateral information, which is in the form of personal guarantee.

Figure A.15 Update Collateral Information: This figure represents the screen for selecting the type of collateral, which is to be updated by the users.

Figure A.16 Update Collateral Information-Land: This figure shows the screen for updating the selected collateral information, which is in the form of land.

Figure A.17 Update Collateral Information-Building: This figure shows the screen for updating the selected collateral information, which is in the form of building.

Figure A.18 Update Collateral Information-Security: This figure shows the screen for updating the selected collateral information, which is in the form of security.

Figure A.19 Update Collateral Information-Deposit Account: This figure shows the screen for updating the selected collateral information, which is in the form of deposit account.

Figure A.20 Update Collateral Information-Personal Guarantee: This figure shows the screen for updating the selected collateral information, which is in the form of personal guarantee.

Figure A.21 Delete Collateral Information: This figure represents the screen for selecting the type of collateral, which the user wants to delete collateral information from the collateral database.

Figure A.22 Delete Collateral Information-Land: This figure shows the screen to be used for deleting the selected collateral information, which is in the form of land.

Figure A.23 Delete Collateral Information-Building: This figure shows the screen to be used for deleting the selected collateral information, which is in the form of building.

Figure A.24 Delete Collateral Information-Security: This figure shows the screen to be used for deleting the selected collateral information, which is in the form of security.

Figure A.25 Delete Collateral Information-Deposit Account: This figure shows the screen to be used for deleting the selected collateral information, which is in the form of deposit account

Figure A.26 Delete Collateral Information-Personal Guarantee: This figure shows the screen to be used for deleting the selected collateral information, which is in the form of personal guarantee.

3.2.4 Report Design

All reports are designed so that all users can read and understand them easily. All reports are also designed to cover all relevant information needed by all relevant users. All report designs are presented in Appendix B. The descriptions of all report designs are as follows.

Figure B.1 Applicable Value Report: This report contains information about the applicable value of each collateral. This report is printed every month, and as requested.

Figure B.2 Collateral Report-Building: This report contains the information about the collateral that is in the type of building. This report is printed every month, and as requested by the users.

Figure B.3 Collateral Addition Report: This report contains information the collateral that is added to the collateral information system. This report is printed every month, and whenever there is any collateral information added into the collateral information system.

Figure B.4 Collateral Report: This report contains information about the collateral's detail, no matter of what type of collateral it is. This report is printed every 3 months, and as requested by the users.

Figure B.5 Collateral Deletion Report: This report contains the list of collateral of which information has been deleted. This report is usually printed every month, and whenever there is any collateral information deleted from the collateral information system, as well as when it is requested by the users.

Figure B.6 Collateral Update Report: This report contains the list of collateral of which information has been updated. This report is usually printed every month, and whenever there is any collateral information updated into the collateral information system. Also, this report may be printed as requested by the users.

Figure B.7 Collateral Report-Deposit Account: This report contains the information about the collateral, which is in the type of deposit account. This report is usually printed every month, and as requested by the users.

Figure B.8 High Volume Report: This report contains the collateral information of the customer who borrows money from the bank by the amount of more than 500 million Baht. This report is usually printed as requested by the users.

Figure B.9 Collateral Report-Land: This report contains the information about the collateral, which is in the type of land. This report is usually printed every month, and as requested by the users.

Figure B.10 Low Volume Report: This report contains the collateral information of the customer, who borrows money from the bank by the amount of between 100-499 million Baht. This report is usually printed as requested by the users.

Figure B.11 Medium Volume Report: This report contains the collateral information of the customer, who borrows money from the bank by the amount of less than 100 million Baht. This report is usually printed as requested by the users.

Figure B.12 Out-of-date Applicable-value Report: This report contains information about the collateral, of which the applicable-value has been already out-of-date, and must be re-calculated. This report is usually printed every week, and as requested by the users.

Figure B.13 Out-of-date Collateral-value Report: This report contains information about the collateral, of which the appraisal-value has already out-of-date, and must be re-calculated. This report is usually printed every week, and as requested by the users.

Figure B.14 Collateral Report-Personal Guarantee: This report contains information about the collateral, which is in the type of personal guarantee. This report is usually printed every month, and as requested by the users.

Figure B.15 Collateral Report-Security: This report contains information about the collateral, which is in the type of security. This report is usually printed every month, and as requested by the users.

Figure B.16 Uncovered Collateral-value Report: This report contains information about the collateral, of which the appraisal value is less than the borrowed amount (principal). This report is usually printed every month, and as requested by the users.

Figure B.17 User Report: This report contains information about the users who can access to the collateral information system. This report is usually printed as requested by the users.

Figure B.18 User Addition Report: This report contains the list of users whose information has been added from the collateral information system. This report is usually printed as requested by the users.

Figure B.19 User Deletion Report: This report contains the list of users whose information has been deleted from the collateral information system. This report is usually printed as requested by the users.

Figure B.20 User Update Report: This report contains the list of users whose information has been updated to the collateral information system. This report is usually printed as requested by the users.

3.3 Hardware and Software Requirements

This part is prepared for describing the specification of the hardware and software that are required to be used for implementing the developed system. Hardware and software requirement can be described as follows:

3.3.1 Hardware Requirements

- (1) Database File Server:
 - (a) Model: HP NetServer LH3 Rack
 - (b) CPU: Pentium III 500
 - (c) RAM: 128 MB ECC
 - (d) CD-ROM: 24X
 - (e) Array: NetRAID
 - (f) VGA Card Memory: 2 MB
 - (g) Network Interface Card: 10/100TX
 - (h) HDD Interface: Dual channel Ultra-2 SCSI
- (2) Personal Computer:
 - (a) Model: Compaq Presario 7500
 - (b) CPU: Intel Pentium III 500 MHz
 - (c) Memory: SDRAM 64 MB
 - (d) Hard disk: 13 GB
 - (e) VGA card: 2X AGP+3D Graphic
 - (f) Monitor: 15"
 - (g) CD-ROM: 40X
 - (h) Fax/Modem: 56K Fax/Modem V.90 INT
 - (i) Keyboard: 108 keys PS/2

- (3) UPS
 - (a) Model: Best Power LI3KS
 - (b) Power supply capability (VA): 3000
- (4) Printer
 - (a) Model: HP Laser jet 11000
 - (b) dpi: 600*600
 - (c) Speed: 8 pages per minute
 - (d) Parallel Port

3.3.2 Software Requirements

- (1) Microsoft Windows 98
- (2) Microsoft Office 2000

In order to provide a higher benefit to the bank, suitable hardware and software are to be acquired. Furthermore, the proposed system is to be designed to run on network environment so that all relevant users can access the collateral database through their own personal computers. At this moment, the bank has already installed the necessary network equipments throughout the building, so there is no need to worry about network equipments. The operating system to be used for the server is Microsoft Windows 98. Database will be developed on Microsoft Access 2000. Microsoft Access 2000 is preferable for the proposed system because it can be connected to SQL Server database. With the proposed system configuration, system security can also be enhanced through the use of passwords and users. Figure 3.10 (Network Configuration of the Proposed System) can provide a clearer description for the network configuration of the proposed system.

Currently, Radanakosin bank has already implemented Local Area Network (LAN). The network architecture of the existing system is LAN, setting peer to peer, in which a network node is capable of sending information directly to another network node without routing it through a central device. This type of network is easy to be set up. Each workstation can continually store and manage data even when there is something wrong with the network. In that case, though workstations will not be able to connect to each other, each workstation can still work individually. Figure 3.10 (Network Configuration of the Existing System) can provide the picture of the current network architecture. Network topology is a ring network, using an Ethernet LAN card as a network interface card, which allows a workstation to communicate with other workstations. The protocol of an existing system is TCP/IP. TCP/IP (Transmission Control Protocol) deals with construction of data packets. IP (Internet Protocol) will be responsible for routing them from machine to machine.

The network architecture of an existing system is a peer-to-peer configuration, so it is not suitable for supporting a centralized database. Also, it cannot serve database expansion in the future. Thus, the network architecture of the proposed system will be local area network (LAN), two-tiered client/server system, which is more flexible than a peer-to-peer system and is capable of supporting future expansion better than the existing system. The two-tiered client/server system is a set of client computers with which each sub-division is connected to one server computer through a cable over relatively short distances, and within a single department or the same floor of the building.

By doing this, the system will be able to store all information in the database server and distribute software applications and user interfaces to the client servers. The computers of each relevant working unit will be linked to the central database server, in order to retrieve data directly. In addition, they can share other resources such as laser printers, fax-modems, scanners, files, as well as other software and hardware. As the data is kept centrally, the data will be able to retain its integrity and always be updated.

Ring topology will be implemented for the network of the proposed system because it can connect multiple computers and some other peripheral equipment into ring-like structure. Ring networks generally transmit data in one direction; therefore many computers can transmit data at the same time. The network throughput can also be increased by Ethernet card. (see Figure 3.11 Network Configuration of the Proposed System).

Data architecture of the proposed system is a shared data resource. It is suitable to keep data in the form of a relational database. The database server will be used for controlling and managing the developed database, as well as facilitate the user for accessing to the database. Both input and output interface have been designed in the form the Graphical User Interfaces (GUIs), because users are more familiar with the graphical than primitive user interfaces. It is also easier for the users to key in data and access to the database, through Graphical User Interface (GUI).

Process architecture of the proposed system is Microsoft Access 2000. MS-Access 2000 will be used for developing the Collateral Information System for Radanakosin bank, because it is a very flexible and powerful software.

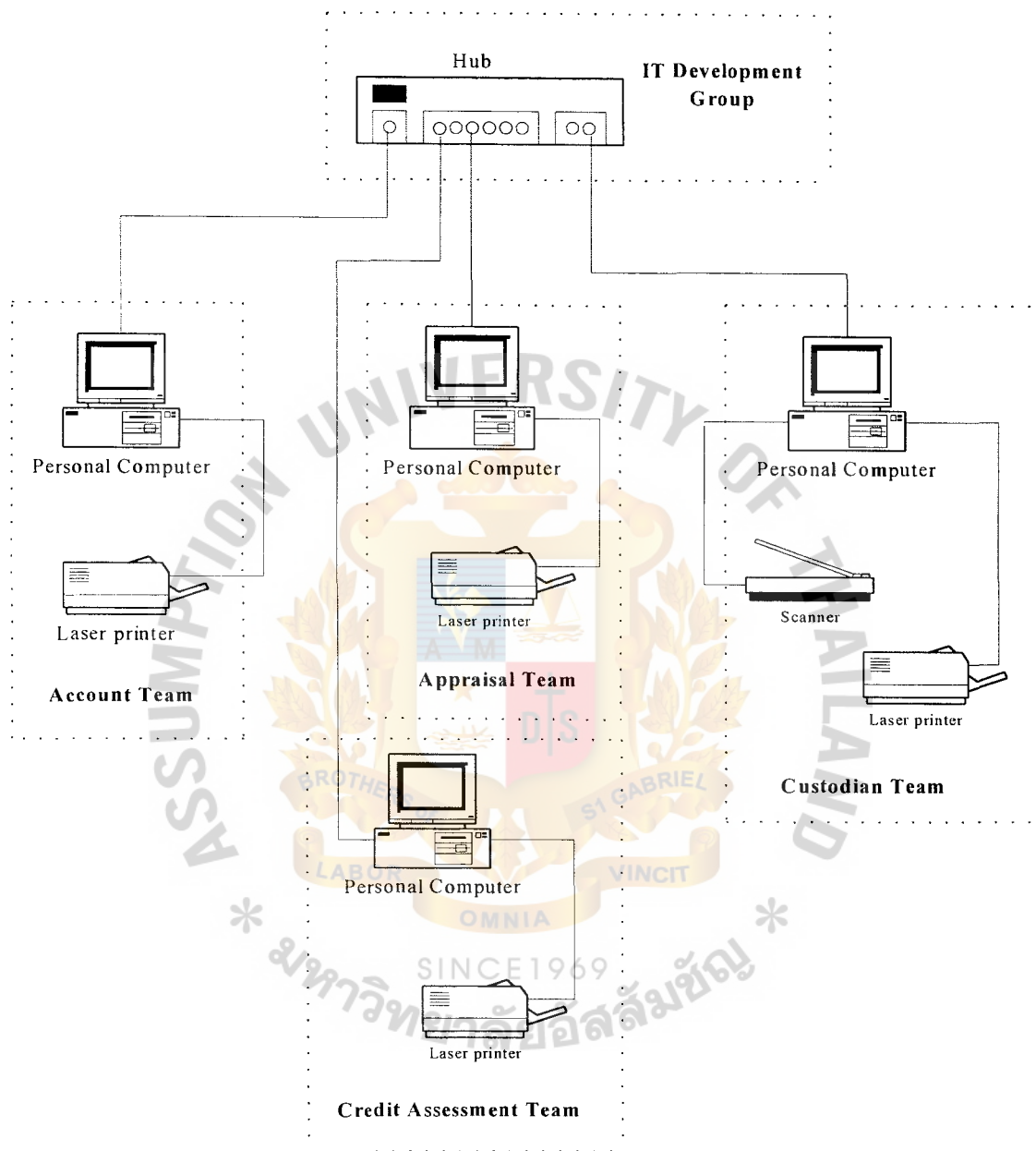


Figure 3.10. Network Configuration of the Existing System.

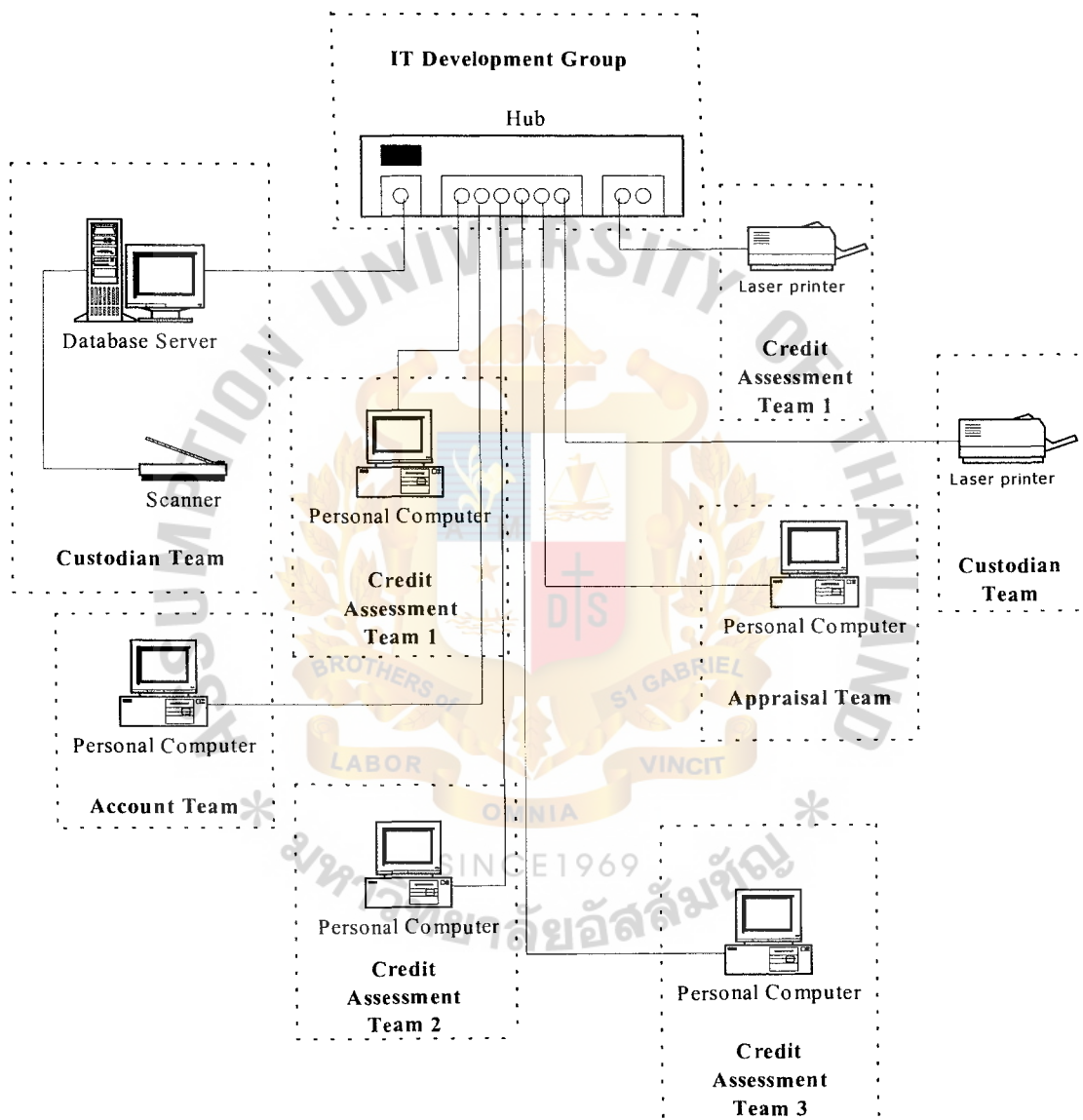


Figure 3.11. Network Configuration of the Proposed System.

3.4 Security and Control

As a matter of fact, information is very expensive and valuable. Especially for the banking business, collateral information is very crucial, and need to be carefully controlled. By this reason, there must be a good policy and procedure to promote system security and control. Basically, system security and control can be divided into Physical security and Logical security. Information about system security and control are provided in more details as follows:

3.4.1 Physical Security

(1) Uninterruptible Power Source (UPS)

UPS system serves as a control buffer between the external source and the computer system during the period of data transmission and program execution. In case that the external power source fails, the UPS system can help continue the operation for a period of time after electricity shortage. This allows the users to either “power off” their computers normally, or switch to any other back-up resource.

(2) Backup Facilities

Backup facilities may be used for the purpose of system security and control. Backup facilities can help ensure that the data files can be reconstructed if the master files were lost or some corruption has occurred. The application software and system software should be backed up to prevent loss or corruption when the system fails. Spare parts should be provided for replacing any damaged equipments. In the case that any computer hardware were damaged, there must be some spare parts to be used for replacement as soon as possible. This is done to prevent process interruption.

(3) System Maintenance

Server computer must be kept in a safety place. It should not be possible for any unauthorized person to be able to access the server. All network cable should be looked after carefully. Maintenance should be done periodically. This is done to prevent any damage that may occur to the network cable.

(4) Virus Protection

Computer viruses are software programs that attach themselves to another program in the computer memory or on a disk, and spread from one program to another. Viruses can damage data, cause computers to crash, display offending or annoying messages, or lie dormant until the time they are set to be “awaken”.

Computer viruses attack not only your computing environment, but also any other computing environment that you are contacting with. Computer viruses can attach themselves to the disks and files, and then propagate themselves throughout the disks and files. If the proper precaution has not been taken adequately, these viruses can plague your computing environment, resulting in information loss and hardware failure.

Anti-viruses software should be installed at all computers. They should be updated frequently, in order to be able to cope with the new version of viruses. Nowadays, there are several anti-virus programs such as McAfee Virus Scan, Norton Anti Virus, etc. McAfee Virus Scan program is the most popular one. McAfee program can detect, identify, and disinfect the found DOS and Windows computer viruses. The program can check the memory of the system and the data areas of the disks for virus infection. If it found a

known virus, in most cases, it will eliminate the virus and fully repair the infected programs to recover their original conditions. That is why McAfee Virus Scan has been selected for the proposed system.

(5) File Control

This is done to ensure that files are suitably stored, and also to limit the files from being accessed by any unauthorized persons. All files should be labeled externally and internally, and stored in a library when they are not in use. File cabinets should be locked after use. There must be a person who will be responsible for holding the keys to unlock all file cabinets. Unauthorized persons should not be able to gain access to the files being held.

3.4.2 Logical Security

(1) Password

All users must use their user ID and password for accessing the system. This is done to ensure that only the authorized users can sign onto the system and access the collateral information. The system should be able to log the date and time when users log on to and log off from the system. These log files can be reviewed by the system administrator to identify any unusual activity on the system, which may indicate attempted security breaches. If the data are sensitive, log file can be used for any retrospective investigation of unauthorized activity, and to find out the one who will be responsible for damage done to the collateral information. Different users should be assigned different modes of access, which will be varied according to their responsibilities and positions. Each user must change their password every

30 days, so that other persons will not be able to guess the password correctly.

(2) Systems Timeout

The systems should have a time limit for all users. If any users do not press any button on the keyboard within, says, 5 minutes, the system will be timed out automatically. This can help prevent other users from performing any illegal action on the collateral database after one user has already signed on to the system, and leave the system for a while.

(3) Data Encryption

The highly sensitive data may need higher level of protection than just an access denial. If an unauthorized user does gain access to the data, encryption can be used to deny his/her ability to use them. When the authorized user accesses the encrypted data, these data will be automatically decrypted and the user will be able to view the data in the readable format. The unauthorized user, who accesses the encrypted data without the use of encryption key, will receive only the cipher, or unreadable text. In order to understand the data, the unauthorized user needs to decrypt the data by trial and error method.

3.5 Cost /Benefit Analysis

3.5.1 Benefit Summary

Intangible Benefit

- (1) To be able to improve the work efficiency, which is the result of computerized processing.
- (2) To be able to facilitate the process of storing the collateral information.
- (3) To be able to facilitate the process of adding the new collateral information into the developed database.
- (4) To be able to facilitate the process of modifying the outdated collateral information that is stored in the collateral database.
- (5) To be able to facilitate the process of deleting the outdated collateral information into the developed database.
- (6) To ensure that the collateral information stored in the developed system is accurate and can be retrieved on a timely basis.
- (7) To ensure that the data integrity can be achieved from the developed system.
- (8) To be able to provide timely, and up-to-date information to support management decision.
- (9) To be able to reduce some redundant task.

Tangible Benefit

To make it easier for the readers to understand the tangible benefit calculation, the author would like to explain some assumptions to be used in the calculation.

For the ease of calculation, the average salary of each credit officer is approximated to be 25,000.00 Baht per month. The author assumes that each credit officer works for 4 weeks per month, 5 days per week, and eight hours per day. The daily salary can be found by dividing the monthly salary, which is equal to 25,000.00

Baht, by the number of working-day-per-month, which is equal to 20 days. The result is equal to 1,250.00 Baht per day. The hourly salary can be found by dividing the salary, which is equal to 1,250.00 Baht per day, by the working-hour-per-day, which is equal to 8 hours per day. The result will be equal to 156.25 Baht per hour. To facilitate the calculation, the author would like to approximate such a number to equal to 156.00 Baht. By implementing the proposed system, there will be no need to waste the time for finding any collateral information manually. The author notices that the time required for finding some collateral information manually is approximated to be half an hour per day. That is, for each month, the credit officer should be able to spend approximately 10 hours more to perform any other task. In conclusion, the bank would be able to save money by $94 \times 10 \times 25 = 39,000.00$ Baht per month. Currently, there are altogether 25 bank officers involved in this analyzed process.

Since the proposed system can help reduce the workload for each bank officer, the bank would be able to reduce the overtime expense. It is approximated that the overtime for each officer can be reduced by one hour per day. Bank officer usually works for approximately 10 hours of overtime per month. Currently, the overtime rate is 250.00 Baht per hour. In conclusion, the bank would be able to save the overtime cost by $250 \times 10 \times 25 = 62,500.00$ Baht.

With the developed system, the author forecast that the bank would be able to decrease the cost of office facility, cost of paper, and cost of documentation. In reality, it is quite difficult to calculate the exact amount of these expenses. To facilitate the cost-saving calculation, these amount of cost-saving would be guesstimated by the author. The author approximates that the cost saving for office-facility is 250 Baht per month per team, which is equal to 1,250.00 Baht per month. By office facility, the author intends to include office space, as well as other stationeries. The author approximates

that the cost saving for paper and documentation is equal to 1,250.00 Baht per month per team, which is equal to 6,250.00 Baht per month for all 5 teams. The benefit from cost saving is expected to increase by 15% each year. For candidate solution 1, the development team spends 4 months on developing the proposed system. For candidate solution 2, the development team spends 3 months on developing the proposed system. For candidate solution 3, the development team spends 6 months on developing the proposed system. You can see Table 3.8 for the Benefit Summary for the Proposed System.

3.5.2 Cost Summary

Development cost for the proposed system includes only the cost of hardware. Software has been already included in the hardware package. For the cost summary of three candidate solutions, please see Table 3.5, Table 3.6, and Table 3.7.

The proposed system also incurs the training and documentation cost. Training cost is approximated to be equal to 1,100.00 Baht per each attendant. There are altogether 25 attendants to get involved in the training session. So, the cost of training will be equal to 12,500.00 Baht. Documentation cost is approximated to be equal to 2,500 Baht totally.

System maintenance must be continually performed to ensure that the system still works smoothly. Of course, there is some cost involved. The operation and maintenance cost for the candidate solution 1, 2, and 3 is approximated to be equal to 7,000 Baht, 5,000.00 Baht, and 10,000 Baht per month. Operation and maintenance cost is expected to increase by 15% each year.

In order to facilitate the comparison between the cost of an existing system and the cost of the proposed system, the author also prepares Table 3.8 Comparison between the cost of operating an existing system and the cost of operating the proposed system.

Table 3.3. Cost Summary for the Candidate Solution 1, Baht.

Cost Items	No. of Unit	Total Cost
<u>Development Cost</u>		
Database File Server	1 unit	226,200.00
Personal Computer	25 units	1,147,500.00
UPS	1 unit	126,000.00
Printer	5 units	81,250.00
System Analyst's Salary	4 months	140,000.00
Programmer's Salary	4 months	160,000.00
Training and Documentation	-	400,000.00
Total Development Cost		2,280,950.00
<u>Other Cost</u>		
Operation and Maintenance Cost (first year)	per month	7,000.00

Table 3.4. Cost Summary for the Candidate Solution 2, Baht.

Cost Items	No. of Unit	Total Cost
<u>Development Cost</u>		
Database File Server	1 unit	226,200.00
Personal Computer	25 units	1,147,500.00
UPS	1 unit	126,000.00
Printer	5 units	81,250.00
System Analyst's Salary	3 months	105,000.00
Programmer's Salary	3 months	120,000.00
Training and Documentation	-	400,000.00
Total Development Cost		2,205,950.00
<u>Other Cost</u>		
Operation and Maintenance Cost (first year)	per month	5,000.00

Table 3.5. Cost Summary for the Candidate Solution 3, Baht.

Cost Items	No. of Unit	Total Cost
<u>Development Cost</u>		
Database File Server	1 unit	226,200.00
Personal Computer	25 units	1,147,500.00
UPS	1 unit	126,000.00
Printer	5 units	81,250.00
System Analyst's Salary	6 months	210,000.00
Programmer's Salary	6 months	240,000.00
Training and Documentation	-	400,000.00
Total Development Cost		2,430,950.00
<u>Other Cost</u>		
Operation and Maintenance Cost (first year)	per month	10,000.00

Table 3.6. Comparison between the Cost of Operating an Existing System and the Cost of Operating the Proposed System, Baht.

Cost Items	Existing System	Proposed System
Salary	375,000.00 per month	336,000.00 per month
Overtime Expense	11,250.00 per month	-
Cost of Office Facility	5,000.00 per month	3,750.00 per month
Cost of Paper and Documentation	25,000.00 per month	18,750.00 per month

Table 3.7. Benefit Summary for the Proposed System, Baht.

Type of Benefit	Amount
Cost-saving from reduced salary expense.	39,000.00
Cost-saving from reduced overtime salary expense.	62,250.00
Cost-saving from reduced office-facility expense.	1,250.00
Cost-saving from reduced expense on paper and documentation	6,250.00



3.5.3 Payback Analysis

In the practice of capital budgeting, payback period is the length of time needed to recoup the cost of a capital investment (or an initial investment). Theoretically, the payback period is the ratio of initial investment (cash outlay) to the annual cash inflows for the recovery period.

To be sufficient for analyzing payback period, all cash flow should be discounted to the present time. It should be these discounted cash flows that will be sufficient for calculating payback period.

Referred to Table 3.10, Table 3.11, and Table 3.12, all cash flows are discounted to the present time at the current cost of capital (that is usually the interest rate). It is these discounted cash flows that will be used for calculating the payback period.

Payback period can be calculated by the following formula:

$$P = I / (1-T)*R$$

where: I = Investment

T = Corporate tax rate (which is equal to 12% for this case)

R = Annual saving from investment

The benefit derived from operating the new system is approximated to increase by 15% each year. The discount factor, which is used for calculating the present value, is equal to 12%. The initial investment costs (development cost) for the three candidate solutions are 844,950.00 Baht, 800,950.00 Baht, and 920,950.00 Baht consecutively. After system implementation, there will be some operation and maintenance cost incurred. The operation and maintenance are required so that the proposed system will be able to work smoothly. The annual operation and maintenance cost for the three candidate solutions are initially approximated to be equal to 84,000.00 Baht, 60,000.00 Baht, and 120,000.00 Baht consecutively, and is approximated to increase by 15% each

year. Benefit derived from the new system tends to increase by the same percentage each year.

The payback period can be calculated for each candidate solution as follows:

Candidate Solution 1

$$\begin{aligned} P &= 2,280,950 / [(1-0.12) * 1,308,000] \\ &= 2,280,950 / 1,151,040 \\ &= 1.98, \text{ or 2 years approximately} \end{aligned}$$

In conclusion, it can be said that it takes approximately 24 months for the proposed system, which is developed by the candidate solution 1, to recoup all the development costs.

Candidate Solution 2

$$\begin{aligned} P &= 2,205,950 / [(1-0.12) * 1,308,000] \\ &= 2,205,950 / 1,151,040 \\ &= 1.92, \text{ or 1 year and 11 months approximately} \end{aligned}$$

In conclusion, it can be said that it takes approximately 23 months for the proposed system, which is developed by the candidate solution 2, to recoup all the development costs.

Candidate Solution 3

$$\begin{aligned} P &= 2,430,950 / [(1/0.12) * 1,308,000] \\ &= 2,430,950 / 1,151,040 \\ &= 2.11, \text{ or 2 years and 1 month approximately} \end{aligned}$$

In conclusion, it can be said that it takes approximately 25 months for the proposed system, which is developed by the candidate solution 3, to recoup all the development costs.

Figure 3.12 is the graphical demonstration of the payback analysis of candidate solution #1. Figure 3.13 is the graphical demonstration of the payback analysis of candidate solution #2. Figure 3.14 is the graphical demonstration of the payback analysis for candidate solution #3.



Table 3.8. Payback Analysis for the Candidate Solution 1, Baht.

Cost Items	Years					
	0	1	2	3	4	5
Development Cost	-2,280,950					
Operation & Maintenance Cost		-84,000	-96,600	-111,000	-127,754	-146,917
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost	-2,280,950	-75,012	-76,990	-79,096	-81,252	-83,302
Cumulative Time-adjusted Cost over Lifetime	-2,280,950	-2,355,962	-2,432,952	-2,512,048	-2,593,300	-2,676,602
Benefits derived from Operation of New System	0	1,308,000	1,504,200	1,729,830	1,989,305	2,287,700
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost	0	1,168,044	1,198,847	1,231,639	1,265,198	1,297,126
Cumulative Time-adjusted Benefit over Lifetime	0	1,168,044	2,366,891	3,598,530	4,863,728	6,160,854
Cumulative Lifetime Time-adjusted Cost + Benefit	-2,280,950	-1,187,918	-66,061	1,086,482	2,270,428	3,484,252

Table 3.9. Payback Analysis for the Candidate Solution 2, Baht.

Cost Items	Years				
	0	1	2	3	4
Development Cost	-2,205,950				
Operation & Maintenance Cost		-60,000	-69,000	-79,350	-91,253
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636
Time-adjusted Cost	-2,205,950	-53,580	-54,993	-56,497	-58,037
Cumulative Time-adjusted Cost over Lifetime	-2,205,950	-2,259,530	-2,314,523	-2,371,020	-2,429,057
Benefits derived from Operation of New System	0	1,308,000	1,504,200	1,729,830	1,989,305
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636
Time-adjusted Cost	0	1,168,044	1,198,847	1,231,639	1,265,198
Cumulative Time-adjusted Benefit over Lifetime	0	1,168,044	2,366,891	3,598,530	4,863,728
Cumulative Lifetime Time-adjusted Cost + Benefit	-2,205,950	-1,091,486	52,368	1,227,510	2,434,671
					3,672,295

Table 3.10. Payback Analysis for the Candidate Solution 3, Baht.

Cost Items	Years					
	0	1	2	3	4	5
Development Cost	-2,430,950					
Operation & Maintenance Cost		-120,000	-138,000	-158,700	-182,505	-209,881
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost	-2,430,950	-107,160	-109,986	-112,994	-116,073	-119,003
Cumulative Time-adjusted Cost over Lifetime	-2,430,950	-2,538,110	-2,648,096	-2,761,090	-2,877,163	-2,996,166
Benefits derived from Operation of New System	0	1,308,000	1,504,200	1,729,830	1,989,305	2,287,700
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost	0	1,168,044	1,198,847	1,231,639	1,265,198	1,297,126
Cumulative Time-adjusted Benefit over Lifetime	0	1,168,044	2,366,891	3,598,530	4,863,728	6,160,854
Cumulative Lifetime Time-adjusted Cost + Benefit	-2,430,950	-1,370,066	-281,205	837,410	1,986,565	3,164,688

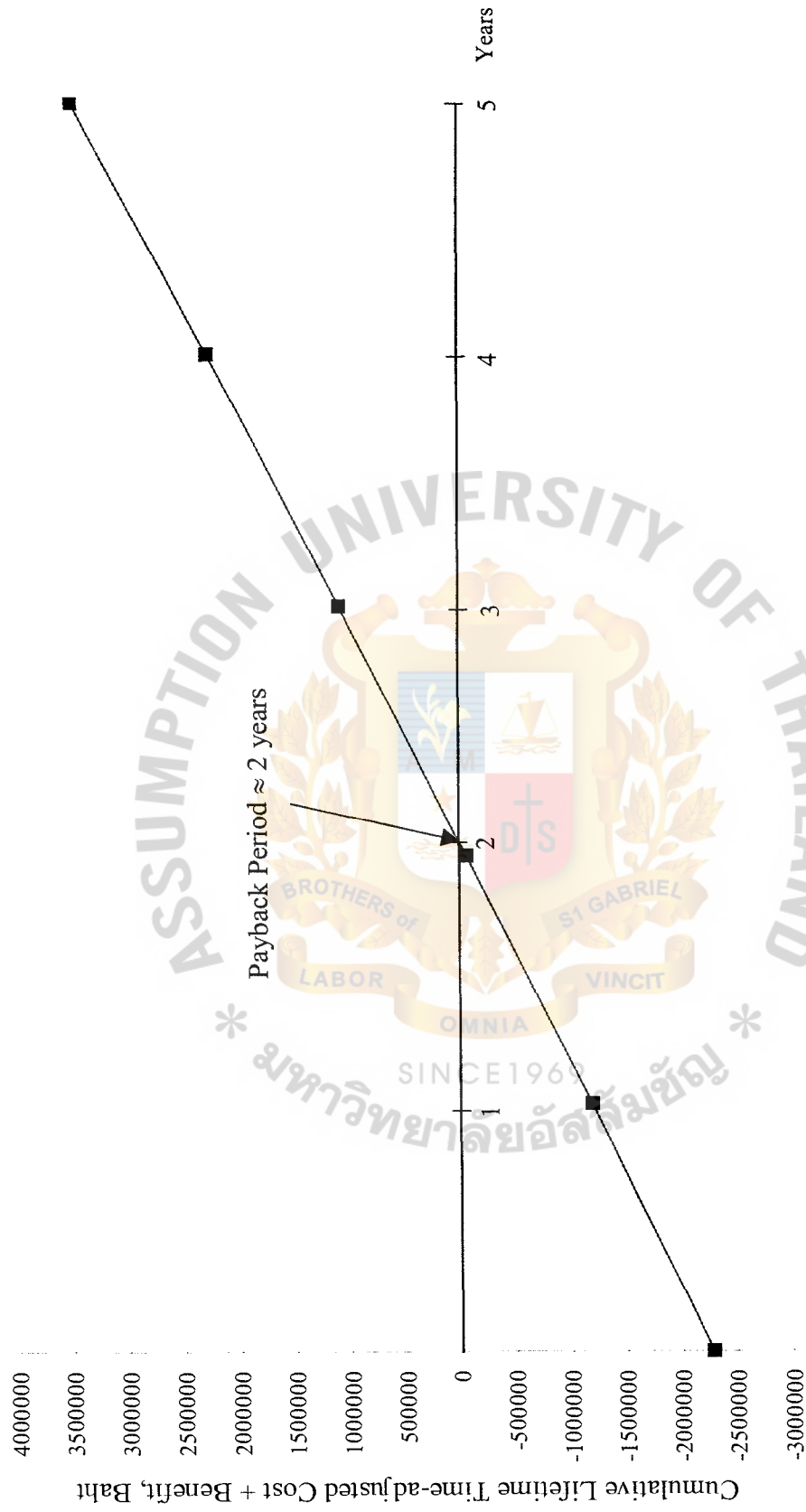


Figure 3.12. Payback Analysis for Candidate Solution 1.

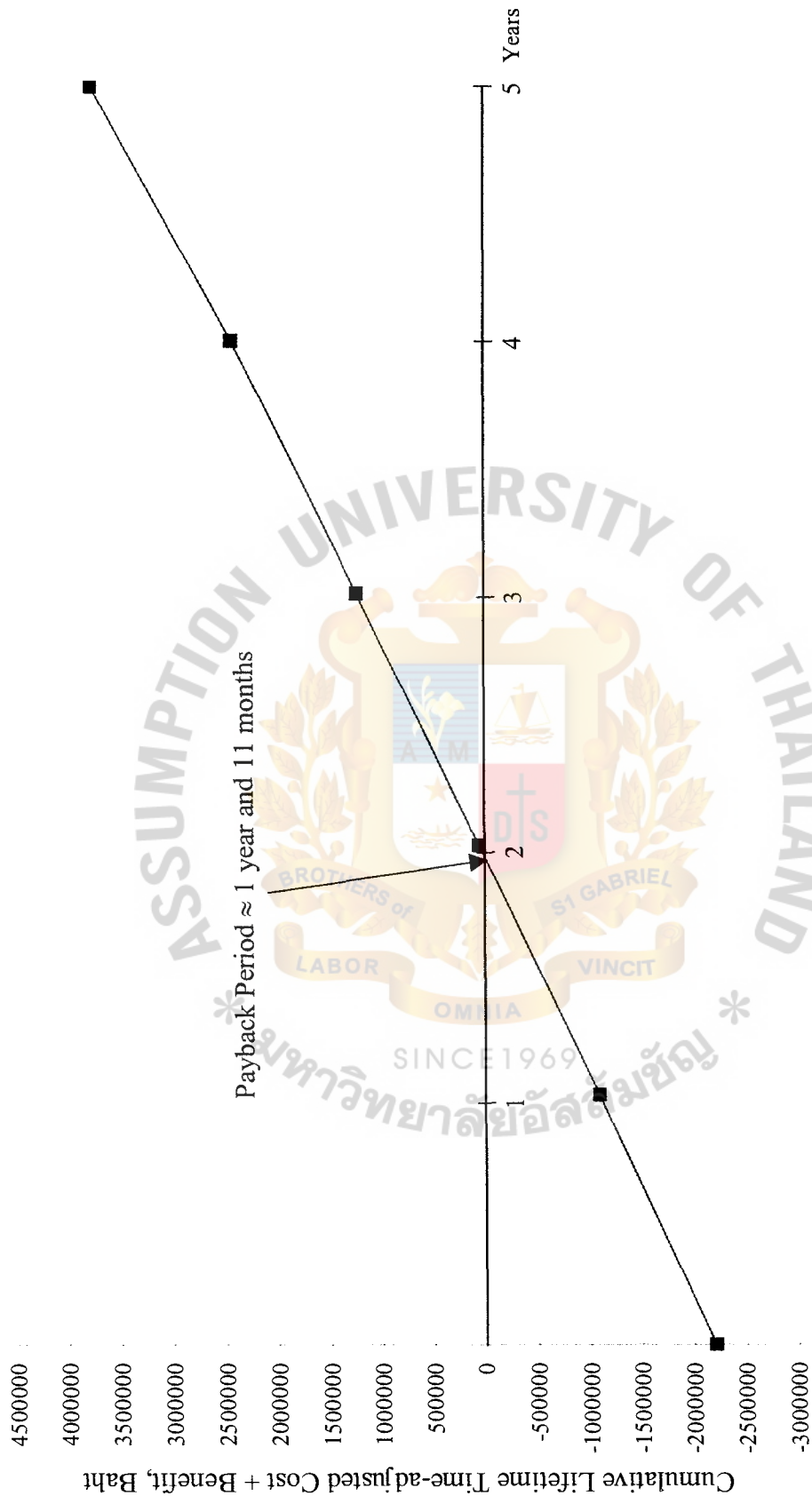


Figure 3.13. Payback Analysis for Candidate Solution 2.

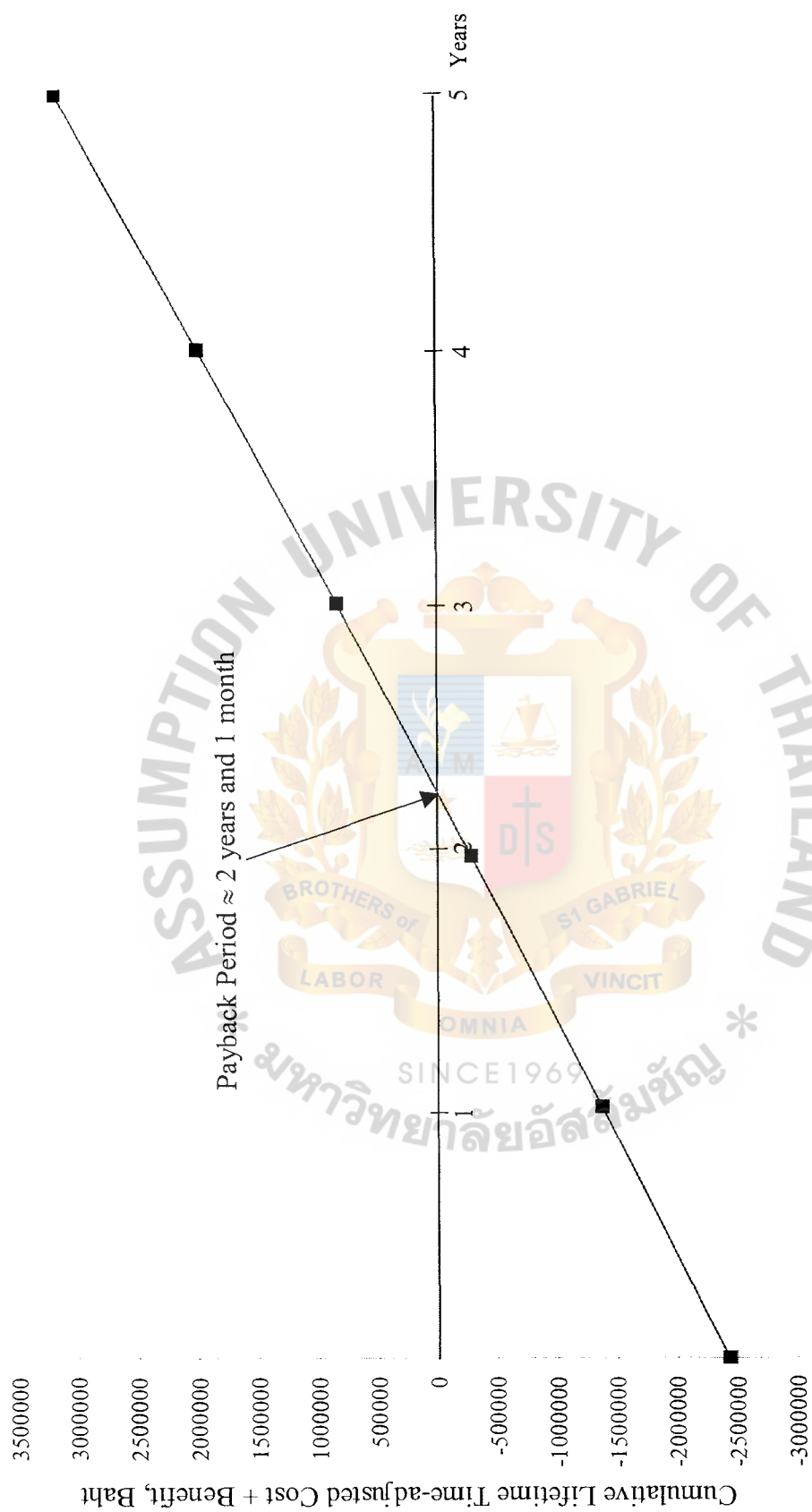


Figure 3.14. Payback Analysis for Candidate Solution 3.

3.5.4 Net Present Value

Net Present Value can be calculated by subtracting the project's initial investment cost from the present value of its cash inflows, which are discounted at a rate, which is usually equal to the firm's cost of capital. The decision criterion when Net Present Value is used to make accept-reject decisions is as follows: if Net Present Value is greater than 0.00 Baht, accept the project; if Net Present Value is less than 0.00 Baht, reject the project. If Net Present Value is greater than zero, the firm will earn a return that is greater than their cost of capital, and the project should be approved for development. The proposed system is expected to have 5 years of useful life. After 5 years, the system should be revised and reconstructed. Table 3.13 shows the net present value for candidate solution # 1. Table 3.14 shows the net present value for candidate solution # 2. Table 3.15 shows the net present value for candidate solution # 3. Theoretically, these values imply that all candidate solutions are eligible to be developed because all of them can generate positive Net Present Value, and, of course, generate some benefits for the bank.

Table 3.11. Net Present Value for the Candidate Solution 1, Baht.

Cost Items	Years					
	0	1	2	3	4	5
Development Cost	-2,280,950					
Operation & Maintenance Cost		- 84,000	-96,600	-111,000	-127,754	-146,917
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost	-2,280,950	-75,012	-76,990	-79,096	-81,252	-83,302
Cumulative Time-adjusted Cost over Lifetime	-	-	-	-	-	-2,676,602
Benefits derived from Operation of New System	0	1,308,000	1,504,200	1,729,830	1,989,305	2,287,700
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost	0	1,168,044	1,198,847	1,231,639	1,265,198	1,297,126
Cumulative Time-adjusted Benefit over Lifetime	-	-	-	-	-	6,160,854
Cumulative Lifetime Time-adjusted Cost + Benefit	-	-	-	-	-	3,484,252

Table 3.12. Net Present Value for Candidate Solution 2, Baht.

Cost Items	Years					
	0	1	2	3	4	5
Development Cost	-2,205,950					
Operation & Maintenance Cost		-60,000	-69,000	-79,350	-91,253	-104,941
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost	-2,205,950	-53,580	-54,993	-56,497	-58,037	-59,502
Cumulative Time-adjusted Cost over Lifetime	-	-	-	-	-	-2,488,559
Benefits derived from Operation of New System	0	1,308,000	1,504,200	1,729,830	1,989,305	2,287,700
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost	0	1,168,044	1,198,847	1,231,639	1,265,198	1,297,126
Cumulative Time-adjusted Benefit over Lifetime	-	-	-	-	-	6,160,854
Cumulative Lifetime Time-adjusted Cost + Benefit	-	-	-	-	-	3,672,295

Table 3.13. Net Present Value for the Candidate Solution 3, Baht.

Cost Items	Years					
	0	1	2	3	4	5
Development Cost	-2,430,950					
Operation & Maintenance Cost		-120,000	-138,000	-158,700	-182,505	-209,881
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost	-2,430,950	-107,160	-109,986	-112,994	-116,073	-119,003
Cumulative Time-adjusted Cost over Lifetime	-	-	-	-	-	-2,996,166
Benefits derived from Operation of New System	0	1,308,000	1,504,200	1,729,830	1,989,305	2,287,700
Discount Factor (12%)	1.00	0.893	0.797	0.712	0.636	0.567
Time-adjusted Cost	0	1,168,044	1,198,847	1,231,639	1,265,198	1,297,126
Cumulative Time-adjusted Benefit over Lifetime	-	-	-	-	-	6,160,854
Cumulative Lifetime Time-adjusted Cost + Benefit	-	-	-	-	-	3,164,688

3.5.5 Feasibility Analysis

Referred to Table 3.14 (Feasibility Analysis Matrix for Three Candidate Solutions), candidate solution 2 gets the highest total score, which is equal to 90. It gets the highest score for operational feasibility, technical feasibility, economical feasibility, as well as schedule feasibility. Also, candidate solution 2 incurs the lowest development cost, takes the shortest period of time to recoup all development costs, and also has the highest net present value. By this reason, it can be concluded that candidate solution 2 is the most feasible solution to be used for developing the proposed system. Please see Table 3.16 and Table 3.17 (Feasibility Analysis Matrix for Three Candidate Solutions) for more details about all of the three candidate solutions.



Table 3.14. Feasibility Analysis Matrix for the Three Candidate Solutions.

Feasibility Criteria	Weight	Candidate 1	Candidate 2	Candidate 3
<u>Operational Feasibility</u> Functionality. A description of to what degree the candidate would benefit the organization and how well the system would work. Political. A description of how well received this solution would be from user, management, and organization perspective.	30 %	This solution can support the work processing of the credit officers, accountants, as well as any other related working unit. Score: 90	This solution can support the working process of the credit officers, accountants, as well as any other related working unit. Score: 90	This solution can support the working process of the credit officers, accountants, as well as any other related working unit. Score: 90
<u>Technical Feasibility</u> Technology. An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate. Expertise. An assessment of the technical expertise needed to develop, operate, and maintain the candidate solution	30 %	Programmers are capable of developing Microsoft Visual Basic application, and it has already been mature enough to be used for developing the proposed system. Score: 80	Bank's officers are so familiar with Microsoft Access, so it will be very easy for use. MS-Access has already been mature enough. Score: 90	Programmers have only some basic knowledge of MS-FoxPro. So, they may take some period of time to learn how to use this application. Score: 75

Table 3.14. Feasibility Analysis Matrix for the Three Candidate Solutions (Continued).

Feasibility Criteria	Weight	Candidate 1	Candidate 2	Candidate 3
<u>Economic Feasibility</u> Development Cost Payback Period (discounted) Net Present Value Detailed Calculation	30%	2,280,950 Baht 24 months 3,484,252 Baht Table 3.8, and Table 3.11 <u>Score: 80</u>	2,205,950 Baht 23 months 3,672,295 Baht Table 3.9, and Table 3.12 <u>Score: 90</u>	2,430,950 Baht 25 months 3,164,688 Baht Table 3.10, and Table 3.13 <u>Score: 70</u>
<u>Schedule Feasibility</u> An assessment of how long the solution will take to design and implement.	10%	4 months <u>Score: 80</u>	3 months <u>Score: 90</u>	6 months <u>Score: 70</u>
	100 %	Total Score: 83	Total Score: 90	Total Score: 77.50

3.5.6 System Cost Analysis

(1) Cost of Existing System

Table 3.15. Existing System Cost Analysis, Baht.

Cost Items	Years				
	1	2	3	4	5
<u>Development Cost</u>					
Typewriter 5 units@15,000	75,000.00	-	-	-	-
Calculator 25 units@1,000	25,000.00	-	-	-	-
Total Development Cost	100,000.00	-	-	-	-
<u>Operating Cost</u>					
Operation & Maintenance Cost	60,000.00	69,000.00	79,350.00	91,253.00	104,941.00
Salary	4,500,000.00	5,175,000.00	5,951,250.00	6,843,938.00	7,870,529.00
Overtime Expense	135,000.00	155,250.00	178,538.00	205,319.00	236,117.00
Utility Cost	60,000.00	69,000.00	79,350.00	91,253.00	104,941.00
Cost of Paper & Documentation	300,000.00	345,000.00	396,750.00	456,263.00	524,702.00
Total Operating Cost	5,055,000.00	5,813,250.00	6,685,238.00	7,688,026.00	8,841,230.00
Total Cost	5,155,000.00	5,813,250.00	6,685,238.00	7,688,026.00	8,841,230.00

Table 3.16. Five Years Accumulated Existing System Cost, Baht.

Year	Total Existing System Cost	Accumulated Cost
1	5,155,000.00	5,155,000.00
2	5,813,250.00	10,968,250.00
3	6,685,238.00	17,653,488.00
4	7,688,026.00	25,341,514.00
5	8,841,230.00	34,182,744.00
Total	34,182,744.00	-

(2) Cost of Proposed System

Table 3.17. Proposed System Cost Analysis, Baht.

Cost Items	Years				
	1	2	3	4	5
Hardware Cost					
Database File Server 1 unit	70,000.00	70,000.00	70,000.00	70,000.00	70,000.00
PC 25 units @ 25,000	229,500.00	229,500.00	229,500.00	229,500.00	229,500.00
UPS 1 unit	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
Printer 5 units @ 16,250	16,250.00	16,250.00	16,250.00	16,250.00	16,250.00
Peopleware Cost					
System Analyst's Salary	105,000.00	-	-	-	-
Programmer's Salary	120,000.00	-	-	-	-
Training & Documentation	200,000.00	-	-	-	-
Total Development Cost	780,750.00	355,750.00	355,750.00	355,750.00	355,750.00
Operating Cost					
Operating & Maintenance Cost	60,000.00	69,000.00	79,350.00	91,253.00	104,941.00
Salary	4,218,000.00	4,850,700.00	5,578,305.00	6,415,051.00	7,377,309.00
Utility Cost	45,000.00	51,750.00	59,513.00	68,440.00	78,706.00
Cost of Paper & Documentation	225,000.00	258,750.00	297,563.00	342,197.00	393,527.00
Total Operating Cost	4,548,000.00	5,230,200.00	6,014,731.00	6,916,941.00	7,954,483.00
Total Cost	5,949,500.00	5,585,950.00	6,370,481.00	7,272,691.00	8,310,233.00

Table 3.18. Five Years Accumulated Proposed System Cost, Baht.

Year	Total Proposed System Cost	Accumulated Cost
1	5,168,750.00	5,168,750.00
2	5,585,950.00	10,754,700.00
3	6,370,481.00	17,125,181.00
4	7,272,691.00	24,397,872.00
5	8,310,233.00	32,708,105.00
Total	31,471,305.00	-

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

Table 3.19. Comparison of the System Costs, Baht.

Year	Accumulated Existing System Cost	Accumulated Proposed System Cost
1	5,155,000.00	5,168,750.00
2	10,968,250.00	10,754,700.00
3	17,653,488.00	17,125,181.00
4	25,341,514.00	24,397,872.00
5	34,182,744.00	32,708,105.00



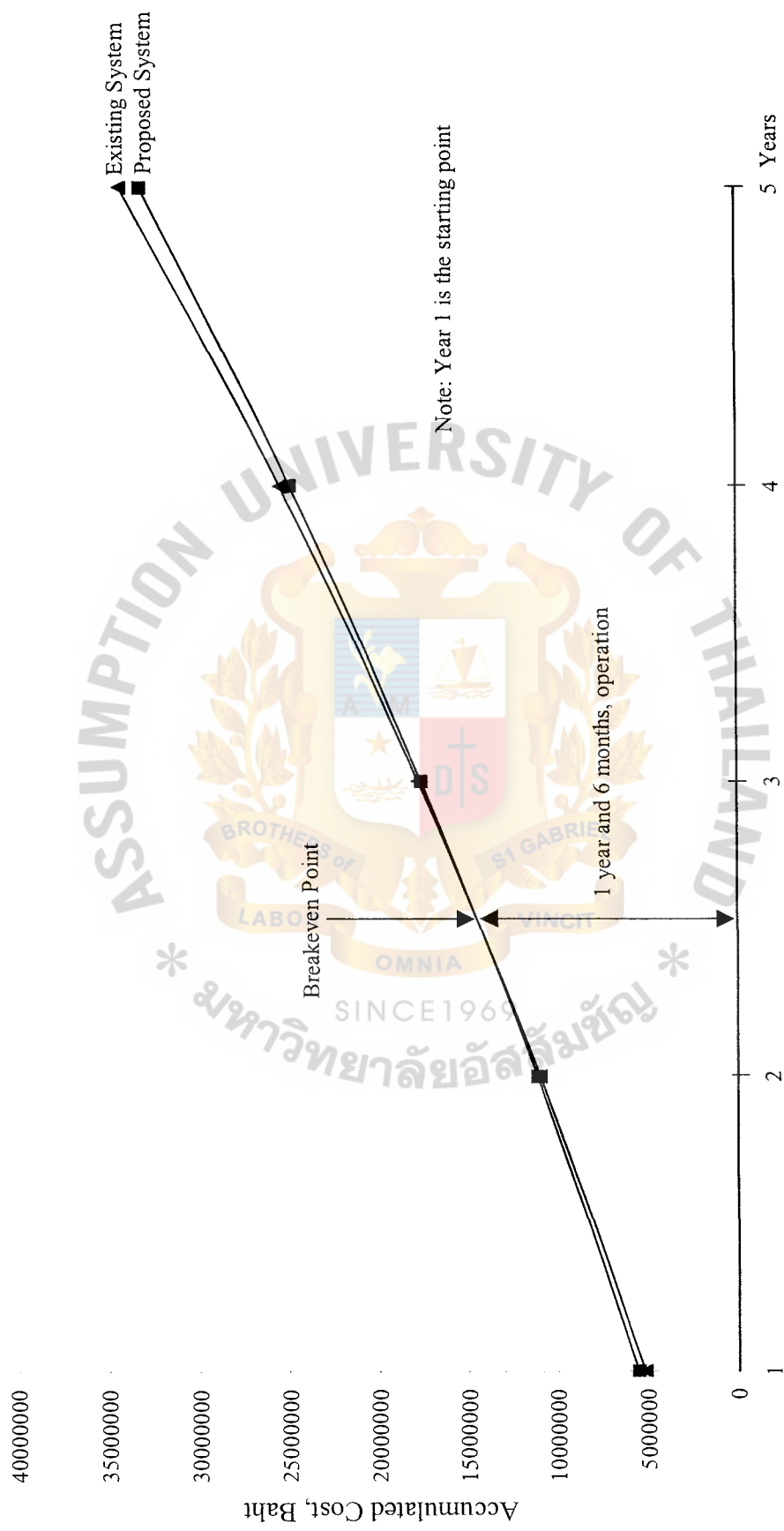


Figure 3.15. Graphical Demonstration of the Breakeven Point.

IV. PROJECT IMPLEMENTATION

4.1 Overview of Project Implementation

As referred to the Gantt chart (Figure 1.1 on page 5), this project has been started on October 1st, 2000, and will be completed on January 31st, 2001. The project implementation process can be divided into several tasks, which include system analysis, details analysis & design, implementation, training, and conversion. These tasks can be described in details as follows:

System Analysis

The activity to be performed during this phase involves the process of gathering the information about an existing system. The flow of data through the existing system will be studied in details. The way that data are kept in an existing system will be carefully analyzed. Data Flow Diagram will be prepared for providing a clearer picture of such an existing system. Once the existing system has been completely studied in details, problem of the existing system will be identified, and the area of improvement can be developed.

Details Analysis and Design

After completing the part of system analysis, the new system can be designed to solve the problems that are uncovered during the system analysis phase. Workflow of the existing system will be redesigned, with the aim of solving the problems created by the existing system. New data flow diagram will be created for the proposed system. Together with the data flow diagram, data dictionary will be created for a better understanding of the diagram, as well as the workflow. Structure chart will also be developed with the aim of facilitating the work of programmers. Data modeling will be designed, and will be used for developing the database. The relationship among all data

in the database will be designed to the best relation. User's interface will be designed in such a way that it is easy and convenient for the users to work with the developed system.

Implementation

This is the crucial task required by this project. It is to implement all designs to be workable in reality. The implementation part consists of many works to be done, such as pseudo-code creation, programming, screen layout, report layout, data conversion, testing, adjusting and documentation.

Documentation

All paper work, that is to be created during this project, must be kept for future reference. These documents will be very useful when there is a need to modify the system in the future.

Training

Training should be done before the developed system is to be used by any users. All users will have to get involved in this process. User manual must be prepared for all users. In practice, this task is to be performed by the Training Center of the bank. The user training usually involves:

- (1) Equipment use(if required)
- (2) Equipment troubleshooting (if required)
- (3) Application familiarization
- (4) Data capturing and Data handling
- (5) Addition of records/ Deletion of records/ Modification of records
- (6) Information retrieval
- (7) Information utilization
- (8) System access

4.2 Test Plan

Testing includes verification of the basic logic of each program, as well as the effectiveness of the entire system. It is absolutely important to be sure that the system can work correctly, before it is to be installed. The programmers should be responsible for basic test of the developed system. The testing process should be performed incrementally in conjunction with the system implementation. The testing process usually consists of the following five stages.

- (1) Unit Testing: Individual components will be tested to ensure that they can operate correctly. Unit testing treats each component as a stand-alone entity that does not need other components for its operation. This process is initially performed by the programmer, who codes that tested components.
- (2) Module Testing: A module is a collection of dependent components such as an object or some looser collection of procedures and functions. A module encapsulates related components so that they can be tested without other system modules.
- (3) Sub-system Testing: This phase involves testing each collection of modules that have been integrated into sub-systems. Sub-systems may be independently designed and implemented. The most common problems, that are usually uncovered, are sub-system interface mismatches. The sub-system test process should concentrate on the detection of interface errors by rigorously exercising these interfaces.
- (4) System Testing: The sub-systems will be integrated to make up the entire system. This testing process is concerned with finding out the errors, which is normally the result of unanticipated interactions between sub-systems and

components. It is also concerned with validating that the system meets its functional and non-functional requirements.

- (5) Acceptance Testing: This is the final stage of the testing process, which is to be done before the developed system will be accepted for operational use. This involves testing the system with data supplied by the system procurer, rather than simulated data developed as a part of the testing process. Acceptance testing often reveals some errors and omissions in the system requirements definition. The requirements may not reflect the actual facilities and performance required by the user and testing may demonstrate that the system does not exhibit the anticipated performance and functionality.



V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Currently, there are many problems occurring with the bank's working process. One problem is the amount of time required for accessing the required collateral information. This could make the working efficiency of the bank officers to be lower than what it should be. Information loss is the other serious problem of the current working process. Inconsistent collateral information is the other problem that has to be solved. Sometimes, even if the information can be captured on a timely basis, yet the information may contain some errors. As a result, the captured information may be useless because of the error attached. These problems also create some difficulties in decision making for the management team.

In order to solve the aforesaid problem, the system development team has been set up to be responsible for developing the collateral information system for the bank. Workflow of the current system has been analyzed in detail, and the problem has been uncovered. Solutions to the uncovered problem have been discovered and proposed to the management team for their approval. Upon approval, the system development team discussed with the relevant users, in order to know their requirements on the to-be-developed system. Then, the new workflow will be designed to provide higher working efficiency. Database will be designed and normalized to the third normal form. Input screens are designed and developed so that it would be very easy and convenient for the users to input, update, or delete the collateral information. Report are designed so that it would be in an understandable format, and also contain the required and complete information. Security and control policy is also developed for the proposed system. After the system is completely developed, it is tested to make sure that it would be able

to work smoothly. Users are trained to be able to use the developed system smoothly and correctly.

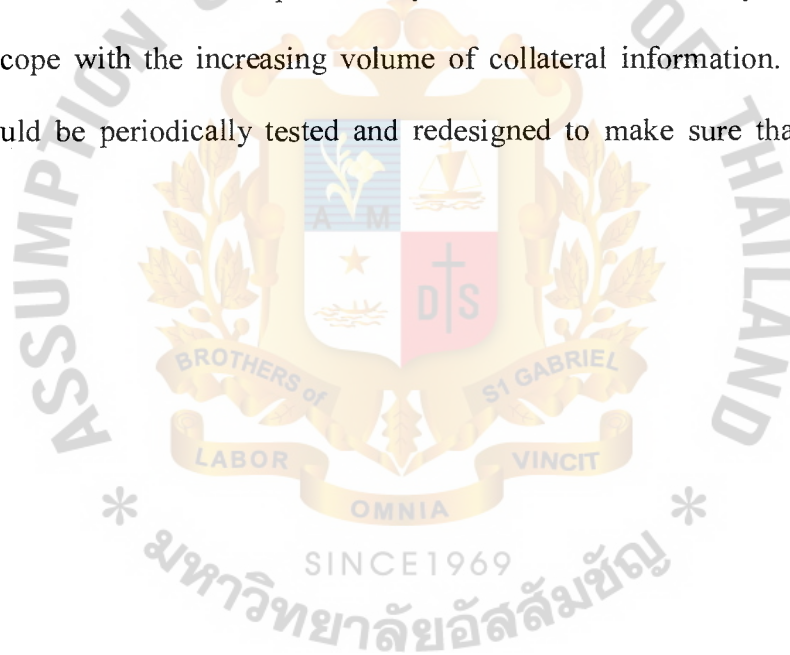
Though the investment cost of the new system is quite high, the operation cost will be much less expensive than that of the current system in the very near future. That is, all investment cost will be recouped within 2 years after system implementation. Table 5.1 could provide the information about how the proposed can save the work processing time. Because the collateral information is kept in the computerized system, credit officers can spend less time on the inquiry process. With the existing system, credit officers must spend 1 hour on the inquiry process. With the proposed system, credit officers can spend only 10 minutes on the process. Report preparation process is also facilitated by the proposed system. With the proposed system, credit officers spend only 5 minutes on printing the report. On the other hand, with the existing system, they have to spend 30 minutes on the same process. Information update process is also facilitated by the proposed system. With the proposed system, credit officers spend only 20 minutes on updating the collateral information. But, with the existing system, they have to spend 2 hours and 30 minutes on performing the same task.

Table 5.1. Degree of Achievement of the Proposed System.

Process	Existing System	Proposed System
Inquiry Process	1 hour	10 minutes
Report Preparation Process	30 minutes	5 minutes
Information Update	1 hour	20 minutes
Total	2 hours and 30 minutes	35 minutes

5.2 Recommendations

The developed system is said to be a stepping-stone toward computerization for the bank's working process. In the future, this system should be expanded and connected to other systems operating within the bank. Moreover, the new system should be further developed to operate on the e-commerce platform. This system should be a part of the bank's website. That is, it should be possible for the users to access to the collateral information system, regardless of where they are. Also, it should be possible for the users to print any report from anywhere that has an access the Internet application. Database should be periodically revised and, if necessary, redesigned. This is done to cope with the increasing volume of collateral information. The developed system should be periodically tested and redesigned to make sure that it still works smoothly.





APPENDIX A

INPUT DESIGN

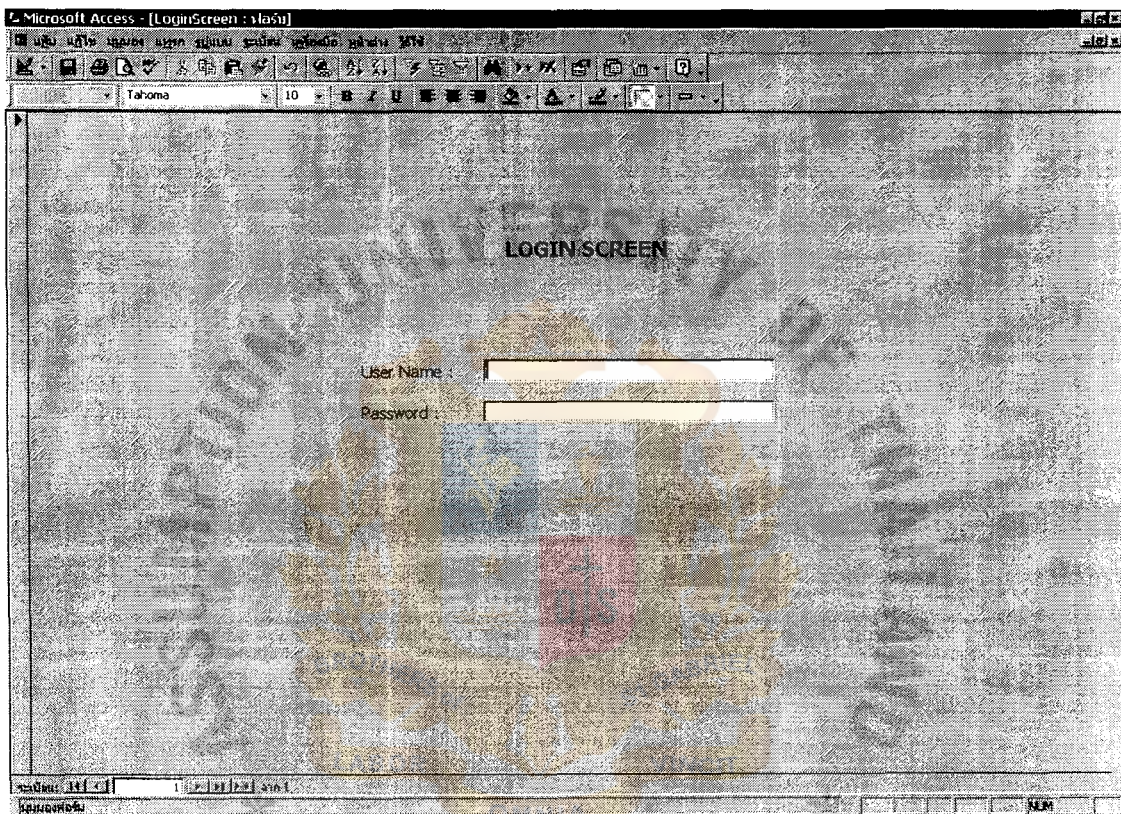


Figure A.1. Login Screen.

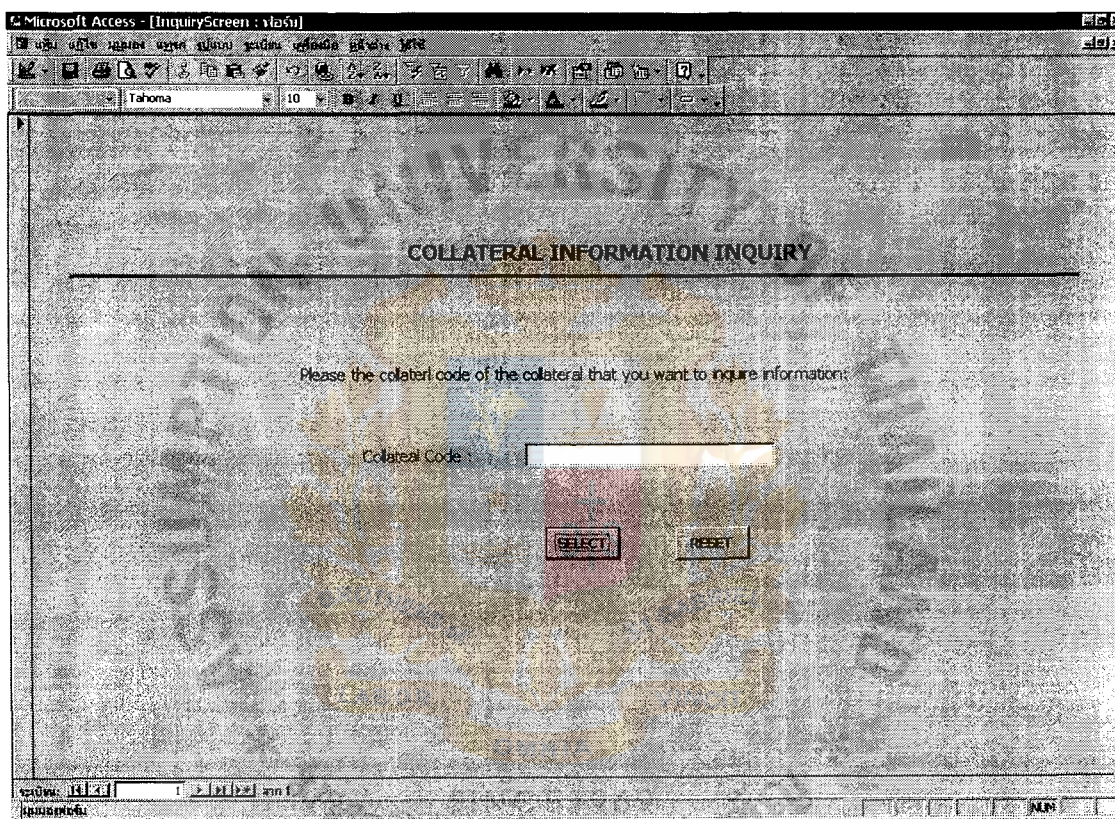


Figure A.2. Collateral Information Inquiry Screen.

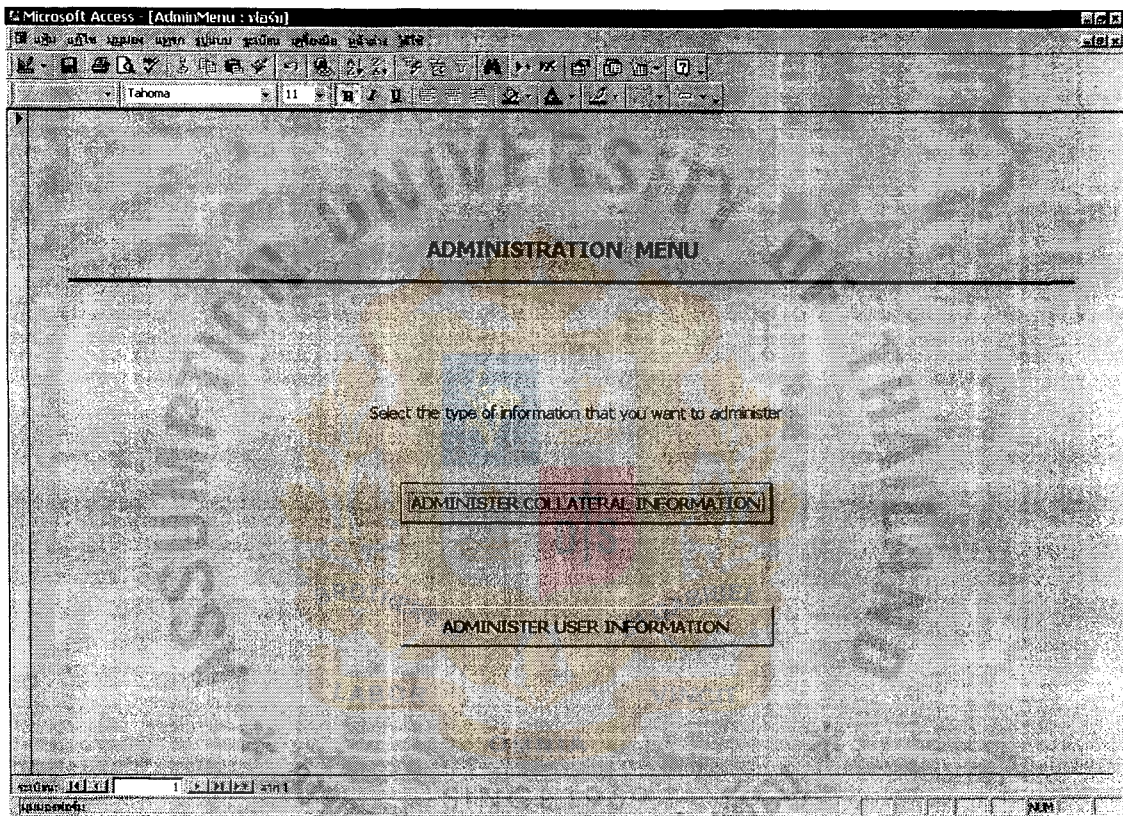


Figure A.3. Administration Menu Screen.

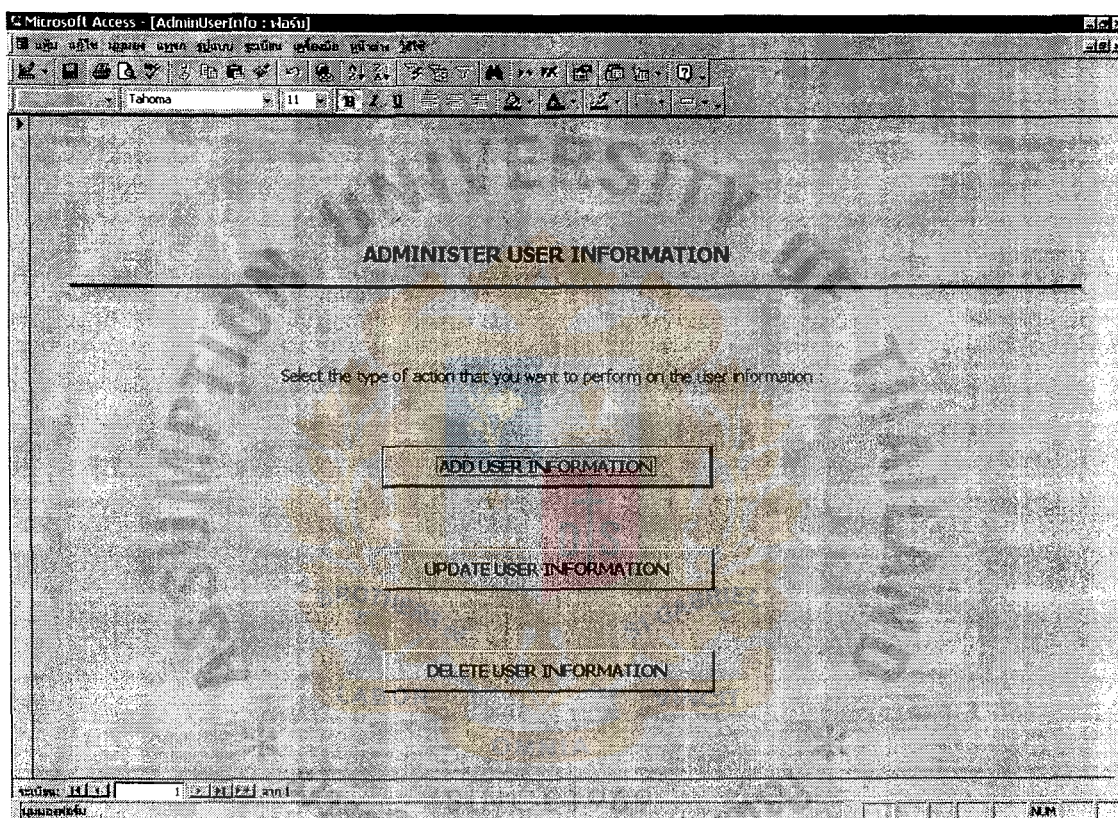


Figure A.4. Administer User Information Screen.

Microsoft Access - [UpdateUserInfo : ปรานี]

Toolbar: Save, Undo, Redo, Find, Print, etc.

Font: Tahoma, Size: 9

UPDATE USER INFORMATION

Officer Code :

Officer Name :

Position :

Department :

Extension No. :

User Level :

Buttons: [Save] [Cancel] [Delete]

Status Bar: Record: 1 of 1, Page: 1

Figure A.6. Update User Information Screen.

Microsoft Access - [DeleteUserInfo : ว่าง]

DELETE USER INFORMATION

Officer Code :

Officer Name :

Position :

Department :

Extension No. :

User Level :

Figure A.7. Delete User Information Screen.

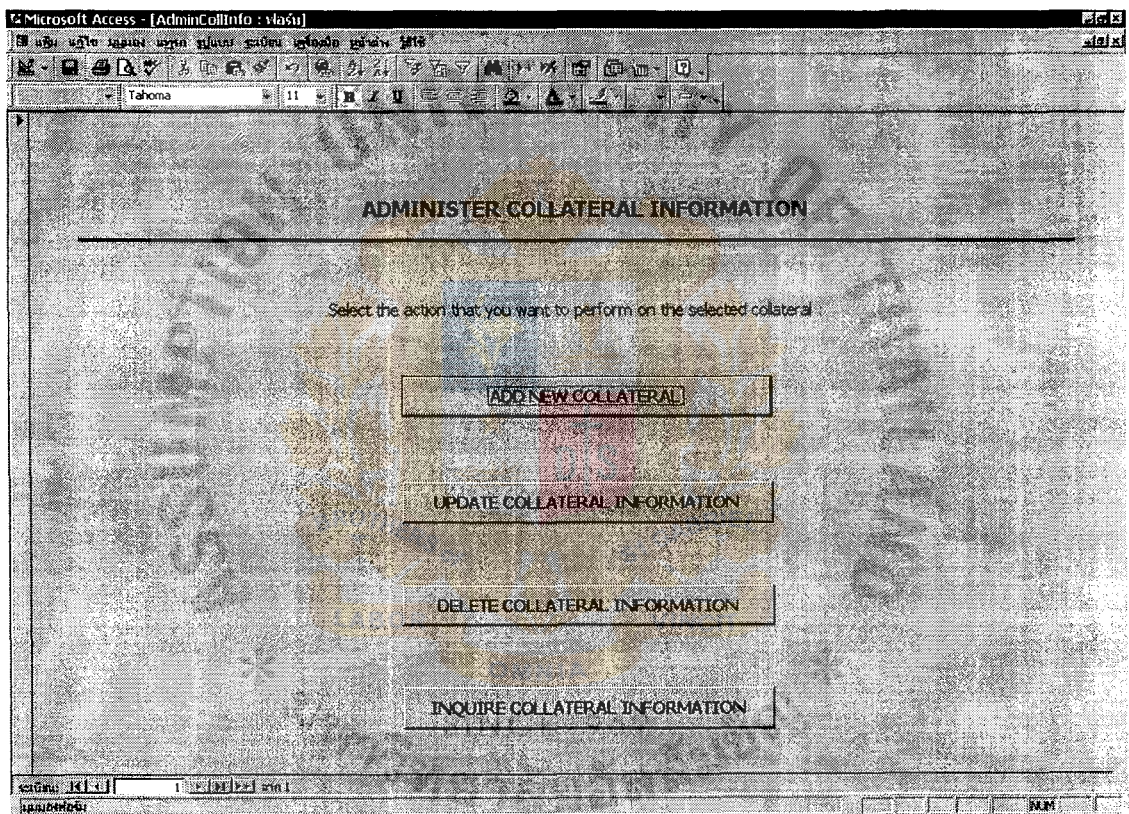


Figure A.8. Administer Collateral Information Screen.

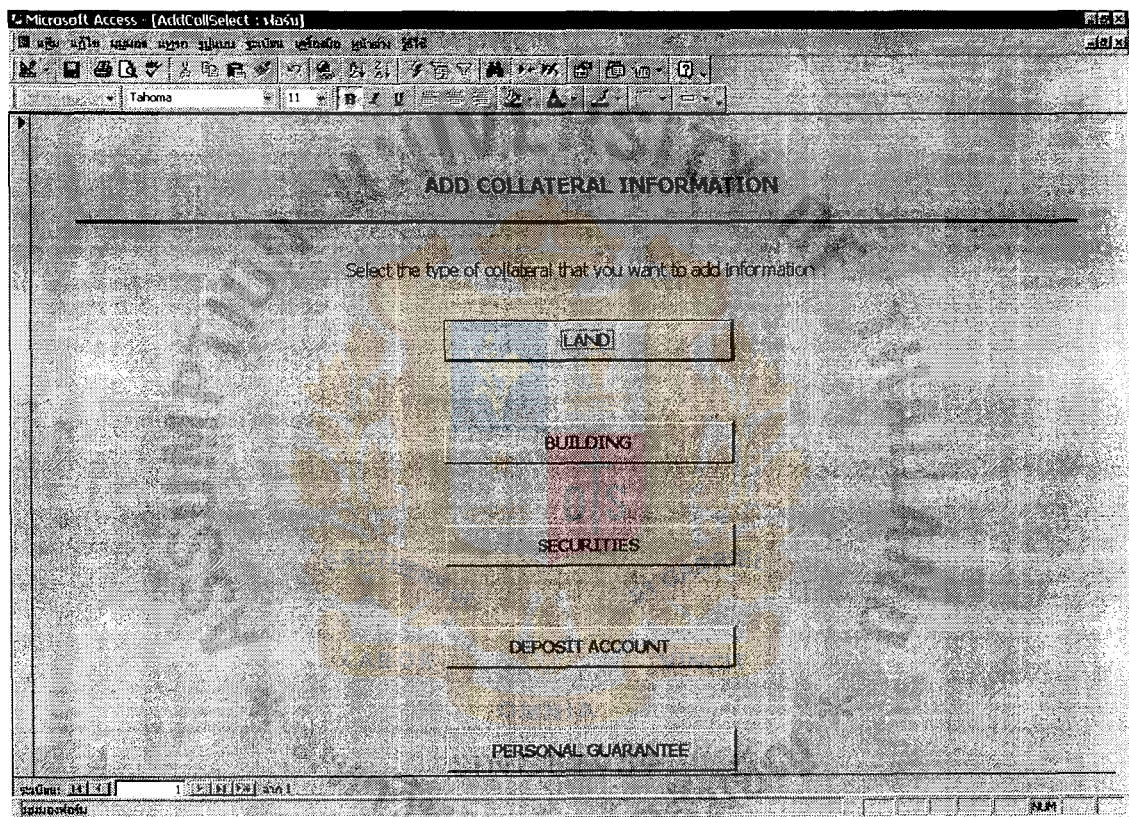


Figure A.9. Add Collateral Information Screen.

Microsoft Access - [AddCollateral : <name>]

ADD COLLATERAL INFORMATION

SECURITY	LAND	BUILDING	DEPOSIT ACCOUNT	PERSONAL GUARANTEE
Collateral Code :	<input type="text"/>	Customer Code :	<input type="text"/>	
Credit Officer Code :	<input type="text"/>	Appraisal Officer Code :	<input type="text"/>	
Area :	<input type="text"/>	Land Title Deed Number :	<input type="text"/>	
Address :	<input type="text"/>			
Pledged Value :	<input type="text"/>	Appraisal Value :	<input type="text"/>	
Appraisal Date :	<input type="text"/>	Collateral's Owner :	<input type="text"/>	
Relationship :	<input type="text"/>			

Microsoft Access - [AddCollateral : <name>]

1/1/2011

Microsoft Access - [AddCollateral : <name>]

Figure A.10. Add Collateral Information- Land Screen.

Microsoft Access - [AddCollateral : vba5u]

Tahoma

ADD COLLATERAL INFORMATION

SECURITY	LAND	BUILDING	DEPOSIT ACCOUNT	PERSONAL GUARANTEE
Collateral Code :		<input type="text"/>	Customer Code :	
Credit Officer Code :		<input type="text"/>	Appraisal Officer Code :	
Type of Building :		<input type="text"/>	Area :	
Address : <input type="text"/>				
Pledged Value :		<input type="text"/>	Appraisal Value :	
Appraisal Date :		<input type="text"/>	Collateral's Owner :	
Relationship :		<input type="text"/>		

Page: 1 of 1

Figure A.11. Add Collateral Information-Building Screen.

Microsoft Access - [AddCollateral:stain]

ADD COLLATERAL INFORMATION

SECURITY | LAND | BUILDING | DEPOSIT ACCOUNT | PERSONAL GUARANTEE

Collateral Code :	<input type="text"/>	Customer Code :	<input type="text"/>
Credit Officer Code :	<input type="text"/>	Appraisal Officer Code :	<input type="text"/>
Type of Security :	<input type="text"/>	Return on Security :	<input type="text"/>
Maturity Date :	<input type="text"/>	Pledged Value :	<input type="text"/>
Appraisal Value :	<input type="text"/>	Appraisal Date :	<input type="text"/>
Collateral's Owner :	<input type="text"/>	Relationship :	<input type="text"/>

Microsoft Access - [AddCollateral:stain]

Figure A.12. Add Collateral Information-Security Screen.

Microsoft Access - [AddCollateral : vlsu]

ADD COLLATERAL INFORMATION

SECURITY | LAND | BUILDING | DEPOSIT ACCOUNT | PERSONAL GUARANTEE

Collateral Code : Customer Code :

Credit Officer Code : Appraisal Officer Code :

Guarantor's Name : Guaranteed Value :

Relationship :

NUM

Figure A.14. Add Collateral Information-Personal Guarantee Screen.



Figure A.15. Update Collateral Information Screen.

Microsoft Access - [UpdateCollateral : ใหม่]

Tahoma

UPDATE COLLATERAL INFORMATION

SECURITY	LAND	BUILDING	DEPOSIT ACCOUNT	PERSONAL GUARANTEE
Collateral Code :	<input type="text"/>	Customer Code :	<input type="text"/>	
Credit Officer Code :	<input type="text"/>	Appraisal Officer Code :	<input type="text"/>	
Area :	<input type="text"/>	Land Title Deed Number :	<input type="text"/>	
Address :	<input type="text"/>			
Pledged Value :	<input type="text"/>	Appraisal Value :	<input type="text"/>	
Appraisal Date :	<input type="text"/>	Collateral's Owner :	<input type="text"/>	
Relationship :	<input type="text"/>			

หน้าปัจจุบัน: 11/33 1 11/11/2555 cont

NM

Figure A.16. Update Collateral Information-Land Screen.

Microsoft Access - [UpdateCollateral : ใหม่]

Database: UpdateCollateral

Table: UpdateCollateral

UPDATE COLLATERAL INFORMATION

SECURITY | LAND | BUILDING | DEPOSIT ACCOUNT | PERSONAL GUARANTEE

Collateral Code :

Customer Code :

Credit Officer Code :

Appraisal Officer Code :

Type of Building :

Area :

Address :

Pledged Value :

Appraisal Value :

Appraisal Date :

Collateral's Owner :

Relationship :

Save | Cancel | Print

Page: 1 of 1

NUM

Figure A.17. Update Collateral Information-Building Screen.

Microsoft Access - [UpdateCollateral : Main]

Update Collateral Information

SECURITY | LAND | BUILDING | DEPOSIT ACCOUNT | PERSONAL GUARANTEE

Collateral Code : Customer Code :

Credit Officer Code : Appraisal Officer Code :

Type of Security : Return on Security :

Maturity Date : Pledged Value :

Appraisal Value : Appraisal Date :

Collateral's Owner : Relationship :

Microsoft Access - [UpdateCollateral : Main]

Figure A.18. Update Collateral Information-Security Screen.

Microsoft Access - [UpdateCollateral : Main]

Tahoma 9

UPDATE COLLATERAL INFORMATION

SECURITY	LAND	BUILDING	DEPOSIT ACCOUNT	PERSONAL GUARANTEE
Collateral Code :	<input type="text"/>	Customer Code :	<input type="text"/>	
Credit Officer Code :	<input type="text"/>	Appraisal Officer Code :	<input type="text"/>	
Deposit Type :	<input type="text"/>	Principal Amount :	<input type="text"/>	
Interest Rate :	<input type="text"/>	Deposit Period :	<input type="text"/>	
Pledged Value :	<input type="text"/>	Collateral's Owner :	<input type="text"/>	
Relationship :	<input type="text"/>			

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Figure A.19. Update Collateral Information-Deposit Account Screen.

Microsoft Access - [UpdateCollateral : 14650]

Tahoma

UPDATE COLLATERAL INFORMATION

SECURITY	LAND	BUILDING	DEPOSIT ACCOUNT	PERSONAL GUARANTEE
Collateral Code :		Customer Code :		
Credit Officer Code :		Appraisal Officer Code :		
Guarantor's Name :		Guaranteed Value :		
Relationship :				

Navigation buttons: [Previous] [Next] [Cancel]

Footer: 14650

Figure A.20. Update Collateral Information-Personal Guarantee Screen.

Microsoft Access - [DelCollateral : <name>]

DELETE COLLATERAL INFORMATION

SECURITY	LAND	BUILDING	DEPOSIT ACCOUNT	PERSONAL GUARANTEE
Collateral Code :	<input type="text"/>	Customer Code :	<input type="text"/>	
Credit Officer Code :	<input type="text"/>	Appraisal Officer Code :	<input type="text"/>	
Area :	<input type="text"/>	Land Title Deed Number :	<input type="text"/>	
Address :	<input type="text"/>			
Pledged Value :	<input type="text"/>	Appraisal Value :	<input type="text"/>	
Appraisal Date :	<input type="text"/>	Collateral's Owner :	<input type="text"/>	
Relationship :	<input type="text"/>			

OK Cancel Help

Form: 14.1 1/2/2007

Figure A.22. Delete Collateral Information-Land Screen.

Microsoft Access - [DelCollateral : 14551]

DELETE COLLATERAL INFORMATION

SECURITY LAND BUILDING DEPOSIT ACCOUNT PERSONAL GUARANTEE

Collateral Code : Customer Code :

Credit Officer Code : Appraisal Officer Code :

Type of Building : Area :

Address :

Pledged Value : Appraisal Value :

Appraisal Date : Collateral's Owner :

Relationship :

Record: 14551 Page: 1 of 1

Figure A.23. Delete Collateral Information-Building Screen.

Microsoft Access - [DelCollateral : ව්‍යුහ]

Tahoma

DELETE COLLATERAL INFORMATION

SECURITY	LAND	BUILDING	DEPOSIT ACCOUNT	PERSONAL GUARANTEE
Collateral Code :	<input type="text"/>	Customer Code :	<input type="text"/>	
Credit Officer Code :	<input type="text"/>	Appraisal Officer Code :	<input type="text"/>	
Type of Security :	<input type="text"/>	Redm on Security :	<input type="text"/>	
Maturity Date :	<input type="text"/>	Pledged Value :	<input type="text"/>	
Appraisal Value :	<input type="text"/>	Appraisal Date :	<input type="text"/>	
Collateral's Owner :	<input type="text"/>	Relationship :	<input type="text"/>	

Microsoft Access - [DelCollateral : ව්‍යුහ]

Start | InputScreen_word - M... | CollInterface - ගුණදාය | DelCollateral : ව්‍යුහ | 17:10

Figure A.24. Delete Collateral Information-Security Screen.

Microsoft Access - [DelCollateral : 1/1/2011]

Tahoma 9

DELETE COLLATERAL INFORMATION

SECURITY	LAND	BUILDING	DEPOSIT ACCOUNT	PERSONAL GUARANTEE
Collateral Code :	<input type="text"/>	Customer Code :	<input type="text"/>	
Credit Officer Code :	<input type="text"/>	Appraisal Officer Code :	<input type="text"/>	
Deposit Type :	<input type="text"/>	Principal Amount :	<input type="text"/>	
Interest Rate :	<input type="text"/>	Deposit Period :	<input type="text"/>	
Pledged Value :	<input type="text"/>	Collateral's Owner :	<input type="text"/>	
Relationship :	<input type="text"/>			

Page: 141 of 141 | 1/1/2011 | 11:11 AM

Figure A.25. Delete Collateral Information-Deposit Account Screen.

Microsoft Access [DelCollateral : v1a5u]

Tahoma

DELETE COLLATERAL INFORMATION

SECURITY	LAND	BUILDING	DEPOSIT ACCOUNT	PERSONAL GUARANTEE
Collateral Code :		Customer Code :		
Credit Officer Code :		Appraisal Officer Code :		
Guarantor's Name :		Guaranteed Value :		
Relationship :				

Microsoft Access [DelCollateral : v1a5u]

Figure A.26. Delete Collateral Information-Personal Guarantee Screen.



APPLICABLE VALUE REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Appraisal Officer Code	Credit Officer Code	Collateral Type	Appraisal Value	Appraisal Date	Applicable Value	Pledged Value
coll002369	003293	a002	c015	Land	1,300,000	12/08/1998	1,150,000	1,100,000
coll002345	001695	a016	c043	Land	1,800,000	14/01/1999	1,650,000	1,500,000

Printed on:

Printed by:

Figure B.1. Applicable Value Report.

COLLATERAL REPORT - BUILDING
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Area	Address	Building Type	Appraisal Value	Appraisal Date	Collateral's Owner	Relationship	Pledged Value
col1003269	000689	365	6/8 Soi. Somkid Bangkok 10230	House	2,500,000	18/06/2000	Customer	-	2,000,000
col1000659	001539	450	9 Ladprao Bangkok 10110	Office Building	15,000,000	14/02/2000	Mr.Chai K.	Father	12,000,000

Printed on:

Printed by:

Figure B.2. Collateral Report – Building.

COLLATERAL ADDITION REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Appraisal Officer Code	Credit Officer Code	Appraisal Value	Appraisal Date	Collateral's Owner	Relationship	Pledged Value	Date Added
coll003369	003596	a053	c036	1,650,000	29/05/1999	Mr.Som R.	Brother	1,200,000	12/06/1999
coll002659	002169	a009	c024	1,200,000	12/08/1999	Ms.Wei T.	Sister	820,000	15/09/1999

Printed on:

Printed by:

Figure B.3. Collateral Addition Report.

COLLATERAL REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Appraisal Officer Code	Credit Officer Code	Collateral Type	Appraisal Value	Appraisal Date	Collateral's Owner	Relationship	Pledged Value
coll002159	001259	a006	c026	Building	5,200,000	12/06/2000	Mr.Sang S.	Brother	4,500,000
coll000369	000159	a003	c012	House	2,300,000	15/03/2000	Ms.Tang R.	Mother	2,000,000

Printed on:

Printed by:

Figure B.4. Collateral Report.

COLLATERAL DELETION REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Appraisal Officer Code	Credit Officer Code	Appraisal Value	Appraisal Date	Collateral's Owner	Relationship	Pledged Value
coll000236	000243	a002	c015	5,020,000	12/03/2000	Mr. Gang Fu	Husband	4,500,000
coll0002536	001536	a026	c019	1,850,000	26/11/2000	Mr. Tae U.	Brother	1,000,000

Printed on:

Printed by:

Figure B.5. Collateral Deletion Report.

COLLATERAL UPDATE REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Appraisal Officer Code	Credit Officer Code	Appraisal Value	Appraisal Date	Collateral's Owner	Relationship	Pledged Value	Date Added
coll002569	000259	a009	c010	2,500,000	15/12/2000	Mr. Yang T.	Father	2,000,000	22/12/2000
coll003963	004596	a016	c018	2,800,000	18/10/2000	Ms. Nok P.	Brother	1,500,000	02/11/2000

Printed on:

Printed by:

Figure B.6. Collateral Update Report.

COLLATERAL REPORT – DEPOSIT ACCOUNT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Deposit Type	Principal Amount	Interest Rate	Deposit Period	Collateral's Owner	Relationship	Pledged Value
coll000329	002369	Fix deposit	5,500,000	12.00	10	Mr.Yok R.	Brother	3,000,000
coll0006213	009635	Saving deposit	2,500,000	3.5	-	Mr.Yop T.	Father	2,000,000

Printed on:

Printed by:

Figure B.7. Collateral Report – Deposit Account.

HIGH VOLUME REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Credit Officer Code	Appraisal Value	Appraisal Date	Pledged Value	Borrowed Amount	Beginning Period	Ending Period	Current Balance
coll003269	002359	c026	3,200,000	19/02/2000	2,500,000	2,500,000	12/08/1995	13/08/2005	1,750,000
coll001239	006932	c013	2,860,000	12/12/2000	2,500,000	2,000,000	15/01/1998	16/02/2002	1,020,000

Printed on:

Printed by:

Figure B.8. High Volume Report.

COLLATERAL REPORT – LAND
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Area	Land Title Deed Number	Address	Appraisal Value	Appraisal Date	Collateral's Owner	Relationship	Pledged Value
coll003126	002536	620	23015	6/2 Silom Bangkok 10153	5,000,000	12/08/2000	Ms.Chao W.	Sister	4,500,000
coll006596	004963	885	32693	26 South Sathorn Bangkok 10145	15,000,000	29/11/2000	Mr.Ren A.	Brother	12,000,000

Printed on:

Printed by:

Figure B.9. Collateral Report – Land.

LOW VOLUME REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Credit Officer Code	Appraisal Value	Appraisal Date	Pledged Value	Borrowed Amount	Beginning Period	Ending Period	Current Balance
coll003369	000923	c009	1,500,000	13/05/2000	1,200,000	1,000,000	12/04/1998	13/05/2003	300,000
coll000365	002659	c014	3,200,000	19/11/2000	2,800,000	2,000,000	15/02/1997	16/03/2009	1,020,000

Printed on:

Printed by:

Figure B.10. Low Volume Report.

MEDIUM VOLUME REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Credit Officer Code	Appraisal Value	Appraisal Date	Pledged Value	Borrowed Amount	Beginning Period	Ending Period	Current Balance
coll001553	000374	c021	6,200,000	26/04/2000	5,500,000	5,000,000	12/08/1998	13/08/2016	3,520,000
coll000613	003269	c011	3,200,000	12/06/2000	3,000,000	2,500,000	15/01/1996	16/03/2006	1,250,000

Printed on:

Printed by:

Figure B.11. Medium Volume Report.

OUT-OF-DATE APPLICABLE-VALUE REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Appraisal Officer Code	Credit Officer Code	Collateral Type	Appraisal Value	Appraisal Date	Applicable Value
coll003269	004896	a012	c019	Building	3,250,000	12/08/2000	2,500,000
coll006963	003265	a036	c042	Land	12,650,000	25/03/2000	9,500,000

Printed on:

Printed by:

Figure B.12. Out-of-date Applicable-value Report.

OUT-OF-DATE COLLATERAL-VALUE REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Appraisal Officer Code	Credit Officer Code	Collateral Type	Appraisal Value	Appraisal Date
coll003269	003269	a012	c026	Land	2,300,000	15/03/2000
coll006329	004269	a002	c015	Land	5,250,000	03/10/2000

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Printed by:

Figure B.13. Out-of-date Collateral-value Report.

COLLATERAL REPORT – PERSONAL GUARANTEE
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Guarantor's Name	Guaranteed Value	Appraisal Value	Appraisal Date	Collateral's Owner	Relationship	Pledged Value
coll003169	002369	Mr.Hay L.	300,000	-	-	-	Father	-
coll002163	004956	Mrs.Yuan K.	1,200,000	-	-	-	Mother	-

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Figure B.14. Collateral Report – Personal Guarantee.

COLLATERAL REPORT – SECURITY
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Type of Security	Return on Security	Maturity Date	Appraisal Value	Appraisal Date	Collateral's Owner	Relationship	Pledged Value
coll003696	003232	Preferred Stock	12	12/03/2001	1,000,000	12/03/2000	Mrs.Tang Y.	Aunt	800,000
coll001269	002696	Common Stock	14	26/08/2002	850,000	15/06/2000	Ms.Yogi T.	Uncle	550,000

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Figure B.15. Collateral Report – Security.

UNCOVERED COLLATERAL-VALUE REPORT
Radanakosin Bank Public Company Limited

Collateral Code	Customer Code	Appraisal Officer Code	Credit Officer Code	Collateral Type	Appraisal Value	Appraisal Date	Borrowed Amount	Loss Value	Pledged Value
coll003126	003269	a011	c005	Land	1,200,000	15/08/2000	1,000,000	-	1,000,000
coll002136	003859	a008	c021	Land	3,500,000	22/11/2000	3,000,000	-	3,000,000

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Figure B.16. Uncovered Collateral-value Report.

USER REPORT
Radanakosin Bank Public Company Limited

Officer Code	Officer Name	Position	Department	Extension #	User Level
ap015	Chaikiat R.	Officer	Appraisal Team	123	User
ct003	Ratanin R.	Officer	Custodian Team	236	Admin



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Figure B.17. User Report.

USER ADDITION REPORT Radanakosin Bank Public Company Limited

Officer Code	Officer Name	Position	Department	Extension #	User Level
c022	Elisa Sh.	Manager	Credit Assessment Team	326	Supervisor
a003	Wittaya R.	Officer	Account Team	420	User



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Figure B.18. User Addition Report.

USER DELETION REPORT
Radanakosin Bank Public Company Limited

Officer Code	Officer Name	Position	Department	Extension #	User Level
ap001	Saharat P.	Officer	Appraisal Team	302	User
c015	Patchara T.	Officer	Credit Assessment Team	630	User



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Figure B.19. User Deletion Report.

USER UPDATE REPORT
Radanakosin Bank Public Company Limited

Officer Code	Officer Name	Position	Department	Extension #	User Level
ap005	Tanya N.	Officer	Appraisal Team	520	User
ct013	Pramol W.	Officer	Custodian Team	285	User



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Figure B.20. User Update Report.



APPENDIX C

DATABASE DESIGN

Collateral Information System's Database

Table C.1. Structure of “Account Team” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Officer Code	text	Y	Y	-	-	Primary key
Officer Name	text	-	-	-	-	Attribute
Position	text	-	-	-	-	Attribute
Extension No	text	-	-	-	-	Attribute
User Level	text	-	-	-	-	Attribute

Table C.2. Structure of “Appraisal Team” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Officer Code	text	Y	Y	-	-	Primary key
Officer Name	text	-	-	-	-	Attribute
Position	text	-	-	-	-	Attribute
Extension No	text	-	-	-	-	Attribute
User Level	text	-	-	-	-	Attribute

Table C.3. Structure of “Building” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Collateral Code	text	Y	Y	-	-	Primary key
Building Type	text	-	-	-	-	Attribute
Area	int(10)	-	-	-	-	Attribute
Address	text	-	-	-	-	Attribute

Table C.4. Structure of “Collateral” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Collateral Code	text	Y	Y	-	-	Primary key
Officer Code	text	-	Y	-	-	Foreign key
Appraisal Officer Code	text	-	Y	-	-	Foreign key
Customer Code	text	-	Y	-	-	Foreign key
Relationship	text	-	-	-	-	Attribute
Applicable Value	int(10)	-	-	-	-	Attribute
Appraisal Date	date/time	-	-	-	mm/dd /yy	Attribute
Applicable Value	int(10)	-	-	-	-	Attribute
Pledged Value	int(10)	-	-	-	-	Attribute
Collateral's Owner	text	-	-	-	-	Attribute

Table C.5. Structure of “Collateral Code” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Collateral Code	text	Y	Y	-	-	Primary key
Collateral Type	text	-	-	-	-	Attribute

Table C.6. Structure of “Credit Assessment Team” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Officer Code	text	Y	Y	-	-	Primary key
Officer Name	text	-	-	-	-	Attribute
Position	text	-	-	-	-	Attribute
Extension No	int(5)	-	-	-	-	Attribute
User Level	text	-	-	-	-	Attribute

Table C.7. Structure of “Custodian Team” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Officer Code	text	Y	Y	-	-	Primary key
Officer Name	text	-	-	-	-	Attribute
Position	text	-	-	-	-	Attribute
Extension No	inter(5)	-	-	-	-	Attribute
User Level	text	-	-	-	-	Attribute

Table C.8. Structure of “Customer” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Customer Code	text	Y	Y	-	-	Primary Key
Officer Code	text	-	-	-	-	Foreign Key
Collateral Code	text	-	-	-	-	Foreign Key
Customer Name	text	-	-	-	-	Attribute
Address	text	-	-	-	-	Attribute
Phone No.	int(30)	-	-	-	-	Attribute
Type of Borrowing	text	-	-	-	-	Attribute
Borrowed Amount	*inter(30)	-	-	-	-	Attribute
Beginning Period	date/time	-	-	-	mm/dd /yy	Attribute
Ending Period	date/time	-	-	-	mm/dd /yy	Attribute
Interest Rate	int(5)	-	-	-	=	attribute

Table C.9. Structure of “Deposit Account” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Collateral Code	text	Y	Y	-	-	Primary key
Deposit Type	text	-	-	-	-	Attribute
Principal Amount	int(30)	-	-	-	-	Attribute
Interest Rate	int(5)	-	-	-	-	Attribute
Deposit Period	date/time	-	-	-	mm/dd /yy	Attribute

Table C.10. Structure of “Land” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Collateral Code	text	Y	Y	-	-	Primary key
Area	int(10)	-	-	-	-	Attribute
Address	text	-	-	-	-	Attribute
Land Title Deed Number	text	-	-	-	-	Attribute

Table C.11. Structure of “Personal Guarantee” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Collateral Code	text	Y	Y	-	-	Primary key
Guarantor’s Name	text	-	-	-	-	Attribute
Guaranteed Value	int(30)	-	-	-	-	Attribute

Table C.12. Structure of “Security” Table.

Field Name	Field Type	Index	Unique	Null able	Check	Key Type
Collateral Code	text	Y	Y	-	-	Primary key
Type of Securities	text	-	-	-	-	Attribute
Return on Securities	int(5)	-	-	-	-	Attribute
Maturity Date	date/time	-	-	-	dd/mm/yy	Attribute





APPENDIX D

PROCESS SPECIFICATION

Table D.1. Process Specification for Process 1.

Process Name:	Calculate applicable appraisal-value
Data In:	Updated collateral-value
Data Out:	Applicable collateral-value
Process:	(1) Acknowledge the new collateral-value from the Custodian Team (2) Classify the collateral into each specific type (3) Apply the formula, which is specified by BOT, on the collateral-value according to its specific type. (4) Update the applicable value on the collateral database.
Attachment:	-

Table D.2. Process Specification for Process 1.1.

Process Name:	Acknowledge the new collateral-value
Data In:	Notice of updated collateral-value
Data Out:	Updated collateral-value
Process:	Acknowledge the new collateral-value
Attachment:	-

Table D.3. Process Specification for Process 1.2.

Process Name:	Classify the collateral into a specific type
Data In:	Updated collateral-value
Data Out:	Type of collateral
Process:	Classify the collateral into each specific type, e.g. land, building, personal guarantee, etc.
Attachment:	-

Table D.4. Process Specification for Process 1.3.

Process Name:	Apply formula for calculating applicable collateral-value
Data In:	Type of collateral
Data Out:	Applicable collateral-value
Process:	(1) Check the applicable rate, as specified by the Bank of Thailand (2) Multiply the applicable rate to the appraisal value.
Attachment:	-

Table D.5. Process Specification for Process 2.

Process Name:	Appraise the collateral-value
Data In:	Current collateral-value
Data Out:	Updated collateral-value
Process:	(1) Register the request for collateral-appraisal (2) Determine the type of collateral, which is requested for appraisal (3) If the collateral is in the form of deposit-account, then (3.1) Check the period of deposit, and interest rate (3.2) Calculate interest amount (4) Else (4.1) Prepare the collateral-appraisal request form, which is to be sent to the Appraisal Team (4.2) Appraise the collateral-value. (5) Prepare the collateral appraisal-value report. (6) Update the collateral information in the collateral database.
Attachment:	-

Table D.6. Process Specification for Process 2.1.

Process Name:	Register the request for collateral-appraisal
Data In:	Request for collateral-appraisal
Data Out:	Registered request for collateral-appraisal
Process:	Register the request for collateral-appraisal on the record book.
Attachment:	-

Table D.7. Process Specification for Process 2.2.

Process Name:	Determine the type of collateral
Data In:	Request for collateral-appraisal
Data Out:	Type of collateral
Process:	Determine the type of collateral
Attachment:	-

Table D.8. Process Specification for Process 2.3.

Process Name:	Prepare collateral-appraisal request form
Data In:	Type of collateral
Data Out:	Collateral-appraisal request form
Process:	(1) Type the collateral-appraisal request form (2) Print the collateral-appraisal request form
Attachment:	-

Table D.9. Process Specification for Process 2.4.

Process Name:	Appraise the collateral-value
Data In:	Collateral-approval request form
Data Out:	Updated collateral-value
Process:	Appraise the collateral-value
Attachment:	-

Table D.10. Process Specification for Process 2.5.

Process Name:	Prepare the collateral appraisal-value report
Data In:	Updated collateral-value
Data Out:	Collateral-value report
Process:	(1) Type the collateral appraisal-value report (2) Print the collateral appraisal-value report
Attachment:	-

Table D.11. Process Specification for Process 2.6.

Process Name:	Check the period of deposit
Data In:	Deposit account
Data Out:	Period of Deposit
Process:	Check the deposit period of the deposit account
Attachment:	-

Table D.12. Process Specification for Process 2.7.

Process Name:	Calculate interest
Data In:	Period of deposit
Data Out:	Calculated interest
Process:	Multiply the interest rate on the current balance of the deposit account.
Attachment:	-

Table D.13. Process Specification for Process 2.8.

Process Name:	Update the collateral-value
Data In:	Updated collateral-value
Data Out:	Updated collateral-value
Process:	Update the collateral-value, which is stored on the collateral database.
Attachment:	-

Table D.14. Process Specification of Process 3.

Process Name:	Sign the legal contract
Data In:	New credit approval
Data Out:	Legal documents
Process:	<ol style="list-style-type: none"> (1) Register the request for preparing the legal contract (2) Prepare the legal contract, which is to be signed by the customer and the authorized bank's officer (3) Sign the legal contract by the customer and the authorized bank officer (4) Add the new collateral information into the collateral database
Attachment:	-

Table D.15. Process Specification for Process 3.1.

Process Name:	Register the request for preparing the legal contract
Data In:	New credit-approval
Data Out:	Approved condition
Process:	Register the "request for preparing the legal contract" on the record book.
Attachment:	-

Table D.16. Process Specification for Process 3.2.

Process Name:	Prepare the legal contract
Data In:	Credit detail
Data Out:	Legal contract
Process:	<ol style="list-style-type: none"> (1) Print the legal contract (2) Type the legal contract
Attachment:	-

Table D.17. Process Specification for Process 3.3.

Process Name:	Sign the legal contract
Data In:	Legal documents and Legal contract
Data Out:	Signed legal contract and New collateral-detail
Process:	Sign the legal contract by the borrowers and the authorized bank officer.
Attachment:	-

Table D.18. Process Specification for Process 4.

Process Name:	Request for collateral-value
Data In:	Request for collateral-value
Data Out:	Collateral-value report
Process:	(1) Register collateral-value request (2) Access to the collateral's database (3) Prepare collateral-value report
Attachment:	-

Table D.19. Process Specification for Process 4.1.

Process Name:	Register collateral-value request
Data In:	Request for collateral-value
Data Out:	Registered request for collateral-value
Process:	Register the collateral-value request on the record book.
Attachment:	-

Table D.20. Process Specification for Process 4.2.

Process Name:	Access to collateral database
Data In:	Registered request for collateral-value
Data Out:	Request for collateral-value
Process:	Access to the collateral-value, which is stored on the collateral database.
Attachment:	-

Table D.21. Process Specification for Process 4.3.

Process Name:	Prepare collateral-value report
Data In:	Collateral-value
Data Out:	Collateral-value report
Process:	(1) Type the collateral-value report (2) Print the collateral-value report
Attachment:	-





APPENDIX E

DATA DICTIONARY

DATA DICTIONARY

Table E.1. Data Dictionary for the Process Model.

Object Name	Meaning
Account Team	This is one department of the bank. The Account Team will be responsible for keeping track of the bank's financial records. The Account Team may require the collateral value for performing some jobs, such as calculating the bank's reserve.
Acknowledge collateral-value request	The process of perceiving the collateral-value request
Acknowledge the new collateral-value	The process of perceiving the new collateral-value, which will require some action to be taken, for example calculating the applicable value.
Analyze security-value	The process of analyzing the security-value, using various financial model, together with some other economic indicator
Applicable appraisal-value	The applicable collateral-value after applying the percentage specified by the Bank of Thailand. This applicable-value can be said to be the real value of each collateral.
Apply formula for calculating applicable collateral-value	The process of applying to the appraisal-value the percentage, which is specified by the Bank of Thailand. Such a percentage is deemed to reflect applicable and reasonable collateral-value.
Appraisal Team	This is one department of the bank. Appraisal Team will be responsible for appraising the collateral value. Sometimes, there may be a decision to assign the appraisal-work to the external appraisal-company. For that case, Appraisal Team will be the coordinator between the bank and the external appraisal-company.
Appraise the collateral-value	The process of appraising the collateral-value, using the specified procedure.
Approved condition	The condition of each credit approval, such as repayment amount, payback period, etc.

Table E.1. Data Dictionary for the Process Model (Continued).

Object Name	Meaning
Bank of Thailand	The Bank of Thailand, which is responsible for monitoring the operation of all commercial banks in Thailand.
Calculate applicable appraisal-value	The process of calculating the applicable value by applying the formula, which is specified by the Bank of Thailand.
Calculate interest	The process of calculating the interest on each deposit account that is pledged with the bank.
Check the period of deposit	The process of checking the period of each deposit, especially for fixed deposit account.
Classify the collateral into a specific type	The process of classifying the collateral into each specific type, such as land, deposit account, etc.
Collateral	This covers information on all kinds of collateral. The most important information is the collateral value, and the date of the latest appraisal
Collateral-appraisal request form	The request form that is sent by the individual who need to appraise the collateral-value. This is the standard form created by the Appraisal Team
Collateral-value report	The report that contains the appraisal value of the appraised collateral.
Credit detail	The detail of each credit-approval, such as credit term, installation amount, interest rate, etc.
Current collateral detail	The current detail of each collateral, such as amount, appraisal value, etc.
Current collateral-value	The current appraisal-value of each collateral. This is the updated one, but may not reflect the current trading price.
Current deposit-account balance	The current balance of each deposit account. This should reflect the initial deposit-amount, plus accrued interest.

Table E.1. Data Dictionary for the Process Model (Continued).

Object Name	Meaning
Current value of securities	The current value of each security, such as common stock, preferred stock, bond, etc. This can be said to be the updated value. Anyway, this may not reflect the current trading price.
Custodian Team	This is one department of the bank. Custodian Team would be responsible for creating, updating, and keeping all kinds of collateral, which are used for pledging with the bank.
Customer	These are the customers who contact the bank, or having some business transactions with the banks. Such business transactions may include money saving, credit request, etc.
Determine the type of collateral	The process of determining the type of collateral, such as land, securities, deposit account, etc.
Legal contract	The standard legal contract, which is created and updated by Legal Team. This is kept at the Custodian Team. It is the custodian officers who use these legal contracts whenever there is a new credit-approval. This is the blank legal contract, which has not been signed by anyone.
Legal documents	All legal documents associated with each credit, such as legal contract, the title deed to the piece of land, etc.
New collateral-detail	The detail of each collateral, which is used to back up the credit-transaction.
New credit-approval	The detail of each collateral, which is used to back up the credit-transaction.
New legal contract	The legal contract that has already been signed by the customers, and the representatives of the bank.
Notice of updated collateral-value	The notice, which is sent from the Custodian Team to the Account Team. This notice is sent to acknowledge the staff of the Account Team about the updated collateral-value.
Prepare collateral-appraisal request form	The process of preparing the collateral-appraisal request form. The output may be in the form of print paper.

Table E.1. Data Dictionary for the Process Model (Continued).

Object Name	Meaning
Prepare collateral-value report	The process of preparing the collateral-value report. The output of this process may be in the form of print paper
Prepare legal contract	The process of preparing a legal contract, which is to be signed by the bank officer and the customers.
Prepare the collateral appraisal-value report	The process of collecting the collateral value and forming it into an understandable format. This would make it easy for reading, and also being comfortable to be used by other team.
Register collateral-value request	The process of registering the receipt of each collateral-value request, which is to be used as a record. The Custodian Team will be the team to be responsible for performing this action.
Register the request for collateral-appraisal	The process of registering the receipt of each collateral-value request, which is to be used as a record. This process is to be performed by the Custodian Team, who is directly responsible for this process. This is to be sent to the appraisal team for appraisal.
Request for collateral-appraisal	The request sent by the ones who need to know the current, updated value of each collateral. So they send the request to the Appraisal Team to appraise the collateral-value for them.
Request for collateral-value	This is the process of requesting for the collateral-value. This process can be performed by any teams, which need to know the collateral-value.
Request for current security-value	The request sent to the Custodian Team, in order to get the current collateral-value. This occurs when the credit officers are not sure whether there is a newer collateral-value than that is stored in the database or not. So they send the request to the Custodian Team to make sure about that.
Request for security-analysis	The request sent to Custodian Team. This will request the Custodian Team to analyze the securities, in order to know their current value.
Sign the legal contract	The process of signing the legal contract. This process is to be done by both the bank officers and the customers (borrowers).

Table E.1. Data Dictionary for the Process Model (Continued).

Object Name	Meaning
Signed legal contract	The legal contract that has been already signed by the customers and the bank officers.
Stock Exchange of Thailand	The Stock Exchange of Thailand, which is responsible for monitoring the operation of all companies listed in the Stock Exchange of Thailand.
Type of collateral-value	The type of collateral, e.g. land, deposit account, etc.
Update collateral information	The process of updating the collateral information to reflect the change in the appraisal (or the collateral) value.
Updated collateral-value	The collateral-value that has already been re-appraised (updated) to reflect the current value.
Updated deposit-account balance	The deposit-account balance that has already been updated to reflect the current amount (initial deposit amount + interest amount).
Update the collateral database	The process of updating the collateral information, which is stored in the collateral database.
Update the deposit-account balance	The process of updating the deposit account to reflect the current deposit-balance, which includes the principal amount plus the up-to-date interest.

Table E.2. Data Dictionary for Entity Relationship Diagram (Continued).

Object Name	Meaning
Customer Code	This is the code of each customer. This code can be used for accessing collateral information.
Customer Name	This is the name of each customer.
Deposit Period	This is the deposit period of each deposit account, e.g. 3 months, 6 months, one year, etc.
Deposit Type	This is the type of each deposit account, e.g. fixed deposit account, current deposit account, saving deposit account, etc.
Ending Period	This is the ending period of each borrowing transaction.
Extension No.	This is the extension number (internal phone number) of each officer.
Guarantor's Name	This is the name of each guarantor.
Guaranteed Value	This is the amount of money that each guarantor will be responsible for the bank, in the case that the guaranteed customer cannot afford to repay to Radanakosin Bank.
Interest Rate	This is the interest rate for each type of product, e.g. deposit account, loan, etc.
Land Title Deed Number	This is the land title deed number of each land pledged by the customer.
Maturity Date	This is the date that each security will be matured.
Officer Code	This is the code of each officer of Radanakosin Bank.
Officer Name	This is the name of each officer of Radanakosin Bank.
Phone No	This is the phone number of each customer.
Pledged Value	This is the amount of appraisal-value that the customer pledged with the bank. This may be equal to the appraisal-value, or less than the appraisal-value. But it cannot be more than the appraisal-value.

Table E.2. Data Dictionary for Entity Relationship Diagram (Continued).

Object Name	Meaning
Position	This is the position of each officer of Radanakosin Bank.
Principal Amount	This is the original amount of money that each customer borrows from Radanakosin Bank.
Relationship	This is the relationship between the borrower and the collateral owner.
Return on Securities	This is the rate of return on each security.
Type of Borrowing	This is the type of borrowing of each customer, e.g. commercial loan, overdraft, housing loan, etc.
Type of Securities	This is the type of securities, e.g. preferred stock, common stock, bond, debenture, etc.
User Level	This is the level of authorization of each officer. This will indicate the action that each customer can perform on the information in the collateral information system.

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