DEVELOPMENT OF LIBRARY AUTOMATED SYSTEM BY OBJECT ORIENTED APPROACH

By

MR. LE PHU BINH

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

Submitted in Partial Fulfillment
of the Requirement for the Degree of
Master of Science
in Computer Information Systems
Assumption University

April, 1998

MS (CIS)

ABAC
GRADUATE SCHOOL LIBRARY

Development Of Library Automated System By Object Oriented Approach

By
Mr. Le Phu Binh

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

April 1998

Project Title	Development Of Library Automated System By Object Oriented Approach
Name	Mr.Le Phu Binh
Project Advisor	Air Marshal Dr.Chulit Meesajjee
Academic Year	1/1998

The Graduate School of Assumption University had approved this final report of the three-credit course CS6998 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information System.

Approval Committee :

(Pro.Dr.Srisakdi Chamonman)
Chairman and Mmember

(Air Marshal Dr.Chulit Meesajjee)
Dean and Advisor

(Dr.Sudhiporn Patumtaewapibal)
Member

(Assoc.Prof. Somchai Thayarnyong)
MUA Representative

April 1998

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

ABAC
GRADUATE SCHOOL LIBRARY

ABSTRACT

This project covers the analysis, design and implementation strategy of the automated system for the library of Ho Chi Minh City University of Technology, which has been growing up with the development of the university in recent years and urgently required to computerized its operation for improving services as well as achieving better management.

To analyze the existing system and design the new computer system to meet the expectation and requirements of the library, Object Oriented Approach is chose as the best methods nowadays, and then the designed system will be developed also by an Object Oriented Programming Language to accommodate the benefit from the result of the analysis and design steps, and also to accommodate the benefit of Object Oriented Technology.

In recent years, the library has been expanding rapidly in term of amount of resources as well as services providing for library's members. Therefore to keep up with the workload, computer must be applied to assist managing and operating of the library. It will also have a good impact in improving the quality of education within the University.

ASSUMPTION UNIVERSITY OF THAILAND
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

ACKNOWLEDGMENTS

I am very appreciate the contributions of several people who make the completion of this project possible.

I would like to say my most appreciate to my family who always exhort for my effort so far, to Assumption University which gave me the opportunity to study this program and to my advisor of this project, Dr. Ouen Pin-Ngern, for his valuable suggestions and guidances.

I would like to thank all other my instructors for the time they spent to teach me in computer information system courses.

I would like to thank to library's staffs of Ho Chi Minh City University of Technology, who have helped me a lot by answering my questions and providing necessary information for my project.

I would like to thank my classmates and other friends who has been cooperated with me in studying and doing the project, as well as the ones who always encourage me during the time I am studying this program.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

ABAC
GRADUATE SCHOOL LIBRARY

TABLE OF CONTENTS

Chapter		Page
ABSTRACT		i
ACKNOWLEDGMENTS		ii
LIST OF FIGURES		vii
I.	INTRODUCTION	1
	1.1 Object Oriented Versus Traditional Structure Approach	1
	1.2 Background Of The Organization	2
	1.3 Description of the system	3
	1.4 Objectives	4
	1.5 Scope	5
	1.6 Project Plan	6
II.	ESTABLISH CORE REQUIREMENTS OF THE SYSTEM	8
	2.1 General Requirements of the system	8
	2.2 Library's members requirements	9
	2.3 Catalogue requirements	10
	2.4 Library's services requirements	11
	2.5 Reporting requirements	13
	2.6 Security requirements	13

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
VINCIT OMNIA
SINCE1969

Chapter		Page

III.	ANALYSIS OF THE EXISTING SYSTEM	14
	3.1 Existing functions	14
	3.1.1 Acquisition of library's resources	14
	3.1.2 Catalogue	15
	3.1.3 Providing Services to library's members	16
	3.2 Current Problem and Areas of Improvements	18
	3.3 Existing computer System	19
	3.4 Identifying of classes and objects and its semantics	20
	3.5 Identify the relationships between classes and objects	21
	3.5.1 Relationships between classes and objects	21
	3.5.2 Classes and Objects Diagrams	23
	3.6 Scenario planning	30
	3.6.1 Identify primary methods of classes and objects	30
	3.6.2 State Transition Diagram	35
IV.	SYSTEM DESIGN	42
	4.1 Implementation of classes and Objects	42
	4.1.1 Attributes of Classes and Objects	42
	4.1.2 Functions of Classes and Objects	49
	4.2 Interaction Diagram	59
	4.3 Designation of user interface	66
	4.3.1 Definition of Windows' identification	66
	4.3.2 Common part of the System's User Interface	66

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST. GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Chapter **Page**

4.3.3 Main window of the system 68

4.3.4 Catalogue process part of the user interface 68

4.3.5 Member management part of the user interface 79

4.3.6 Service providing part of the user interface 83

4.4 Hardware and Software Requirements 94

4.4.1 Hardware Requirement 94

4.4.2 Software Requirement 94

4.5 Security and Controls 94

4.6 Cost and Benefit Analysis 95

4.6.1 Implement Cost 96

4.6.2 Investment Cost 96

4.6.3 Annual Cost 97

4.6.4 Total Costs 97

4.6.5 Tangible Benefit 97

4.6.6 Payback Period Method 98

4.6.7 Intangible Benefits 99

4.6.8 Comparing Two Method by Graph 99

V. PROJECT IMPLEMENTATION 100

5.1 Overview Of Project Implementation Schedule/Resource Utilized 100

5.2 Test Plan And Results 100

VI. CONCLUSIONS AND RECOMMENDATIONS 102

Chapter		Page

BIBLIOGRAPHY		104
APPENDIX A	Report Templates	105
APPENDIX B	Organization Chart	110
APPENDIX C	Screens Of The System Application	113

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

LIST OF FIGURES

Figure		Page
3.1	General Classes Diagram	23
3.2	Classes Diagram Of Supplier	24
3.3	Donor Object Diagram	25
3.4	Vendor Object Diagram	25
3.5	Member Object Diagram	26
3.6	Cataloguecard Object Diagram	27
3.7	Borrower Object Diagram	28
3.8	Search Object Diagram	29
3.9	Administrative Report Object Diagram	30
3.10	Cataloguecard State Tranition Diagram	35
3.11	Material State Transition Diagram	36
3.12	Media State Transition Diagram	37
3.13	Member State Transition Diagram	38
3.14	Borrower State Transition Diagram	39
3.15	Acknowledgment State Transition Diagram	40
3.16	Order State Transition Diagram	40
3.17	Policy State Transition Diagram	41
4.1	Acknowledgment Interaction Diagram	59
4.2	Acquisition Interaction Diagram	60
4.3	Borrower Interaction Diagram	61
4.4	Order Interaction Diagram	62
4.5	Member Interaction Diagram	63
4.6	Administrative Report Interaction Diagram	64
4.7	Service Interaction Diagram	65
4.8.	Proposal System Cost Vs Existing System Cost	99
B.1	Organization Chart	111
C.1	Confirmation Dialog Box	112
C.2	Confirmation Dialog Box (2)	112

GRADUAT

Figure **Page**

C.3	Error Message Dialog Box	113
C.4	Library Input Dialog Box	113
C.5	Application Wizard Screen	114
C.6	Main Window Acquisition Screen	115
C.7	Book Processing Wizard	116
C.8	New Book Processing Screen	117
C.9	Editing Book Data Screen	118
C.10	Deleting Book Screen	119
C.11	Magazine Processing Screen	120
C.12	New Magazine Processing Screen	121
C.13	Editing Magazine Data Screen	122
C.14	Deleting Magazine Screen	123
C.15	Report Processing Wizard Screen	124
C.16	New Report Processing Screen	125
C.17	Editing Report Data Screen	126
C.18	Delete Report Screen	127
C.19	Media Processing Wizard Screen	128
C.20	New Media Processing Screen	129
C.21	Editing Media Data Screen	130
C.22	Delete Media Screen	131
C.23	Membership Processing Screen	132
C.24	Membership Creating Screen	133
C.25	Membership Editing Screen	134
C.26	Membership Disabling Screen	135
C.27	Main Screen Of Service Providing Wizard	136
C.28	Borrowing Screen	137
C.29	Returning Screen	138
C.30	Reservation Screen	139
C.31	Searching Screen	140
C.32	Search Book By Title Screen	141

UNIVERSITY OF THAILAND
SUMPTION
SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

Figure **Page**

C.33	Search By Author Screen	142
C.34	Search Book By Subject Screen	143
C.35	Magazine Searching By Title	144
C.36	Magazine Searching By Subject	145
C.37	Report Searching By Advisor	146
C.38	Report Searching By Subject	147
C.39	Media Searching	148
C.40	Screen Of Administrative Report	149

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

I. INTRODUCTION

1.1 Object Oriented versus Traditional Structure Approach

Since the early of 1980s, Object Oriented technology has been becoming a very important part of computing area, especially nowadays, Object Oriented Approach is not only a major field of study in computer science, but also applying strongly in development of application systems. With different characteristics that we are going to described in this section, it is realized that Object Oriented Approach is taking part of Structure Approach because of its following advantages:

- Structure Approach often gets the problems of lacking of overlap or smooth transition between analysis and design, while the approach adopted in object oriented analysis and design tends to merge the systems analysis with the process of logical design.
- Object Oriented is based on information hiding, while Structure Approach is based on analysis information to find existing problem of the system –if existed- and to design the recommended system or the prototype system.
- Object Oriented Approach is bottom-up technique, while structure analysis and design is top-down approach and having a series of multilevel diagrams which will be very complicated in the complex systems.
- Object Oriented Approach with its inheritance characteristic will make the system more flexible and easier when having any change on demand. Changes can be added up as objects naturally with less modification, compared with what we have to do in the same situation with Structure Approach.

With those above advantages, object oriented approach is chosen as the selected methodology to develop the required library automated system.

1.2 Background of the organization

The Library of HCMCUT was established at the same time as the university for purpose of serving the students and faculty members reading and referring. Materials of the library comprise books, journals and magazines, reports of students' thesis, CD-ROM and floppy disks. All of them are classified based on the field or area of study and assigned unique identified keys for reference. Readers of the library have to register for their status at the first time, and at the beginning of each academic year. Each of reader will be given a library card with their unique number (also classified based on each kind of reader, differ from students and faculty members). At the current time, there are around 200,000 titles of materials in the library, which serving for around 8,000 readers, comprise students, faculty members and university officers.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

1.3 Description of the system

The computerized library system will be designed and implemented based on the client/server environment, with the purpose of serving more than one users and doing more than one task at the same time. This is necessary because of the characteristics of library operation, information about available books must be provided on time to library's members and staffs, and also on line updated for inventory purpose.

The analyze and designation of the system will be done by using Object Oriented Approach, which is regarded as the latest and best methodology for system analysis and design nowadays. The system will be developed by using an Object Oriented Programming Language, that is Microsoft Visual Basic. By that, this library system will be able to gain a lot of benefits such as easy to modify to adapt with the new requirements in the future when necessary, easy to inherit and provide ability of inheritance for and from other projects.

Database of the library system will be stored and managed by using Microsoft SQL Server 6.5, which is currently running under the environment of Microsoft Window NT Server. Compare with other Database Management System, Microsoft SQL Server gets more benefit because it is much better than small software packages such as Microsoft Access, Microsoft FoxPro, Borland Paradox... and not so big and expensive such as Oracle, Sybase... In addition, SQL server provide a lot of utility to interact with data stored on it either directly or by interactive library function call (using DAO or ODBC). By using it, we can achieve the benefit of data management utilities such as data protection, data backup and restore... and all of them can run in PCs, which is chosen as the platform of the library system.

To get familiar with users, the user interface will be implemented based on Microsoft Windows environment which is said as the best and the most popular man-machine-interface environment nowadays.

1.4 Objectives

This project is done in expecting of the two following benefits:

1. Building the computerized system for the library of the university will assist the operation of it and improve the ability of serving readers, reduce costs of library's operation and afford for the development of the library in the future.

2. To provide practical experiences in analyzing, designing, implementing and evaluating information systems by using knowledge from System Analysis and System Design Courses, especially from Object Oriented System Analysis and Design Course. By applying those knowledge to a real system, student will be able to not only understand in deep about what was taught in the classes, but also prove that all necessary knowledge were received correctly. Finishing of the project will arm the student either experiences or ability for doing further projects in their duties.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

1.5 Scope

The project will focus on analysis the current system, then provides a designation of the full system by using Object Oriented methodology. The system will be implemented based on the designation by using an Object Oriented Programming Language. Because the library system in the real life requires serving for more than one people at the same time, the system will be developed to work in the Client/Server mode, and it should provide a user-friendly working environment as well. For achieving the purpose, Microsoft Windows will be chosen as the working environment, Visual Basic will be chosen as the programming language and the database system would be MS-SQL Server 6.5. Following features will be covered within the system:

Library members management

- Registration process of new members.
- Expiration process of members.

Materials Management

- Registration process of new material (books, magazines, journals…)
- End up the use of materials in the library (donate, overused…)

Library Services

- Search engine for resources of the library, based on individual unique keys or combination of them.
- Borrowing, returning and reservation of library's resources.

Reports

- Reports relate to members' status.
- Status reports of materials in the library periodically, which serve for the statistic tasks and administrative tasks.

Security providing: Manage of login and different access levels for different user login.

1.6 Project Plan

The project is planned to do by the following phases:

I. Feasibility study

- Figure out the scope and objective of the project.
- Investigate the existing system 's problem.
- Determine user requirements and evaluate the possibility justification.
- Determine the tasks need to be done.

II. General study and information collecting

- Study the library's policies and procedures in operation.
- Analyze the interactive processes between the library and other relevant departments in the university.
- Analyze the interactive processes between the library and its members.
- Examine relevant documents and forms of the existing library system.
- Survey the of computer knowledge of staffs in the library to have the appropriate training plan when having the new system in operation.
- Inspect the existing computer system of the library.

III. Analysis the existing library system and defined user requirement

- Identify of classes, objects and its semantics.
- Identify the relationship between classes and objects, establish the scenario planning.
- Identify the current problems and solutions for solving and improvement in the new system.
- Obtain user requirements of the new system.
- Determined the required reports on the regular basis and the ad-hoc basis.
- Determined the needs of the administrative department.

IV. Design the proposed system

- Identify attributes and functions of classes and objects.
- Provide the State Transition Diagram.
- Provide the Interaction Diagram.
- Provide Life Cycle of Objects.
- Specify security and control.
- Cost and benefit analysis of the proposed system.

V. Determine and evaluate the new system requirements

- Evaluate hardware requirements.
- Identify software requirements.

VI. Implement the designed system

- Coding the software package based on the designation of the system.
- Document during the progress of coding.

VII. Testing the new system and fixing bugs

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

II. ESTABLISH CORE REQUIREMENTS OF THE SYSTEM

2.1 General Requirements of the system

GR-10010

The computerized system must follow up with current tasks with least change in operation of the library.

GR-10010

GR-10020

The application must be designed and developed under the Graphic User Interface (GUI) environment.

GR-10020

GR-10030

The application user interface must be developed to be compatible with the Windows 95 system, and should provide ability to work in the Microsoft Window NT environment.

GR-10030

GR-10040

The application should be able to work in the Client/Server environment, which will be able to serve for multiple tasks and multiple users at the same time as one of essential requirement of the library operation.

GR-10040

GR-10050

The system should be developed on PC platform for achieving eases in maintenance because PC systems are using very popular with a lot of supports from manufacturers as well as other consultants nowadays.

GR-10050

GR-10060

The system must be done with all detail documents for referring when modifying, updating or because of any other requirement in the future.

GR-10060

2.2 Library's members requirements

MR-10010

It is required that users of the library have to register for their memberships before being able to use any resource of the library. Each user will be assigned a unique identification number when qualified to be a member of the library.

MR-10010

MR-10020

Member of the library should be classified to different kinds of memberships depends on their responsibilities in the university. Different policies in provided services will be applied for different memberships.

MR-10020

MR-10030

Library's members should not be able to borrow more materials if they reach the limited number of borrowing.

MR-10030

MR-10040

Library's members should not be ale to borrow more materials if they are still keeping any over-due-date material.

MR-10040

MR-10050

Late in returning borrowed materials to the library should be fined by the defined rate multiple by the number of days between the due date and the returning date.

MR-10050

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

2.3 Catalogue requirements

CR-10010

There are three kinds of card catalogue files which are using in the library: author card, subject card and title card. All of them have to contain the following information

- Call number of the material.
- Title of the material
- ISBN of the material (if available)
- Author name (if available)
- Published year
- Publishing company
- Subject of the material
- Number of pages in case of printed materials.

CR-10010

CR-10020

Depends on each kind of card provided, the author name, subject name or title of the material will be the head title of the card for ease in reference purpose.

CR-10020

CR-10030

Call number of the material must be unique and classified clearly based on the definition in the requirement CR-10031

CR-10030

CR-10031

The call number contains two parts: classification number and book number. Classification number comprises 3-digit number which specifies the category of the material and 1-digit number which specifies the sub-category of the material. Those two number are separated by a dot (“.”). Book number is a 4-character

974 c.1
MS (CIS)
ABAC
GRADUATE SCHOOL LIBRARY

combination which comprises the first letter of the author name, 3-digit running number and a character to specify the language of the material.

CR-10031

CR-10032

If there are more than one copy for a title of material, there will be additional two-digit running number to distinguish the different copy of the material.

CR-10032

CR-10033

Classification numbers are distributed as follow:

- 000 Generalities
- 100 Basic sciences (in mathematics, chemistry, physical…)
- 200 Civil Engineering.
- 300 Chemical Engineering and Petroleum processing.
- 400 Mechanical Engineering.
- 500 Industrial Art Design and Industrial Management
- 600 Geometry and Petroleum.
- 700 Computer Science and Information Technology.
- 800 Electronic and Electric Engineering.

CR-1003

2.4 Library's services requirements

SR-10010

Number of borrowing materials is limited at 5 copies for student membership and 10 ones for staff and faculty membership.

SR-10010

SR-10020

Borrowing period is limited at a week for student membership and one month for staff and faculty membership.

SR-10020

SR-10030

Members of library can borrow only regular materials. Reserved materials (of the library) could not be taken out of the library under any circumstance.

SR-10030

SR-10040

All kinds of magazines, journals as well as reports could not be borrowed.

SR-10040

SR-10050

Any borrowing that is overdue for a month should be noticed and the membership of the owner will be expired then.

SR-10050

SR-10060

Members of the library are provided reservation service, but limited at one reserved material at a time. The reservation must be done based on the call number of the required material.

SR-10060

SR-10061

The reservation could is done as first come first served, that means library members could not reserve for the material which was already reserved by another member until it is in the borrowing status.

SR-10061

SR-10070

Searching of required materials is provided. Library members should be able to search for a material based on its call number, title, ISBN … or combination of them.

SR-10070

SR-10080

Status of the seeking material should be provided as a part of the material searching process, such as borrowed or reserved…

SR-10080

2.5 Reporting requirements

RR-10010

Status of materials within the library should be able to reported based on the regular operation of the library system.

RR-10010

RR-10020

Report status of a specific membership should be able to provide as a function for library's officers from a specific of time to the current time.

RR-10020

RR-10030

Usage density of a specific material should be able to report for library's officers when having requirements.

RR-10030

RR-10040

Necessary information about members and materials on overdue date at the time should be provided when having requirement.

RR-10040

2.6 Security requirements

SE-10010

Different levels of accessing to the computer system are provided, depend on the users are library's members or library's officers.

SE-10010

III. ANALYSIS OF THE EXISTING SYSTEM

3.1 Existing functions

There are three main functions of the library, those are acquisition of library's resources, cataloging and members' services supporting. When a request of new materials is made, it must be confirmed by the library's director then approved by Vice Rector of Administration before being ordered. Request of new materials could be made by faculty members (with the confirmed of the dean of department about its necessary) or by selection of the library in period. After that, purchasing order is sent to the vendor. Materials also received from donors sometimes and students' reports at the end of academic years. Since the time of establishing so far, the library has been receiving a large amount of material such as reference books, magazines, journals... from NGOs and from other university of developed countries. After receiving the materials, the library's staffs record information of them in respective files and send them to the catalogue section to produce shelf list cards, subjects cards, title cards and author cards as well as borrowing cards. The staffs then have to stick the call number slip on the book and place the material at the correct shelf, and the material is ready for serving library's members.

The library offer its members several services such as loaning services, material reservation, inquiry. Members search for the required material by catalogue cards then can use it there or take out by using his/her borrowing card. In case the required material is not available, he/she can reserve for it by registering at the library's staffs.

At the end of each semester, statistical reports will be done to report about the operation of the library.

3.1.1 Acquisition of library's resources

This section contains description of library's function in collection resources' information as well as obtaining them. The function also includes of how to order materials, and accepting donated materials from other sources.

Requests of new materials are usually sent to the library from departments of the university, based on requirements of faculties' members at 2 semesters in advance. Lists of new materials from vendors are also sent to the library at a period of time, in this case it will be transferred to each department depend on each category of materials, then return to the library with marks of chosen items. Material lists then will be checked and approved by the director of library after considering the library's current budget and relevant conditions. If the vice rector of administration approves after that, purchasing orders will be made and sent to the appropriate vendors.

When the ordered materials are received with the invoices, library's staffs will check to verify the number of material as well as status of it. In case of missing or having some defects, a report will be done and sent to the vendor to ask for supplement or change.

When materials are received from donors, classification of materials will be done and reported to the director of the library. An acknowledgment letter will be sent to the donors. All received materials will be registered in appropriate data files and transfer to catalogue process before putting into service. Catalogue process is also applied when receiving thesis from students at the end of each semesters.

3.1.2 Catalogue

When new materials are received at the library, its information will be obtained such as ISBN number, title of the book, author name, publishing company, edition, and accession date. Those data will be kept in the master file of all of materials in the library for referring later in other processes as well as for reporting purpose.

After recording necessary information of materials, catalogue cards of the book will be provided in 3 categories:

- Title card: Uses the title of the material as the key to search for the book.
- Author card: Uses the name of author as the key to search for the book.

Subject card: Uses the subject of the material as an index to find the information about the material.

A book card is then created for each new material. This card will be contained in the book's pocket which will be provided and attached inside at the back cover. The book

card is usually kept in the library for reference purpose about the circulation of the material. When the material is returned to the library from the member, the book card will be put back to the pocket before the material is placed back to the shelf.

Call number of the material is also provided in this step. This is a unique number which is very important to identify the material in the library. It is attached to the spine of the material and contains two parts: classification number and material number (also copy number if there are more than one copies of this title). Classification number is chosen based on the subject of the material (which was defined by the library) and material number is a running number which is unique for each title within the subject.

3.1.3 Providing Services to library's members

This section describes services which are providing by the library to its members. These services comprise new member registration (also with classification), borrowing, returning and reservation of materials within the library.

3.1.3.1 Member Registration

Member registration is required for every library's user before they are able to access to library's resources. Several kinds of members are provided depend on if the applicant is faculty member, university officer or student. Below is the purpose of member registration of the library:

- To be able to control all transactions of members and the materials which are used and kept by members.
- To classify types of members in order to provide different services to them appropriately.
- To be able to control and keep trace of members' status such as the validity of members when borrowing books, difference in loaning policy (depends on the variety of members)…
- To provide statistical reports which is a part of the library's operation.

Following services are providing to members by the library:

3.1.3.2 Borrowing service

This allows library members to borrow materials from the library. Depend on each type of membership, there are different policies for members of the library when they use this service. Library members can borrow materials from the library because of research purposes, teaching, studying, etc. and have to follow up with the following steps:

- Show their library's member card to the staff at the borrowing desk to be verified the validity of the card as well as the status of the membership.
- Fill out the member identification number (which was provided along with the library card) and accession number of the book to the book card then submit it to the library staff.
- The staff will check the book card, information on the card and also check if the borrowing is over the limited number borrowed materials or not.
- Date of returning the book to the library will be stamped on the library member card, depend on each category of membership as well as classification of materials.
- Material and member card will be given to the member, and the book card will be kept at the library as a record of transaction.

3.1.3.3 Returning service

When members return the borrowed materials to the library, the library staff will check the book cards then return it to the book pocket (the process is done based on the matching of accession number on both the book card and the book pocket). Date of return will be recorded to either the book card or the member card, as well as signature of the library staff. If members return the materials to the library late, they will have to pay the fine before available to use any other library's services. The amount of the fine payment will be done based on the rate of overdue and number of days for which the materials are late.

3.1.3.4 Reservation service

Members of the library can ask for reserving the item they want in case it was borrowed by another member. When they ask for this service, the library staff will check the

charging tray - which holds all book cards of the borrowed books- with the most following date. If the card of the required material is found, it will be marked as "reserved" with the identification number of the requested member on it. This member will have it right after when it is returned to the library. A flag card maybe attached to the book card to ensure that it is visible.

3.1.3.5 Material searching

Members of the library can search for materials they are seeking by using different ways depend on information they have about the materials. The library provide three different ways for searching for a material within the library: search based on the title card, search based on the name of the author (author card) or search base on the subject of the material.

3.2 Current Problem and Areas of Improvements

Below are current general problems which are facing when using the existing system:

1. Classification and assigning unique identified numbers of new books are doing manually and it takes a lot of time to pick up the unduplicated numbers and in round for them.
2. It takes time for doing status reports of the library and usually information provided on it is not in-time correct.
3. It is very difficult for users to check if a desired material is available at a time or not without walk-in by themselves.
4. Borrowing and returning of materials take time to process manually. And it is difficult for library staffs for checking the due date as well as late of return of material on demand.
5. The reservation is doing manually and it is difficult for assigning and checking priority of readers to reserve a material, that cause conflict between requests sometime.

6. It takes time for searching desired material manually as complain of readers, especially when there are many requests to check if the library has those material or not.
7. Because most of the tasks are doing manually, unexpected mistakes are unavoidable because of human weakness, which sometime causes troubles for operation of the library.

For better operation of the library system, a computerized system is required to improve following areas:

1. Total computerized the inventory of materials in the library which is also support for all kind of relevant reports (detail will be listed later in section below).
2. Lending task (borrowing and returning of materials) should be done automatically and all data of it should be stored in the appropriate database for reporting when having requirement.
3. Searching of materials in the library should be enhanced for better service. Computer system should be made of use to provide users the ability of searching the desired material based on specific keys which are title of the material, call numbers, ISBN number, author name…or combination of them.
4. Computer system in the library should be communicated together for having ease in exchanging data as well as for making use of the computer resource.

3.3 Existing computer System

The library has some computers at that time for doing some simple office task as well as reporting. Readers management and parts of inventory system have been done based on Microsoft FoxPro but could not cover all requirements of the library, in addition, those software modules have not run properly and not up-to-date to accommodate with the some changes in operation of the library.

Those computers were given to the library recent years and have been working individually instead of connecting together in a local area network, and data exchanges have been done by copying data to floppies and sometime it causes data in consistency.

AUAC
GRADUATE SCHOOL LIBRARY

3.4 Identifying of classes and objects and its semantics

The following classes are identified based on the description of the system:

CatalogueCard: Class contains information of the catalogue card of the materials. Depend of the use of the card at the specific time, its object would be title card, author card or subject card.

Book: Class has common attributes of all books in the library. Based on this class, each book will be describe by an object delivered from this class.

Report: Class has common attributes of all kind of reports in the library. Either there are several kinds of reports such as thesis, project reports, conferences' reports...but they all have been classified and done based on the defined format of the library in advance. Each object delivers from this class will represent for a report which is being kept in the library.

Magazine: Class has common attributes of all journals, magazines, newspaper.... When we refer to either a magazine, journal or newspaper which is keeping in the library, an object of this class will be used.

It is seen that either all of them are printed materials of the library, their characteristics and their uses are different. So for each kind of such the materials we need to have an individual class to describe. More abstraction of classes and objects' definition will be done later on, when we go to next steps of the analysis work.

Media: Class has common attributes of all kind of other materials such as Computer CD-ROM, Floppy disks, Video tapes...

BorrowedStuff: Class of reading-material which are borrowed by reader. Each object deliver from this class contains necessary information of the borrowed material as well as of the borrower, and other relevant data such as due date...For keeping trace of the operating of the library system, especially lending status, objects of this class will be created, referred and stored whenever a lending is made.

Member: Class of members of the library. Each member of the library will be referred under an object of this class.

Borrower: Class of members who are borrowing library's materials. Because it is possible that some members may not take out library's resources while other ones could be, so objects of this class will be used to manage the borrowing of members for inventory purpose.

As we can see in the requirements above, there are different kind of members in the library, depend of each kind of them, there will be a different policy for accessing library's resources. By the reason, class of **Teacher, Student and Staff** are also necessary to describe 3 major kinds of people who use library's services.

Policy: Class contains the policies of the library upon the different kind of memberships.

Acknowledgment: Class describes the acknowledgment letter which sends to the donors when getting donation of materials from them and also its information.

Order: Class contains information of orders of materials. Object of this class will contain all information about the order, such as vendor name, list of ordered material at that time, date…

Vendor: Class of vendors who have supplied materials for the library. It should contain information of how to contact to the vendor as

well as some briefly description about them.

Donor: Class of donors who have donated materials to the library, comprise information of how to contact to the donor as well as some briefly description about them.

Overdue: Class of borrowings which are overdue at that time, comprise information of the borrower and the borrowed stuffs those are overdue.

FineDue: Class contains data of fine-payment of overdue material.

3.5 Identify the relationships between classes and objects

3.5.1 Relationships between classes and objects

Considers classes of materials in the library, we realize that even though they are differ from each other, there are still some common information and characteristics for

reading-material like that. So, we should have a class to describe those common information, then Book, Magazine, Report and Media will inherit from it with its own characteristics. We name it Material and let it be the meta-class of Book, Magazine, Report and Media.

Class Member contains general information about all readers of the library, and other classes such as Teacher, Student and Staff inherit from it with each of its own characteristics (number of volumes has being kept for example).

Class BorrowedStuff contains information of taken-out material. So it use an object of member and object of Material as a part of its data. Each object delivered from the BorrowedStuff will also include an object of the material they borrow (identified by the material Identify number which is unique for each material in the library) and an object of the Member class (which is unique by the library number assigned to each reader of the library).

Class Borrower contains data of members who have been keeping materials. Each object represents a borrower and contain either member's information or borrowed stuffs information, so it uses either data object of Member class as well as data objects of Material class.

Because classes Vendor and Donor contain information of objects which have the same functions in general, that is providing materials to the library, we should have another class with those common characteristics and named it as Supplier. Vendor and Donor will inherit this class with their own attributes and methods.

Besides that, classes and objects which contain and use other classes and objects will be described in more detail in the section of Classes and Objects diagrams below.

3.5.2 Classes and Objects Diagrams

General Classes Diagram: Describes general relationship between main classes in the system.

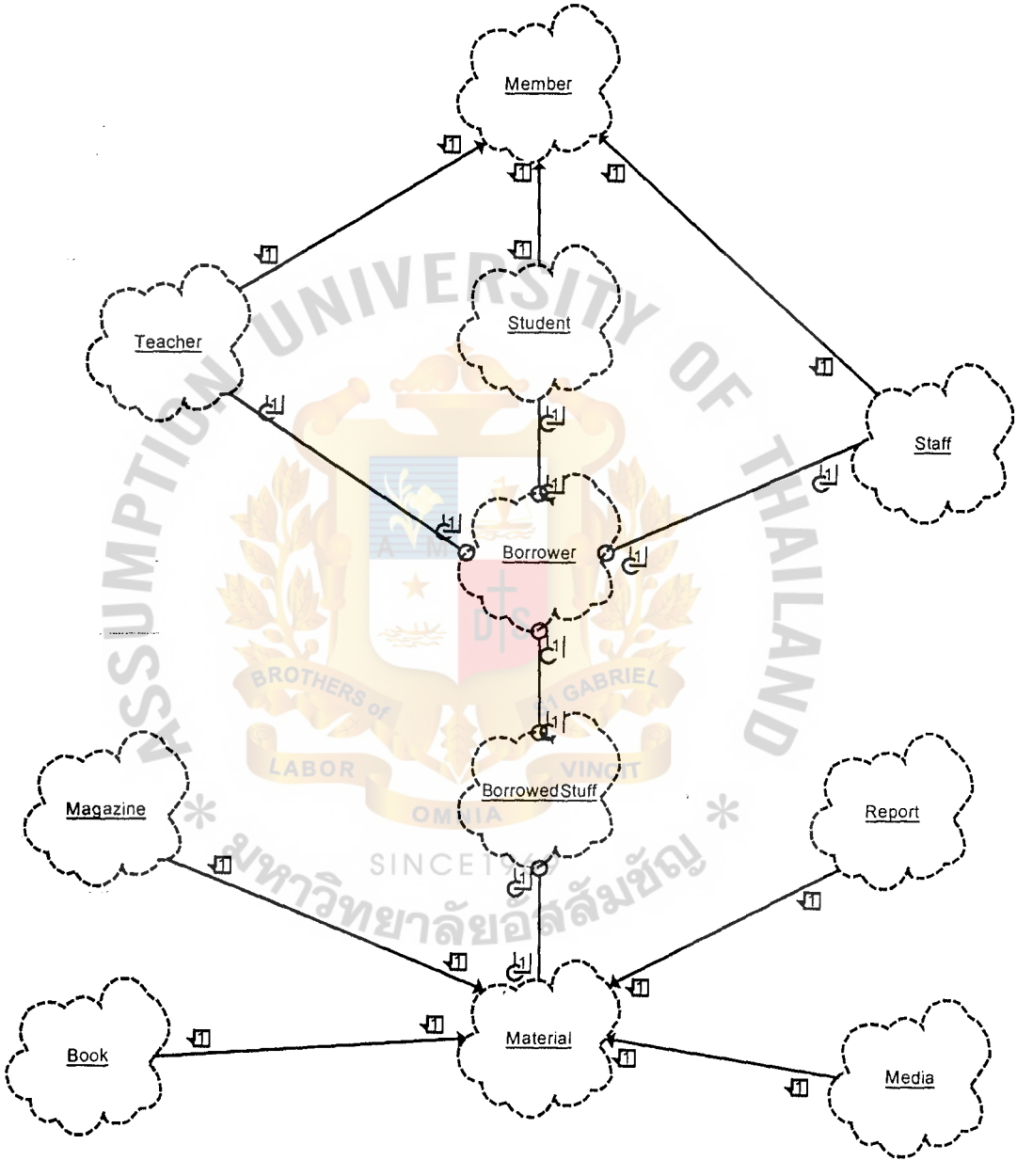

Figure 3.1. General Classes Diagram

Class Diagram of Supplier: Describes the relationship between Supplier object and other relevant objects, such as Vendor, Donor (which are inherited from the Supplier), then Object of Order, Material and Acknowledgment.

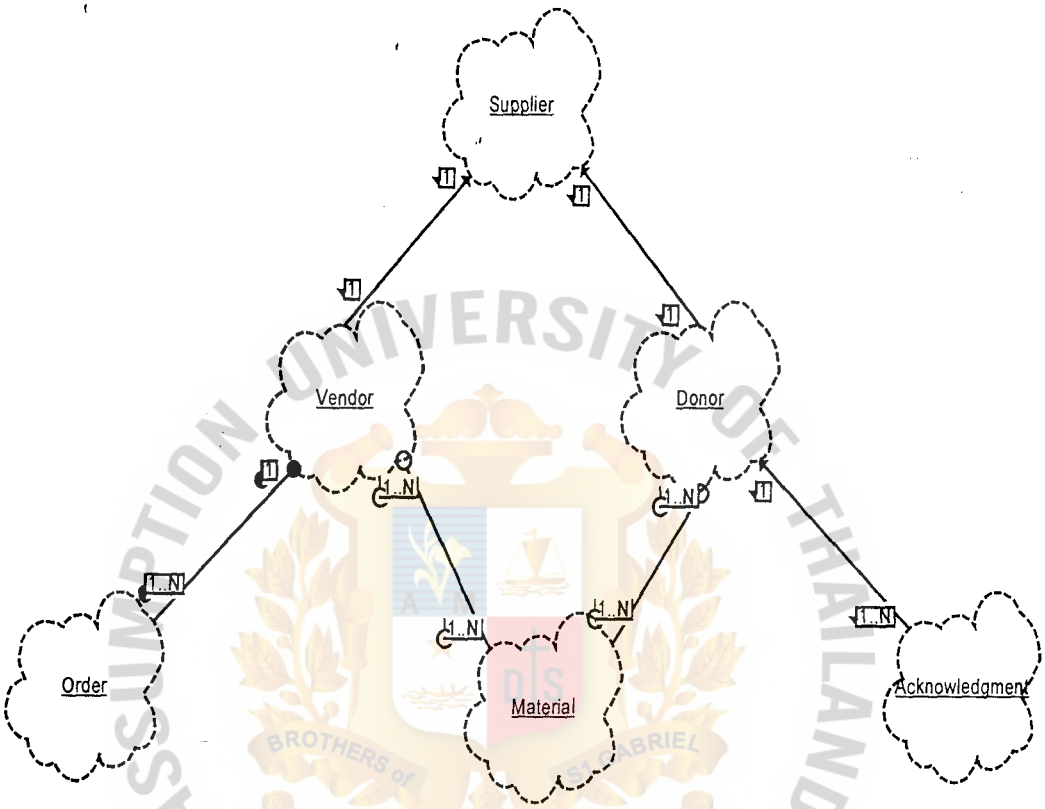

Figure 3.2. Classes Diagram of Supplier

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST. GABRIEL
OMNIA
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Object diagram of Donor: Describe the relationship between Object of Donor and Object of Acknowledgment letter.

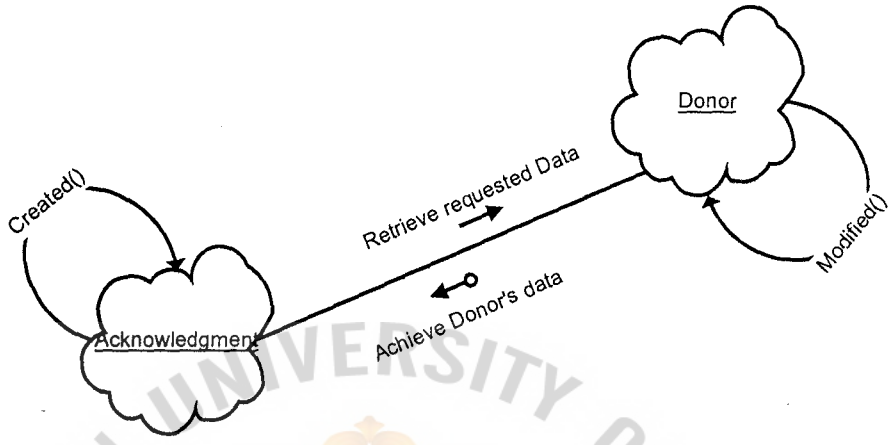

Figure 3.3. Donor Object diagram

Object Diagram of Vendor: Describes the relationship between Vendor 's object and Order's object.

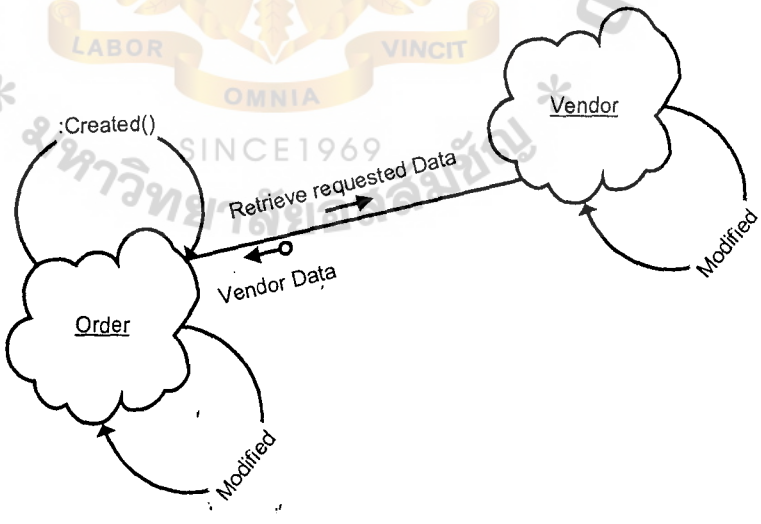

Figure 3.4. Vendor Object diagram

Object Diagram of Member: Describes the relationship among member of the library, those are Lecture membership, Staff membership and Student membership.

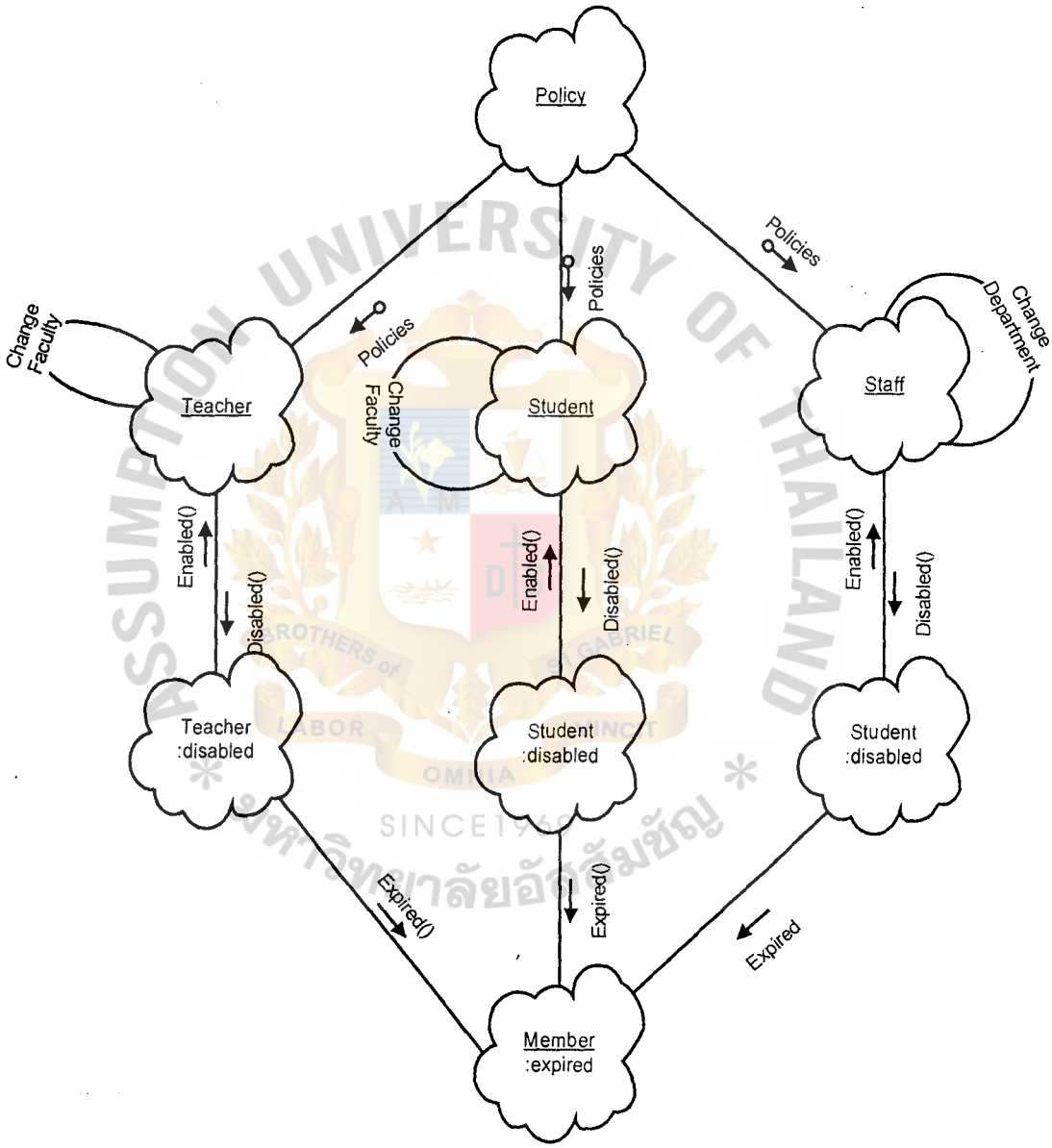

Figure 3.5. Member Object diagram

Object Diagram of CatalogueCard: Describes the relationship between resources within the library with the catalogue card.

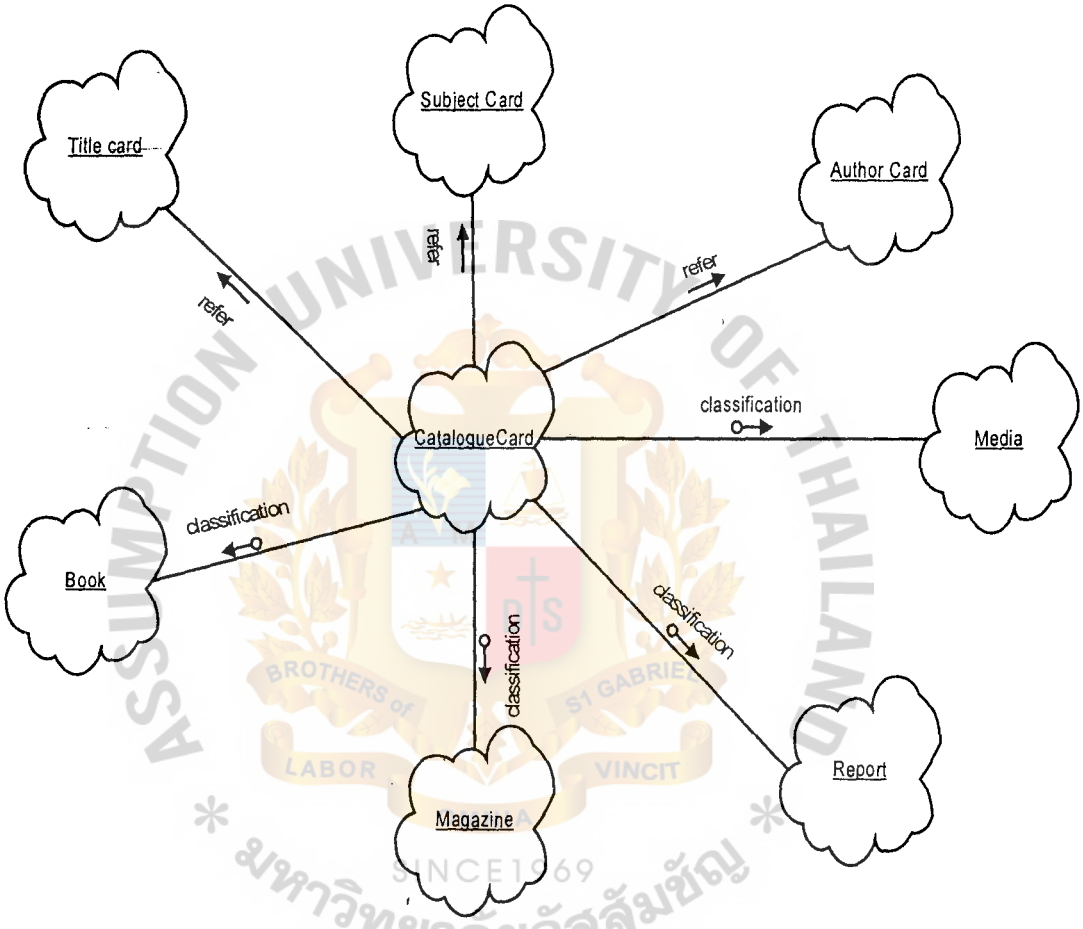

Figure 3.6. CatalogueCard Object diagram

Object Diagram of Borrower: Describes the relationship and communication between Borrower object and other relevant objects of resources and policy of the library.

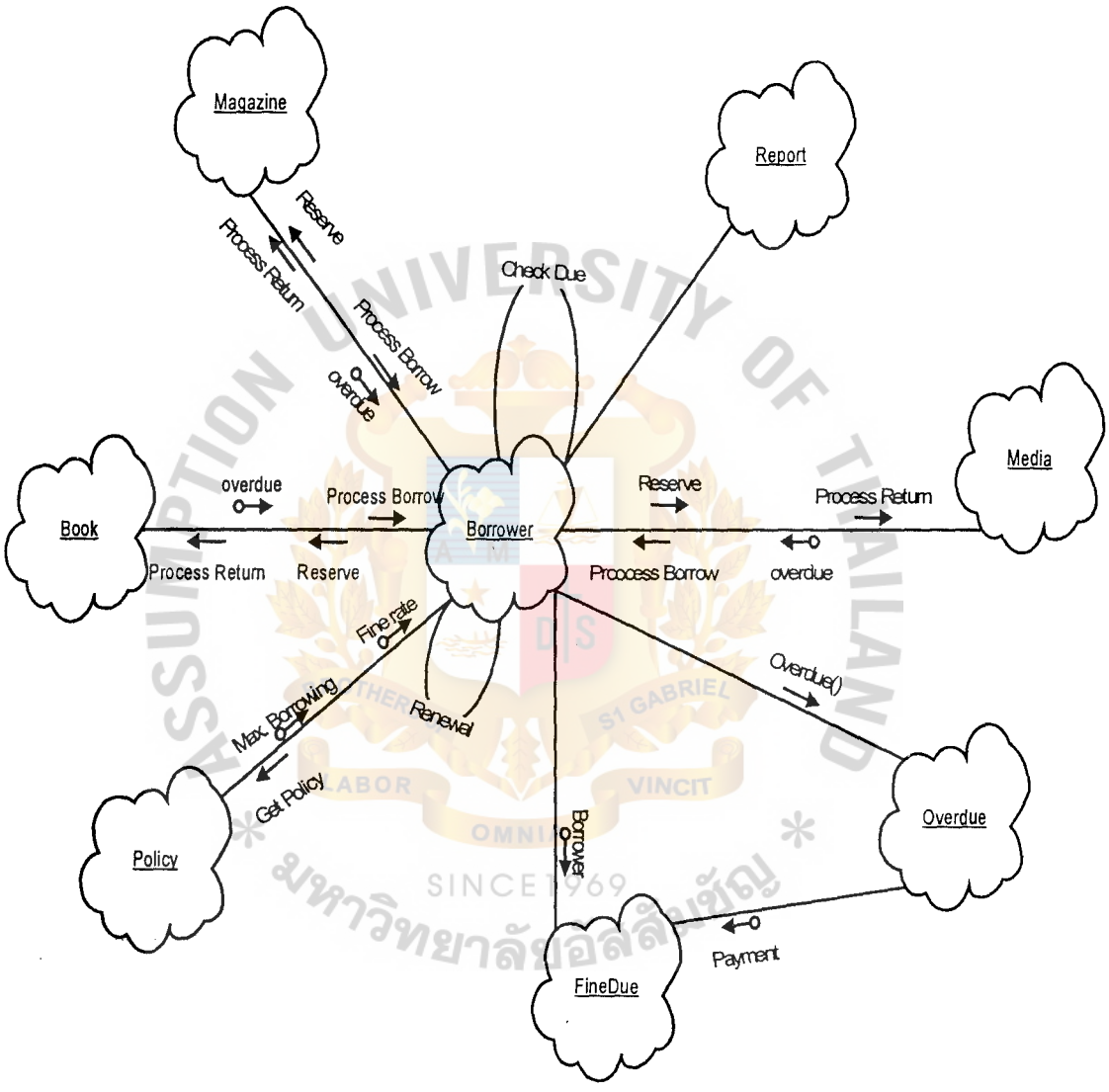

Figure 3.7. Borrower Object diagram

Object Diagram of Search: Describe the communication between objects when user doing a search of materials of the library.

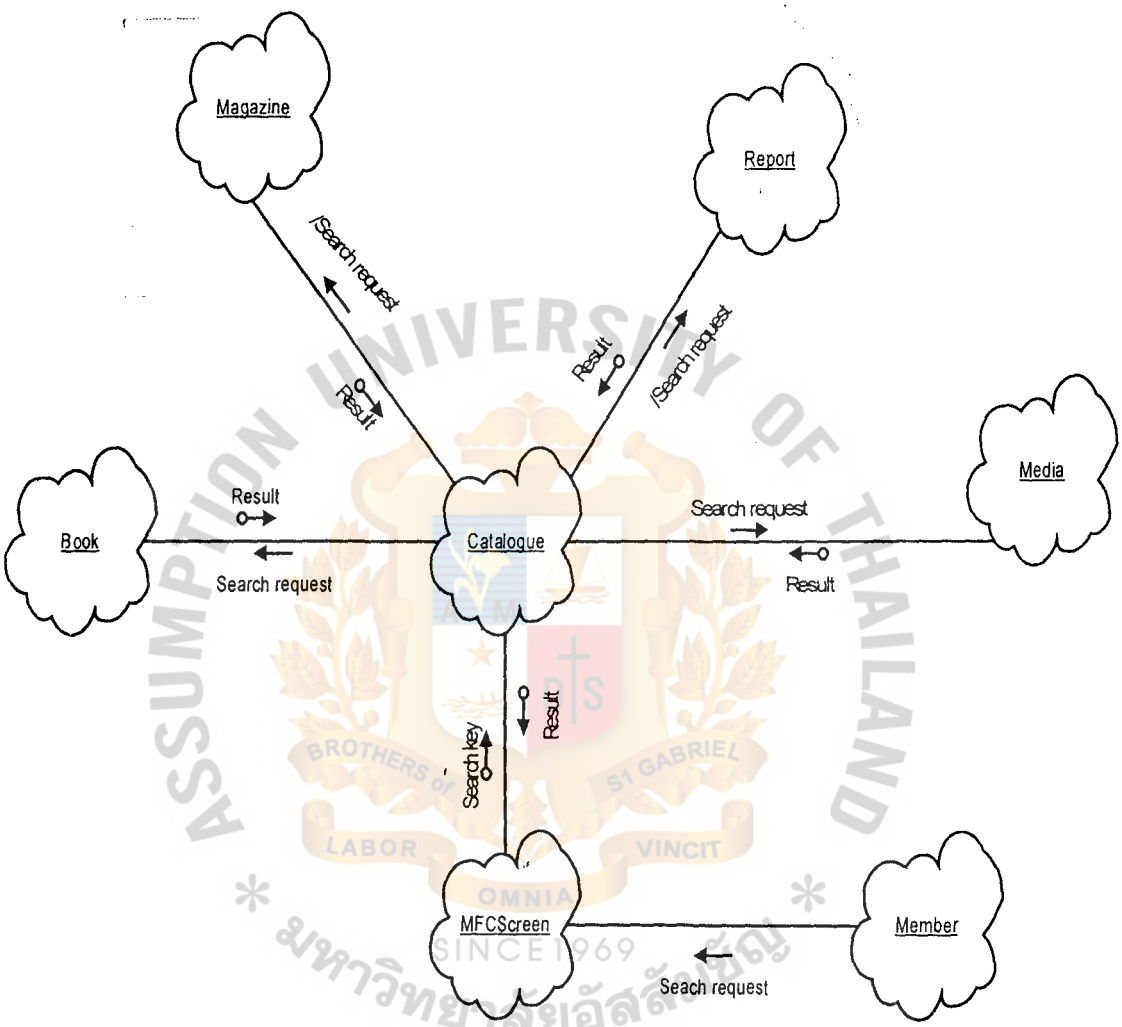

Figure 3.8. Search Object Diagram

Object Diagram of Administrative Report: Describes the communication between objects when doing administrative reporting tasks.

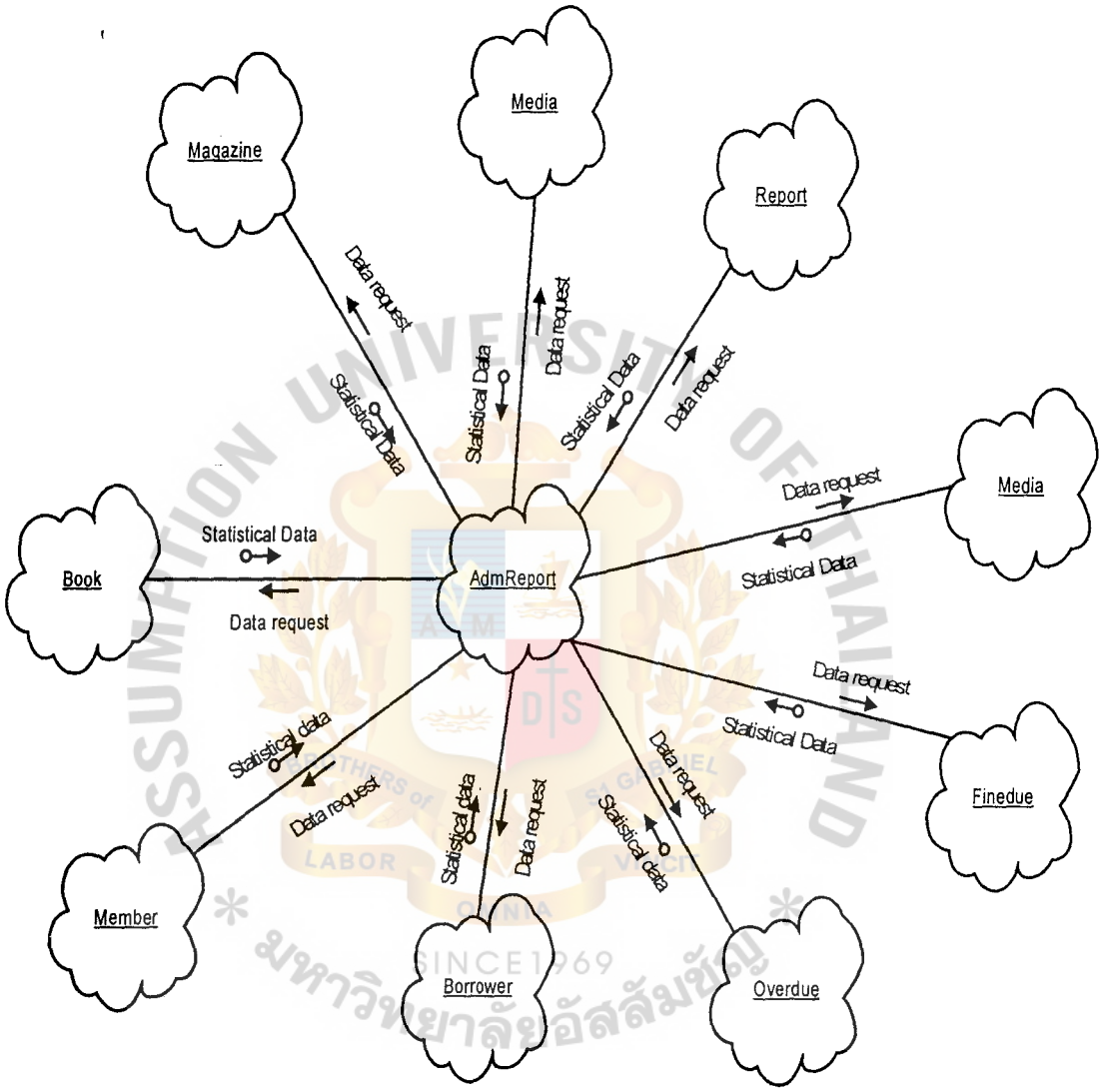

Figure 3.9. Administrative Report Object Diagram

3.6 Scenario planning

3.6.1 Identify primary methods of classes and objects

Class CatalogueCard should provide methods with:

3.6 Scenario planning

3.6.1 Identify primary methods of classes and objects

Class CatalogueCard should provide methods with:

1. Ability to create a catalogue card from provided information of the material.
2. Ability to distribute information within the card to provide title card, author card or subject card as requirement.

Class Book should provide methods with:

1. Ability to check the current status of the book with necessary information provided.
2. Ability of changing the classification of book (for the circumstance that the library needs to classify books again).
3. Ability of changing the number of copies (for the circumstance that the library have more books to serve for readers).
4. Ability of changing the number of copies available at the current time (for inventory and searching purpose, which can help the library members know if the book is still available in the library or not).

Class Magazine should provide methods with:

1. Ability to check the current status of the magazine, journal… with necessary information provided.
2. Ability of changing the classification of magazine (for the circumstance that the library needs to re-classify materials)
3. Ability of changing the number of copies (for the circumstance that the library have more magazines which is similar with this one)
4. Ability of changing the number of copies available at the current time (for inventory and searching purpose).

Class Report should provide methods with:

1. Ability of checking the current status of the report with necessary information provided.
2. Ability of changing the classification of report (reserve for the circumstance that the library needs to re-classify reports)
3. Ability of changing the number of copies in the library as well as number of copies available at the current time (for inventory and searching purpose).

Class Member should provide methods with:

1. Ability of active, de-active the status of member in case of necessary.
2. Ability of creating new member as well as expiring an outdated membership.
3. Ability of getting member's name based on the library ID number and vice versa (searching member's information based on his/her name or library ID number)
4. Ability of getting report status of the specific member in using library's services.

Class Teacher should provide methods with:

1. Ability of changing title of the member when he/she has a promotion or new title in academic degree.
2. Ability of changing department/faculty.
3. Ability of changing the number of copies a teacher can hold at a time.

Class Staff should provide methods with:

1. Ability of changing the position of staff (for the case of the staff has a promotion to the new position).
2. Ability of changing department/faculty.
3. Ability of changing the number of copies a staff an hold at a time.

Class Student should provide methods with:

1. Ability of changing faculty (for the case of transferring to another faculty).
2. Ability of changing the number of copies a student can hold at a time (for the case there is a change in the policy of the library).

Class Borrower should provide methods with:

1. Ability of checking the number of copies the borrower is holding at the time.
2. Ability of checking if there is existing any overdue borrowing or not.
3. Ability of checking the borrowing status of the borrower (for example: if there is an overdue material, he/she will not be able to borrow more).
4. Ability of retrieving all material which he/she is holding.

Class BorrowedStuff, should provide methods with:

1. Ability of retrieving information of the one who is holding the material.
2. Ability of checking the overdue of the borrowing.
3. Ability to retrieve the borrowed date as well as update the return date.

Class Acknowledge should provide method with ability of invoking the acknowledgment letter to view or edit its content.

Class Supplier should provide methods with:

1. Ability of retrieving contacted address and phone/fax number of the provider.
2. Ability to change contacted address and phone/fax numbers of the provider when necessary.

Class Policy should provide methods with:

1. Ability of retrieving policy of the library with different kinds of membership.
2. Ability of changing policy in providing service to specific membership.

Class Order should provide methods with:

1. Ability of creating an order with specific provider (vendor or donor).
2. Ability of retrieving the order which was made in a specific date for reference.

Class Overdue should provide methods with ability of retrieving all overdue holdings at the specific time, then able to provide required data right when getting request from library's officers.

Class FineDue should provide methods with ability to add and retrieving fine-payment data within a specific time for operated reporting purposes.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

3.6.2 State Transition Diagram

State Transition Diagram of CatalogueCard: Describes the change of states of CatalogueCard class in operation of the system.

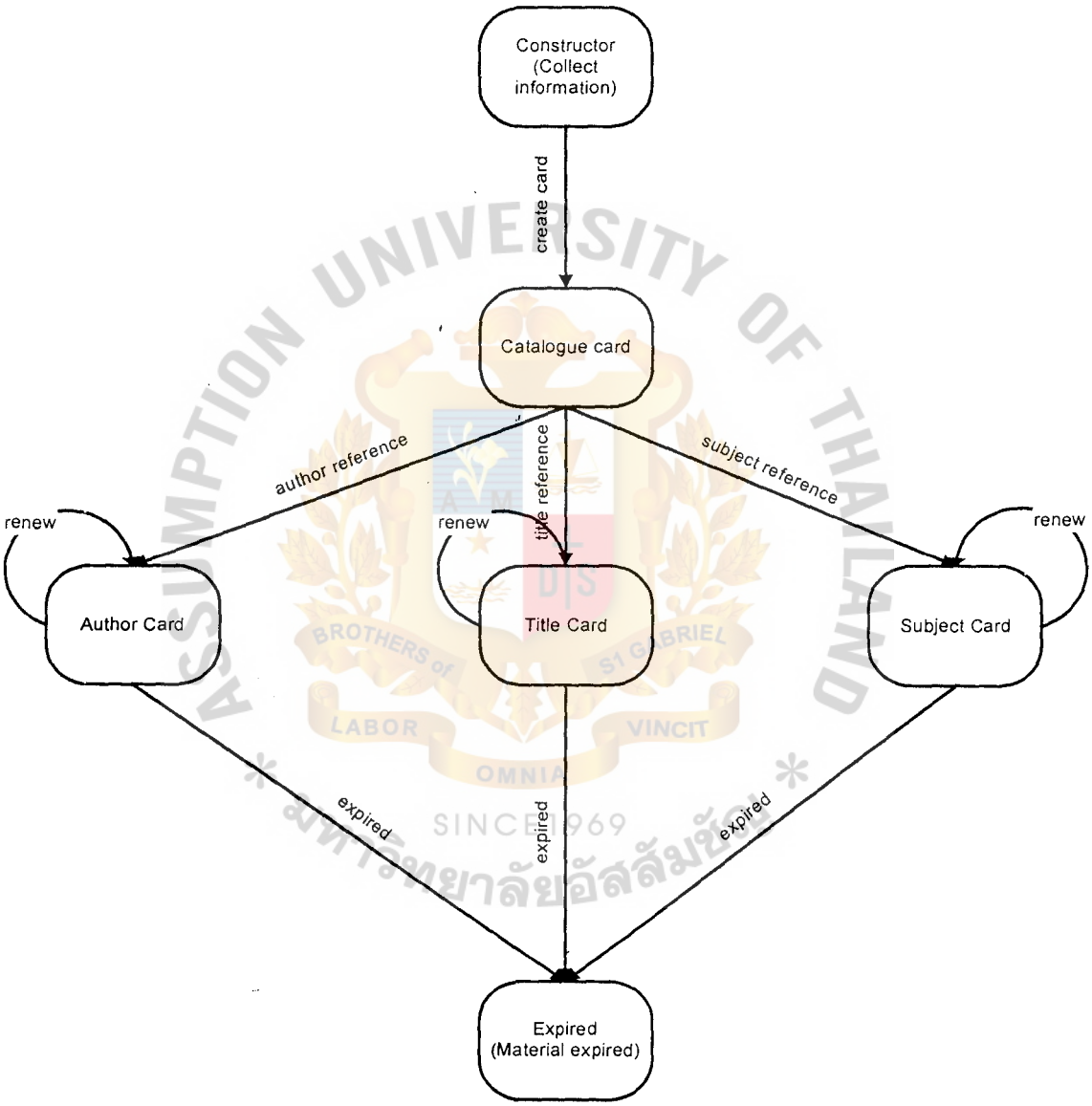

Figure 3.10. CatalogueCard State Tranition Diagram

State Transition Diagram of Material: Describe different states of material in operation of the system

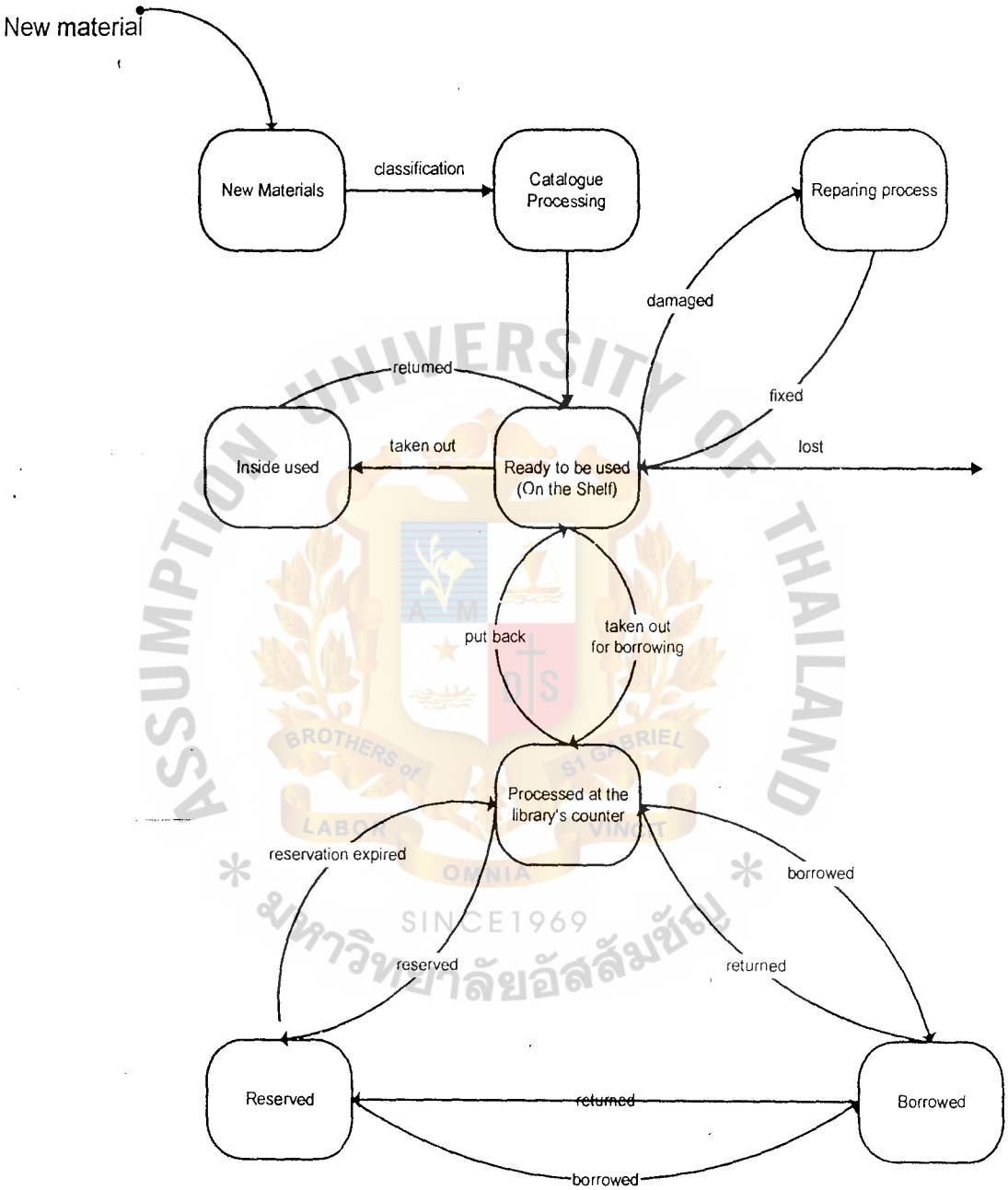

Figure 3.11. Material State Transition Diagram

State Transition Diagram of Media class: Described the changes of states of media class in operation of the system, it is as same as changing states of other similar classes in operation.

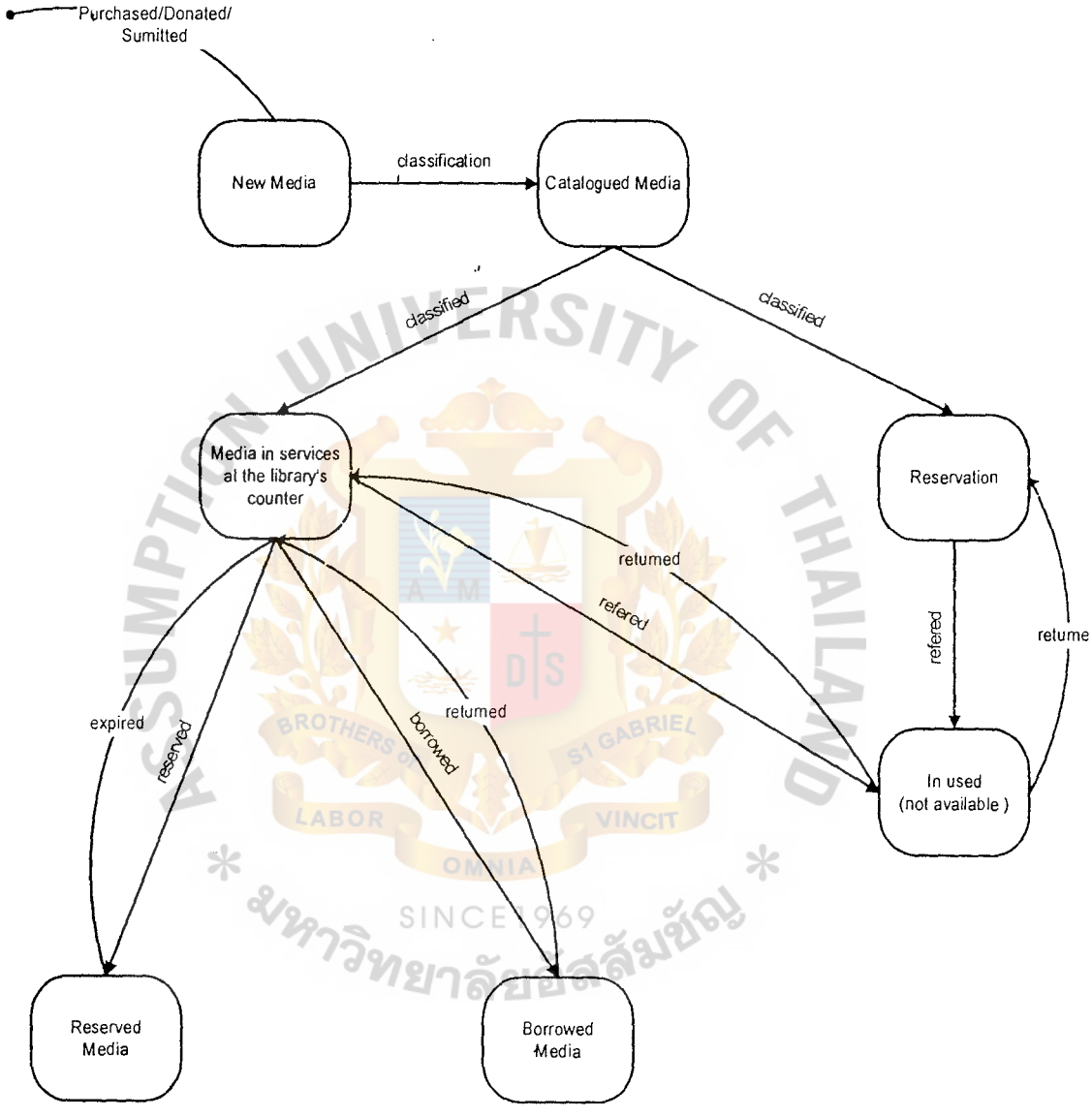

Figure 3.12. Media State Transition Diagram

State Transition Diagram of Members Describes the changes of state classes and objects of membership during the operation of the system.

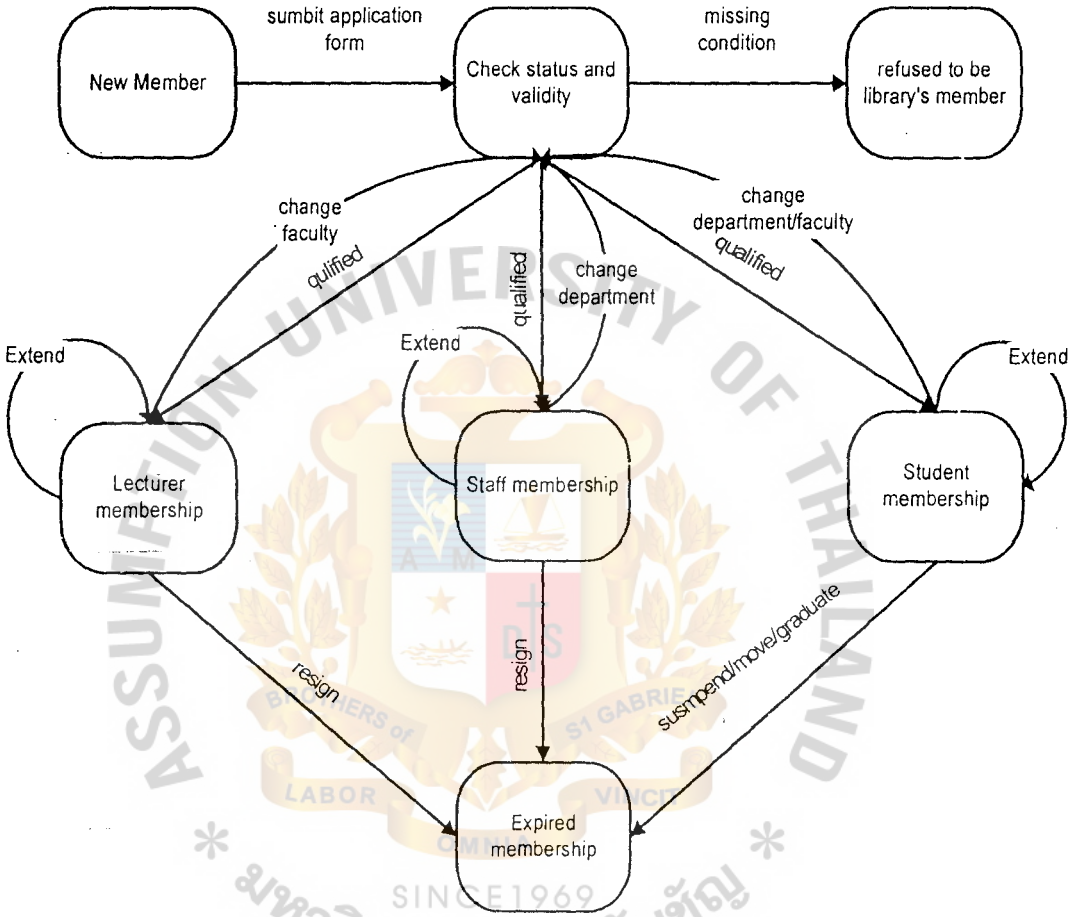

Figure 3.13. Member State Transition diagram

State Transition Diagram of Borrower: Describes the changes of state of classes and object of member when using services of the library.

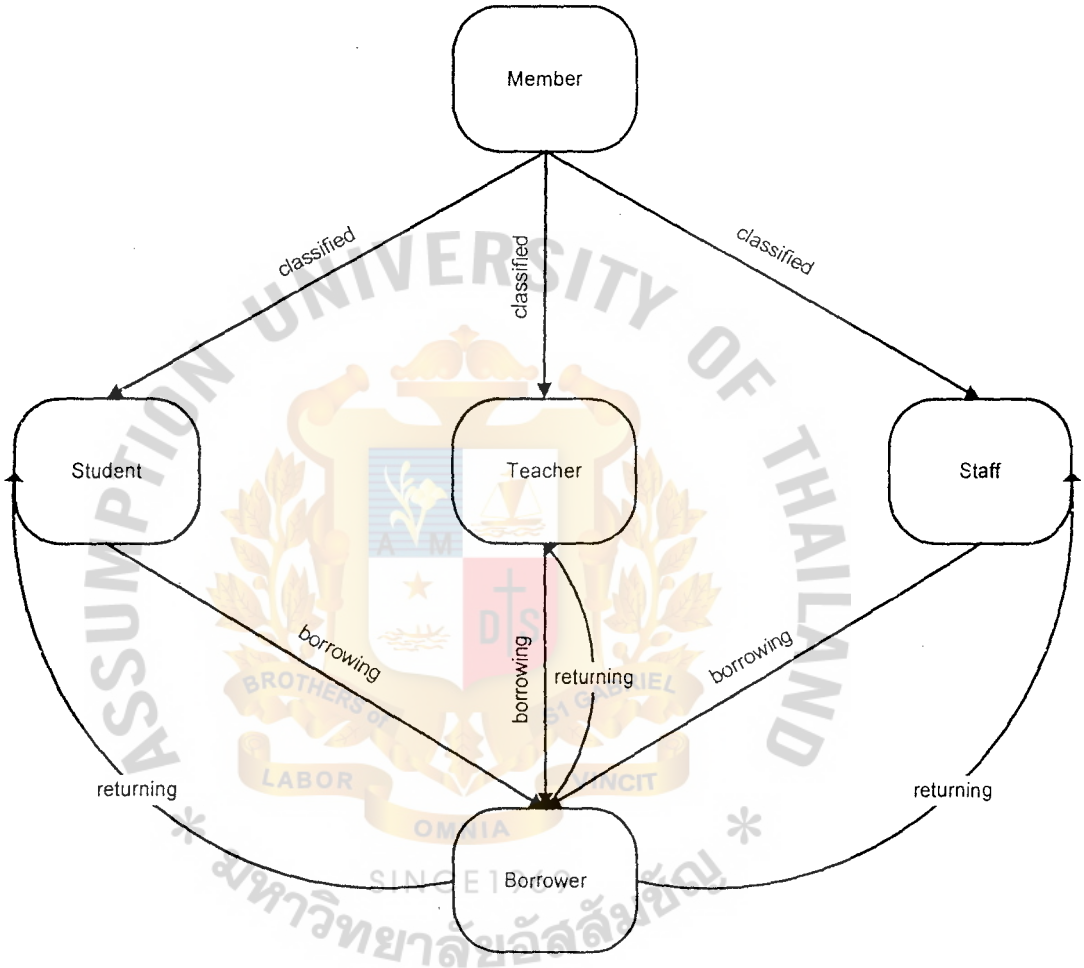

Figure 3.14. Borrower State Transition diagram

State Transition Diagram of Acknowledgment

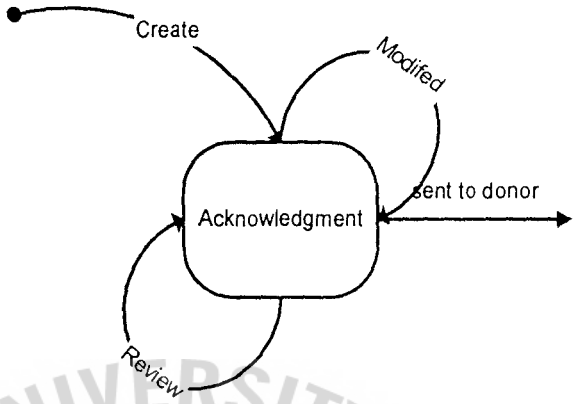

Figure 3.15. Acknowledgment State Transition Diagram

State Transition Diagram of Order

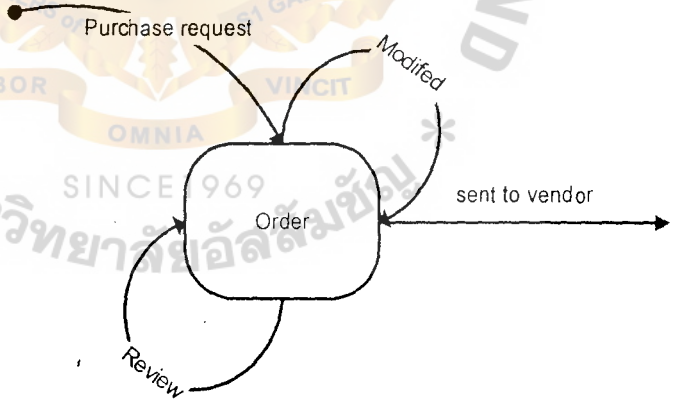

Figure 3.16. Order State Transition Diagram

State Transition Diagram of Policy

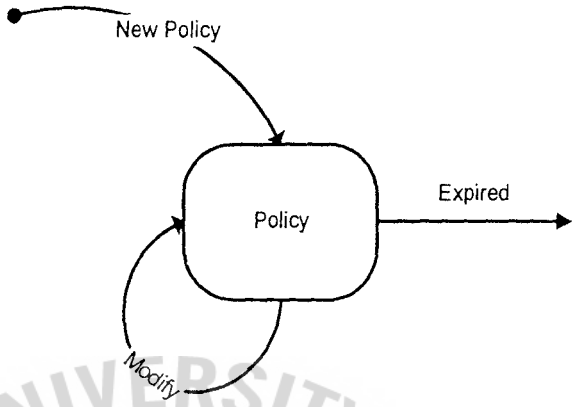

Figure 3.17. Policy State Transition Diagram

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

IV. SYSTEM DESIGN

4.1 Implementation of classes and Objects

4.1.1 Attributes of Classes and Objects

MATERIAL: Contains general information about library's materials.

Data member:

Call number	String to express the call number of the material.
Accession number	Accession number of the material in the libarary.
Subject	String to specify the classification of the material based on the field of study that the material serve for.
Type of document	Classification of the material based on the policy of the library, such as able to borrow or reservation.

CATALOGUECARD: Inherit MATERIAL, it can be used as an optional class to when searching for documents within the system.

Data member:

Category	Specify the material is book, magazine,....
Title	Title of the material
Author Name	Specify the name of the author in case of book.

BOOK: inherits MATERIAL. Contains specific information of books in the library.

Data member:

Title	String to specify the title of the book.
ISBN	String to specify the ISBN number of the book.
Author name	Name of the author of the book.
Publishing company	Name of the publishing company.
Edition	Edition of the book

Page	Number of pages.

MAGAZINE: inherit MATERIAL. Contain specific information of magazines and journal in the library.

Data member:

Name	Name of the magazine or journal
Volume	Volume of the publishing.
Date	Date of publishing

REPORT: inherit MATERIAL. Contains specific information of reports (comprise project's reports, thesis…) in the library.

Data member

Topic	Topic of the report/thesis.
Author name	Name of the one who did the report.
Advisor name	Name of the advisor of the author.
Submitted time	Time of finishing the report (semester, year).

MEDIA: inherit MATERIAL. Contains specific information of kind of library's resources such as CD-ROM, floppy disks, tapes…

Data member

Topic	Topic of the media.
Accession number	Accession identification number of the media.
Relevant accession	Accession identification number of the book along with the media.

MEMBER: Defines member in general, provides methods to interface with data members within the class's object.

Data member:

First name	First name of the member
Last name	Last name of the member
Library ID number	Library ID number of the member.
Status	Status of the member, it could be either Enable, Disable…
Comment	A comment about the member. If status is disable, it could be a brief description about the reason of disabling the status of the member.

TEACHER : inherits READER. Contains information about borrowers who are teachers and also provides functions to interface with its data.

Data member:

ID number	Teacher ID number
Title	Title of the borrower, such as Doctor, Professor….
Department	Department/faculty of the teacher.
Maximum of borrowing	Number of materials a teacher can borrow from the library.
Maximum date	Number of date a teacher can hold a material of the library.

STAFF: Inherits READER. Contains information about borrowers who are staffs and also provides functions to interface with its data.

Data member:

ID Number	Staff ID number.
Position	Position of the staff.

Department	Department/faculty the staff is working for.
Maximum of borrowing	Number of the materials a staff can borrow from the library.
Maximum date	Number of date a staff can hold a material of the library.

STUDENT: inherits READER. Contains information about borrowers who are students and also provides functions to interface with its data.

Data member:

ID number	Student ID number
Faculty	Faculty of the student.
Maximum of borrowing	Number of the materials a student can borrow from the library.
Maximum date	Number of date a student can hold a material of the library.

BORROWER: Contains information about the current borrower of the library. Each one who is holding a material of the library will be described by an object of BORROWER. This class also provides functions to interface with its data member.

Data member:

ID number	Library ID number of the borrower.
Borrowing list	List of materials the member is holding.
Due status	Value which specify whether the borrower have any overdue or not.

ABAC
GRADUATE SCHOOL LIBRARY

BORROWED: Contains information about the borrowed material of the library. Each taken-out material will be described by an object delivered from this class for inventory purpose.

Data member:

Accession number	Accession number of the material
Borrower	Object of the one who is holding the material.
Borrowed date	Date of borrowed.
Due date	Due date.
Return date	Date of return.

SUPPLIER: Contains information about the suppliers of materials for the library in general.

Data members:

Name	Name of the Supplier
Address	Address of the supplier
Phone number	Phone number of the supplier
Fax number	Fax number of the supplier

VENDOR: Inherits SUPPLIER. Contain information about specific vendor of the library.

Data members:

Starting time	Time of establishing the relationship.
Ordered times	Times of ordering material from this vendor.
Provided amount	Amount of materials has been supplied by this vendor.

DONOR: Inherits SUPPLIER. Contains information about specific Donor who has been donated materials to the library.

Data members:

Starting time	First time of getting donation from the donor.
Donated times	Times of receiving material from the donor.
Provided amount	Number of materials has been donated by the donor.

ACKNOWLEDGE: Contains the content as well as related information of acknowledgment letters have been sent to donors after receiving their donated materials. This class will use an object of DONOR as a data member.

Data members:

Date	Date of issuing the acknowledgment letter
Receiver	Object to specify the Donor that the acknowledgment is/was sent to.
Content	Content of the acknowledgment letter

ORDER: Contains the content as well as related information of an order of materials. This class will use an object of VENDOR as a data member.

Data members:

Order ID	Identification number of the order (unique)
Date	Date of issuing the order.
Vendor	Object to specify the Vendor that will/would receive the order.
Content	Content of the order.

POLICY: Describe the difference kinds of policy of using library's services which are applied to different kinds of membership within the library. Those data will be referred especially when processing new membership applicants as well as when providing services to library members.

Data members:

Membership	Specify the kind of membership of library. Could be one of the following: - Lecture membership - Staff membership - Student member
Date	Date of issuing the policy (also date of last change).
Max material	Number of materials that the member can hold at a time.
Max Day	Number of days that the member can borrow a material.
Fine Rate	Fine rate per day that will be applied in case the member late in returning borrowed material to the library.

OVERDUE : Contain data of overdue borrowing either about the borrower or the borrowed stuffs. Also provides functions to work with those data.

Data members:

Member	Object specify the member who is owing the overdue at that time.
Material	Object specify the material which is being held overdue at that time.
NumberOfDay	Number of day that is overdue.

FINEDUE

Member	Object specify the member who have to pay for the fine of overdue at that time.
Amount	Amount of money that member have to pay for the overdue.
Date	The date that the payment was paid.

4.1.2 Functions of Classes and Objects

CLASS BOOK:

Classification	Function provides ability of changing the classification of the book.
Get Number	Function provides number of copies of the book in the library.
Update Number	Function provides ability of changing the number of copies of the book in the library.
Get Author Name	Function provides ability of retrieving the name of the author of the book.
Get Publishing	Function provides the name of the publishing house which published the book.
Get Copy Available	Function provides number of copies available of the book in the library.
Update Copy Available	Function provides ability of changing the number of copies available of this title in the library.
Get Call Number	Function provides library call number of the book (Read only)
Assign call Number	Function provides ability of create new call number for the book. Available only when a new book is put into the library.

Get Accession Number	Function provide call number of the book
Assign accession Number	Function creates and assigns new accession number for the book.

CLASS MAGAZINE

Classification	Function provides ability of changing the classification of the magazine.
Get Number	Function provides number of copies of the magazine in the library.
Update Number	Function provides ability of changing the number of copies of the magazine in the library.
Get Copy Available	Function provides number of copies available of the magazine in the library.
Update Copy Available	Function provides ability of changing the number of copies available of this volume in the library.
Get Accession Number	Function provides accession number of the magazine (Read only)
Assign accession Number	Function provides ability of create new accession number for the magazine. Available only when a new magazine is put into the library.

CLASS REPORT:

Classification	Function provides ability of changing the classification of the report.
Get Number	Function provides number of copies of the report in the library.
Update Number	Function provides ability of changing the number of

	copies of the report in the library.
Get Copy Available	Function provides number of copies available of the report in the library.
Update Copy Available	Function provides ability of changing the number of copies available of this report in the library.
Get Call Number	Function provides library call number of the report (Read only)
Assign Call Number	Function provides ability of create new library call number for the report. Available only when a new report is put into the library.
Get Accession Number	Function provides accession number of the report.
Assign Call Number	Function provides ability to create new call number for the report.
Get Author Name	Function provides the name of the author of the report.
Get Advisor Name	Function provides the name of the advisor of the report.
Get submitted date	Function provides the date of submission of the report.

CLASS MEDIA

Get Accession Number	Function provides accession number of the magazine (Read only)
Assign accession Number	Function provides ability of create new accession number for the magazine. Available only when a new magazine is put into the library.
Get Relevant Accession	Function provides ability to get the accession number of the book that along with the media.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Class Member:

Get Name	Function retrieves the name of the reader.
Get ID	Function retrieves library ID number of the reader.
Check,Status	Function provides the current status of the reader.
Change Status	Function provides the ability of changing the current status of the reader.
Get Comment	Function retrieves the comment of the reader.
Create Comment	Function provides ability of creating the comment of the reader.

CLASS TEACHER:

Get ID	Function retrieves the ID number of the teacher (teacher ID number).
Get Title	Function retrieves the title of the teacher.
Change Title	Function provides ability of changing the current title of the teacher to the new one.
Get Faculty	Function retrieves the current faculty of the teacher.
Change Faculty	Function provides the ability of changing the current faculty of the teacher to the new one.
Get Maximum Borrowing	Function retrieves the number of maximum material a teacher can hold at a time.
Change Maximum Borrowing	Function provides ability of changing the maximum material a teacher can hold at a time.
Get Maximum Date	Function retrieves the number of date a teacher can hold a material.
Change Maximum Date	Function provides ability of changing the maximum

date a teacher can hold a material.

CLASS STAFF:

Get ID	Function retrieves the ID number of the staff (staff ID number).
Get Position	Function retrieves the position of the staff.
Change Position	Function provides ability of changing the current position of the staff to the new one.
Get Department	Function retrieves the current department of the staff.
Change Department	Function provides the ability of changing the current department of the staff to the new one.
Get Maximum Borrowing	Function retrieves the number of maximum material a staff can hold at a time.
Change Maximum Borrowing	Function provides ability of changing the maximum material a staff can hold at a time.
Get Maximum Date	Function retrieves the number of date a staff can hold a material.
Change Maximum Date	Function provides ability of changing the maximum date a staff can hold a material.

CLASS STUDENT:

Get ID	Function retrieves the ID number of the student (student ID number).
Get Faculty	Function retrieves the current faculty of the student.
Change Faculty	Function provides the ability of changing the current faculty of the student to the new one.
Get Maximum Borrowing	Function retrieves the number of maximum material a

	student can hold at a time.
Change Maximum Borrowing	Function provides ability of changing the maximum material a student can hold at a time.
Get Maximum Date	Function retrieves the number of date a student can hold a material.
Change Maximum Date	Function provides ability of changing the maximum date a student can hold a material.

CLASS BORROWER:

Check Due	Function provides ability of checking if the borrower has any overdue or not.
Process Return	Function uses when borrower returns borrowed stuff (s) to the library.
Process Borrow	Function uses when borrower borrows more stuff(s) from the library.
Process Renewal	Function uses when borrower renews stuff(s) borrowed from the library.
Process Reserve	Function users when member reserves material of the library.

CLASS BORROWED:

Get Borrowing Date	Function retrieves full information of the borrowed stuff based on its ID number.
Get Borrower	Function retrieves information of the reader who borrow the material.
Get Borrowed Date	Function retrieves the date of borrowing.
Get Due Date	Function retrieves the due date of the borrowing.

Get Return Date	Function retrieves the date of returning material to the library.

CLASS SUPPLIER:

Set Name	Set or change the name of the Supplier
Get Address	Get address of the supplier
Set Address	Set or change address of the Supplier
Get Phone Number	Get Phone Number of the supplier
Set Phone Number	Set or change the phone number of the supplier
Get Fax Number	Get Fax Number of the supplier
Set Fax Number	Set or change the fax number of the supplier.

CLASS VENDOR:

Get Starting time	Get the time of establishing relationship between the library and the vendor.
Get Ordered Times	Get the number of times that library has ordered materials from the vendor.
Set Ordered Times	Change the number of times that library has ordered material from the vendor.
Get Provided Amount	Get the number of materials that library has bought from the vendor.
Set Provided Amount	Change the number of materials that library has bought from the vendor.

CLASS DONOR:

Get Starting Time	Get the first time of getting donation from the donor.

Get Donated Times	Get number of times that library has received donated materials from the donor.
Set Donated Times	Set or change the number of times that library has received donated materials from the donor.
Get Provide Amount	Get the number of materials that the library has received from the donor.
Set Provide Amount	Change the number of materials that the library has received from the donor.

CLASS ACKNOWLEDGMENT:

Get Date	Get the Date of issuing the acknowledgment letter
Set Date	Set the Date of issuing the acknowledgment letter.
Get Receiver	Get the receiver of the acknowledgment letter.
Set Receiver	Set the receiver of the letter
Create Content	Invoke the editor with the blank document to enter the content of the acknowledgment letter (by using OLE technique).
View Content	Invoke the editor with the specific letter to review or edit (By using OLE technique).

CLASS ORDER:

Set Order ID	Set the identification number of the order.
Get Order ID	Get the identification number of the order.
Get Date	Get creating date of the order
Get Vendor	Get the vendor that received the order
Choose Vendor	Specify the vendor will be ordered.

Create Content	Invoke the editor to enter the content of the order (OLE technique)
View Content	Invoke the editor to edit or view the content of the order (OLE technique)

CLASS POLICY:

Set Membership	Specify kind of membership
Get Date	Get date of issuing the policy
Set Date	Set the date of issuing or changing to the new policy.
Get Max Material	Get the maximum number of materials the member can hold at a time
Set Max Material	Set the maximum number of materials the member can hold at a time.
Get Max Day	Get number of days that the member can hold for a borrowing.
Set Max Day	Set the number of days that the member can hold for a borrowing.
Get Fine Rate	Get the fine rate per day that the member has to pay for late in returning material to the library.
Set Fine Rate	Set the fine rate that the member has to pay for late in returning material to the library..

CLASS OVERDUE:

Get Due Date	Get the due date to calculate number late days.
Calculate Days	Calculate the number of days that has been late in returning.
Get Member	Get detail information about the member who is

	holding the overdue.
Get Material	Get detail information about the material which is being held overdue.

CLASS FINEDUE:

Get Fine Rate	Get the fine rate of overdue per day depend on each kind of membership.
Calculate Amount	Calculate the amount of fine payment depends on the number of overdue days.
Set Date	Set the date of the payment
Get Date	Get the date of the payment.
Get Amount	Retrieve the amount of fine payment.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

4.2 Interaction Diagram

Acknowledgment creating interaction diagram: Showing the interaction of classes and objects during the progress of acknowledgment letter processing.

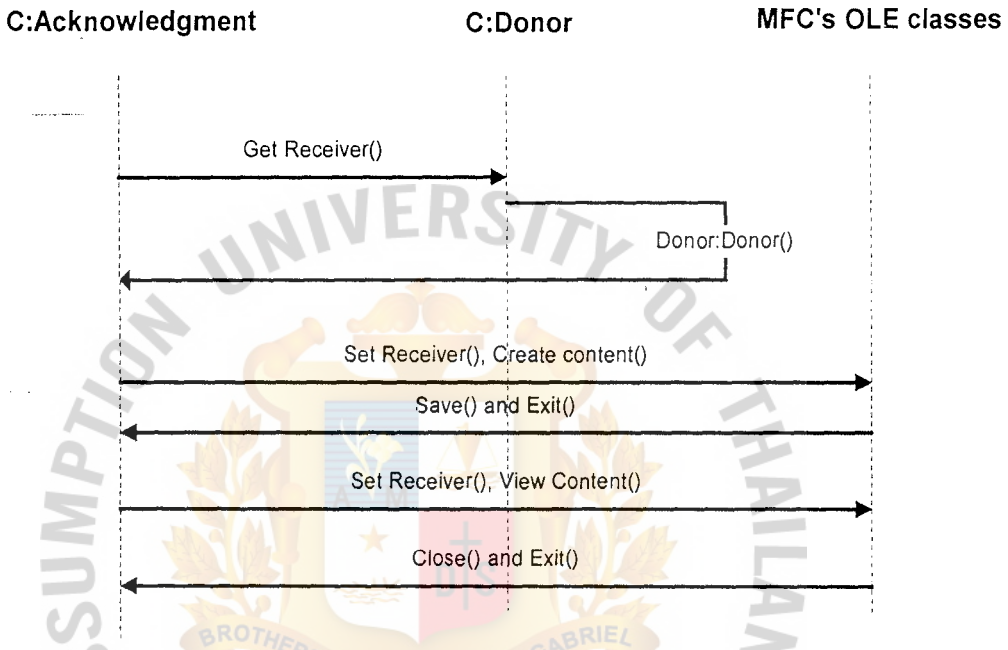

Figure 4.1. Acknowledgment Interaction Diagram

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST. GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Acquisition Interaction Diagram: Showing the interaction of classes and objects during the progress of acquisition processing.

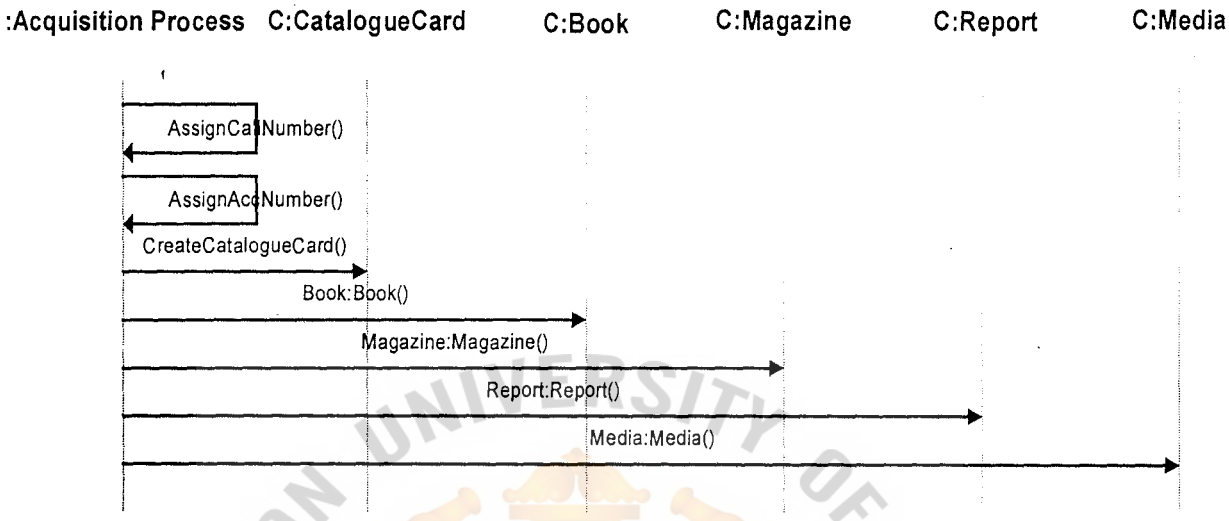

Figure 4.2. Acquisition Interaction Diagram

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Borrower Interaction Diagram: Showing the interaction of classes and objects during the progress of borrowing, returning and reservation materials of the library.

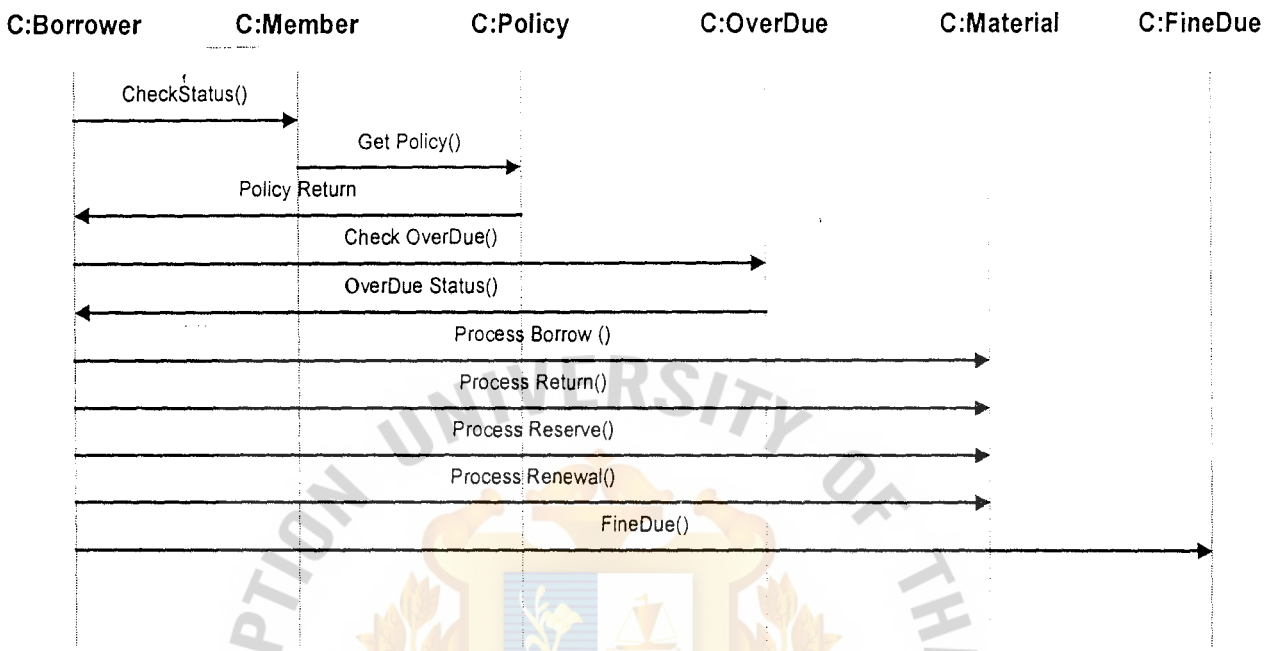

Figure 4.3. Borrower Interaction Diagram

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Order Interaction Diagram: Showing the interaction of classes and objects during the progress of order creating processing .

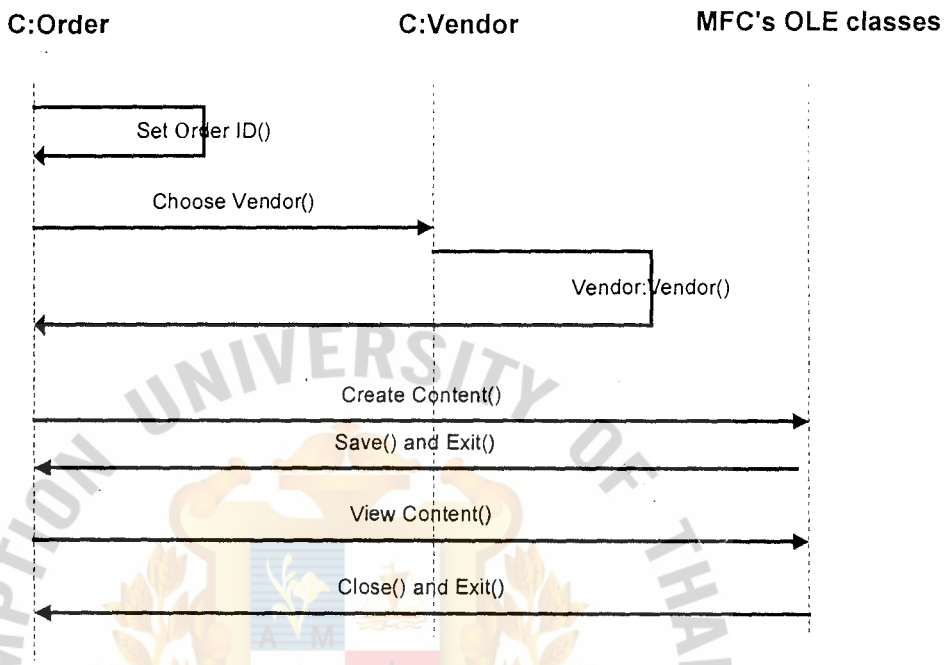

Figure 4.4. Order Interaction Diagram

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Interaction Diagram of Member: Showing the interaction of classes and objects during the progress of membership processing and classification, also the interaction during the lives of different kinds of membership.

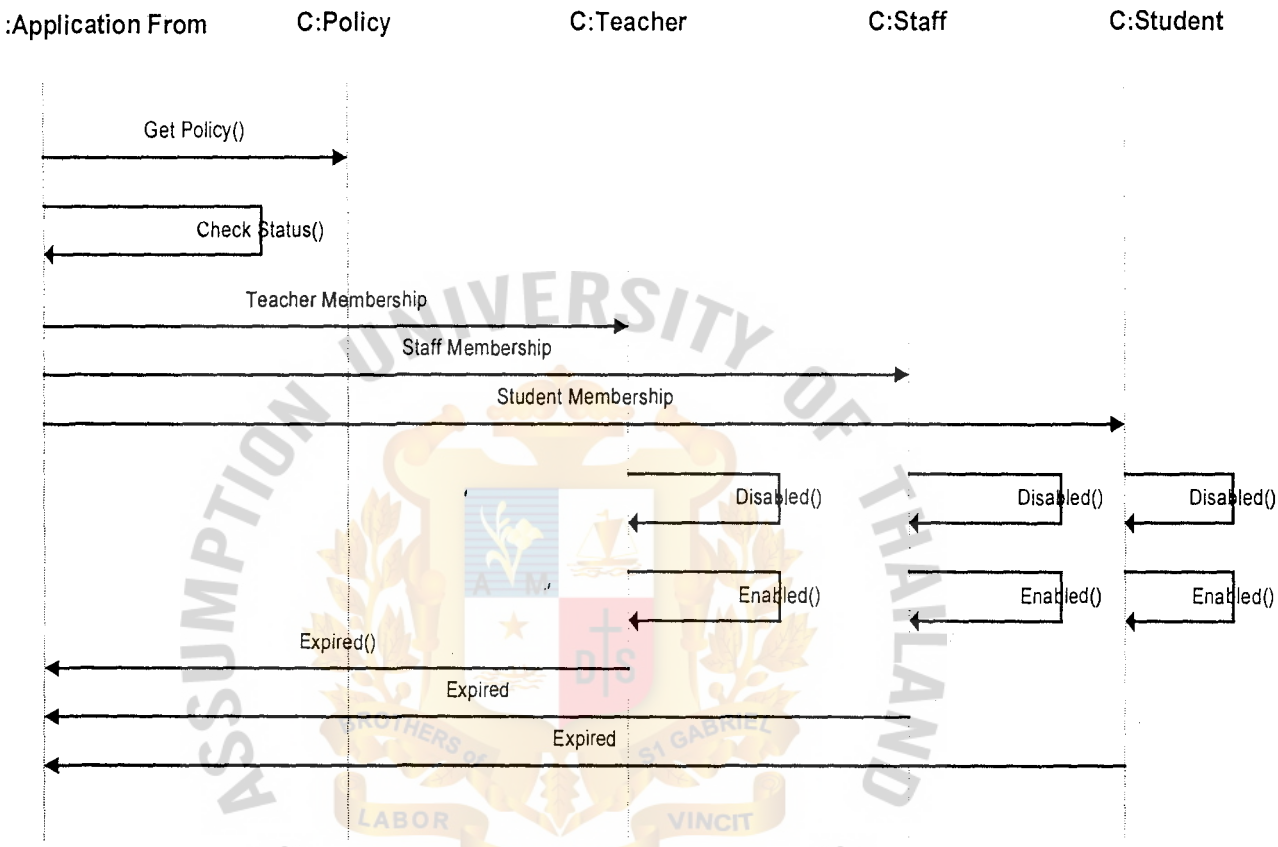

Figure 4.5. Member Interaction Diagram

ASSUMPTION UNIVERSITY OF THAILAND
LABOR VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Interaction Diagram of Administrative Report: Showing the interaction of classes and objects during the progress of Administrative Reports processing.

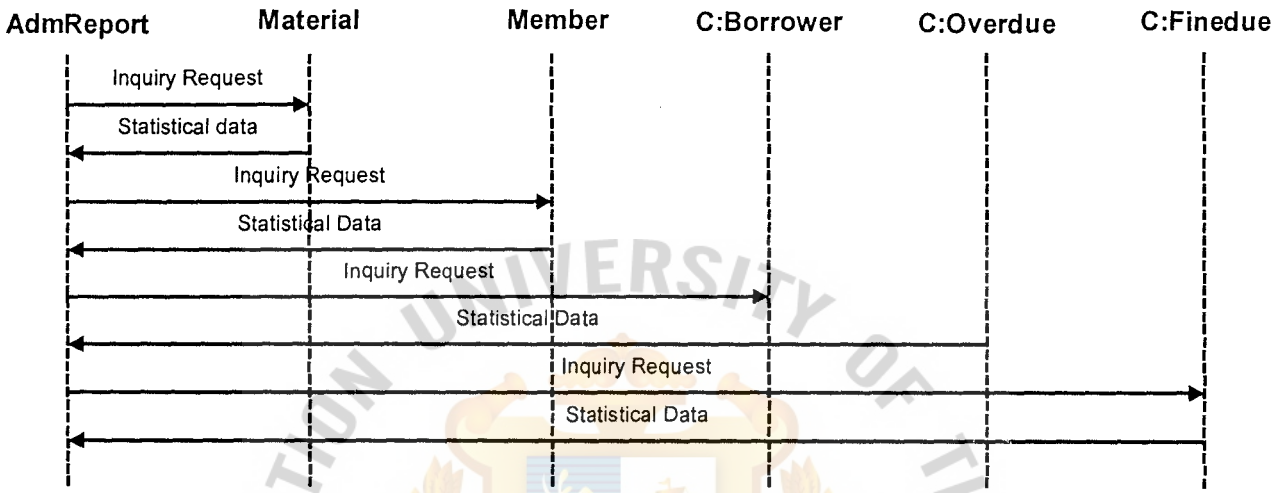

Figure 4.6. Administrative Report Interaction Diagram

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Interaction diagram of Service processing: Showing the interaction of classes and objects during the progress of searching materials processing.

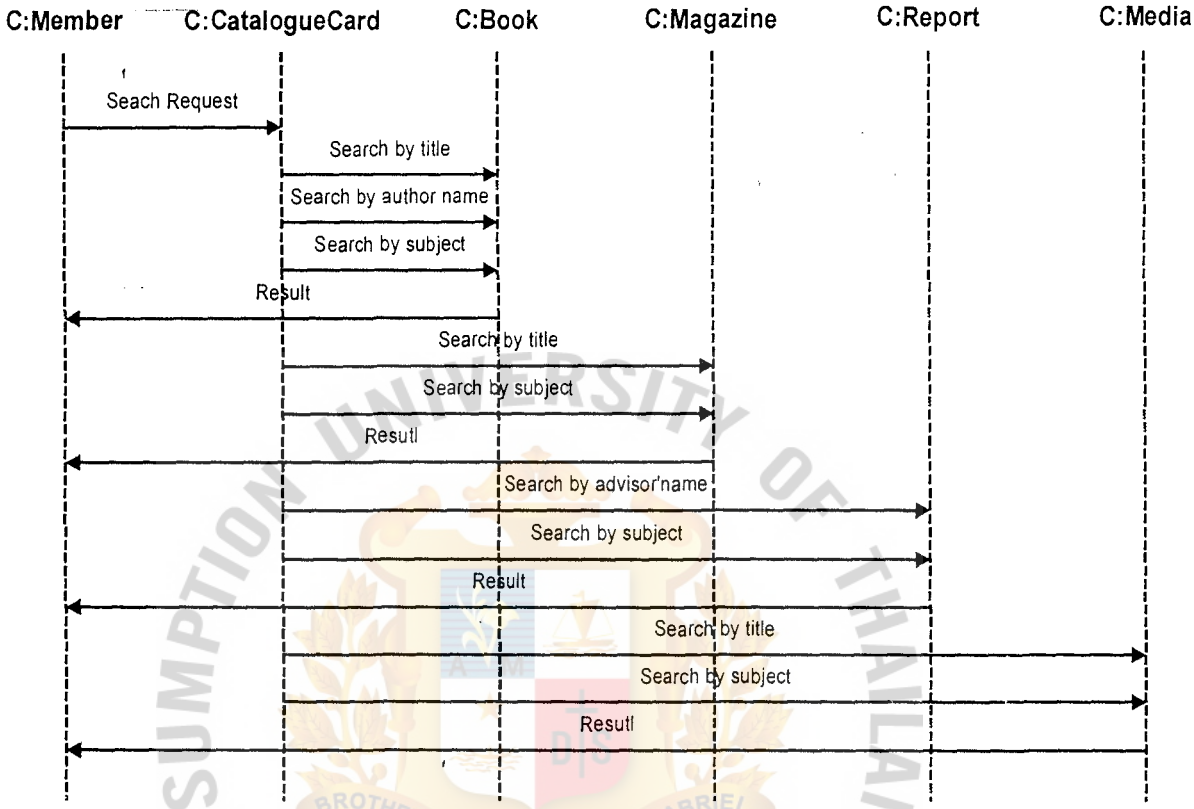

Figure 4.7. Service Interaction Diagram

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST. GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

4.3 Designation of user interface

This section illustrates windows those are using in the application, comprises definition of their names, their codes and their appearances. The first part of this section expresses the meaning of code being used for each kind of windows, and the next part will go in detail about the contain of each windows being used in the application. For visual designation of these windows, please refer to the appendix of this document.

4.3.1 Definition of Windows' identification

Windows in the application will be coded by using the following rules:

- Format of code of window will be assigned as *XX-xxxxx*
- Value of *XX* could be one of the below:
  - CO : Specify common windows those could be invoked at any part of the application.
  - SS: Specify windows those are used in the part of services provider.
  - CS: Specify windows those are used in the part of cataloguing the materials.
  - MS: Specify windows those are used in the part of member management.
  - MW: Specify windows those are used in the part of the main user interface screen.
  - AS: Specify windows those are used in the part of Administrative report creating.
- Value of *xxxxx* is a string of digits (from 0 to 9), to distinguish the difference from one window to other windows in a subsystem.

4.3.2 Common part of the System's User Interfacebvgftr54

CO-10010: Confirmation dialog box:

Name	Type	Description
OK	Button	Used to get acceptance of doing a request from user.
Cancel	Button	Used to get the cancelation of a request from user.

CO-10020: Confirmation dialog box (2) related to updating the database.

Name	Type	Description
Yes	Button	Used to get the acceptation of updating the change to database then exit to the previous task.
No	Button	Used to get the acceptance of exit without updating the database.
Cancel	Button	Used to get the cancelation of the request then exit to the previous task.

CO-10030: Error message notification dialog box

Name	Type	Description
String	Text Control	String to describe the error status of the application briefly.

CO-10040: Library's member identification

Name	Type	Description
Library ID	Label Control	Label control to specify the field to enter the member's identification number (Library ID).
Library ID	Edit Control	Edit control to enter the member's identification number (his/her library ID)
OK	Button	Button to specify that the identification number was entered completely and go to further steps.
Clear	Button	Button to clear the entered identification number and leave it blanked to re-type.
Cancel	Button	Button to cancel what has been done and return to the previous step.

4.3.3 Main window of the system

MW-0001 Application wizard

Name	Type	Description
Catalogue Process	Check box Control	Check box control to specify the selection of catalogue processing in the next steps.
Service Providing	Check box Control	Check box control to specify the selection of the Services Providing in the next steps.
Member Management	Check box Control	Check box control to specify the selection of Member Management in the next steps.
Administrative Report	Check box Control	Check box control to specify the selection of Administrative report task in the next steps.
Exit	Button	Button to exit the application
Next	Button	Button to go to the next screen with the selected option.
Clear	Button	Button to clear all current selection to select again.

4.3.4 Catalogue process part of the user interface

CS-10000: Main windows of the acquisition wizard screen.

Name	Type	Description
Date	Label Control	Specify the current date at the time.
Book process	Check box control	Check box control to select book data processing.
Magazine Process	Check box control	Check box control to select magazine data processing.
Media Process	Check box control	Check box control to select media data

		processing (non-printed materials)
Report Process	Check box control	Check box control to select report data processing.
Exit	Button	Button to exit the screen and return to the previous screen
Next	Button	Button to go to the next screen with the selected option.
Clear	Button	Button to clear all current selection to select again.

CS-10100: Screen of book processing wizard

Name	Type	Description
Date	Label Control	Specify the current date at the time.
New book	Check box control	Check box control to select new book data processing.
Edit book data	Check box control	Check box control to select editing exiting book data.
Delete book	Check box control	Check box control to delete the specific book from the system
Exit	Button	Button to exit the screen and return to the previous screen
Next	Button	Button to go to the next screen with the selected option.
Clear	Button	Button to clear all current selection to select again.

CS-10110: Screen of new book processing

Name	Type	Description
Title	Label Control	Specify the place to input the title of the book
Title	Edit Control	Place to enter the title of the book
Author Name	Label Control	Specify the place to input the author name of the book
Author Name	Edit Control	Place to enter author name of the book
Edition	Label Control	Specify the place to enter the edition of the book
Edition	Edit control	Place to enter edition of the book
Published year	Label Control	Specify the place to enter the published year of the book
Published year	Edit Control	Place to enter the published year of the book
ISBN	Label Control	Specify the place to enter the ISBN of the book
ISBN	Edit Control	Place to enter the ISBN of the book
Subject	Label Control	Specify the place to enter the subject of the book
Subject	Edit Control	Place to enter the selected subject of the book.
Pages	Label Control	Specify the place to enter number of pages of the book.
Pages	Edit Control	Place to enter number of pages of the book.
Publishing Co.	Label Control	Specify the place to enter the publishing house of the book.
Publishing CO.	Edit Control	Place to enter the publishing house of the book.
Call number	Label Control	Specify the place to assign call number of the book

Call number	Edit Control	Place to store assigned call number of the book.
Accession No.	Label Control	Specify the place to assign the accession number.
Accession No.	Edit Control	Place to store the assigned accession number.
Update	Button	Button to update the entered data to the database.
More	Button	Button to refresh the screen to add more new book.
Clear	Button	Clear all data for re-enter the corrected ones.
Exit/Cancel	Button	Button to exit the screen and return to the previous screen. Before Update it is Cancel button.

CS-10120: Screen of editing specific book's data

The structure of this screen is as same as of the CS-10110 screen, except of not having the two buttons More and Clear.

CS-10130: Screen of deleting specific book from the system

For making sure that there is no misplaced deletion of book, a dialog box will be invoke to ask for the call number and accession number of the book that will be delete. After that, the screen of detail description of the book will be invoked to confirm the deletion with the structure below:

Name	Type	Description
Title	Label Control	Specify the title of the book
Author Name	Label Control	Specify the author name of the book

Edition	Label Control	Specify the edition of the book
Published year	Label Control	Specify the published year of the book
ISBN	Label Control	Specify the ISBN of the book
Subject	Label Control	Specify the subject of the book
Pages	Label Control	Specify the number of pages of the book.
Publishing Co.	Label Control	Specify the publishing house of the book.
Call number	Label Control	Specify the call number of the book
Accession No.	Label Control	Specify the accession number of the book
Delete	Button	Button to delete the book from the system
Cancel	Button	Button to cancel the deletion of the book.

CS-10200: Screen of Magazine processing wizard:

Name	Type	Description
Date	Label Control	Specify the current date at the time.
New Magazine	Check box control	Check box control to select new magazine data processing.
Edit Magazine	Check box control	Check box control to select editing exiting magazine data.
Delete Magazine	Check box control	Check box control to delete the specific magazine from the system
Exit	Button	Button to exit the screen and return to the previous screen
Next	Button	Button to go to the next screen with the selected option.
Clear	Button	Button to clear all current selection for the to select again.

CS-10210: Screen of new Magazine processing

Name	Type	Description
Title	Label Control	Specify the place to input the title of the magazine
Title	Edit Control	Place to enter the title of the magazine
Category	Label Control	Specify the place to input the type of magazine (journal, magazine…)
Category	Edit Control	Place to enter the category of the magazine.
Subject	Label Control	Specify the place to enter the subject of the magazine
Subject	Edit Control	Place to enter the selected subject of the magazine
Call number	Label Control	Specify the place to assign call number of the magazine
Call number	Edit Control	Place to store assigned call number of the magazine
Update	Button	Button to update the entered data to the database.
More	Button	Button to refresh the screen to add more new magazine.
Clear	Button	Clear all data for re-enter the corrected ones.
Exit/Cancel	Button	Button to exit the screen and return to the previous screen. Before Update it is Cancel button.

CS-10220: Screen of editing specific kind of magazine's data

The structure of this screen is as same as of the CS-10210 screen, except of not having the two buttons More and Clear.

CS-10230: Screen of deleting specific kind of magazine from the system

For making sure that there is no misplaced deletion of magazine, a dialog box will be invoke to ask for the call number of the magazine that will be delete. After that, the screen of detail description of the magazine will be invoked to confirm the deletion with the structure below:

Name	Type	Description
Title	Label Control	Specify the title of the magazine
Category	Label Control	Specify the type of magazine (journal, magazine…)
Subject	Label Control	Specify the subject of the magazine
Call number	Label Control	Specify the call number of the magazine
Delete	Button	Button to delete the magazine from the system
Cancel	Button	Button to exit the screen and return to the previous screen without delete the magazine.

CS-10300: Screen of report processing wizard

Name	Type	Description
Date	Label Control	Specify the current date at the time.
New Report	Check box control	Check box control to select new report data processing.
Edit Report	Check box control	Check box control to select editing exiting report data.
Delete report	Check box control	Check box control to delete the specific report from the system
Exit	Button	Button to exit the screen and return to the previous screen

Next	Button	Button to go to the next screen with the selected option.
Clear	Button	Button to clear all current selection to select again.

CS-10310: Screen of new report processing

Name	Type	Description
Topic	Label Control	Specify the place to input the topic of the report
Topic	Edit Control	Place to enter the topic of the report
Author Name	Label Control	Specify the place to input the author name of the report
Author Name	Edit Control	Place to enter author name of the report
Advisor Name	Label Control	Specify the place to enter the advisor's name of the report
Advisor Name	Edit control	Place to enter the advisor's name of the report
Submitted date	Label Control	Specify the place to enter the submitted date of the report
Submitted date	Edit Control	Place to enter the submitted date of the report.
Subject	Label Control	Specify the place to enter the subject of the report
Subject	Edit Control	Place to enter the selected subject of the report
Call number	Label Control	Specify the place to assign call number of the book
Call number	Edit Control	Place to store assigned call number of the book.

Update	Button	Button to update the entered data to the database.
More	Button	Button to refresh the screen to add more new book.
Clear	Button	Clear all data for re-enter the corrected ones.
Exit/Cancel	Button	Button to exit the screen and return to the previous screen. Before Update it is Cancel button.

CS-10320: Screen of editing specific report's data

The structure of this screen is as same as of the CS-10310 screen, except of not having the two buttons More and Clear.

CS-10330: Screen of deleting specific kind of report from the system

For making sure that there is no misplaced deletion of report, a dialog box will be invoke to ask for the call number of the report that will be delete. After that, the screen of detail description of the report will be invoked to confirm the deletion with the structure below:

Name	Type	Description
Topic	Label Control	Specify the topic of the report
Author Name	Label Control	Specify the author name of the report
Advisor Name	Label Control	Specify the advisor's name of the report
Submitted date	Label Control	Specify the submitted date of the report
Subject	Label Control	Specify the subject of the report
Call number	Label Control	Specify the call number of the book
Delete	Button	Delete the report from the system

Cancel	Button	Button to cancel the deletion and return to the previous screen.

SC-10400: Screen of Media processing wizard

Name	Type	Description
Date	Label Control	Specify the current date at the time.
New Media	Check box control	Check box control to select new media data processing.
Edit Media	Check box control	Check box control to select editing exiting media data.
Delete Media	Check box control	Check box control to delete the specific media from the system
Exit	Button	Button to exit the screen and return to the previous screen
Next	Button	Button to go to the next screen with the selected option.
Clear	Button	Button to clear all current selection to select again.

SC-10410: Screen of new media processing

Name	Type	Description
Category	Label Control	Specify the place to enter the category of media
Category	Edit Control	Place to enter the category of media (CDROM, tapes…)
Accession No.	Label Control	Specify the place to enter the accession number of the media.

Accession No.	Edit Control	Place to enter the accession number of the media.
Rel. Accession	Label Control	Specify the place to enter the relevant accession number of the material that goes along with the media.
Rel. Accession	Edit Control	Place to enter the relevant accession number.
Update	Button	Button to update the entered data to the database.
More	Button	Button to refresh the screen to add more new book.
Clear	Button	Clear all data for re-enter the corrected ones.
Exit/Cancel	Button	Button to exit the screen and return to the previous screen. Before Update it is Cancel button.

SC-10420: Screen of editing media

The structure of this screen is as same as of the CS-10410 screen, except of not having the two buttons More and Clear.

SC-10430: Screen of deleting media

Name	Type	Description
Category	Label Control	Specify the category of media
Accession No.	Label Control	Specify the accession number of the media.
Rel. Accession	Label Control	Specify the relevant accession number of the material that goes along with the media.
Delete	Button	Delete the media from the system.
Cancel	Button	Cancel the deletion and return to the previous screen.

4.3.5 Member management part of the user interface

MS-10000: Main Screen of the member management wizard of the system

Name	Type	Description
New	Check box control	Check box control to specify the selection of creating the new membership of the library in the next step.
Edit	Check box control	Check box control to specify that it will be the selection of editing a membership's data in the next step.
Disable, Enable or Delete	Check box control	Check box control to specify that it will be the selection of disabling, enabling or deleting a membership in the next steps.
Next	Button	Selected button to go to the next steps of the process.
Clear	Button	Selected button to clear all selection at check box controls.
Exit	Button	Selected button to go back to the main screen of the program.

MS-10010: Screen of the new membership creating

Name	Type	Description
ID	Label control	Specify the field of identification number of the applicant within the university, it could be lecture, staff or student ID.
ID	Edit control	ID of the applicant.
Name	Label control	Specify the field of the applicant name.
Name	Edit Control	Name of the applicant.

Faculty	Combo box	List of faculties in the university to select.
Department	Combo box	List of departments in the university to select.
Type of membership	Combo box	List of type of membership of the library to select.
Loan amount	Label control	Specify the field of number of materials this member can hold at a time.
Loan amount	Edit control	Number of materials the member can hold at a time. Filled automatically after selecting the type of membership.
Date	Label control	Specify the field of the current date.
Date	Edit control	Specify the current date.
Expire date	Label control	Specify the field of expired date of the membership.
Expire date	Edit control	Date of expiring the membership.
Address	Label control	Specify the field of member's address.
Address	Edit control	Address of the member.
Telephone	Label control	Specify the field of member's telephone number.
Telephone	Edit control	Member's telephone number.
OK	Button	Button to update data to the database and return to the previous task.
Cancel	Button	Button to cancel all the data and return to the previous task.
Clear	Button	Button to clear all data in fields and leave them blanked.
Print	Button	Print the library membership card

MS-10020: Screen of editing a current membership's data

Name	Type	Description
ID	Label control	Specify the field of identification number of the applicant within the university, it could be lecture, staff or student ID.
ID	Edit control	ID of the applicant.
Name	Label control	Specify the field of the applicant name.
Name	Edit Control	Name of the applicant.
Faculty	Combo box	List of faculties in the university to select.
Department	Combo box	List of departments in the university to select.
Type of membership	Combo box	List of type of membership of the library to select.
Loan amount	Label control	Specify the field of number of materials this member can hold at a time.
Loan amount	Edit control	Number of materials the member can hold at a time. Filled automatically after selecting the type of membership.
Date	Label control	Specify the field of the current date.
Date	Edit control	Specify the current date.
Expire date	Label control	Specify the field of expired date of the membership.
Expire date	Edit control	Date of expiring the membership.
Address	Label control	Specify the field of member's address.
Address	Edit control	Address of the member.
Telephone	Label control	Specify the field of member's telephone number.

Telephone	Edit control	Member's telephone number.
OK	Button	Button to update data to the database and return to the previous task.
Cancel	Button	Button to cancel all changes and return to the previous task.
Undo	Button	Button to undo all changes in fields.

MS-10030: Screen of disabling or deleting a membership of the library

Name	Type	Description
ID	Label control	Specify the field of identification number of the applicant within the university, it could be lecture, staff or student ID.
ID	Text control	ID of the applicant.
Name	Label control	Specify the field of the applicant name.
Name	Text Control	Name of the applicant.
Faculty	Text control	List of faculties in the university to select.
Department	Text Control	List of departments in the university to select.
Type of membership	Text Control	List of type of membership of the library to select.
Date	Label control	Specify the field of the current date.
Date	Text control	Specify the current date.
Delete	Check box	Check box to delete the selected member.
Disable	Check box	Check box to disable the selected member.
Enable	Check box	Check box to enable the selected member.
OK	Button	Button to update data to the database and return to the previous task.

Cancel	Button	Button to cancel all the data and return to the previous task.

4.3.6 Service providing part of the user interface

SS-10000:Main screen of the service providing wizard of the system

Name	Type	Description
Search	Check box control	Check box control to specify the selection of searching material for next steps.
Borrow	Check box control	Check box control to specify that it will be the selection of borrowing material in the next steps.
Return	Check box control	Check box control to specify that it will be the selection of returning materials in the next steps.
Renewal	Check box control	Check box control to specify that it will be the selection of renewal materials in the next steps.
Reserved	Check box control	Check box control to specify that it will be the selection of reservation a material.
Next	Button	Selected button to go to the next steps of the process.
Clear	Button	Selected button to clear all selection at check box controls.
Exit	Button	Selected button to go back to the main screen of the program.

SS-10010: Screen of the borrowing wizard (referred from SS-10000 when Borrow check box control is selected and pass through the CO-10040 screen)

Name	Type	Description
Member	Label Control	Label control to specify the name of the borrower based on the ID number which was gotten from the previous step (CO-10040).
Member's ID	Label Control	Label control to specify the library's ID of the borrower.
Date	Label Control	Label control to specify the current date.
Status	Text Control	String of text shows status of the member in using service of the library at the current time. There could be following values: - Loan amount is over. - Expired date is over. - Number of over due books. - Number of current holding.
Accession No.	Label Control	Label control to specify the field to enter the accession number of the borrowed material.
Accession No.	Edit Control	Edit control to enter the accession number of the borrowed material.
Due date	Label Control	Label control to specify the due date of the borrowing.
OK	Button	Button to accept the borrowing and return to the previous screen (SS-10000)
Clear	Button	Button to clear all entered data and leave they blank to re-type again.

Cancel	Button	Button to cancel the borrowing and return to the previous screen (SS-10000)

SS-10020: Screen of the returning wizard (referred from SS-10000 when Return check box control is selected)

Name	Type	Description
Member	Label Control	Label control to specify the name of the member based on the ID number which was gotten from the previous step (CO-10040).
Member's ID	Label Control	Label control to specify the library's ID of the member.
Date	Label Control	Label control to specify the current date.
Current holding	DB Grid control	Table to specify list of materials which are holding by the member. Each item will comprises: - Accession number of the material. - Due date of the borrowing. - Overdue of the borrowing.
OK	Button	Button to accept the returning and return to the previous screen (SS-10000) after updating the appropriate database.
Print fine slip	Button	Button to print out the fine slip of the overdue of the selected material.
Cancel	Button	Button to cancel the returning and return to the previous screen (SS-10000)

SS-10030: Screen of the reservation wizard (referred from SS-10000 when Reserved check box control is selected)

Name	Type	Description
Member	Label Control	Label control to specify the name of the borrower based on the ID number which was gotten from the previous step (CO-10040).
Member's ID	Label Control	Label control to specify the library's ID of the borrower.
Date	Label Control	Label control to specify the current date.
Status	Text Control	String of text shows status of the member in using service of the library at the current time. There could be following values: - Loan amount is over. - Expired date is over. - Number of over due books. - Number of current holding.
Accession No.	Label Control	Label control to specify the field to enter the accession number of the reserved material.
Accession No.	Edit Control	Edit control to enter the accession number of the reserved material.
Available date	Label Control	Label control to specify the available date of the reservation.
OK	Button	Button to accept the borrowing and return to the previous screen (SS-10000)
Clear	Button	Button to clear all entered data and leave they blank to re-type again.

Cancel	Button	Button to cancel the reservation and return to the previous screen (SS-10000)

SS-10040: Screen of searching materials and its information based on specific provided data.

Name	Type	Description
Books	Check box control	Check box control to specify that it will be the searching for books in the next steps.
Magazines	Check box control	Check box control to specify that it will be the searching for magazines in the next steps.
Report	Check box control	Check box control to specify that it will be the searching for reports in the next steps.
Media	Check box control	Check box control to specify that it will be the searching for media in the next steps.
Title	Check box control	Check box control to specify that it will be the searching for materials based on its title in the next steps.
Author name	Check box control	Check box control to specify that it will be the searching for materials based on its author name.
Subject	Check box control	Check box control to specify that it will be the searching for materials in the next steps based on its subject.
Previous	Button	Selected button to go back to the previous step.
Next	Button	Selected button to go to the next steps.
Exit	Button	Selected button to go back to the main screen of the program.

SS-10041: Screen of searching books and its information based on its title

Name	Type	Description
Title	Label control	Label control to specify the field to entering the title of the required books.
Title	Edit control	Edit control contains the title of the book.
Search result	DB Grid control	Table of the search result. Each row will contain the following items: - Author name: Author of the book. - Edition: Edition number of the book. - Call number: Call number of the book
Search	Button	Button to start the search after entering the title. It will be changed to be New Search after that.
Exit	Button	Button to return to the previous task.

SS-10042: Screen of searching books and its information based on its author name.

Name	Type	Description
Author name	Label control	Label control to specify the field to entering the author name of the required books.
Author name	Edit control	Edit control contains the author name of the book.
Search result	DB Grid control	Table of the search result. Each row will contain the following items: - Title: Title of the book - Edition: Edition number of the book. - Call number: Call number of the book
Search	Button	Button to start the search after entering the author name. It will be changed to be New Search after that.

Exit	Button	Button to return to the previous task.

SS-10043: Screen of searching books and its information based on its subject.

Name	Type	Description
Subject	Label control	Label control to specify the field to entering the subject of the required books.
Subject	Edit control	Edit control contains the subject of the book.
Search result	DB Grid control	Table of the search result. Each row will contain the following items: - Title: Title of the book - Author name: Author name of the book - Edition: Edition number of the book. - Call number: Call number of the book
Search	Button	Button to start the search after entering the subject. It will be changed to be New Search after that.
Exit	Button	Button to return to the previous task.

SS-10044: Screen of searching magazines (include of journals, newspapers...) based on its title.

Name	Type	Description
Title	Label control	Label control to specify the field to entering the title of the required magazine.
Title	Edit control	Edit control contains the title of the magazine.
Search result	DB Grid control	Table of the search result. Each row will contain the following items: - Name of the magazine (journal,...)

ABAC
GRADUATE SCHOOL LIBRARY

		- Type: Type of the magazine (journal,...) - Serial: serial of the magazine - Call number: Call number of the magazine
Search	Button	Button to start the search after entering the title. It will be changed to be New Search after that.
Exit	Button	Button to return to the previous task.

SS-10045: Screen of searching magazines (include of journals, newspapers...) based on its subject.

Name	Type	Description
Subject	Label control	Label control to specify the field to entering the subject of the required magazine.
Subject	Edit control	Edit control contains the subject of the magazine.
Search result	DB Grid control	Table of the search result. Each row will contain the following items: - Name of the magazine. - Type of the magazine. - Serial of the magazine. - Call number: Call number of the magazine.
Search	Button	Button to start the search after entering the subject. It will be changed to be New Search after that.
Exit	Button	Button to return to the previous task.

SS-10046: Screen of searching reports based on its advisor.

Name	Type	Description
Advisor name	Label control	Label control to specify the field to entering the advisor name to search for the reports.
Advisor name	Edit control	Edit control contains the Advisor name.
Search result	DB Grid control	Table of the search result. Each row will contain the following items: - Topic: Topic of the report. - Author name: Author of the report. - Year submit: Year of submission. - Call number: Call number of the book
Search	Button	Button to start the search after entering the advisor name. It will be changed to be New Search after that.
Exit	Button	Button to return to the previous task.

SS-10047: Screen of searching reports based on its subjects.

Name	Type	Description
Subject	Label control	Label control to specify the field to entering the subject of the required reports.
Subject	Edit control	Edit control contains the subject of the report.
Search result	DB Grid control	Table of the search result. Each row will contain the following items: - Title: Topic of the report. - Author name: Author of the report - Year of submission. - Call number: Call number of the book

Search	Button	Button to start the search after entering the subject. It will be changed to be New Search after that.
Exit	Button	Button to return to the previous task.

SS-10048: Screen of searching non-printed material based on its subject.

Name	Type	Description
Subject	Label control	Label control to specify the field to entering the subject of the required media.
Subject	Edit control	Edit control contains the subject of the media.
Search result	DB Grid control	Table of the search result. Each row will contain the following items: - Type of media (tape, CDROM…) - Call number: Call number of the media
Search	Button	Button to start the search after entering the subject. It will be changed to be New Search after that.
Exit	Button	Button to return to the previous task.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST. GABRIEL
LABOR OMNIA VINCIT
SINCE 1969
มหาวิทยาลัยอัสสัมชัญ

AS-10000: Screen of Annual Administrative Report Creating

Name	Type	Description
Lost/Destroyed/ Weeded Mat.	Check box control	Check box control to specify selection of Lost/Destroyed/weeded materials report for next steps.
Order of Books	Check box control	Check box control to specify selection of Order of Book report for next step.
Order of Mag.	Check box control	Check box control to specify orders of magazine report for next step.
Stat. Report of borrowing	Check box control	Check box control to specify that it will be selection of statistical report of borrowing in the next step.
Stat. Report of delinquent mem.	Check box control	Check box control to specify that it will be the selection of statistical report of delinquent members in the next steps. .
Next	Button	Selected button to go to the next steps of the process.
Clear	Button	Selected button to clear all selection at check box controls.
Exit	Button	Selected button to go back to the main screen of the program.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST. GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

4.4 Hardware and Software Requirements

4.4.1 Hardware Requirement

1. Network Server: 1 set.

Microcomputer Pentium II 266 MHz

64 MBRAM on board.

1.44 FDD, 4GB HDD, 20x CD-ROM

17" Super VGA Monitor.

2. Workstation: 8 sets

Microcomputer Pentium 166 MHz.

16 MB RAM on board.

1.44 FDD, 2.0 GB HDD

14" Super VGA Monitor.

3. UPS : 1 unit.

4. LAN cards: 8 units.

5. Printer: 2 sets.

Epson LQ-1170 24 pins dot matrix printers.

4.4.2 Software Requirement

1. **Microsoft Windows NT Server 4.0**
2. **Microsoft Windows 95.**
3. **Microsoft SQL Server 6.5.**
4. **Microsoft Development Studio with Visual Basic.**

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
มหาวิทยาลัยอัสสัมชัญ

4.5 Security and Controls

Security of data will be controlled by assigning different level accesses within the database system. Three levels of data access will be provided as follow:

- Public : common user for everyone. This provides public access to the material database with full services of library's membership. Ones who log into the system by using this account will be able to access the resources database of the library and use such the services like searching for materials, borrowing or reservation of material but could not be able to view restricted data such as membership's data, operation's logging data....
- Staff: library's common officers access. This level provide ability of accessing all data relate to members' services providing and have permission to change as well as update data relate to serving members' purposes. But this level is not able to access to data which are using for higher reported purposes and contacting with library's providers (such as creating and viewing order, acknowledgment letter for donors....)
- Administrator: This is the top level of accessing data within the system. Besides all rights of two above access levels, administrator have full right to access and modify all data in the database. This access level is used only for specific purposes and officers of the library.

Different level of using the library automation system should be also provided. Depend of the kind of user logging into the system, specific functions available will be allowed to use while the rest will be disable for making sure that all operation of different users were predicted and controlled. These functions could be managed by providing resources management which is a part of Microsoft Windows programming technique when doing the implementation of the system.

4.6 Cost and Benefit Analysis

Three kinds of costs are going to be considered in this section, which are:

- Implement cost. Cost of development the computerized system, comprises analysis, design and implement of the system.
- Investment cost: Cost of investment to buying to the computer system for the library.
- Annual cost: Cost of maintenance the computer system as well as expenses when using it.

For easy in evaluate the cost and benefit of the system, all expenses will be transferred to be Thai Baht as the currency unit.

4.6.1 Implement Cost

Task	**Number of staff**	**Cost**
Analyze of the system	2	60,000
Designation of the system	2	60,000
Development of the system	5	100,000
Total		**220,000**

4.6.1.1.1

4.6.2 Investment Cost

Equipment	**Quantity**	**Cost**
Network Server PII	1	100,000
Workstations	8	240,000
LAN cards and cables	8	10,000
10 Base T Hub	1	8,000

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Printers	2	12,000
Computer desks	9	10,000
UPS for the Server	1	20,000
Windows NT4.0 Server (OS)	1	15,000
Windows 95	8	24,000
MS SQL Server	1	15,000
Total investment cost		**454,000**

4.6.3 Annual Cost

Equipment	**Quantity**	**Cost**
A4 paper	48	3,840
Continuous paper	48	13,340
Ribbons for the printers	12	2,400
Other extra expenses	12	7,000
Salary of 1 staff implementing	(months)	120000
Total annual cost		**146,580**

4.6.4 Total Costs

Cost of the first year comprises Implementation cost, Investment cost, and one year annual cost will be **820,580 Bahts.** Then cost for each next year will be only the annual cost, because we won't have to re-invest and re-implementation the system again.

4.6.5 Tangible Benefit

Without using the computer system, the library will have to hire at least 5 more staffs to accommodate its rapid development in the future. Standard salary of library's staffs is 10,000 Baht per month. So we have:

Saving salary	5x12	600,000
Bonus and Benefit	5	50,000
Security, insurance …	5	10,000
Total saving cost		**670,000**

4.6.6 Payback Period Method

This method indicates how long an initial investment seems to be recovered estimatively, then provide a rough measurement of riskiness. The value P of payback period is calculated based on the formula:

$$\frac{I}{R(1-T)}$$

Where

I stands for Investment or Capital Expenditure.

T stands for Tax Rate (in this situation is 20%)

R stands for annual saving realized by investment.

We have Net Annual Saving per year is the equal the saving amount of implement the proposed system minus the annual operating cost, that is **523,420.** Applying the appropriate value to the formula, we get the value of payback period is **2 years.**

4.6.7 Intangible Benefits

Besides tangible benefit that we already discussed in the previous section, there are other intangible benefits which would also be able to achieve by using the proposed system:

- Better performance of library management by replacing manual tasks with computerized system.
- Services of the library will be provided more efficient which can make use of library's resources as well as more comfortable for library's members.
- Saving time and more accurate for acquisition process.
- Provide more relevant information and utilities for users' inquiry.
- Better and faster in reporting about the status and operation of the library.
- Improve library staffs' moral, accommodate to achieve more high-technology in library's technique in the future.

4.6.8 Comparing Two Methods by Graph :

Applying the function of manual and computing method on graph represented by total saving cost per year and total cost implementation by computer respectively to estimate the total amount expenditure according to time (year).

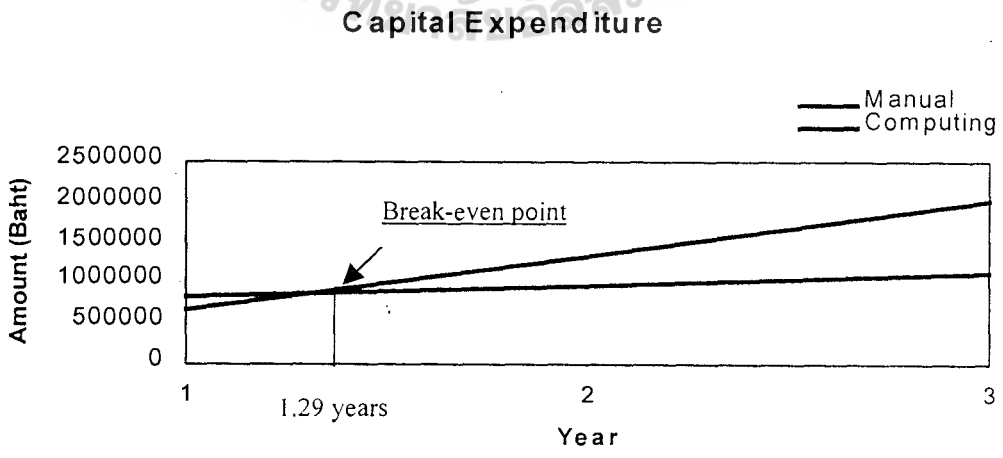

Figure 4.8. Proposal System Cost vs Existing System Cost

V. PROJECT IMPLEMENTATION

Project implementation comprises coding the application system and testing of the system for making sure that all requirements are matched and the system could work properly stably without any problem.

5.1 Overview of Project Implementation Schedule/Resource Utilized

The application system package will be done base on Microsoft Development Studio Environment, by using Microsoft Visual Basic Object Oriented programming language. MFC library (Microsoft Foundation Class library) will be referred when necessary to archive more advantages in building the application under Microsoft Windows' environment.

In the pure Object Oriented methodology, objects will be embedded into the Object Oriented Database and programmers as well as users will not interfere to the progress. So far this automatic library system has been analyzed and designed based on that principle and it is fully available to accommodate with an object oriented database system. But at the moment there is no commercial object oriented database available in the market, so programmers will have to work in an agent step to interact with the Relational Database system (MS-SQL Server is chosen in this system). Data will be retrieved from the Database by using DAO (Data Access Object) and ODBC (Open Database Control) which are provided in both Visual Basic and MFC library, then used to build the objects by its constructor.

5.2 Test plan and Results

Testing of the system is done in several sections as described below. SQA test tool will be used to record all tests and test results as well as comment of the testers.

1. Analysis and Design testing: This test is done through the analysis and designation of the proposed system to make sure that there is no mistake during this step.

2. Module testing: tests are done for every object and module of the system to make sure that objects and modules are working properly and stably in both themselves and in interaction together through objects' interfaces.
3. Data validation testing.
4. Recovery testing: Test of ability in recovering data and operation of the system when there is an failure occurred, include of hardware failure, database crashes, etc.
5. System testing: test of overall operation of the system.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

VI. CONCLUSIONS AND RECOMMENDATIONS

When we do the analysis of the existing system, we already made a suggestion that the computerized system was necessary to overcome current problems, and to accommodate with the rapid development of the library in the future. We also applied the Payback Period Method in analyzing costs and benefits of the suggested system, and it is found that the initial investment is likely to be recovered within 2 years.

The system generates the reports consistently and accurately, by that way, it will provide better management of operation of the library. In addition, the proposed system will help in eliminating many cataloguing processes such as producing title cards, subject cards and author cards for materials of the library. All necessary information of the materials is able to access from the library's database, with the similar functions and operations as the traditional method before.

Services of the library will be provided faster and better, in addition, library's members can search for materials and required information quickly an accurately by using computers.

The new system is developed by Object Oriented Methodology, so it is very flexible and easy to maintain, as well as to expand for future growing up of the library. Since the proposed system was designed to fulfill all requirements of the library, below recommendations are additionally to achieve the best result for the system, in operation as well as for the future:

- Microsoft Development Studio should be used as the development tool to develop the application system. By using Visual Basic programming language and Microsoft Foundation Class (MFC), we will be able to interact with the Database easily by using ODBC and DAO technique and have full compatible with MS-Windows environment.
- Computers within the library should have CD-ROM reader then library's members can make use of it by in-house accessing instead of borrowing.
- For avoiding virus, computers provided to members should not have floppy disk drivers. If members have any requirements about using FDD, they have to contact to library officers.

- The library should provide the possibility of remote connecting through the telephone line network for their members, so they can use some of library's services whenever having requirement.
- The library should have a database of resources of other libraries, so when members can not find the required resources, they could know where they can obtain it.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

BIBLIOGRAPHY

1. Grady, B. Object Oriented Analysis and Design with Application - Second Edition - The Benjamin/Cummings Publishing Company, Inc.
2. Graham, . Object Oriented Methods - second edition - Addison Wesley.
3. Bryson, Jo. Effective Library and Information Center Management – Grower Publishing Company.
4. Padstaw, C. Information Management Technology, A Librarian's Guide – Button F. P., T.J Press Ltd.
5. Gates, J.K. Guide to the use of libraries and information sources, McGraw-Hill

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

APPENDIX A

Report Templates

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Appendix A

Report Templates

Following reports are used in operation of the library:

- Report of lost, destroyed and weeded Materials.
- Report of Orders for Books.
- Report of Orders for Magazines.
- Statistical Report of Borrowing service
- Statistical Report of Delinquent members.

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Report of lost, destroyed and weeded Materials.

Ministry of Education and Training.
Ho Chi Minh City University of Technology
Central Library

REPORT OF LOST/DESTROYED/WEEDED MATERIAL

For the accademic year yyyy

No.	Accession No.	TITLE	L	D	W

Remarks:

Ho Chi Minh City,

Date.....Month.....Year.....

Signature

Library Manager

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Report of Orders for Books.

Ministry of Education and Training.
Ho Chi Minh City University of Technology
Central Library

REPORT OF ORDERS FOR BOOKS

For the accademic year yyyy

No.	Department	Number of Books	Amount of Money
	Total		

Ho Chi Minh City,

Date.....Month.....Year.....

Signature

Library Manager

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Report of Orders for Magazines.

Ministry of Education and Training.
Ho Chi Minh City University of Technology
Central Library

REPORT OF ORDERS FOR MAGAZINES

For the accademic year yyyy

No.	Department	Number of Magazines	Amount of Money
	Total		

Ho Chi Minh City,

Date.....Month.....Year.....

Signature

Library Manager

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Statistical report of Borrowing service

Ministry of Education and Training.
Ho Chi Minh City University of Technology
Central Library

REPORT OF BORROWING SERVICE

For the accademic year yyyy

No.	Faculty	Number of membership	Number of borrowing	Rate of Borrowing (%)

Remarks:

Ho Chi Minh City,

Date.....Month.....Year.....

Signature

Library Manager

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Statistical Report of Delinquent members

Ministry of Education and Training.
Ho Chi Minh City University of Technology
Central Library

REPORT OF DELINQUENT MEMBERS

For the accademic year yyyy

Member ID	Member Name	Department/ Faculty	Title	DueDate

Remarks:

Ho Chi Minh City,

Date.....Month.....Year.....

Signature

Library Manager

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST. GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

APPENDIX B

Organization Chart

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

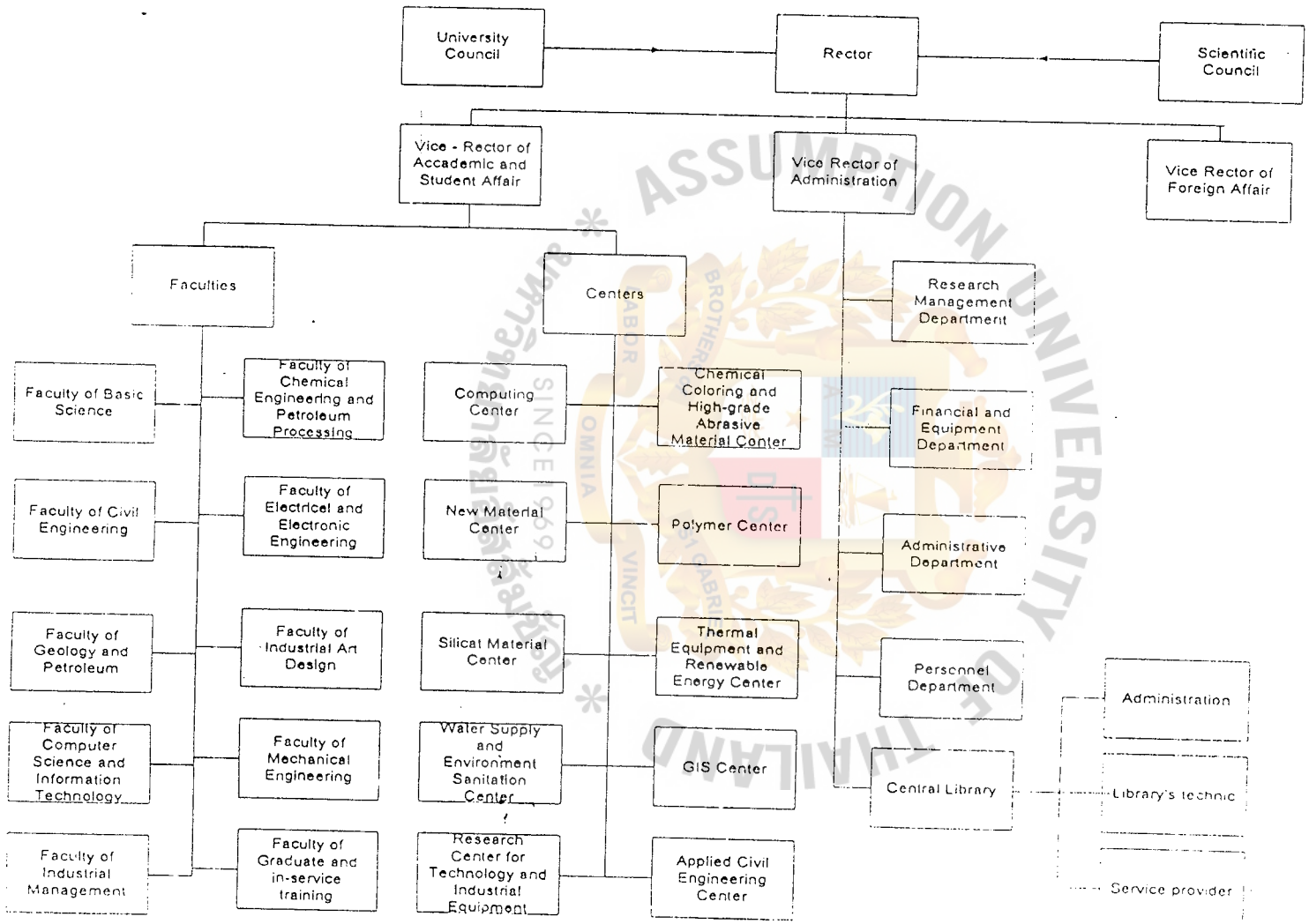

Figure B-1 Organization Chart

APPENDIX C

Screens Of The System Application

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

Appendix C

Screens of the System Application

CO-10010: CONFIRMATION DIALOG BOX

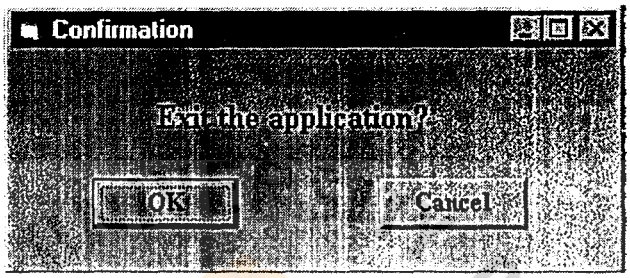

Figure C.1. Confirmation Dialog Box

CO-10020: CONFIRMATION DIALOG BOX (2) RELATED TO UPDATING THE DATABASE.

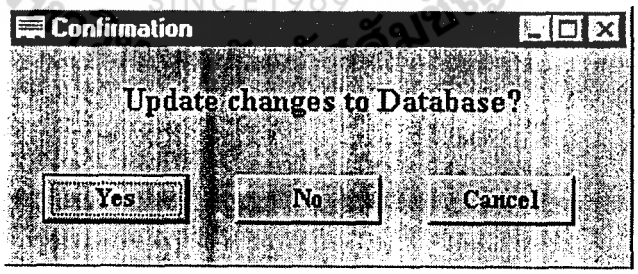

Figure C.2. Confirmation Dialog Box (2)

CO-10030: ERROR MESSAGE NOTIFICATION DIALOG BOX

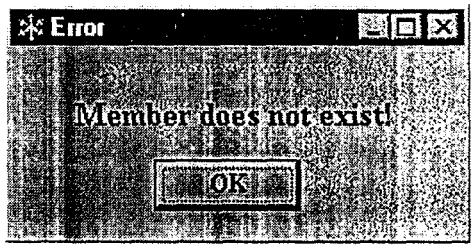

Figure C.3. Error Message Dialog Box

CO-10040: LIBRARY'S MEMBER IDENTIFICATION

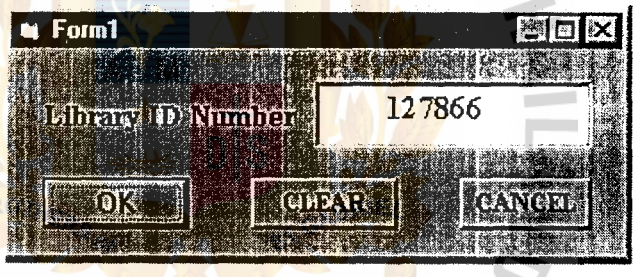

Figure C.4. Library Input Dialog Box

ASSUMPTION UNIVERSITY OF THAILAND
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

MW-0001 APPLICATION WIZARD

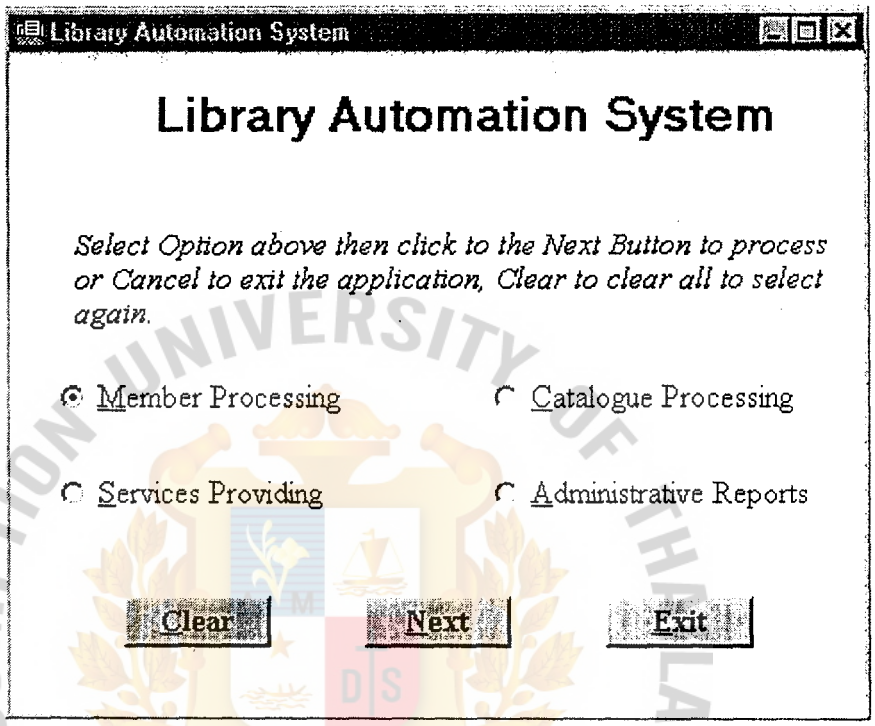

Figure C.5. Application wizard Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10000: MAIN WINDOWS OF THE ACQUISITION WIZARD SCREEN.

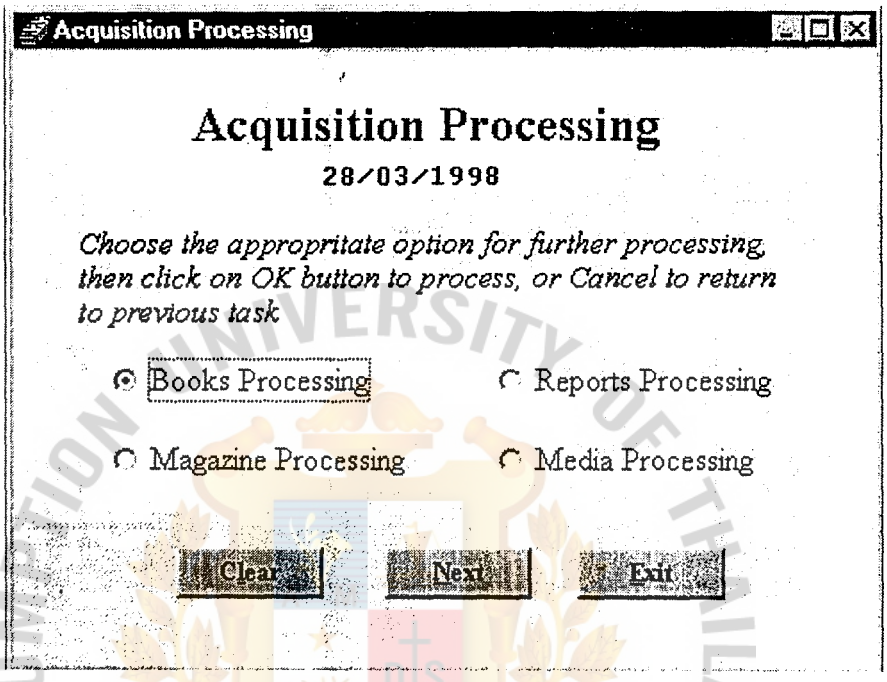

Figure C.6. Main Window Acquisition Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST. GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10100: SCREEN OF BOOK PROCESSING WIZARD

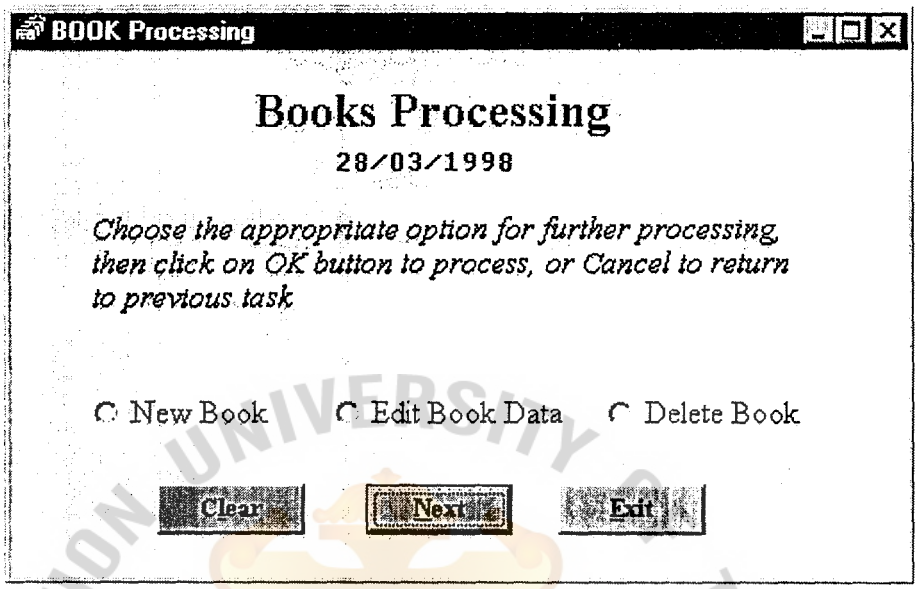

Figure C.7. Book Processing wizard

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10110: SCREEN OF NEW BOOK PROCESSING

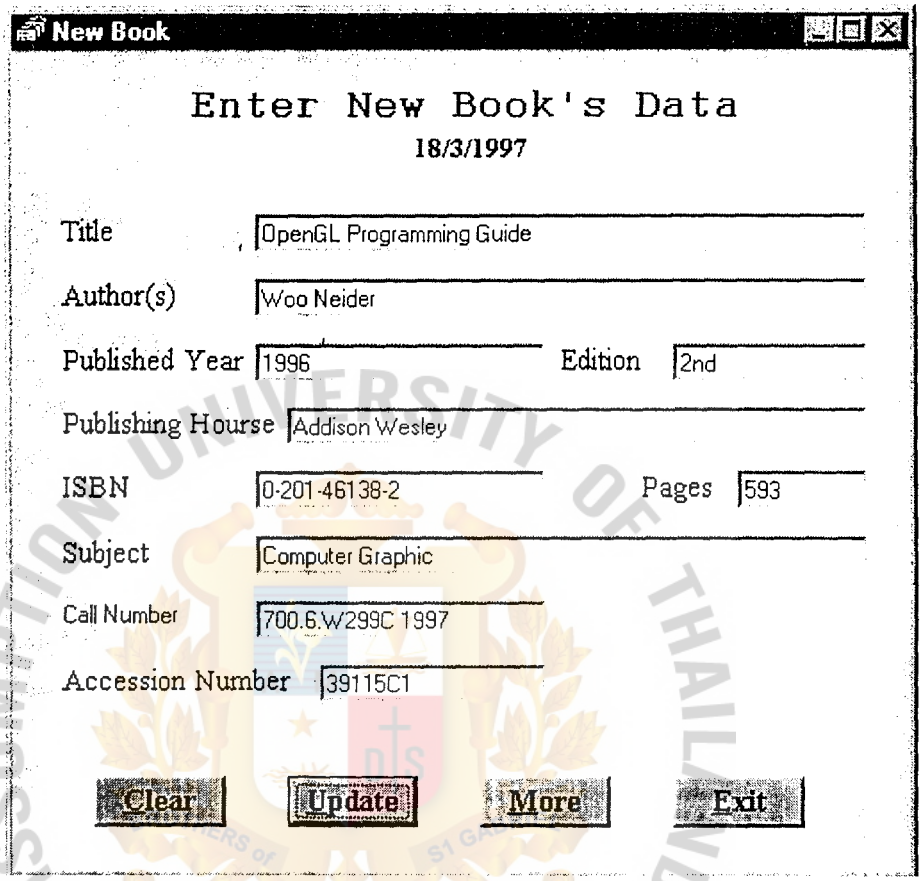

Figure C.8. New Book Processing Screen

ASSUMPTION UNIVERSITY OF THAILAND
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

ABAC
GRADUATE SCHOOL LIBRARY

CS-10120: SCREEN OF EDITING SPECIFIC BOOK'S DATA

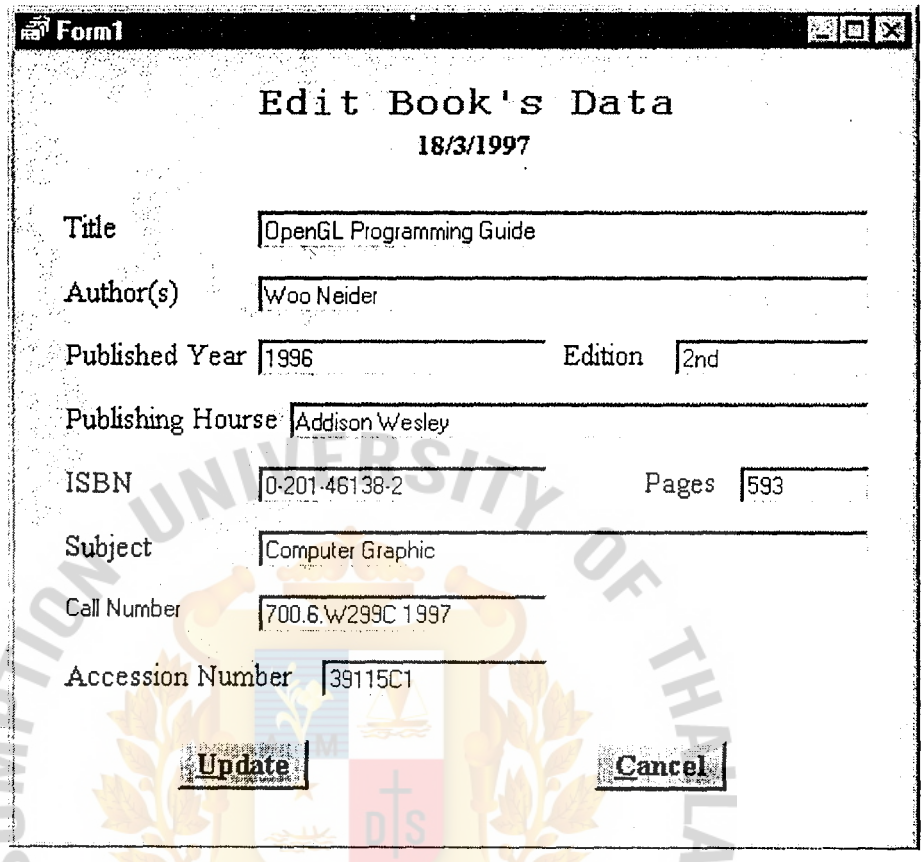

Figure C.9. Editing Book Data Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10130: SCREEN OF DELETING SPECIFIC BOOK FROM THE SYSTEM

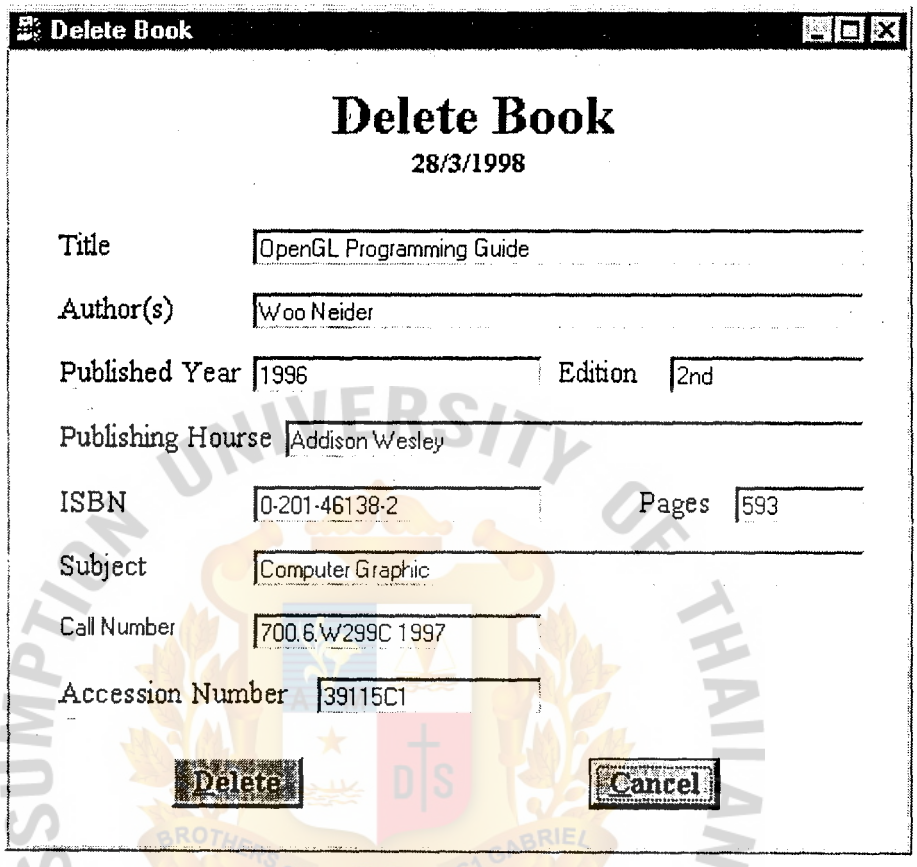

Figure C.10. Deleting Book Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10200: SCREEN OF MAGAZINE PROCESSING WIZARD:

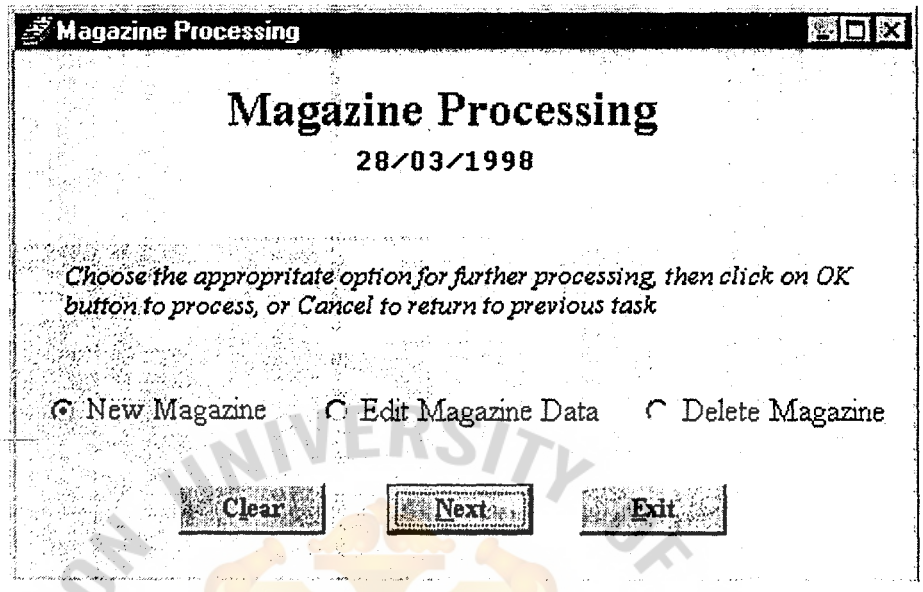

Figure C.11. Magazine Processing Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10210: SCREEN OF NEW MAGAZINE PROCESSING

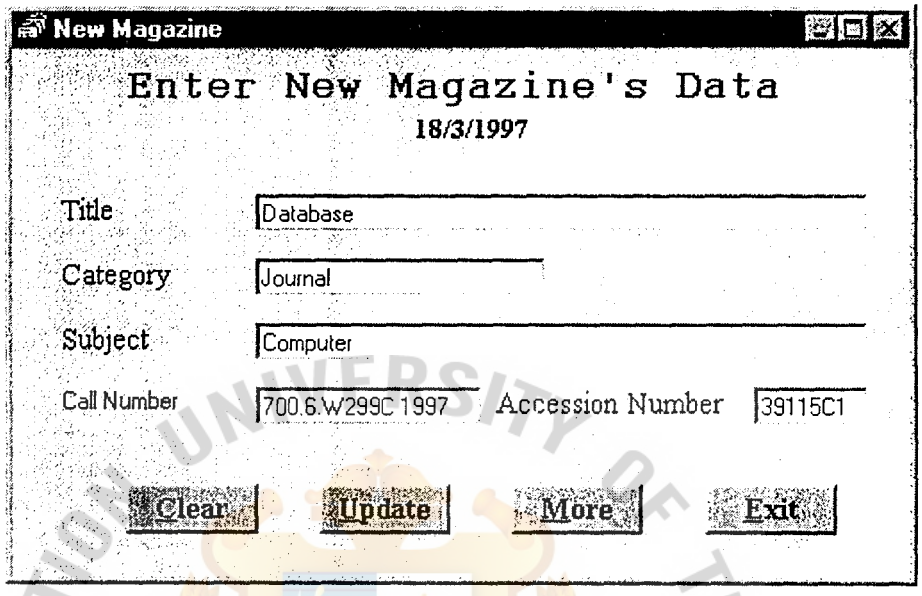

Figure C.12. New Magazine Processing Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10220: SCREEN OF EDITING SPECIFIC KIND OF MAGAZINE'S DATA

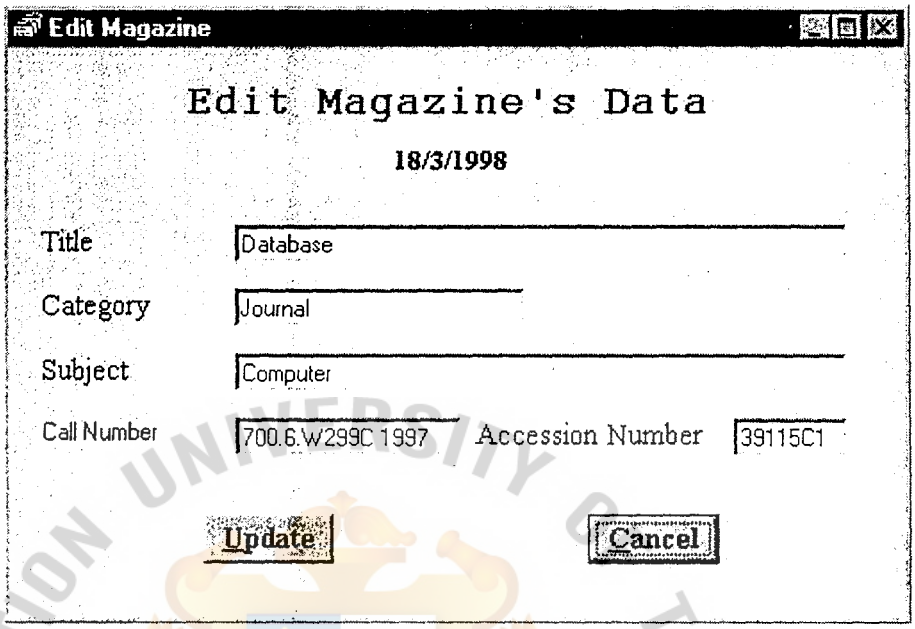

Figure C.13. Editing Magazine Data Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10230: SCREEN OF DELETING SPECIFIC KIND OF MAGAZINE FROM THE SYSTEM

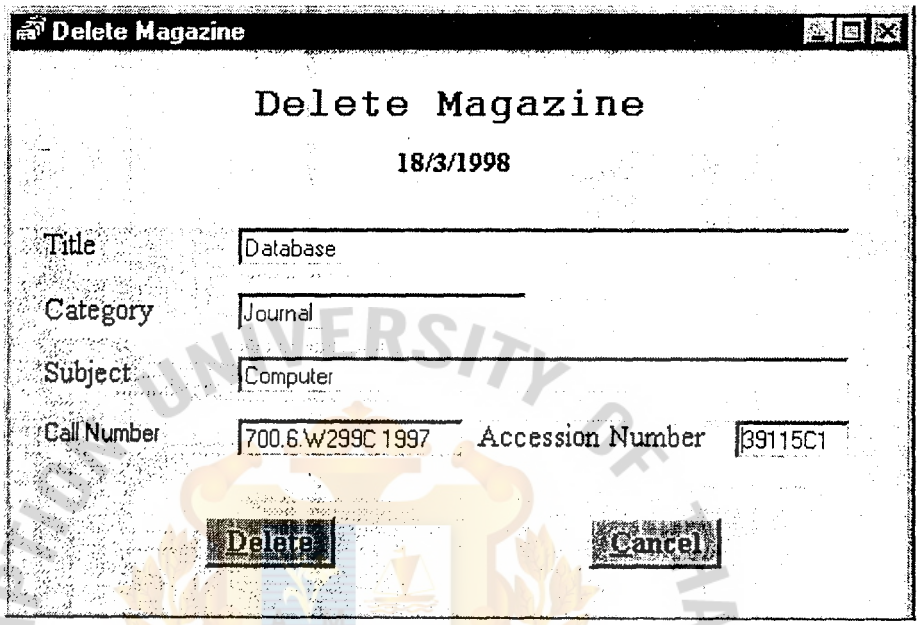

Figure C.14. Deleting Magazine Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10300: SCREEN OF REPORT PROCESSING WIZARD

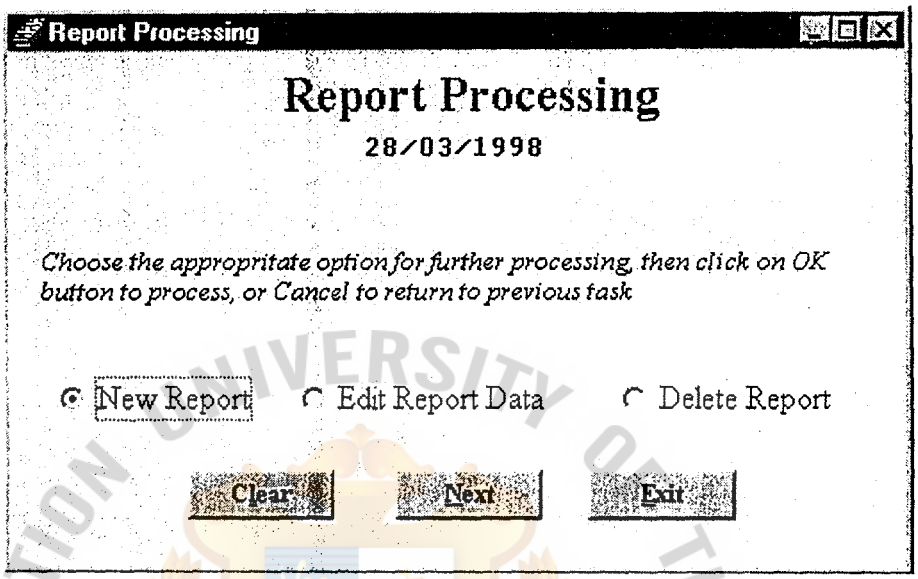

Figure C.15. Report Processing Wizard Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10310: SCREEN OF NEW REPORT PROCESSING

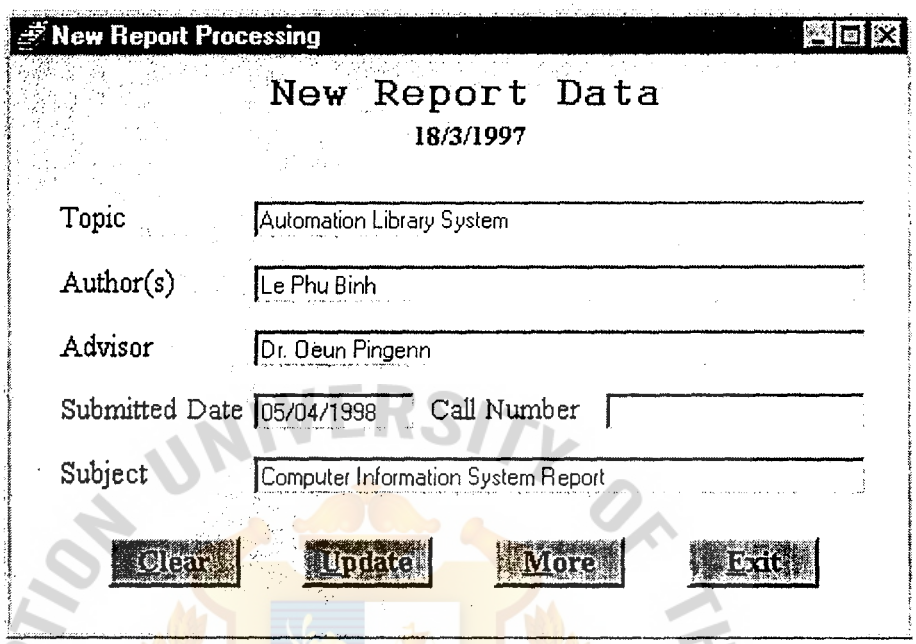

Figure C.16. New Report Processing Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10320: SCREEN OF EDITING SPECIFIC REPORT'S DATA

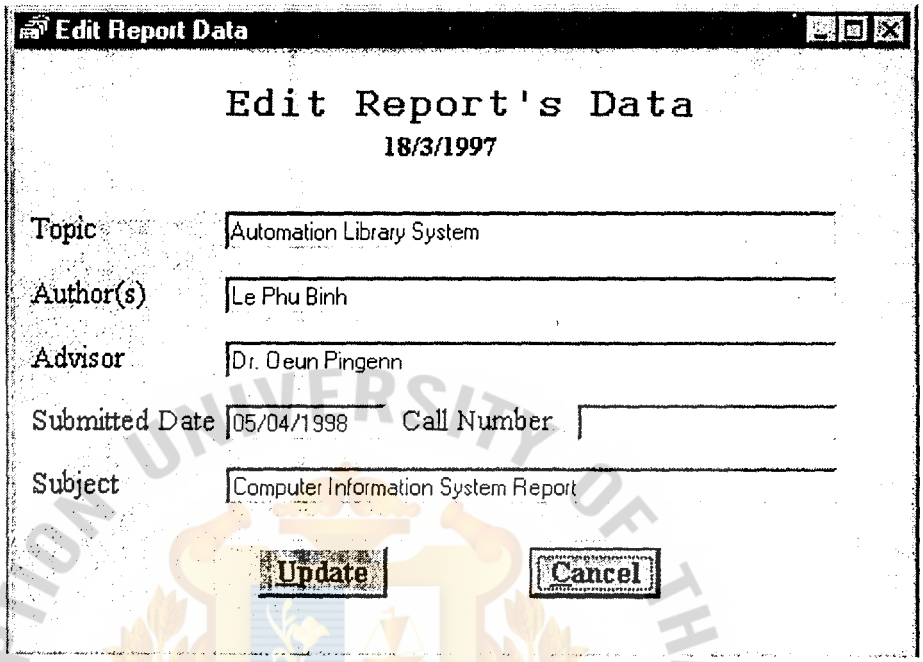

Figure C.17. Editing Report Data Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

CS-10330: SCREEN OF DELETING SPECIFIC KIND OF REPORT FROM THE SYSTEM

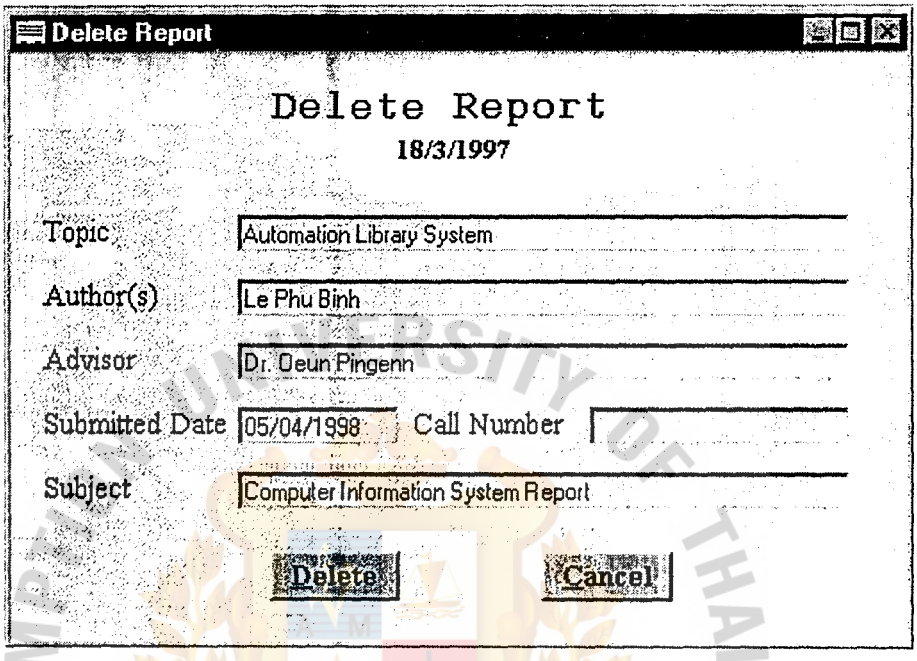

Figure C.18. Delete Report Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SC-10400: SCREEN OF MEDIA PROCESSING WIZARD

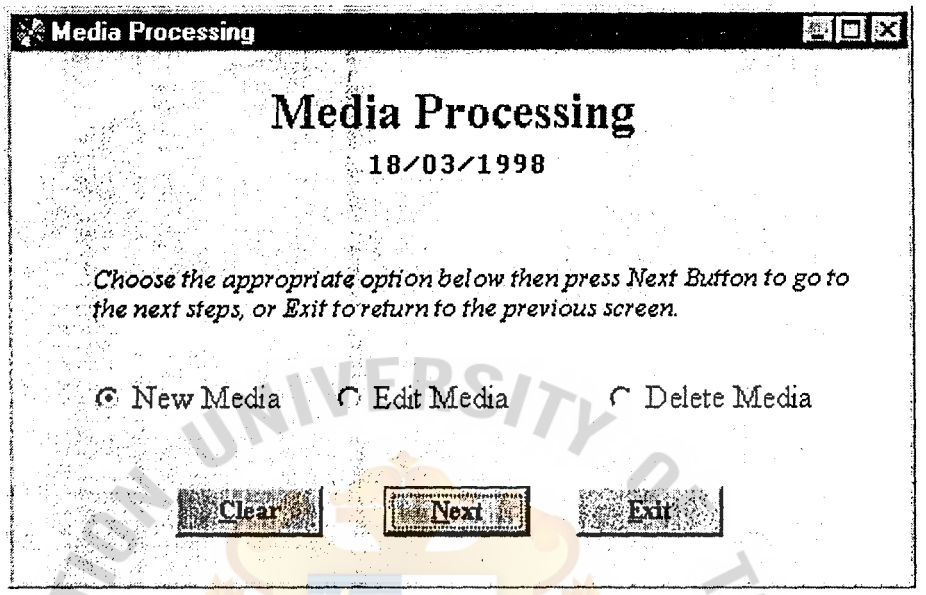

Figure C.19. Media Processing Wizard Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SC-10410: SCREEN OF NEW MEDIA PROCESSING

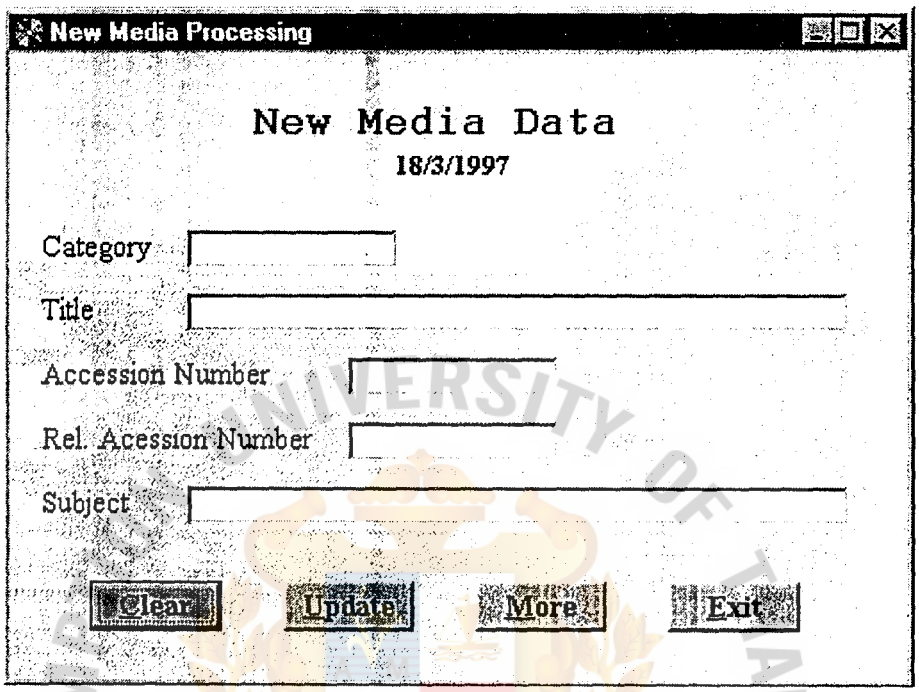

Figure C.20. New Media Processing Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SC-10420: SCREEN OF EDITING MEDIA

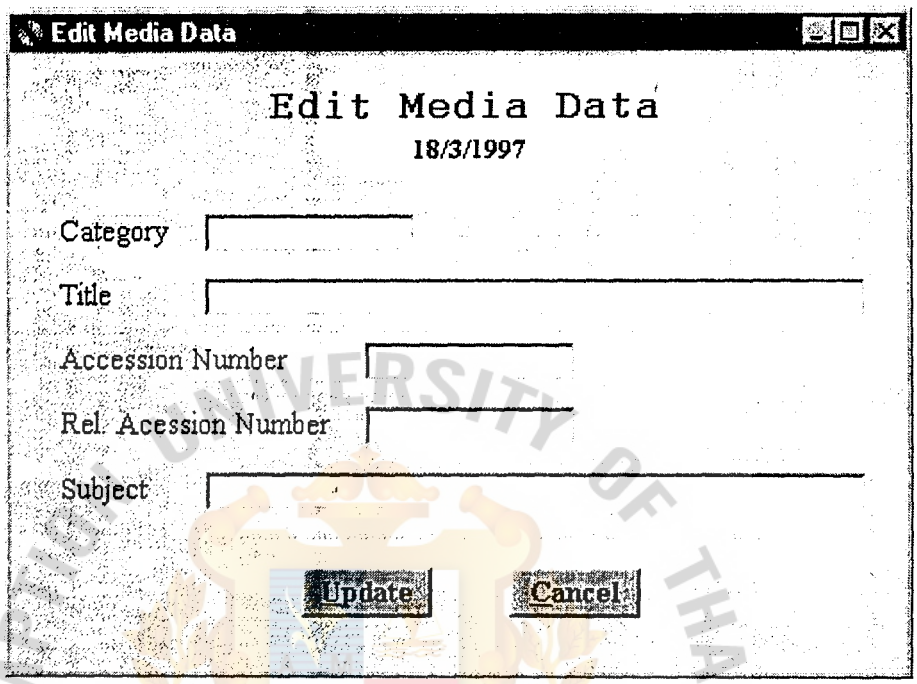

Figure C.21. Editing Media Data Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SC-10430: SCREEN OF DELETING MEDIA

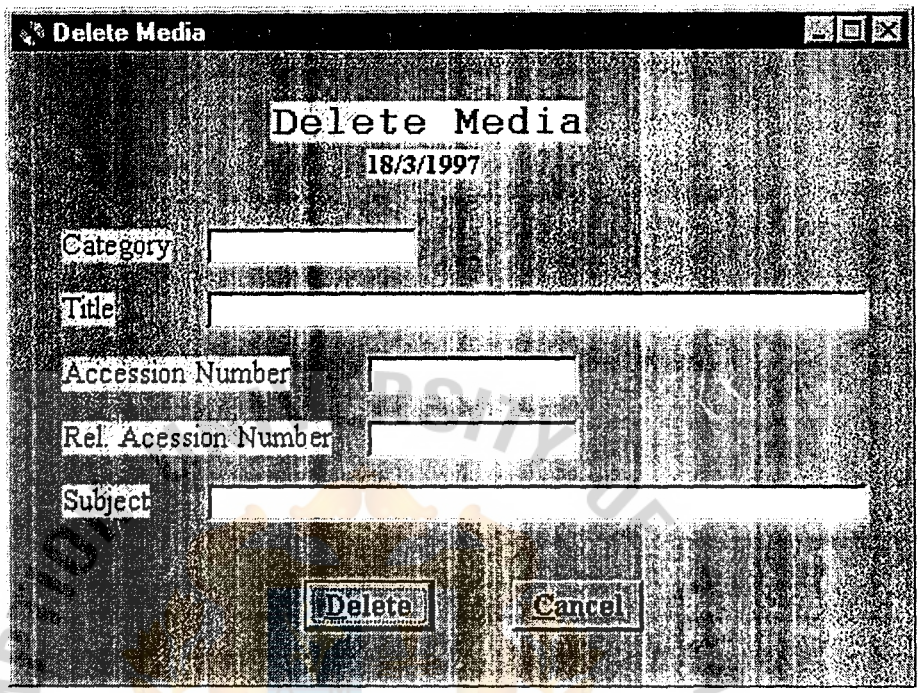

Figure C.22. Delete Media Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

MS-10000: MAIN SCREEN OF THE MEMBER MANAGEMENT WIZARD OF THE SYSTEM

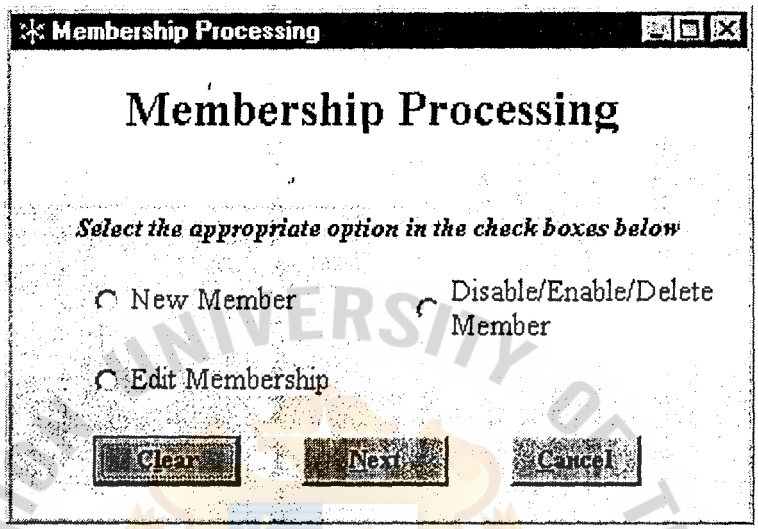

Figure C.23. Membership Processing Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

MS-10010: SCREEN OF THE NEW MEMBERSHIP CREATING

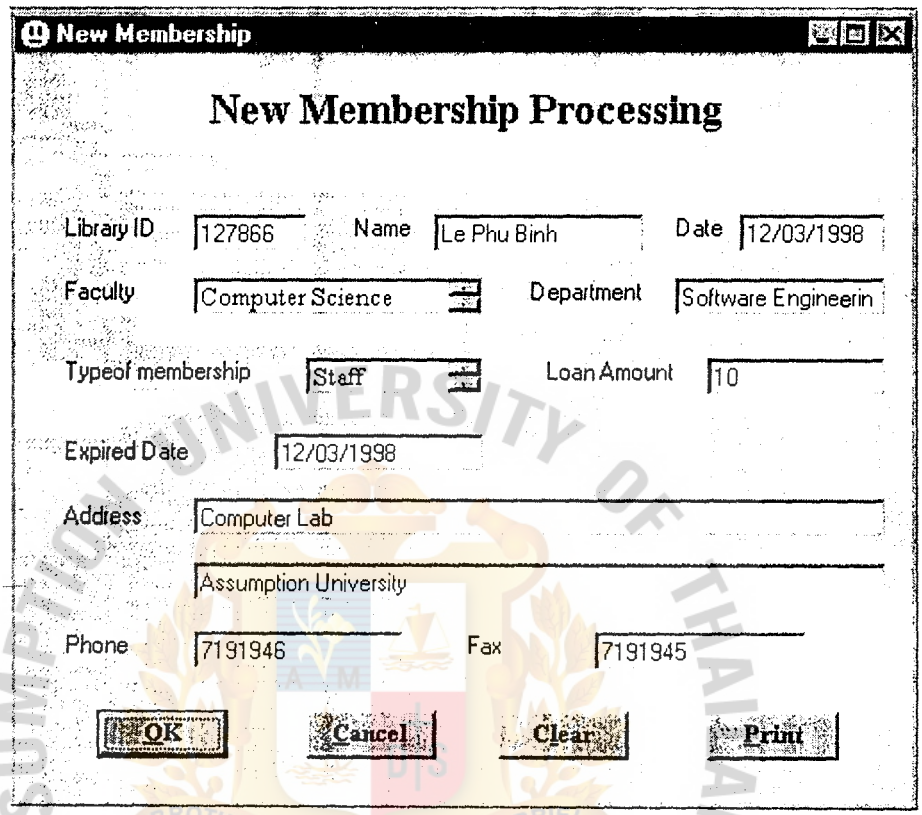

Figure C.24. Membership Creating Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
OMNIA
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

MS-10020: SCREEN OF EDITING A CURRENT MEMBERSHIP'S DATA

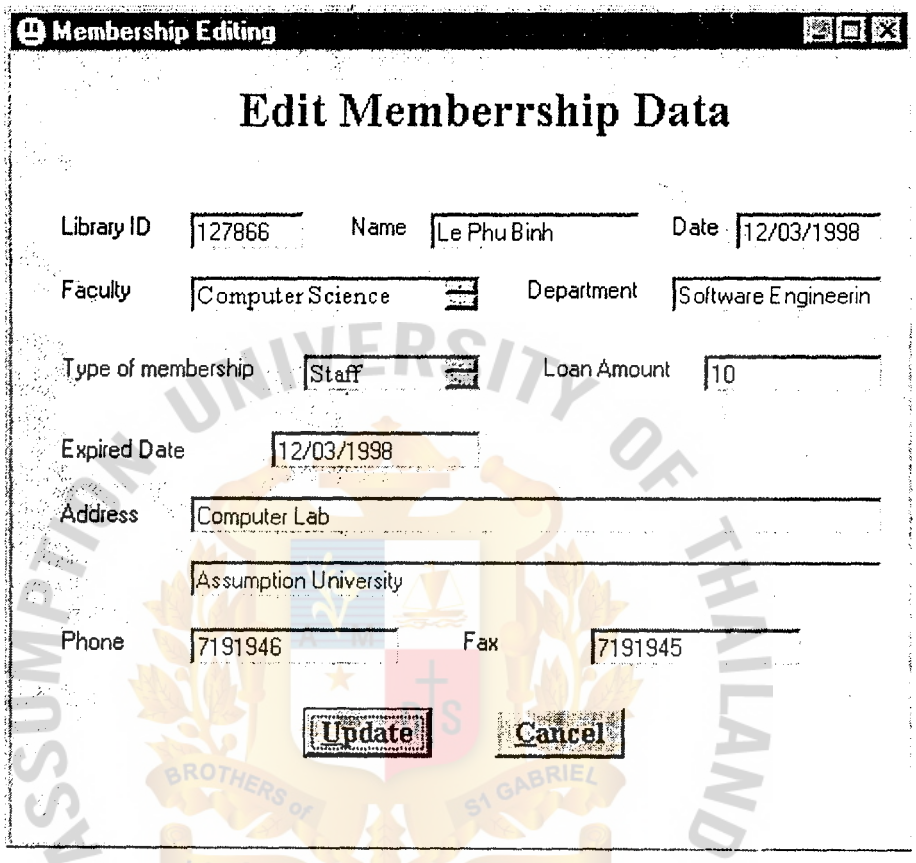

Figure C.25. Membership Editing Screen

MS-10030: SCREEN OF DISABLING OR DELETING A MEMBERSHIP OF THE LIBRARY

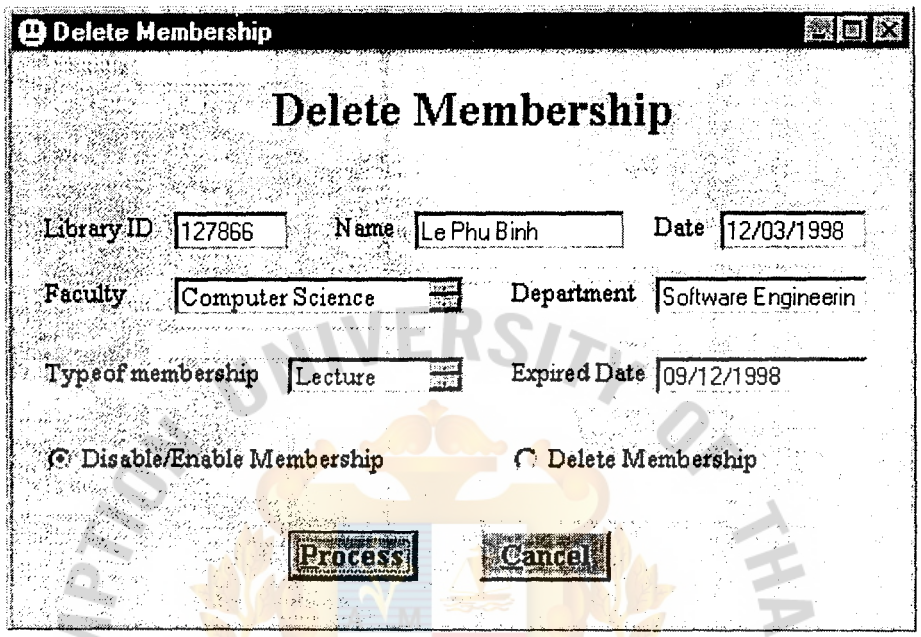

Figure C.26. Membership Disabling Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SS-10000:MAIN SCREEN OF THE SERVICE PROVIDING WIZARD OF THE SYSTEM

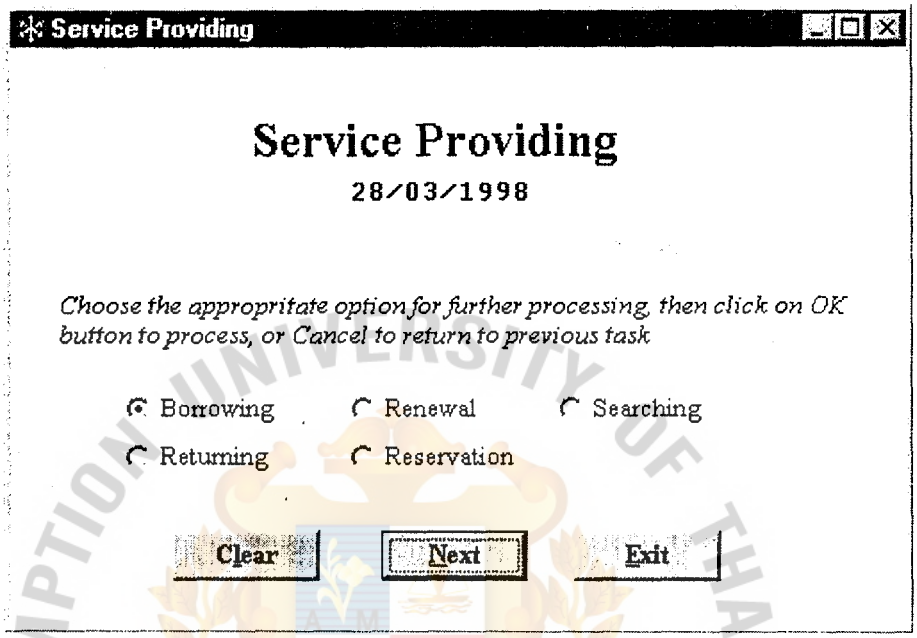

Figure C.27. Main Screen of service providing wizard

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SS-10010: SCREEN OF THE BORROWING WIZARD

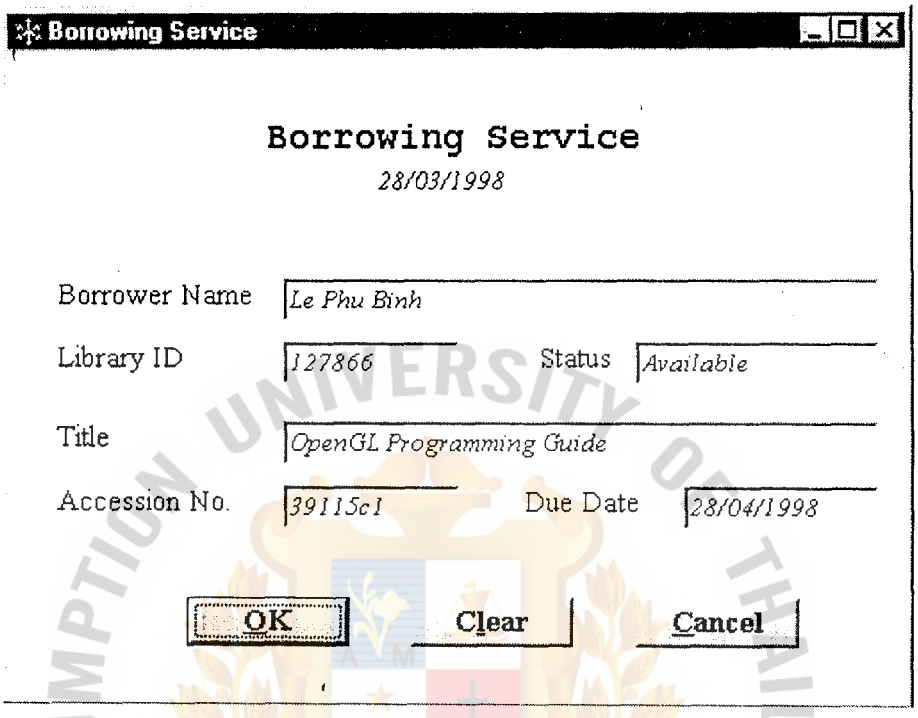

Figure C.28. Borrowing Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST. GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SS-10020: SCREEN OF THE RETURNING WIZARD

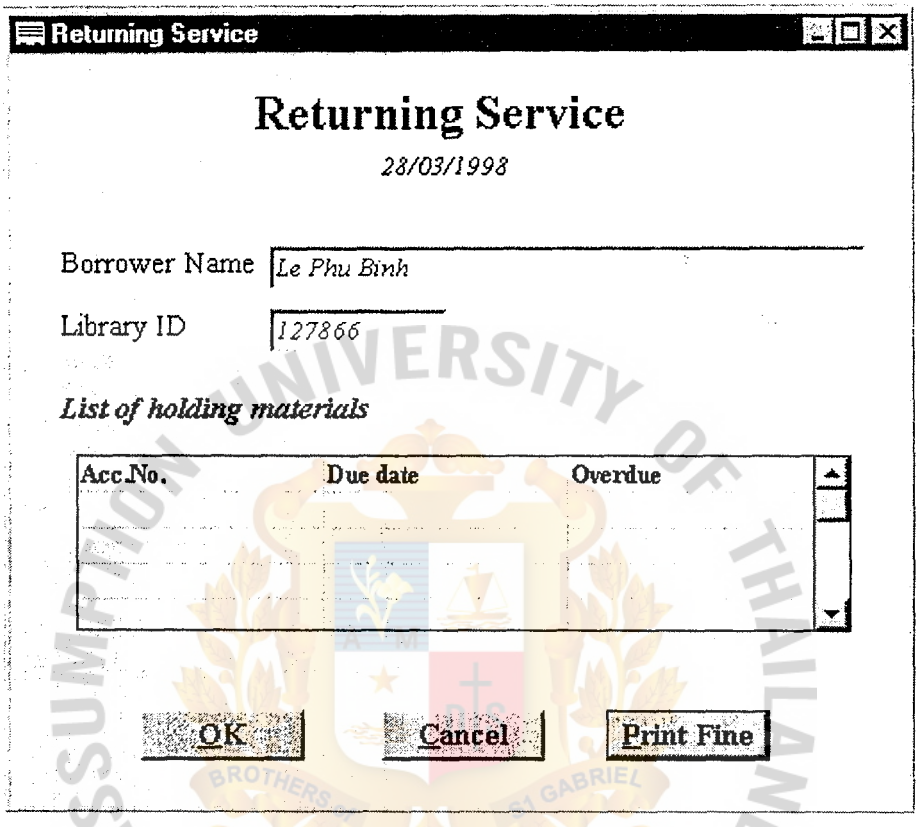

Figure C.29. Returning Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SS-10030: SCREEN OF THE RESERVATION WIZARD

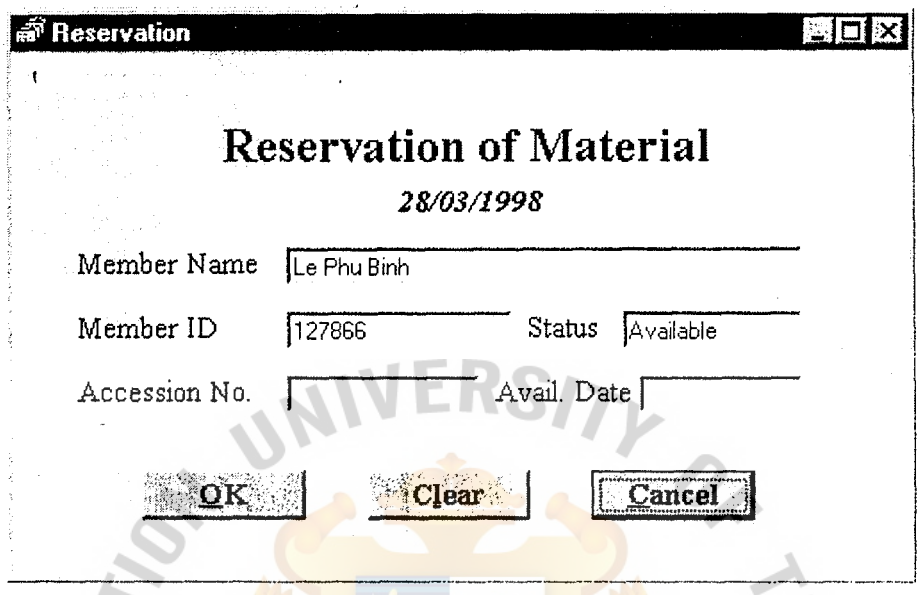

Figure C.30. Reservation Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SS-10040: SCREEN OF SEARCHING MATERIALS AND ITS INFORMATION BASED ON SPECIFIC PROVIDED DATA

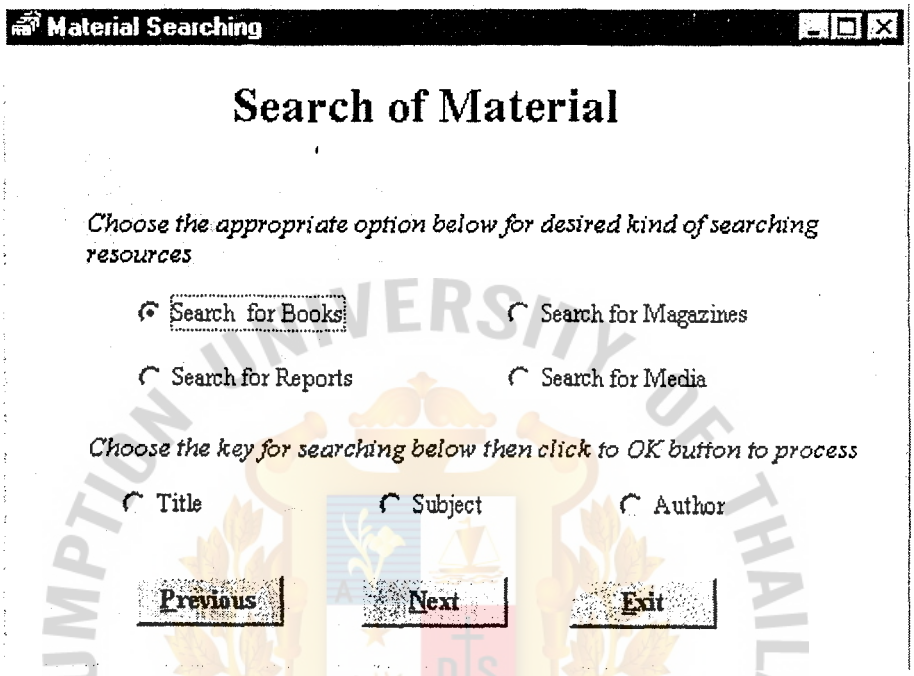

Figure C.31. Searching Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST. GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SS-10041: SCREEN OF SEARCHING BOOKS AND ITS INFORMATION BASED ON ITS TITLE

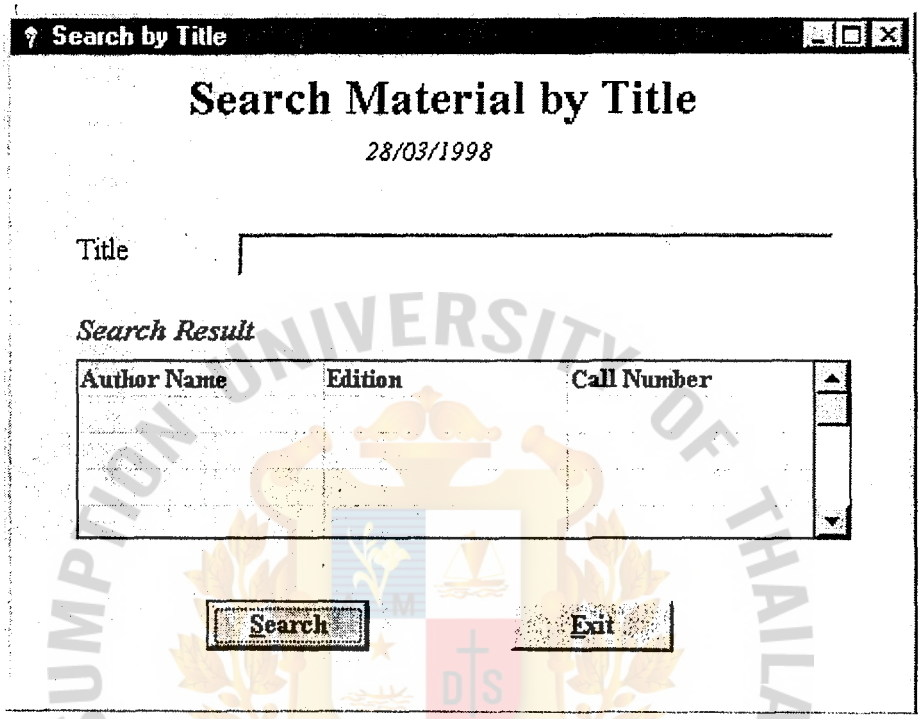

Figure C.32. Search Book by Title Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SS-10042: SCREEN OF SEARCHING BOOKS AND ITS INFORMATION BASED ON ITS AUTHOR NAME.

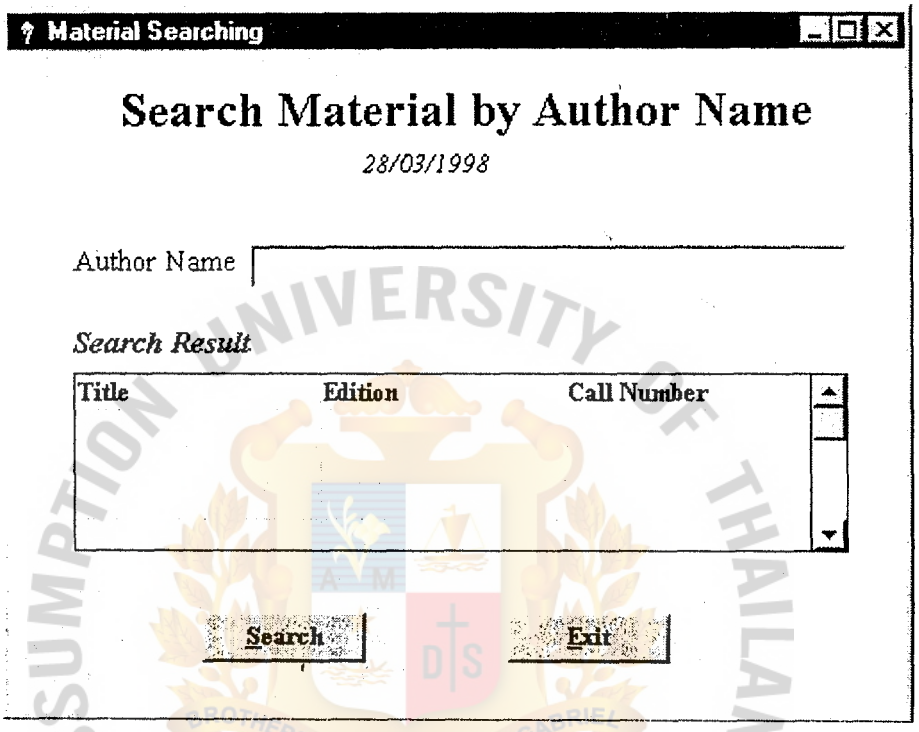

Figure C.33. Search by Author Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
LABORE ET VINCE OMNIA
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SS-10043: SCREEN OF SEARCHING BOOKS AND ITS INFORMATION BASED ON ITS SUBJECT.

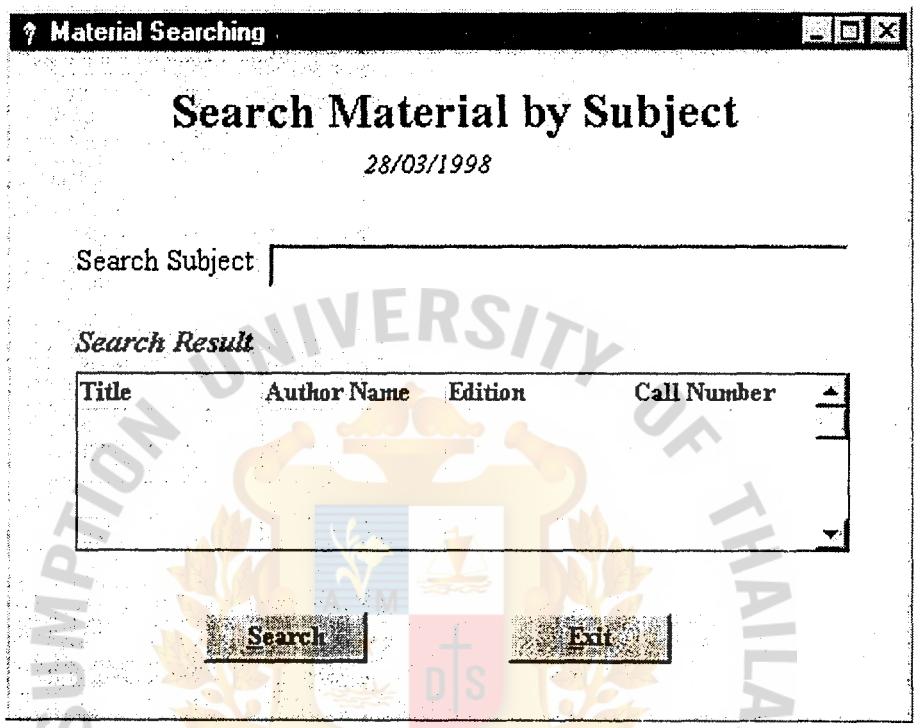

Figure C.34. Search Book by Subject Screen

ASSUMPTION UNIVERSITY OF THAILAND
BROTHERS OF ST GABRIEL
OMNIA
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SS-10044: SCREEN OF SEARCHING MAGAZINES (INCLUDE OF JOURNALS, NEWSPAPERS...) BASED ON ITS TITLE.

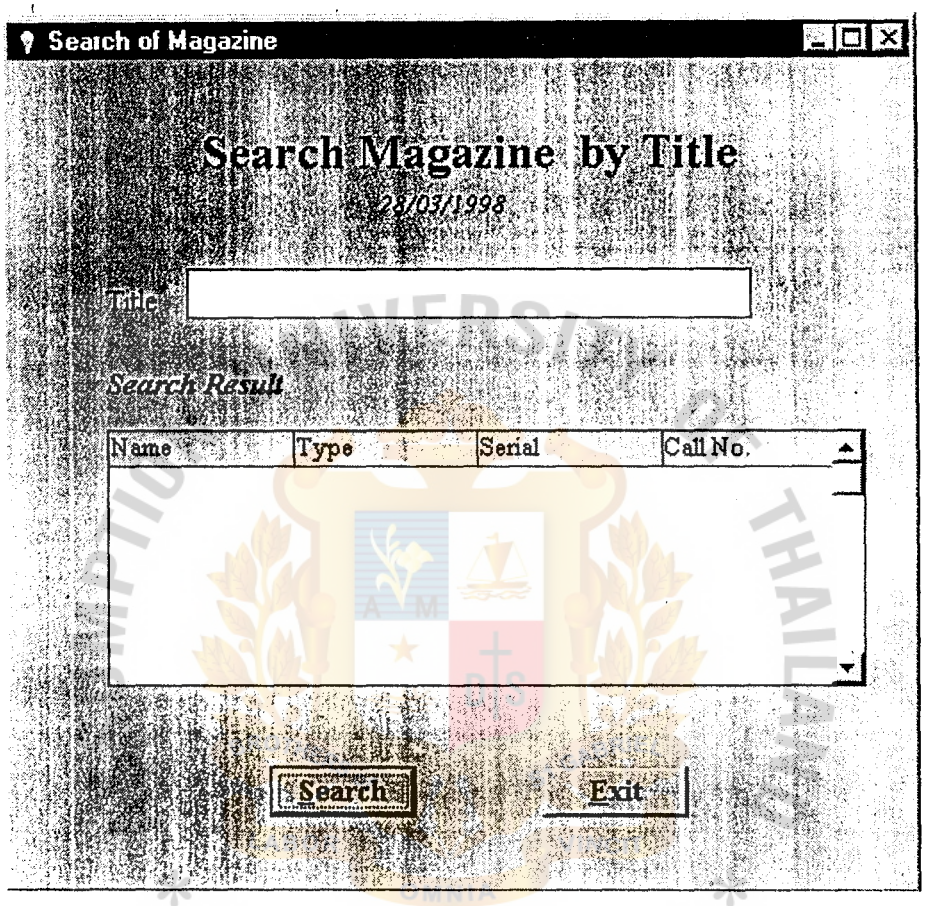

Figure C.35. Magazine Searching by Title

SS-10045: SCREEN OF SEARCHING MAGAZINES (INCLUDE OF JOURNALS, NEWSPAPERS...) BASED ON ITS SUBJECT.

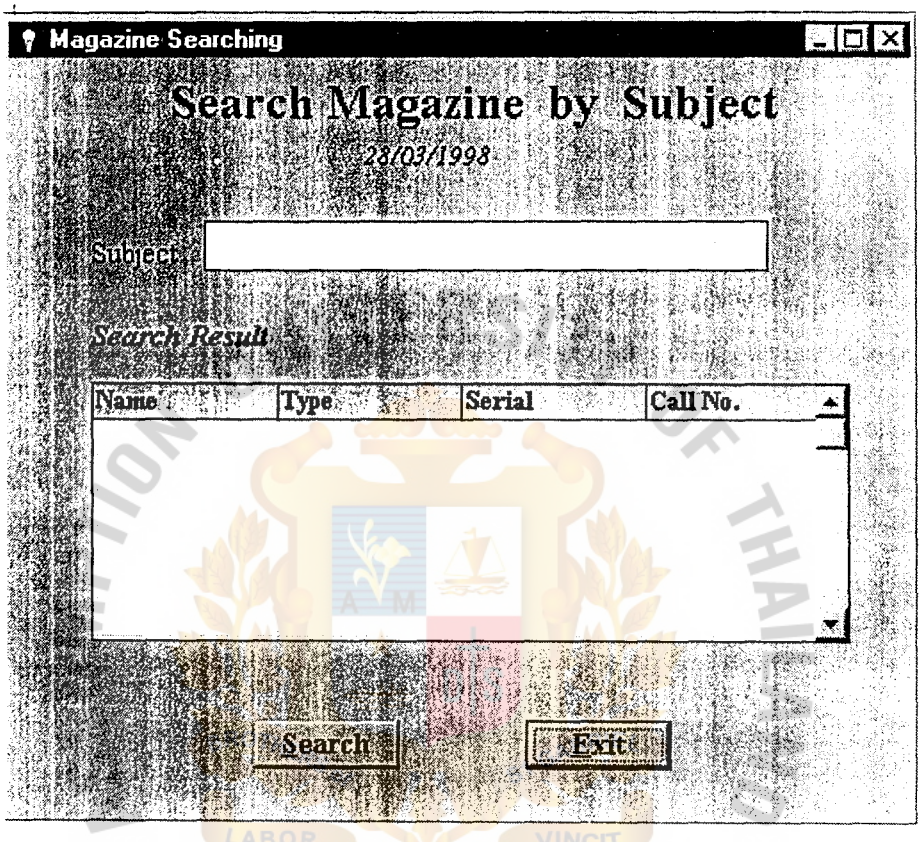

Figure C.36. Magazine Searching by Subject

LABOR OMNIA VINCIT
มหาวิทยาลัยอัสสัมชัญ

SS-10046: SCREEN OF SEARCHING REPORTS BASED ON ITS ADVISOR.

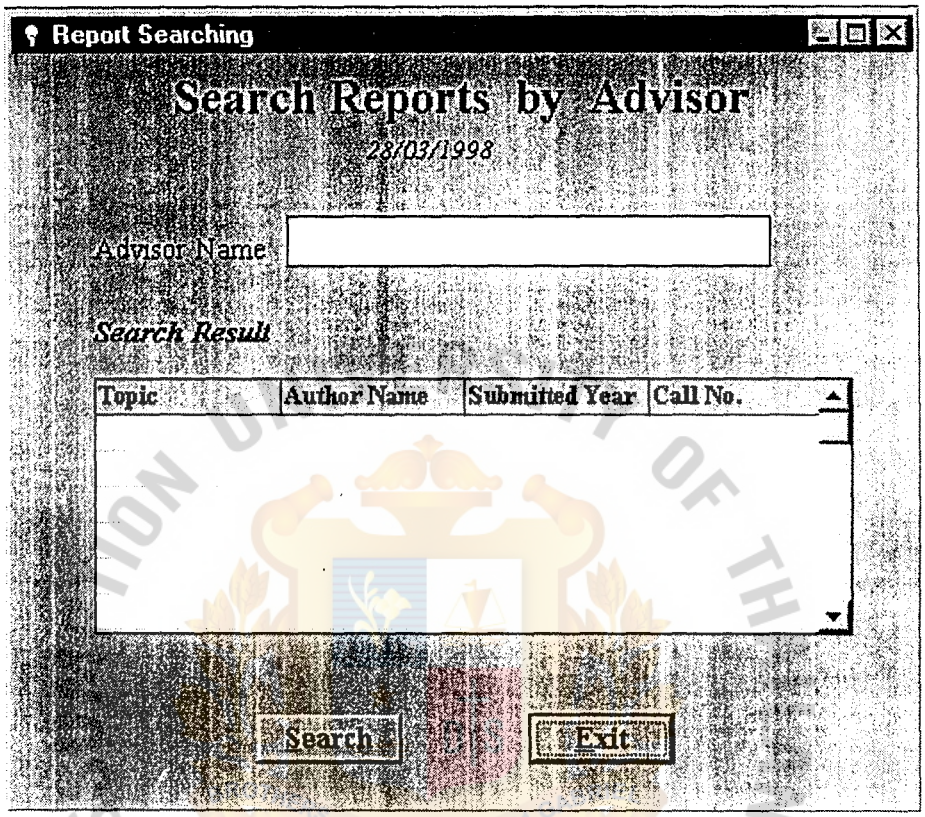

Figure C.37. Report Searching by Advisor

LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

SS-10047: SCREEN OF SEARCHING REPORTS BASED ON ITS SUBJECTS.

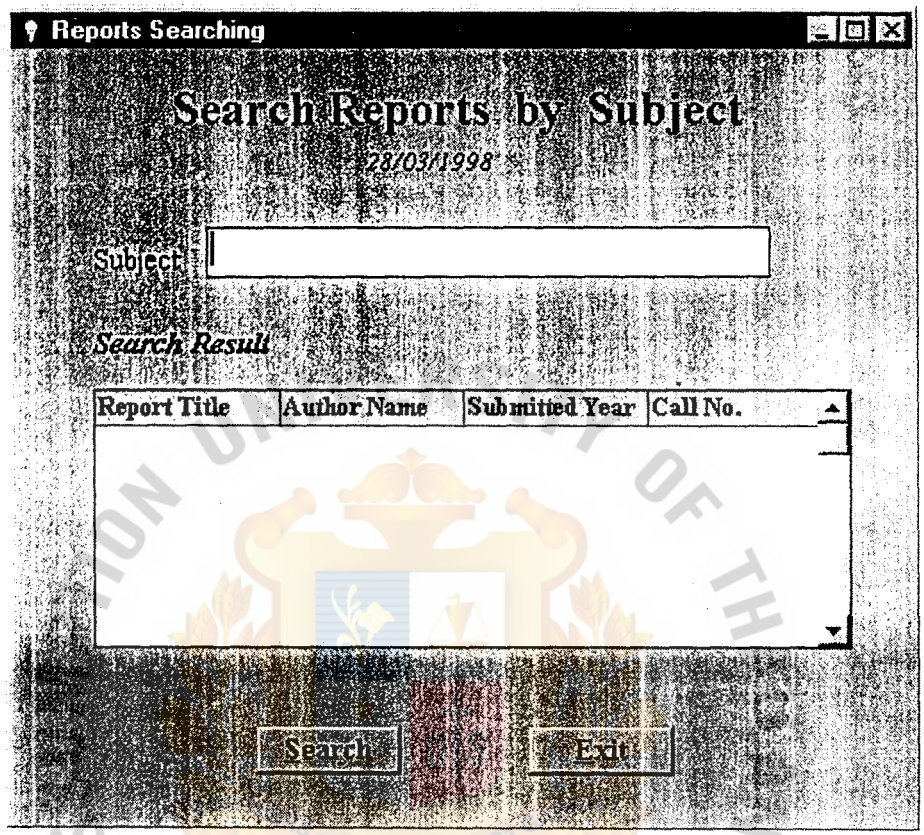

Figure C.38. Report Searching by Subject

LABOR VINCIT OMNIA SINCE1969 มหาวิทยาลัยอัสสัมชัญ

SS-10048: SCREEN OF SEARCHING NON-PRINTED MATERIAL BASED ON ITS SUBJECT.

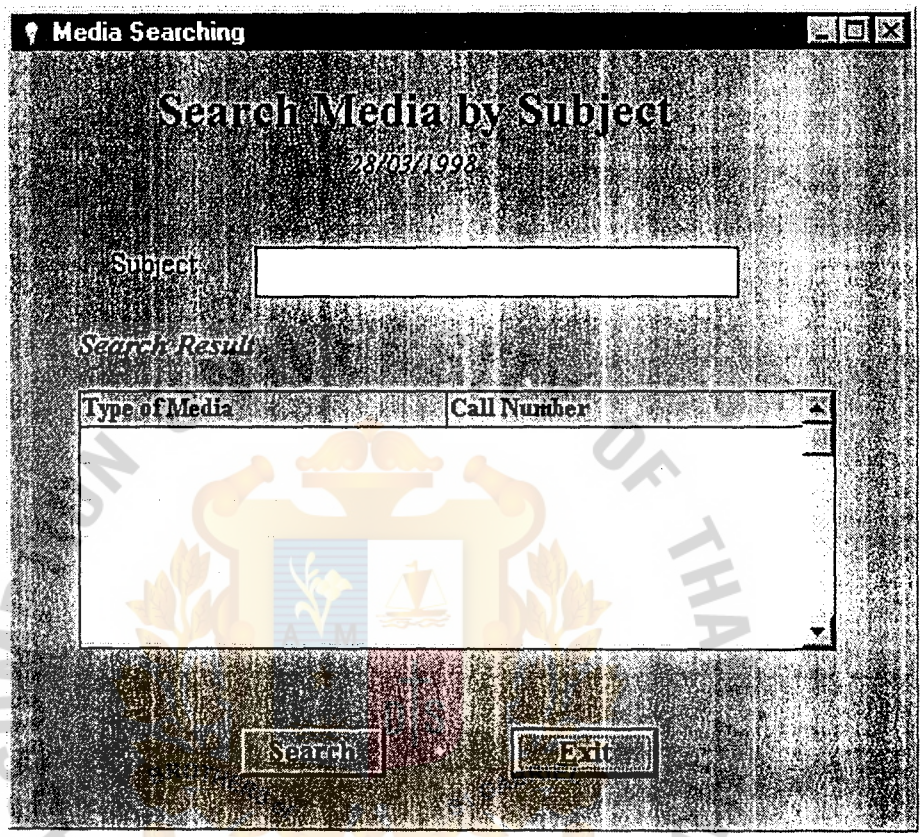

Figure C.39. Media Searching

LABOR OMNIA VINCIT
SINCE1969
มหาวิทยาลัยอัสสัมชัญ

AS-10000 SCREEN OF ADMINISTRATIVE REPORT PROCESSING

Figure C.40. Screen of Administrative Report

ABAC
GRADUATE SCHOOL LIBRARY