



Student Registration System

By

Mr. Piboonlit Viriyaphol

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

November 1999

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Project Title Student Registration System

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


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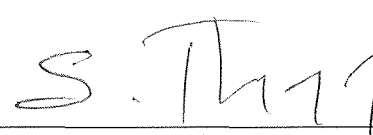
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November 1999

ABSTRACT

Education institutes are increasingly competing in terms of better services, performance, and productivity. The use of high technology, the computerized system, is used as a tool to achieve those goals.

The purpose of this paper is to analyze and design the student system and the registration system in a school using system development tools, such as context diagram, data flow diagram, data dictionary, and structure chart. The process model methodology used in this project is Gane and Sarson's Data Flow Diagram. The development tool used for this paper is Microsoft Access 97, and the CASE tool used in this paper is EasyCASE professional version.

This system development project helps the students not only to develop their knowledge obtained during study into practice, but they will also learn to adapt the computer information system (CIS) to the real world. The project makes the students complete the CIS study in both theoretical and practical aspects.

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TABLE OF CONTENTS

<u>Chapter</u>	<u>Page</u>
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
LIST OF TABLES	v
LIST OF FIGURES	vi
I. INTRODUCTION	
1.1 Background of the Project	1
1.2 Objective of the Project	2
1.3 Scope of the Project	3
II. EXISTING SYSTEM	
2.1 Background of the Organization	4
2.2 Existing Business Functions	7
2.3 Current Problems and Areas for Improvement	8
III. PROPOSED SYSTEM	
3.1 User Requirement (System Specification)	11
3.2 System Design	13
3.3 Hardware and Software Requirements	44
3.4 Security and Controls	46
3.5 Cost-Benefit Analysis	49
IV. PROJECT IMPLEMENTATION	
4.1 Overview of Project Implementation	57
4.2 Test Plan and Results	61
V. CONCLUSIONS AND RECOMMENDATIONS	

<u>Chapter</u>	<u>Page</u>
5.1 Conclusions	63
5.2 Recommendations	65
APPENDIX A DATA DICTIONARY	69
APPENDIX B USER MANUAL AND INPUT SCREEN	73
APPENDIX C REPORTS	94
BIBLIOGRAPHY	107



LIST OF TABLES

<u>Table</u>	<u>Page</u>
3.1 The Proposed System's Payback Analysis	52
3.2 The Break-Even Analysis	55
A.1 Student Table Schema	69
A.2 Subject Table Schema	70
A.3 Teacher Table Schema	70
A.4 Advisor Table Schema	71
A.5 Graduate Table Schema	71
A.6 Registration Table Schema	71
A.7 Grade Table Schema	72



<u>Figure</u>	<u>Page</u>
B.1 Logon Window	73
B.2 Main Menu	74
B.3 Maintain Information Window	75
B.4 Maintain Student Information Window	76
B.5 Maintain Subject Information Window	78
B.6 Maintain Teacher Information Window	79
B.7 Maintain Registration and Grade Window	80
B.8 Maintain Advisor Information Window	81
B.9 Maintain Registration Information	82
B.10 Maintain Grade Information Window	84
B.11 Maintain Graduate Information	85
B.12 Reports Window	86
B.13 Student Report Window	87
B.14 Reference Report Window	88
B.15 Student Information Report Window	88
B.16 Student List Report Window	89
B.17 Graduate Report Window	90
B.18 Teacher Reports Window	90
B.19 Advisor Report Window	91
B.20 Subject Report Window	92
B.21 Registration Report Window	92
B.22 Grade Report Window	93
C.1 Example of Student's Reference Letter (Thai)	94

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
2.1 The Organization Structure of Bangkok Christian College	5
3.1 Data Flow Diagram of the Existing Student Registration System	13
3.2 Context Diagram of the Proposed Student Registration System	16
3.3 Data Flow Diagram (level 0)	21
3.4 Data Flow Diagram (level 1) : Process Student Information	25
3.5 Data Flow Diagram (level 1) : Process Subject Information	26
3.6 Data Flow Diagram (level 1) : Process Registration Information	26
3.7 Data Flow Diagram (level 1) : Process Teacher Information	27
3.8 Data Flow Diagram (level 1) : Process Grade Information	27
3.9 Data Flow Diagram (level 2) : Maintain Student Information	32
3.10 Data Flow Diagram (level 2) : Maintain Subject Information	33
3.11 Data Flow Diagram (level 2) : Maintain Registration	34
3.12 Data Flow Diagram (level 2) : Maintain Teacher Information	35
3.13 Data Flow Diagram (level 2) : Maintain Grade Information	36
3.14 Data Flow Diagram (level 3) : Delete Student Record	36
3.15 Data Flow Diagram (level 3) : Maintain Student Score	38
3.16 Data Flow Diagram (level 4) : Delete Student Record	40
3.17 Entity-Relationship Diagram	42
3.18 The System Configuration of the Proposed System	46
3.19 The Proposed System's Payback Period	53
3.20 The Proposed System's Break-Even Analysis	56
4.1 Gantt Chart Showing the Proposed System Implementation	58

<u>Figure</u>	<u>Page</u>
C.2 Example of Student's Reference Letter (English)	95
C.3 Example of Student Information Report	96
C.4 Example of the List of Students Report (Thai)	97
C.5 Example of the List of Students Report (English)	98
C.6 Example of the List of Graduates Report (Thai)	99
C.7 Example of the List of Graduates Report (English)	100
C.8 Example of the List of Teachers Report (Thai)	101
C.9 Example of the List of Subjects Report (Thai)	102
C.10 Example of the List of Subjects Report (English)	103
C.11 Example of Student's Registration Report	104
C.12 Example of the Student's GPA and Scores Report (Thai)	105
C.13 Example of the Student's GPA and Scores Report (English)	106

I. INTRODUCTION

1.1 Background of the Project

An information system is an integration of system components, such as processes, data, computers, networks, and technology that help to improve a day-to-day operation and decision-making processes. The information system development has become one of the most popular subjects for many organizations all around the world. There are many organizations, especially business organizations, which are developing their own information systems to enhance their productivity.

In Thailand, the information system development has increasingly attracted many organizations. Most large companies and institutions in Thailand have their own information systems. For example, banks have banking system to improve their services and productivity. Information systems for educational institutions are increasingly developed, especially in high level education at universities. Most of the universities have employed information systems in several functions, such as registration systems, personnel systems, and library systems.

In the school level, there are very few schools that have information systems. The reason is because school procedures are not as complicated as in the universities. The officers are used to the manual system that they have followed for a long time. However, in a large school with a lot of students enrolled, manual systems may not give good service to students and parents. Moreover, a lot of officers have to be hired to handle the enormous data processing. To solve these problems, schools are turning their attention to system development.

There are many departments in a school, for example, the academic department, personnel department, and financial department. Students are the most important part of the school. The students' information is kept in the office of the registrar, with the

registration information. The registration system produces fundamental input for other related systems. For example, the financial system has to receive the registration information and student information in order to calculate the fees.

Registration is a core business function for a school. Most of the work in the school relates to students, subjects, and teachers. Students have to be involved a lot with the office of the registrar. For example, they have to ask for references and transcripts when they graduate. When they are studying in the school, they have to go to the office very often to see grade announcements.

To begin the system development for the school, the first function that should be automated is registration. Therefore, this project will analyze and design the student registration system for the school.

1.2 Objective of the Project

The main objective of the project is to design the student registration system for Bangkok Christian College, so the officers can work more efficiently and effectively. Moreover, there are some changes in the registration procedures that the old system does not support. This system will be designed based on the changed environment. It will replace the old system which cannot be expanded or changed to support the new environment. Another objective for this project is to build a pioneer system for the school. If this system works properly and suitably, the school will expand it to cover other applications to form the school management information system.

To achieve these objectives, several tasks are to be conducted in this project. The tasks are as follows:

- Studying an existing registration system.
- Analyzing the problems of the existing system.
- Analyzing the new procedures and requirements from the office of registrar.

- Designing the GUI-based registration system to cover all requirements, and preparing for the expansion of the system.
- Developing and testing the system.

1.3 Scope of the Project

The scopes of the student registration system are as follows:

- Maintaining student information records.
- Registering students to the subjects based on the educational program they are enrolled in.
- Gathering students' grades from teachers teaching the subjects offered in each semester.
- Generating grade reports, summary for the registration, and other registration-based reports, such as a total report for each student's registration.
- Displaying some query results on screen.

II. EXISTING SYSTEM

2.1 Background of the Organization

Bangkok Christian College is the first private school in Thailand. It has been established since 1852 by a group of American missionaries known as the American Presbyterians. The first time it offered a study program to Thai student was on 30th September 1852, at Tumbol Sam-Reh. Later in 1902, BCC moved to 35 Pramuan Rd., Silom, the school's present location.

Now, BCC has more than 5,000 students in 12 grades. There are more than 300 teachers at BCC. The BCC philosophy is Christian, which places special emphasis on the overall mental, spiritual and physical development of each student. More than 90% of BCC graduates continue on to higher education. Many alumni occupy important positions of leadership in government, business, and education.

BCC is under the administration of the education unit of the Church of Christ in Thailand foundation. It has a director who takes care of the school's internal affairs. The executive board consists of the director, the principal, and the assistant principals in 4 areas: curriculum, student affairs, finance and personnel, and service. Under each assistant principal, there are several departments, such as Department of Pratom, Mattayom, religious affairs, finance and personnel, location, and administration. There are department chiefs who take care of their departments.

Each department is divided into units, such as subject groups, and each unit has its head as a decision-maker. The heads have to maintain the school's policy as related to their units. The organization chart is shown in Figure 2.1.

Bangkok Christian College Organization Structure

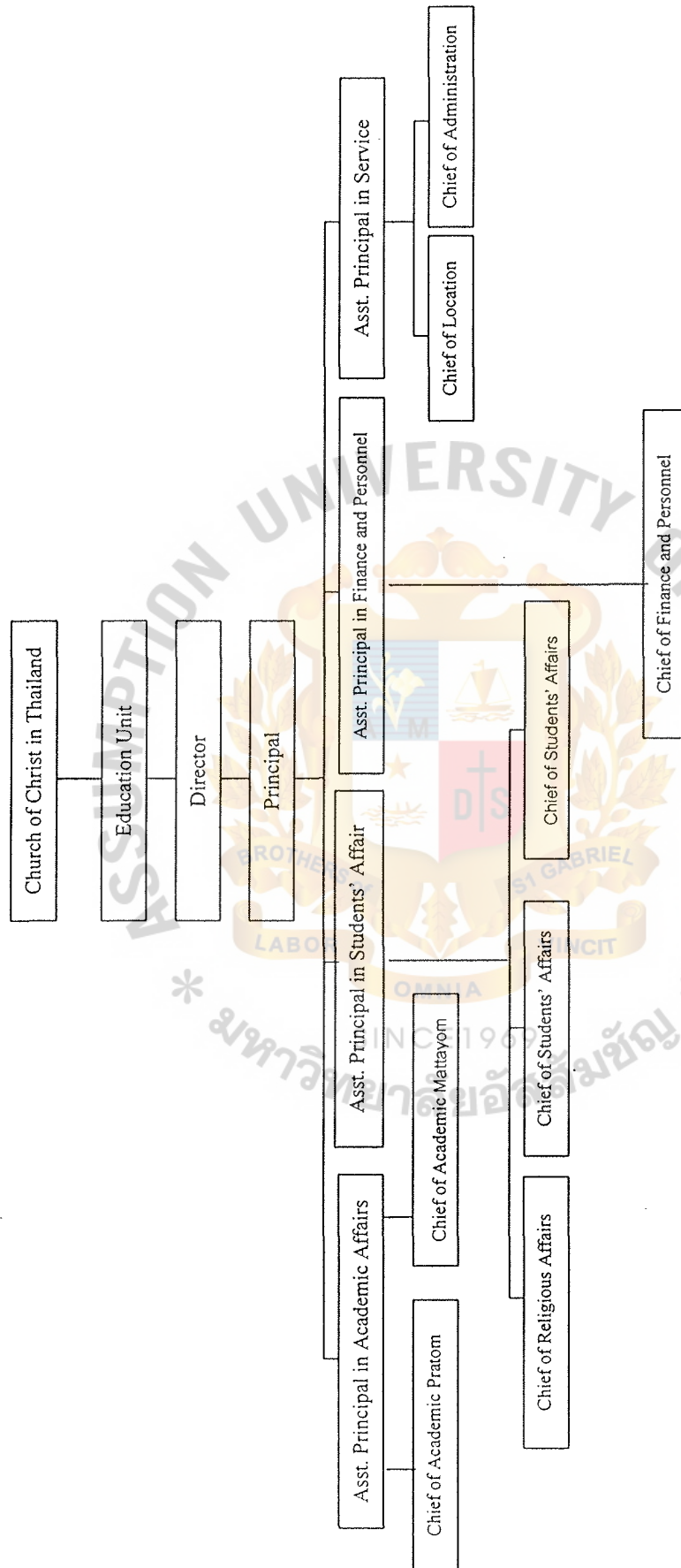


Figure 2.1. The Organization Structure of Bangkok Christian College.

The office of the registrar can be considered the most important unit in BCC because the most important information in schools is student information. The office of the registrar is the place where student information is generated. It is run under the control of asst. principal in academic affairs.

In the present day, BCC has over 5,000 students. Officers in the office of the registrar have to handle all students' records manually. In order to find an individual record, the officers have to spend almost half an hour. They have to ask for a lot of student information from the student, and compare it with huge record folders stored in enormous shelves. The student who is applying for grade reports or transcripts also wastes several days getting those reports because the officers have to reprint the records. At the end of each semester, with the limited number of human resources, the officers are so tired, and have to work both day shifts and night shifts to get all reports ready for the students, especially who have to apply for a university entrance exam.

Moreover, the executive board has found that there are errors on the student reports. The officers may mistype or have eye problems when they are tired. The school has to prevent these errors before they are given out to the student because this information is very important, and the errors can damage the reputation of the school.

Computers will be the best solution to improve the processes in the office of registrar. All student information will be stored in the database, instead of in a large number of folders. The officers will not need to seek the shelves or folders anymore. They just key in some key information, and the system will show the related students' information on the screen. If they have found the individual record, they can print reports by choosing whatever they want, transcripts or a grade report. With the computers replacing humans, the human errors can be reduced, for example, with regard to miscalculation and wrong formats.

2.2 Existing Business Functions

The area under study of this project covers all functions of the office of the registrar. The office of the registrar deals with students including their parents, teachers in academic departments, the executive board, the student affairs department, and the financial department. The existing business functions of the office of registrar are as followed.

- Maintaining the student information after the parents or the students fill in the history form and student information form.
- Maintaining teacher information when new teachers are recruited, including when the current teachers need to change of their information.
- Maintaining the registration of each student in each semester, after the academic department has allocated the suitable subjects in that semester to the students.
- Announcing the grades of every subject and calculating the grade point average, and maintaining the grade information in each semester, after the grade reports are sent to the office.
- Maintaining the graduates' information after the students graduate from the school for future reference.
- Allocating teachers to advise each classroom.
- Producing reports, such as reference letters, grade reports, and etc. for students.
- Producing reports on the request of the executive board.
- Reporting the completed registration to the financial department to calculate the fees.

- Giving the student lists to teachers in each academic department, so they will know the information of the students they teach, and so they can record the scores.
- Sending and updating the student information to the student affairs department in order to oversee the students.

2.3 Current Problems and Areas for Improvements

The existing system of the office of the registrar is a manual system, so there are a lot of problems dealing with human errors. The current problems are as follows:

- 2.3.1 The services are so slow that students and other departments have to wait for a long time to get the reports they want. For example, to get the grade report, students have to wait for at least 1 week in order to allow the officers to seek their records, and summarize all the information manually.
- 2.3.2 The information is not up-to-date because the officers need a long time to process requests of any information updates. For example, if the students ask for their information updates, they have to submit the requests, and wait until their requests are processed by queue.
- 2.3.3 A lot of papers are used unnecessarily. For example, if the executive board wants some information the reports have to be printed out. After that, the reports are discarded, and have to be kept somewhere. So, the office has to provide the space for the documents.
- 2.3.4 There are not enough personnel in the office compared to the work that they have to do. The repeated procedures decrease the productivity of the officers. They have to handle redundant procedures, such as seeking for a file, summarizing the information, and typing the reports.

2.3.5 The system is not efficient or effective. For example, the information search requires a lot of time. The officers have to find the folder in several large cabinets, and the information resides in a folder that keeps hundreds of student records.

2.3.6 There is very low level of information accuracy. As mentioned, the officers have to do their work manually, and human errors are often found. The officers can mistype the reports, and the correction of the mistakes is very hard. For example, if the officers misspell some words in the document, the solution is to retype the whole document.

The areas for improvements are as followed

- The performance of the system will be improved. At the same period of time, the system generates more output. For example, in manual system, the user generates 15 reports a day, but in automated system, the output will be doubled.
- The response time of the system will be improved. In manual system, the user has to seek for individual file in the cabinet that is time-consuming. In the proposed system, the user can search for individual record easily, by keying in the search condition. Report production is also faster. The user enters required attributes instead of typing the whole document, and the report will be printed out.
- The procedures of the system will be improved. The redundant procedures are discarded. Processes done repeatedly will be customized. For example, reports will be generated only once instead of retyping the same report when needed.

- The information availability will be better. In manual system, the user have to manually seek for the file, and the file may be misplaced. Moreover, the paper documents may be damaged unintentionally, so the information is gone with that paper. The proposed system keeps information in the database. With proper backup, information will be secure, and it will always be available when needed.
- The information accuracy will be improved. Human errors will be reduced in the proposed system, so the information is more accurate.
- The information updates can be done easier. In the existing system, changes are hard to be done, and the process is time-consuming, so the information may not be update. The update procedures in the proposed system are easier, and more user-friendly, so the information can be updated faster.
- The cooperation among the departments, students, and the executive board will be improved. With the proposed system, cooperation is needed for all parts of the system. Each part needs input, and also produces output for others.
- The technology used in the system is improved. Instead of using people, computers are used for any processes. Printers and programs are replacing typewriters. The products from high technology tools are better quality.

III. PROPOSED SYSTEM

After studying the existing system, such as business functions, existing computer system, and identifying the problems for the existing system, the next step is to analyze and design the proposed system. In analyzing and designing the proposed system, Data Flow Diagrams are used as a process modelling technique to illustrate processes which need to be included in the system, and an Entity-Relationship Diagram is used as a data modelling technique to identify data required in the system. The following sections describe the design process of the proposed system.

3.1 User Requirement (System Specification)

The user requirements are obtained by interviewing the system users. Then, the existing system is evaluated. For example, the existing forms and reports are reviewed, and summarized, so the important data for the system are captured. Finally, a meeting is arranged for the system users, the head of the office of the registrar, and the system developer for the conclusion of the user requirements. The user requirements are as follows:

3.1.1 The users need a secure system that unauthorized people can not access because the registration information and scores for subjects are very important. They are official information that must be accurate and must not be modified by unauthorized people.

3.1.2 The accuracy of the information is very important. The information retrieved from the database must be correct, and the results of any calculations, such as grade point average, must also be accurate. The reason is that these documents are official. They will be provided to a third party, such as students' parents and universities. The wrong information affects the school's reputation.

3.1.3 The users want all information to be shared. The school has more than 5,000 students. Working separately, like in the present day, can cause the problem of data inconsistency.

3.1.4 The system must have fast response time in order to process requests from students, teachers, and others.

3.1.5 The users would like the system to be user-friendly. The system should not require too many parameters, and it should be easy to operate.

3.1.6 Any information should be easy to search. The office of the registrar provides request forms for people. The users want to use information in the forms, such as student's admission number or codes, to search for an individual record.

3.1.7 The users want some reports, such as student lists and subject lists, to be in both Thai and English because there are also foreign teachers in the school, and sometimes students want to contact foreign schools or universities.

3.1.8 The users want to keep graduates information in the system, so they can print reports about the graduates.

3.1.9 The users want several reports, such as each student's information, students in each class, teacher lists, advisor lists, a grade report, and a registration report in each semester. They also want review not only the present semester, but also the past semester.

3.1.10 The system must be able to calculate the grade point average of the students.

3.1.11 The users must be able to view the search results on the monitor, and preview the reports before printing.

3.1.12 The executive board must be able to view information, such as student information, to help them in the decision making process

3.1.13 The proposed system must be able to generate reference documents to confirm students' status at BCC to both national and international organizations, such as universities and embassies.

3.2 System Design

In the system design phase, data flow diagrams are used to identify processes required for the system, and an entity-relationship diagram is used to identify data needed in the system. This project begins the design phase by introducing data flow diagrams in the overview of the proposed system. Then, the entity-relationship diagram is introduced, followed by the input design and the output design.

After analyzing the current manual system, the data flow diagram of the system is shown in Figure 3.1.

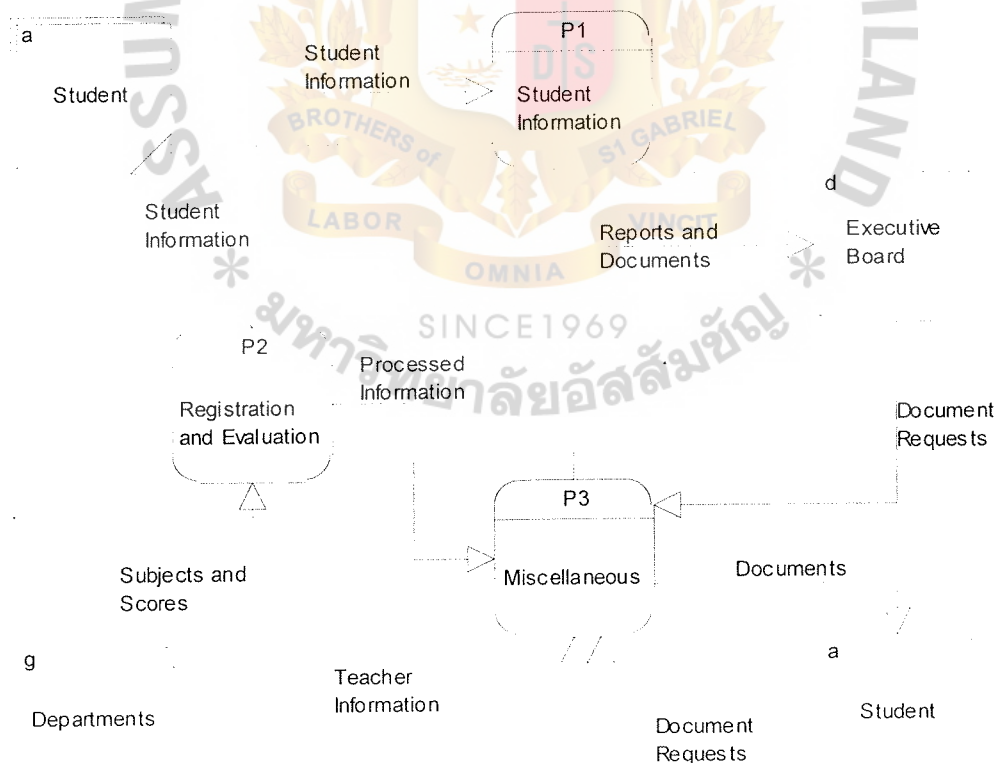


Figure 3.1. Data Flow Diagram of the Existing Student Registration System.

The existing system deals with 3 parts, executives, students, and all academic departments. The office of registrar collects data from students to be kept in the student information part, and the departments send subjects information and grades to the office to record the registration and evaluation information. This part processes the information and sends to the miscellaneous part which also keep other information, such as teacher information. The miscellaneous part is responsible for receiving requests from the executives and students. Then, the officers produce reports, such as grade announcement, student lists, and subject lists. The reports go to students, academic departments, and the executives.

3.2.1 Overview of the Proposed System

The context diagram of the proposed system is illustrated in Figure 3.2. In the student registration system, students have to supply their information including their personal information, such as name, date of birth, and etc., their address and telephone number, and their parents' information including parents' name to the system. They will receive reports, such as registration reports, grade reports, and reference documents from the system. They can also view their registration information from the monitor, if the officer want to confirm the subjects registered.

The academic departments, such as computer department, science department, and etc., will supply the system with their teachers' information, and details of subjects taught in the departments. They are also responsible for giving the system grade reports of the subjects, so the system can use the grades as raw data for reports and calculation. The departments will receive reports back from the system. For example, they will get student lists in each class, and other information, such as student record, if the teachers want to know individual student information.

The finance department deals with the school's financial status, so the students' information is very important. That information includes the students' records, their information, and registration information. The finance department will use the registration information to calculate study fees for each student. The student records will be used to identify the background of the students, especially when the school wants to contact the parents.

The office of the registrar supplies registration information for the system. So the system can use the information to generate reports and summarize the information for the executive board. Student records are also sent to the students' affairs department. The students' affairs department deals with students' problems. The student information is very necessary for the department because some students may cause problems for the school. The department needs their background information to consider their penalties, to contact their parents, and to help with choosing students of the year.

Finally, the executive board will receive every report with they request. The board is also able to view any information they want. For example, if they want to view individual information, they can do it by entering a student's admission number, and then the program will show the requested record. In some cases, the board may want to view individual information, so they identify the admission number to the officer, and the officer can prepare documents, for example, for a meeting. The reports are not supplied to the board on a regular basis, but only for special cases because the board gave basic decision-making power to teachers and departments. Therefore, only special cases that teachers and departments could not make a decision about will go to the executive board.

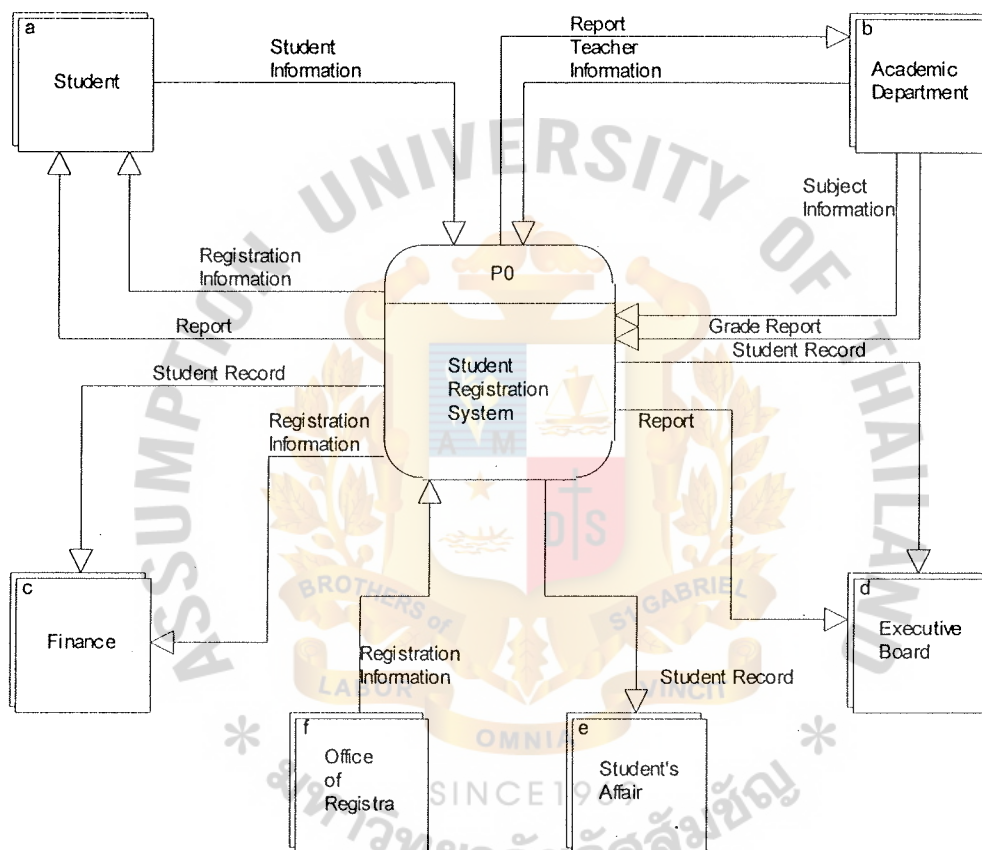


Figure 3.2. Context Diagram of the Proposed Student Registration System.

3.2.2 Data Flow Diagram Level 0

In the student registration system, there are 5 major processes illustrated in Figure 3.3. These 5 processes need to store data in 5 major data stores. The data stores are Student, Subject, Registration, Grade, and Teacher.

Process P1: Process Student Information

The process P1 deals with maintaining student information, such as name, address, telephone number, parents' name, and other personal information. To maintain the information, this process has to be able to add new student records, edit or change existing student records, and remove useless records. In addition to maintaining the information, the process uses the information to generate student-related reports, such as student information and student lists. The main input flow of the process P1 comes from the student. The student has to supply his information to the process, and the process will take care of the information as resources. The information is then kept in the Student table.

The outputs of this process are student records, and they go to the departments, such as students' affairs, and finance. The executives also receive the student records, as mentioned earlier. The system is also able to print student lists for the students' affairs department in order to overview all students in the school.

Process P2 : Process Subject Information

Subject information is very important to the student registration system. Students have to register for the subjects. In the school level, the school, by the academic department (both primary and secondary level), will choose subjects for the students in each level and each semester. The students have no freedom

to choose subjects they would like to study. The input of this process, the subject information, comes from every academic department. The departments decide what subjects the teachers in the departments have enough potential to teach, and what subjects will best benefit the students.

This process is able to maintain the subject information. That is, the new subject information can be added, and the existing information can be changed and removed. The information is stored in the Subject table. The process output is subject-related reports, such as subject lists. The lists are sent back to the academic departments to check if the information is wrong or for future updates of subject information. The reports are also sent to the students, to inform their parents about subjects taught in the school. This is to cooperate with the parents by receiving feedback from them about the arrangement of the subjects their children are studying each semester.

Process P3 : Process Registration Information

This is the most important process in the student registration system. Most of the processes in the system have the main purpose of keep the basic information, and supplying it as resources. This process summarizes information in an easy-to-understand format, and uses it to generate new information. The registration information is comprised of the collection of the fundamental information, such as student information, and subject information, and extra attributes, such as academic year, and semester. The information is kept in the Registration table.

The input of this process comes from the fundamental tables, such as Student, Teacher, and Subject, and from the office of registrar that will enter extra attributes and match the existing information to the extra attributes. The

output of the process are registration reports. The reports will be sent mainly to the students, so they will know subjects they registered for. If errors occur, the students can bring them to correct the errors with the officer. The reports are sent to the executives on request. If they saw unusual events, they will ask for the reports accompanied by student records in the executive meeting.

Process P4 : Process Teacher Information

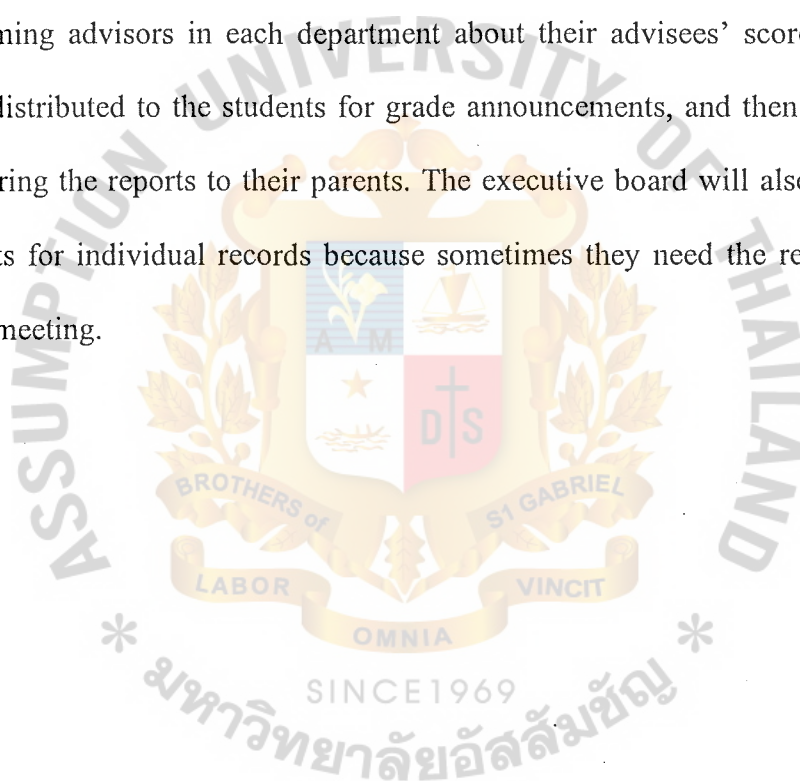
The Process P4 is responsible for maintaining the teacher information, and producing teacher-information-related reports. To maintain the information, the process is able to add new teacher records, edit the existing records, and delete the unwanted records. The information is kept in the Teacher table in the system. The reports received from this process are such as teacher lists.

The process receives teacher information from the academic departments. The information includes teachers' names, and codes. The teacher information is also some of the fundamental information supplied to the registration information. The reports are also sent back to the academic departments to double check the information accuracy.

Process P5 : Process Grade

This process is responsible for maintaining in the students' scores, and producing related reports. To maintain the scores, the process has to get the registration information from the process P3, and add the extra attributes, such as the student's grade. Therefore, this process needs an extra process used to transfer the registration information to the grade information. After the transfer of the information, the process can add new grade information, edit the existing information, and delete the unwanted grade information.

The extra information comes from the academic departments. The departments send the grade report to the process. Then, the process uses the grade report accompanied with the registration information from the Registration table to produce related reports. Moreover, the grade point average can be calculated with this process for the reports, such as GPA reports. The grade information is stored in the Grade table. The grade-related reports are sent to academic departments for 2 reasons, for checking the accuracy, and for informing advisors in each department about their advisees' scores. They are also distributed to the students for grade announcements, and then the students can bring the reports to their parents. The executive board will also receive the reports for individual records because sometimes they need the reports during their meeting.



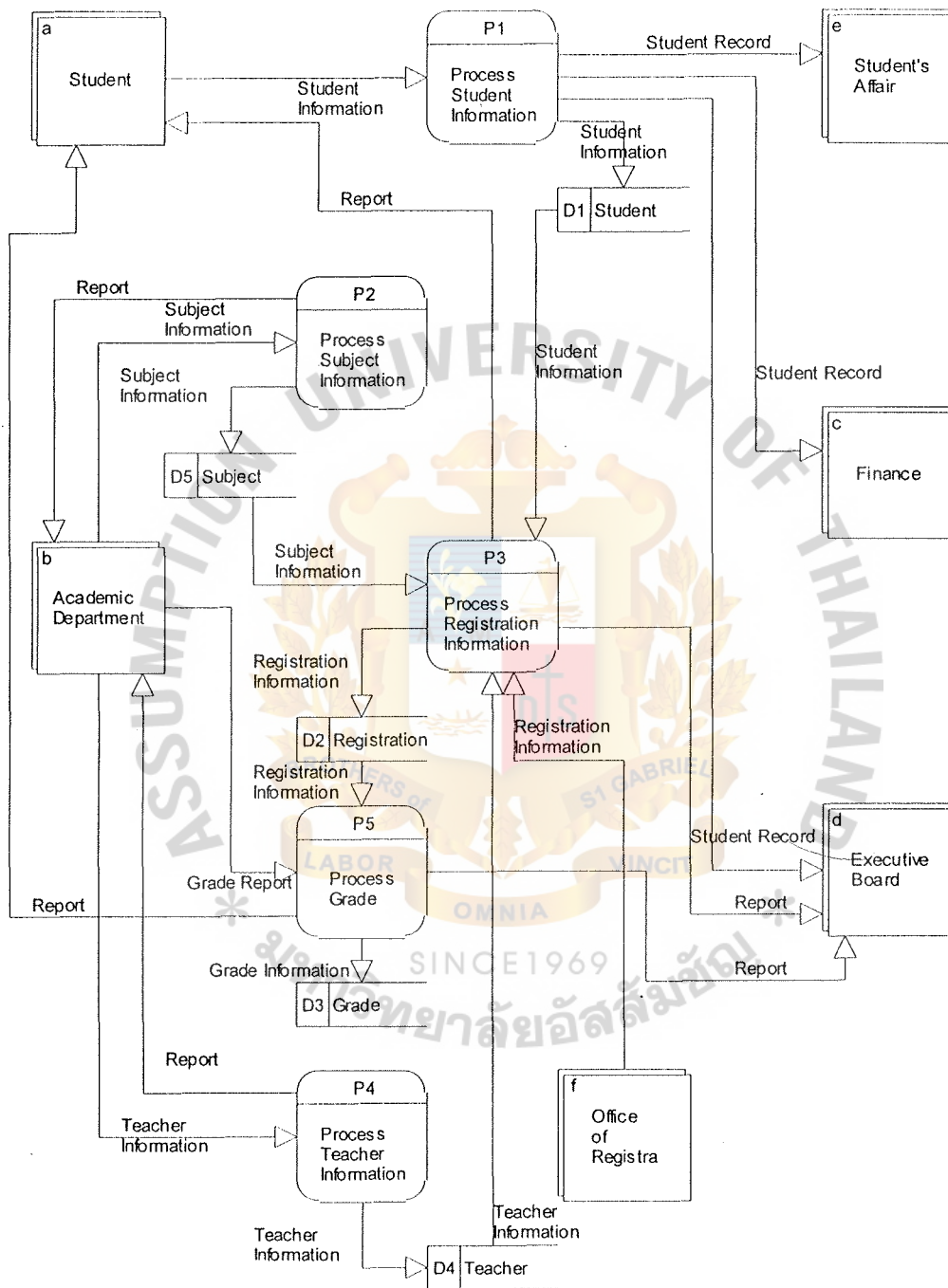


Figure 3.3. Data Flow Diagram (level 0) of the Proposed Student Registration System.

3.2.3 Data Flow Diagram Level 1

There are 5 major processes in the data flow diagram level 0. Each process is divided into several processes in the data flow diagram level 1 depending on their functions.

Process P1 (Process Student Information) has 2 sub-processes (Figure 3.4).

P1.1 Maintain Student Information

This process is to maintain the information by adding, editing, and deleting student information. The process handles only the information in the table, not the report. It also takes care of the school's graduates' information. After maintaining the information, the process will trigger the report generator to produce reports upon the request of the user. The Student Information flow from the Student table and this process retrieves the record in order to correct or update it. After that, the process saves the record back in the table. The flow of Graduate information to the Graduate table means that this process adds the graduate information to the table after the student graduates from the school.

P1.2 Generate Report

The main purpose of this process is to produce student-information-related reports, including graduate-related reports. It is activated by completion of process P1.1 along with the requests of the users. The reports are sent to the appropriate partners.

Process P2 (Process Subject Information) has 2 sub-processes (Figure 3.5).

P2.1 Maintain Subject Information

This process is to maintain the information information by adding, editing, and deleting subject information. The process handles only the information in the table, not the report. After finish maintaining the information,

the process will trigger the report generator to produce reports upon the request of the user. The Subject Information flow from the Subject table and this process retrieves the record in order to correct or update it. After that, the process saves the record back in the table.

P2.2 Generate Report

The main purpose of this process is to produce subject reports. It is activated by the completion of process P2.1 along with the requests of the user. The reports are sent to the appropriate partners.

Process P3 (Process Registration Information) has 2 sub-processes (Figure 3.6).

P3.1 Maintain Registration

This process is to maintain the information by adding, editing, and deleting registration information. The process handles only the information in the table, not the report. After maintaining the information, the process will trigger the report generator to produce reports upon the user's request. The registration Information flow from the Registration table and this process retrieves the record in order to correct or update it. After that, the process saves the record back in the table. Other information, the teacher information, subject information, and student information, enter this process because the registration information needs the fundamental information mentioned above to form the transaction of registration.

P3.2 Generate Report

The main purpose of this process is to produce subject reports. It is activated by the completion of process P3.1 along with the request of the user. The reports are sent to the appropriate partners.

Process P4 (Process Teacher Information) has 2 sub-processes (Figure 3.7).

P4.1 Maintain Teacher Information

This process is to maintain the information by adding, editing, and deleting teacher information. The process handles only the information in the table, not the report. After maintaining the information, the process will trigger the report generator to produce reports upon the user's request. The Teacher Information from the Teacher table indicates that this process retrieves the record in order to correct or update it. After that, the process saves the record back to the table.

P4.2 Generate Report

The main purpose of this process is to produce teacher-information-related reports. It is activated by the completion of process P3.1 along with the request of the user. The reports are sent to the appropriate partners.

Process P5 (Process Grade Information) has 2 sub-processes (Figure 3.8).

P5.1 Maintain Grade Information

This process is to maintain the information by adding, editing, and deleting grade information. This process includes moving registration information to the grade information, for which the register information is needed, and calculating the grade point average of the students. The process handles only the information in the table, not the report. After maintaining the information, the process will trigger the report generator to produce reports upon the user's request. The Grade Information flows from the Grade table and this process retrieve the record in order to correct or update it. After that, the process saves the record back in the table.

P5.2 Generate Report

The main purpose of this process is to produce grade reports including grade point average reports. It is activated by the completion of process P3.1 along with the request of the user. The reports are sent to the appropriate partners.

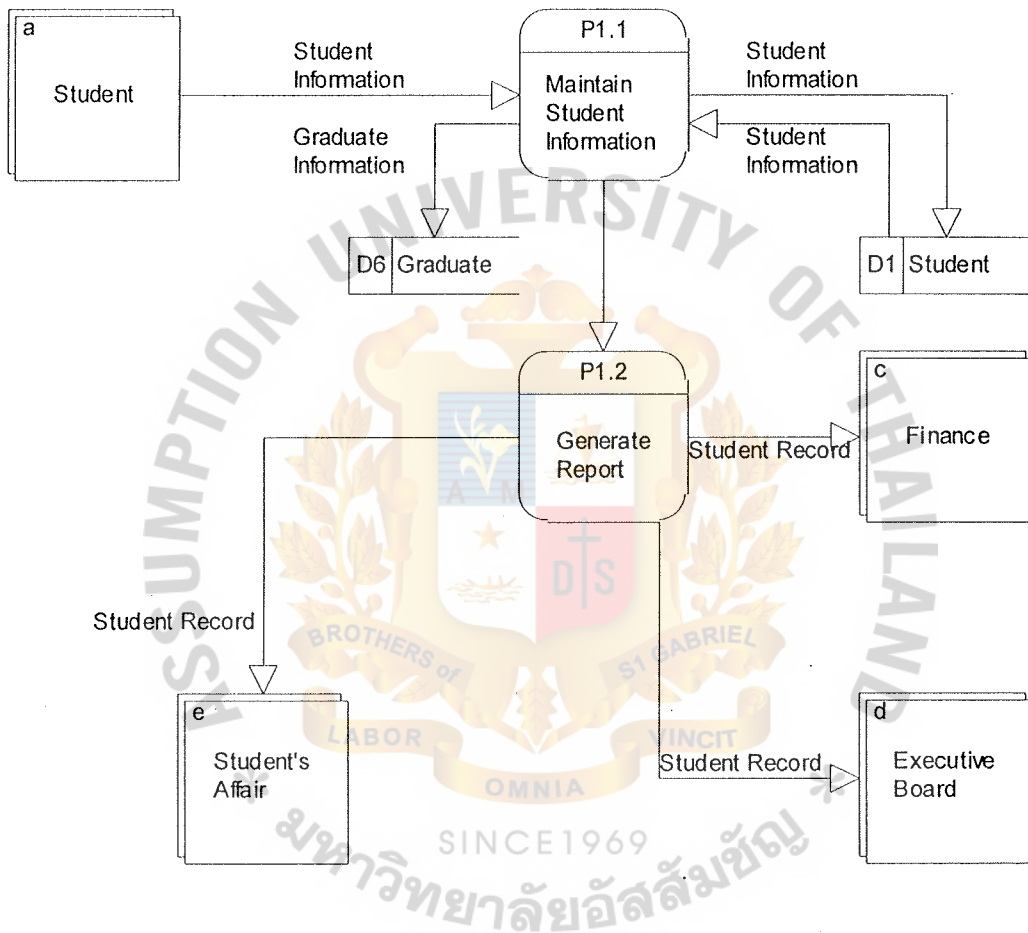


Figure 3.4. The Data Flow Diagram (level 1): Process Student Information.

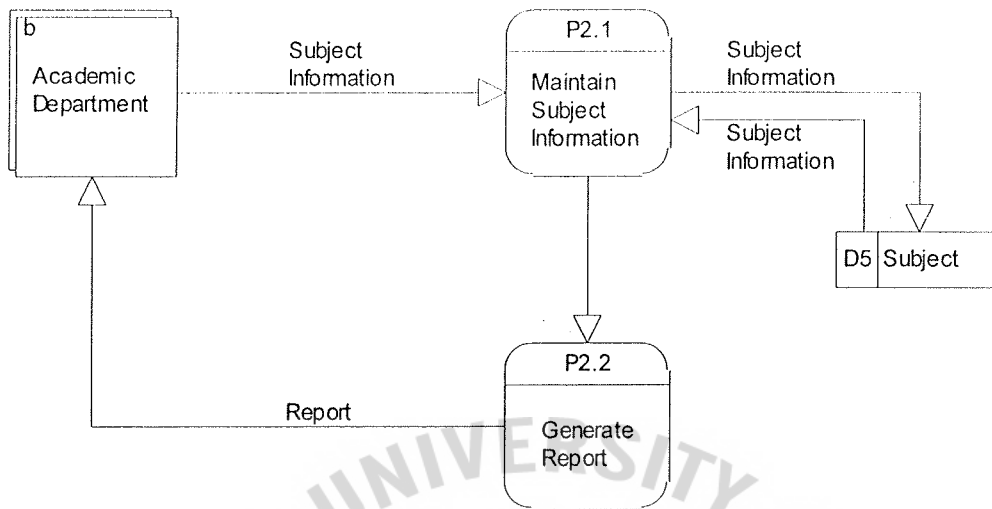


Figure 3.5. The Data Flow Diagram (level 1): Process Subject Information.

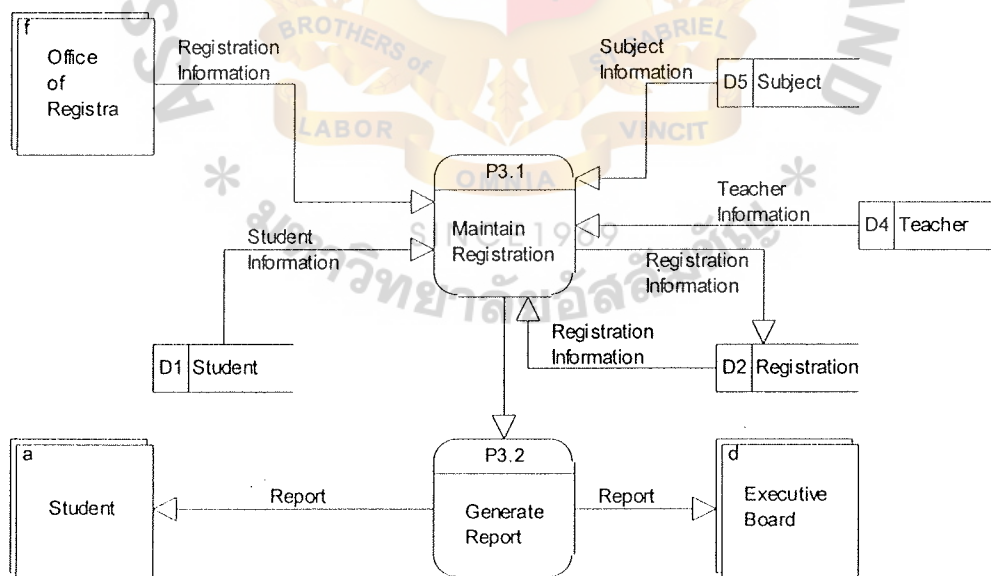


Figure 3.6. The Data Flow Diagram (level 1): Process Registration Information.

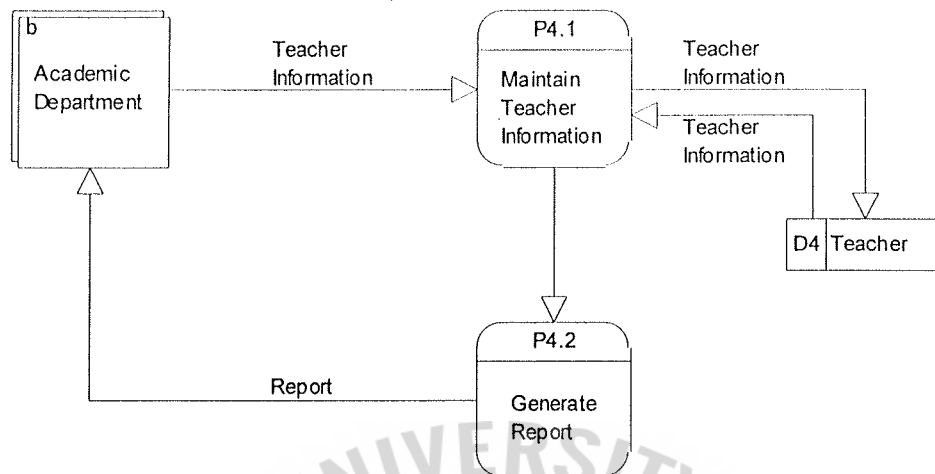


Figure 3.7. The Data Flow Diagram (level 1): Process Teacher Information.

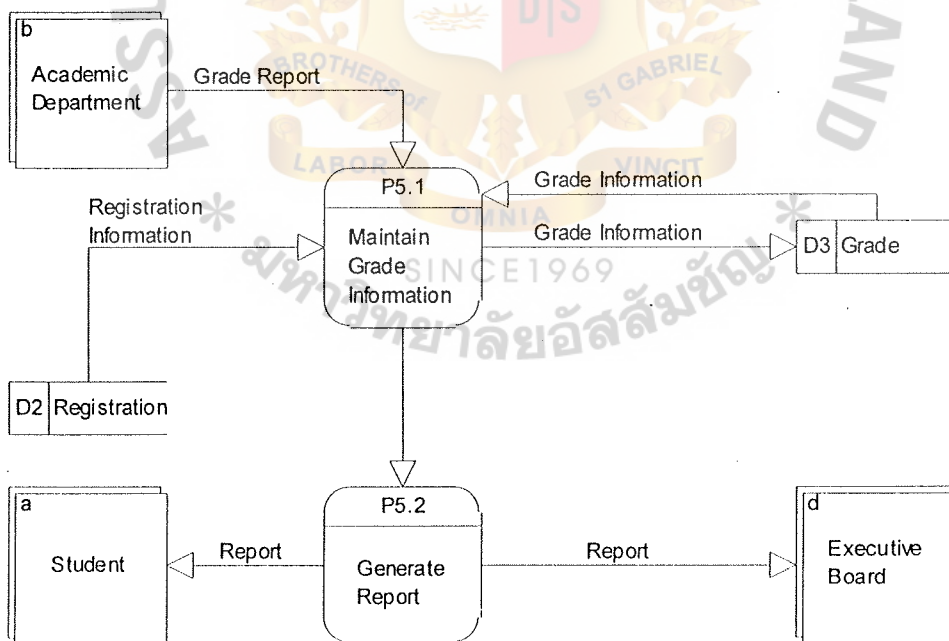


Figure 3.8. The Data Flow Diagram (level 1): Process Grade Information.

3.2.4 Data Flow Diagram Level 2

In the proposed system, there are 5 data flow diagrams for level 2. In level 1, there are 10 processes, but in level 3, 5 processes are already finished. The processes are P1.2, P2.2, P3.2, P4.2, and P5.2. All of the 5 processes are Generate Report. Other processes that have sub-processes are maintaining the information of student, subject, registration, teacher, and grade.

Process P1.1 (Maintain Student Information) has 3 sub-processes (Figure 3.9).

P1.1.1 Add New Student

This process adds new student records to the system. Students supply the information by filling out a form. The user uses the form to enter the information in to the system. The information is stored in the Student table.

P1.1.2 Edit Student Record

This process edits or makes changes in the existing student record. Students request the change of their information by filling out a form. Then, The user retrieves the specific record from the table by identifying the admission number. The user edits the record, and saves it back to the table.

P1.1.3 Delete Student Record

This process deletes or removes student records in case errors occur or students move to another school. For the students that graduate from the school, there is a Graduate table that stores information about the graduation. Students request for the graduation information by filling in the graduation form. The user retrieves the record from the Student table, and adds graduation details to the Graduate table.

To delete the student record from the system, the user receives student requests identifying the record. The user retrieves the record from the table, and applies the delete command to the system. The deleted record will be removed.

Process P2.1 (Maintain Subject Information) has 3 sub-processes (Figure 3.10).

P2.1.1 Add New Subject

This process adds new subject records to the system. The related academic department supplies the information by filling out a form. The user uses the form to enter the information to the system. The information is stored in the Student table.

P2.1.2 Edit Subject

This process edits or makes changes to the existing subject record. The related academic department requests the change of their information by filling out a form. Then the user retrieves the specific record from the table by identifying the subject code. The user edits the record and saves it back to the table.

P2.1.3 Delete Subject

This process deletes or removes subject records if the subjects are no longer taught. To delete the subject record from the system, the user receives requests identifying the record. The user retrieves the record from the table, and applies the delete command to the system. The record will be removed from the table.

Process P3.1 (Maintain Registration) has 3 sub-processes (Figure 3.11).

P3.1.1 Add New Registration

This process adds a new transaction of registration to the system. The office of the registrar enters the registration information into the system. The

user retrieves and matches the fundamental information, such as student and subject information, to the registration transaction. Then the transaction is stored in the Registration table.

P3.1.2 Edit Registration

This process edits or makes changes to the existing registration information. The office of registrar requests the change of the information. Then, The user retrieves the specific record from the table by identifying the admission number, academic year, and semester. Then the fundamental information is retrieved from the tables. The user edits the record, re-matches the fundamental information, and saves the record back to the table.

P3.1.3 Delete Registration

This process is to delete registration transactions. The office of the registrar identifies the deleting transaction by specifying the admission number, academic year, and semester. The fundamental information used in this process is only student information. The unnecessary transaction is retrieved from the system, and the user applies the delete command. Then the record will be removed.

Process P4.1 (Maintain Teacher Information) has 3 sub-processes (Figure 3.12).

P4.1.1 Add New Teacher

This process adds new teacher records to the system. The related academic department supplies the information by filling out a form. The user uses the form to enter the information into the system. The information is stored in the Teacher table.

P4.1.2 Edit Teacher

This process edits or makes changes to the existing teacher record. The related academic department requests the change of the information by filling out a form. Then, The user retrieves the specific record from the table by identifying the teacher code. The user edits the record, and saves the changed record back to the table.

P4.1.3 Delete Subject

This process deletes or removes teacher records, if the teachers no longer teach at the school. The user receives requests identifying the record. The user retrieves the record from the table, and applies the delete command to the system. The record will be removed from the table.

Process P5.1 (Maintain Grade Information) has 2 sub-processes (Figure 3.13).

P5.1.1 Transfer Registration Information

This is to transfer the predefined registration information to the grade information. The reason to transfer the information is because the registration information is viewed as the temporary table of the grade table. The process retrieves the specific registration record from the Registration table, and stores it in the Grade table, so the user can add extra information to the grade information.

P5.1.2 Maintain Student Score

This process maintains the information by adding, editing, and deleting student's grades. The grade information is retrieved from the Grade table in order for the user to maintain the scores of the subjects that the student has registered for. The scores are from the related academic departments through grade reports. After adding, editing, and deleting the record, the Grade table is updated with the changed grade information.

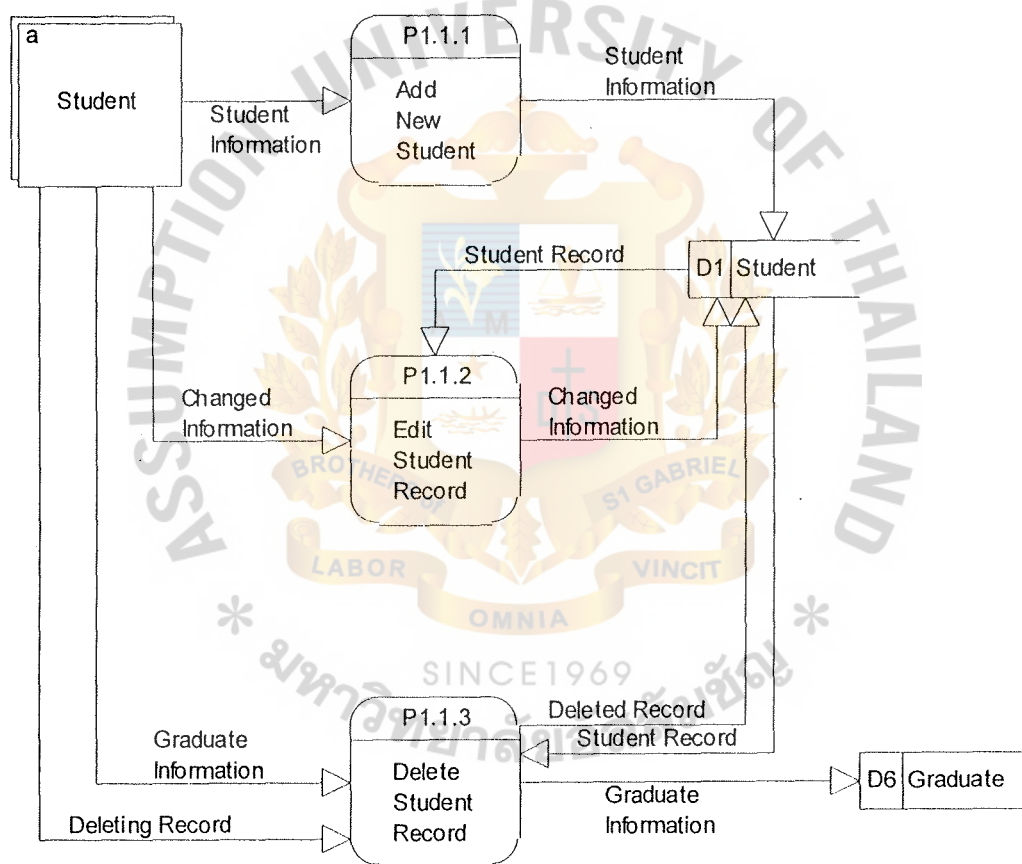


Figure 3.9. The Data Flow Diagram (level 2): Maintain Student Information.

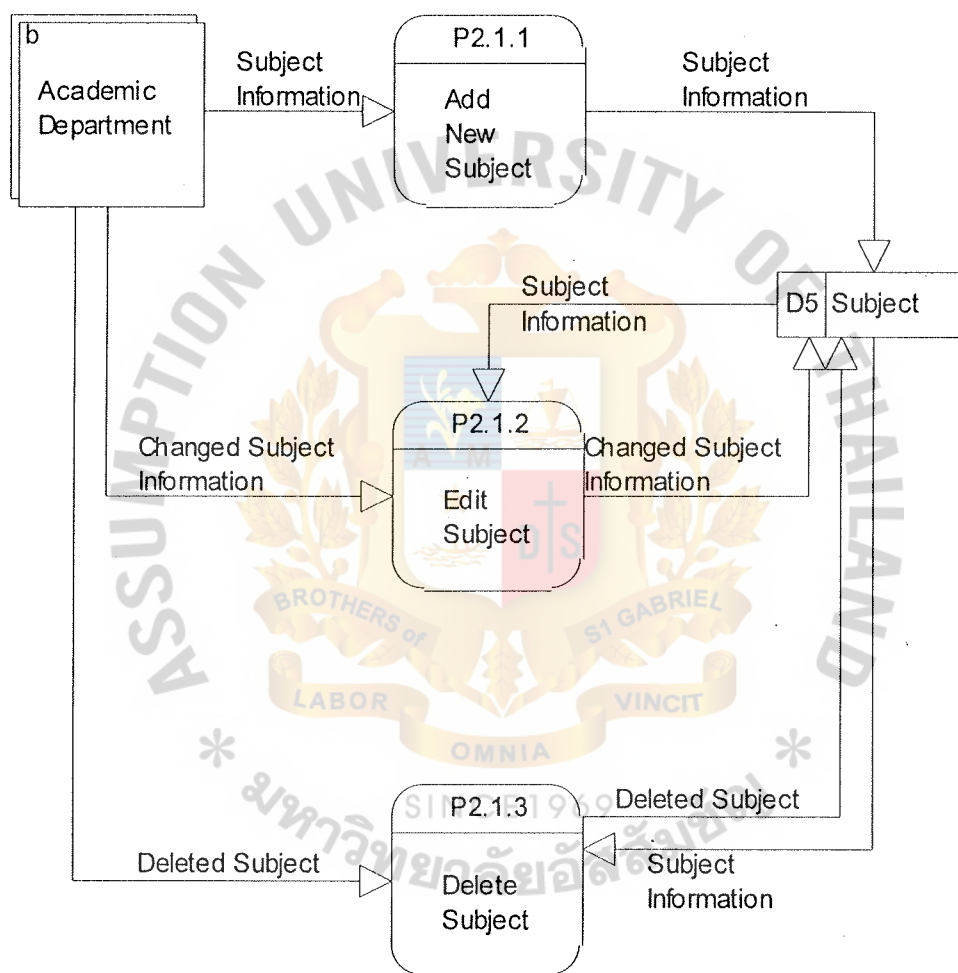


Figure 3.10. The Data Flow Diagram (level 2): Maintain Subject Information.

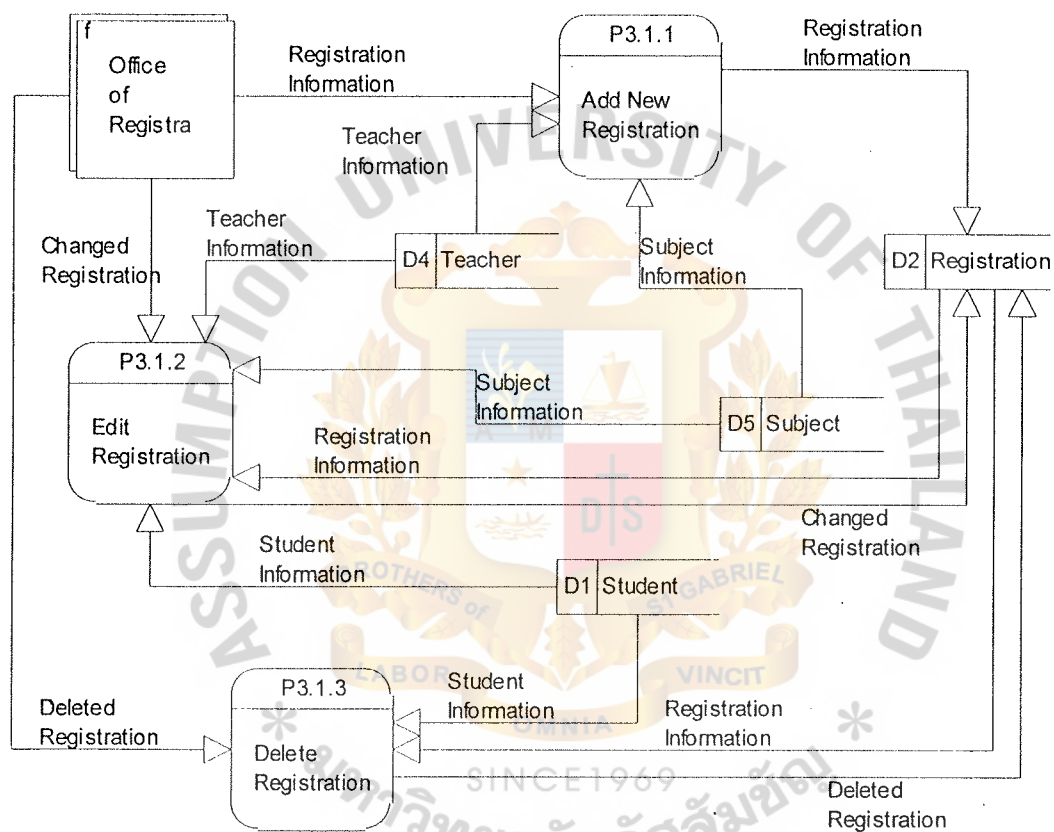


Figure 3.11. The Data Flow Diagram (level 2): Maintain Registration.

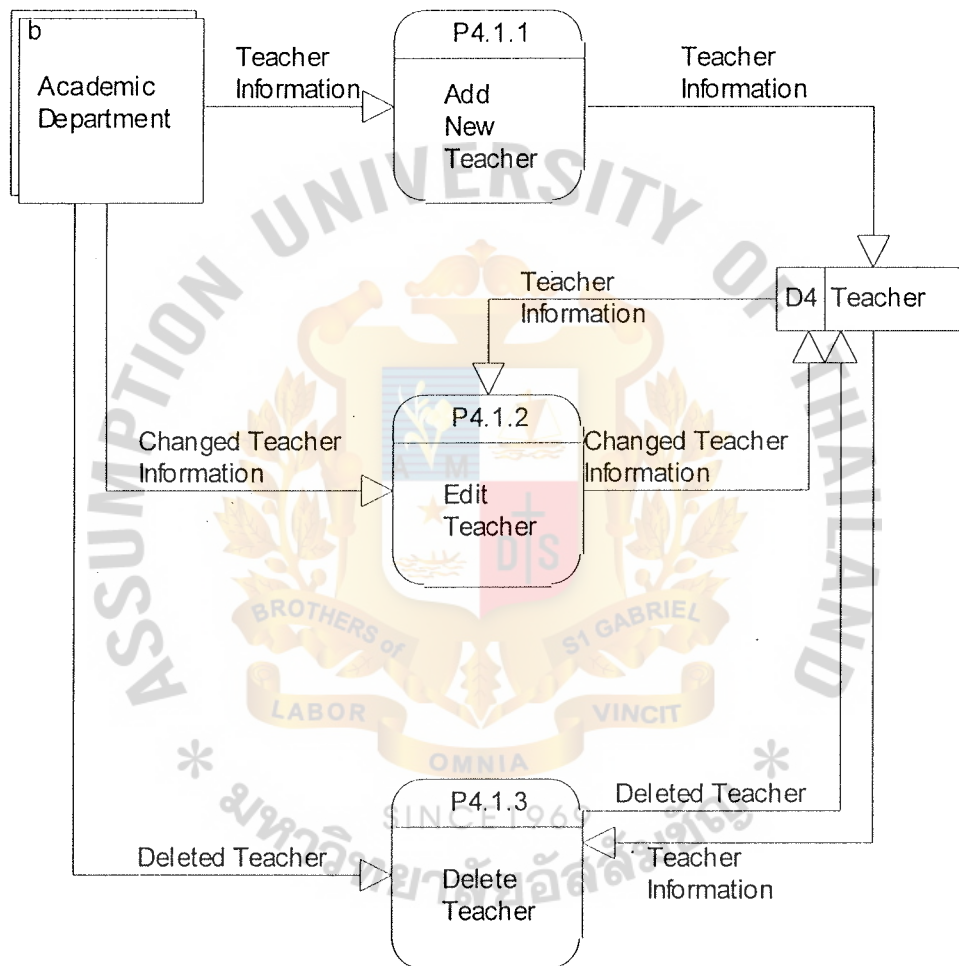


Figure 3.12. The Data Flow Diagram (level 2): Maintain Teacher Information.

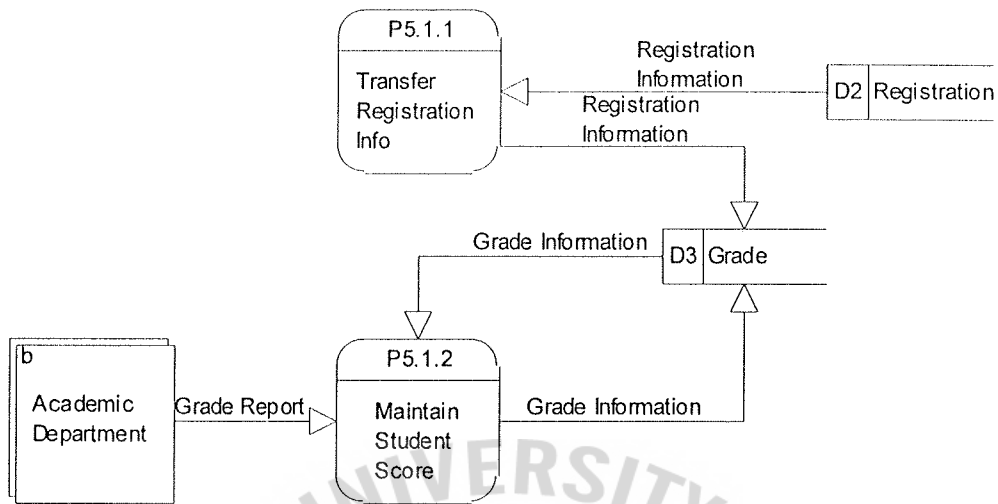


Figure 3.13. The Data Flow Diagram (level 2): Maintain Grade Information.

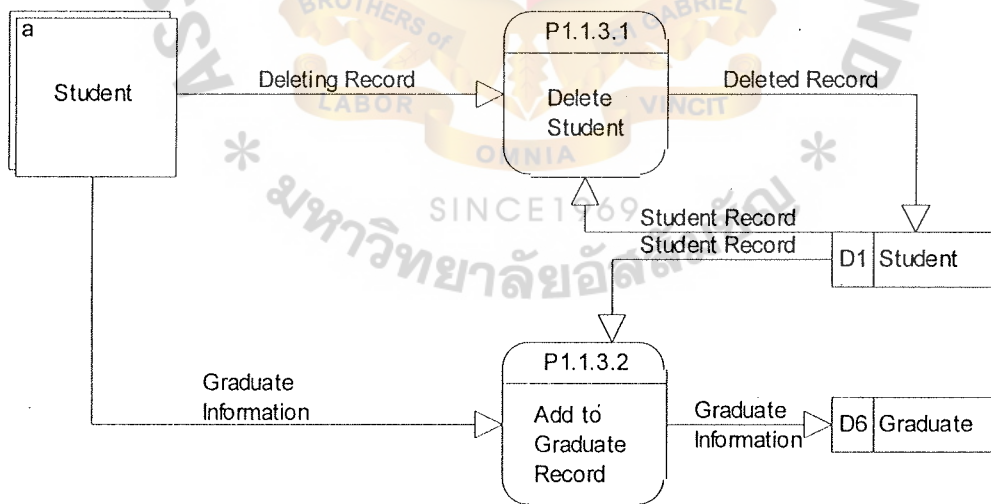


Figure 3.14. The Data Flow Diagram (level 3): Delete Student Record.

3.2.4 Data Flow Diagram Level 3

There are 5 processes in the data flow diagram level 2, but only process P1.1.3 and P5.1.2 have sub-processes in the data flow diagram level 3.

Process P1.1.3 (Delete Student Record) has 2 sub-processes (Figure 3.14).

P1.1.3.1 Delete Student

This process receives a unnecessary student record by the request of the student. Then the record is retrieved from the Student table. The process applies the delete command to the record, and updates the Student table.

P1.1.3.2 Add to Graduate Record

This process receives the graduation request form the student. It retrieves the student record from the Student table, and matches the record to the new graduate record. In addition, it can edit and delete graduate records upon the request of related parts.

Process P5.1.2 (Maintain Student Score) has 3 sub-processes (Figure 3.15)

P5.1.2.1 Enter Grade

This process adds new grade information transactions to the system. The related academic department supplies the information by filling out a form. The user uses the form to enter the information to the system. The information is stored in the Grade table.

P5.1.2.2 Edit Grade

This process is to edit or make changes to the existing grade information. The related academic department requests the change of the information by filling out a form. Then the user retrieves the specific record from the table by identifying the admission number, academic year, semester, and subject code. The user edits the record, and saves the changed record back to the table.

P5.1.2.3 Delete Grade

The process is to delete or remove grade information if it is no longer used. The user receives requests identifying the unnecessary record. The user retrieves the record from the table, and applies the delete command to the system. The record will be removed from the table.

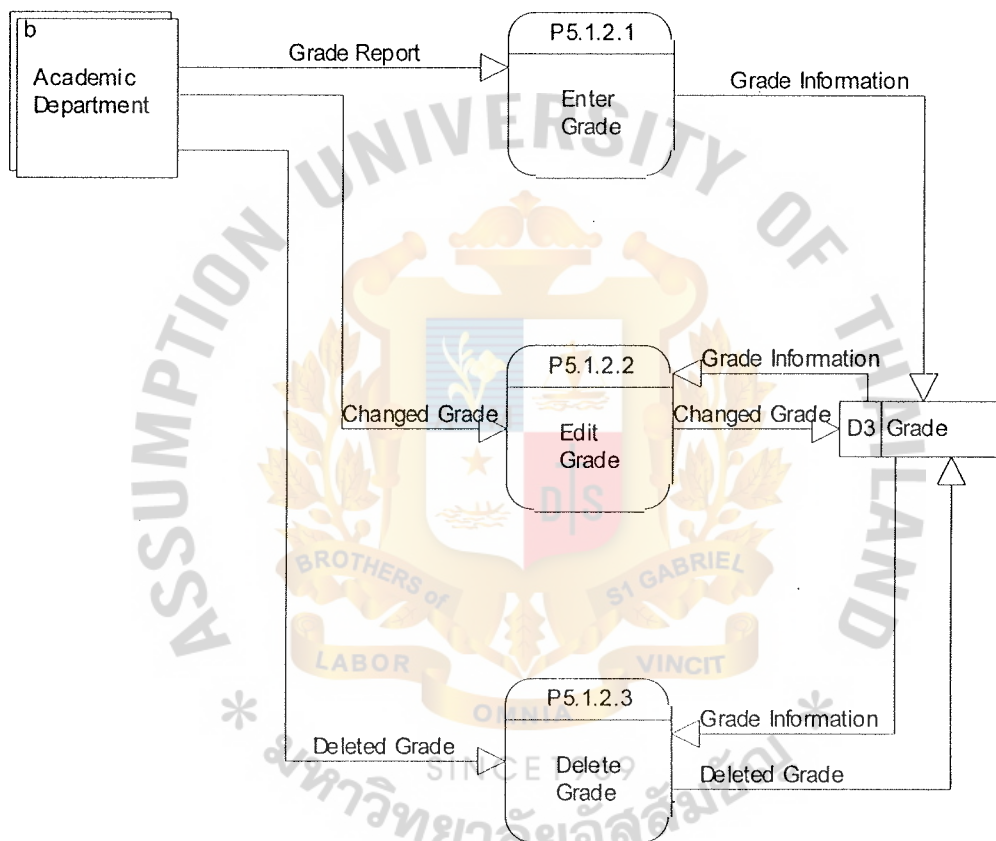


Figure 3.15. The Data Flow Diagram (level 3): Maintain Student Score.

3.2.5 Data Flow Diagram Level 4

There is only 1 diagram in this level from the process P1.1.3.2 in the data flow diagram level 3 (Figure 3.15).

Process P1.1.3.2 (Add to Graduate Record) has 3 sub-processes (Figure 3.16).

P1.1.3.2.1 Add New Graduate

This process adds new graduate information to the system. The student requests the graduation information by filling out a form. The user uses the form to enter the information to the system. The information is stored in the Graduate table.

P1.1.3.2.2 Edit Graduate

This process edits or makes changes to the existing graduate information. The student requests the change of the information by filling out a form. Then the user retrieves the specific record from the table by identifying the admission number. The user edits the record, and saves the changed record back to the table.

P1.1.3.2.3 Delete Graduate

This process deletes or removes graduate information if it is no longer used. The user receives requests identifying the unnecessary record. The user retrieves the record from the table, and applies the delete command to the system. The record will be removed from the table.

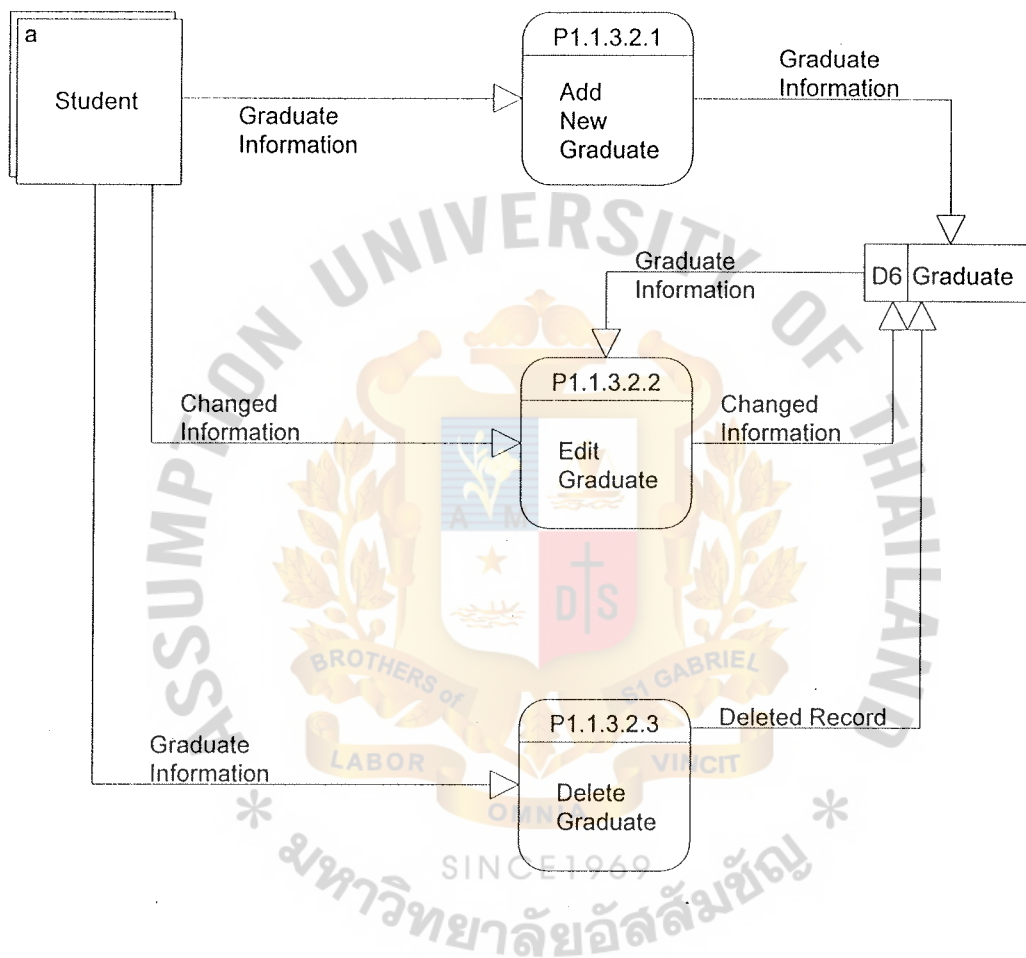


Figure 3.16. The Data Flow Diagram (level 4): Add to Graduate Record.

3.2.6 The Entity-Relationship Diagram of the Proposed System

There are several techniques in database modeling. For this proposed system, an entity relationship diagram (ERD) is used to identify the required data. The diagram gives overview of the database schema of the system. From the entity relationship diagram, rough database relations can be drafted. Finally, the normalization technique is applied to the rough relations, to form normalized database schemas.

To construct data models, the first task is to discover the fundamental entities in the system. This task can be achieved by interviews with the users. Another technique is to study existing forms and reports. Then, all attributes of entities and relationships are listed. These attributes also come from the study of existing documents, such as forms and reports, and summarizing and arranging them into the related entities or relationships.

From Figure 3.17, there are 4 entities, Student, Teacher, Subject, and Graduate. Advisor is a relationship between Student and Teacher. That is, Student is advised by Advisor, and Teacher is an Advisor. Student and Subject have 2 relationships, Relationship and Grade. Student registers for Subject in each semester, and Student gets grades from each Subject. Finally, Graduate has a relationship with Student. That is, Graduate was a Student who already graduated from the school.

The data dictionary can be implemented at this point. The data dictionary is important for system development because it summarizes all attributes in every table of the system. It also describes all attributes' data type and format including the range of the data. The data dictionary is shown in Appendix A.

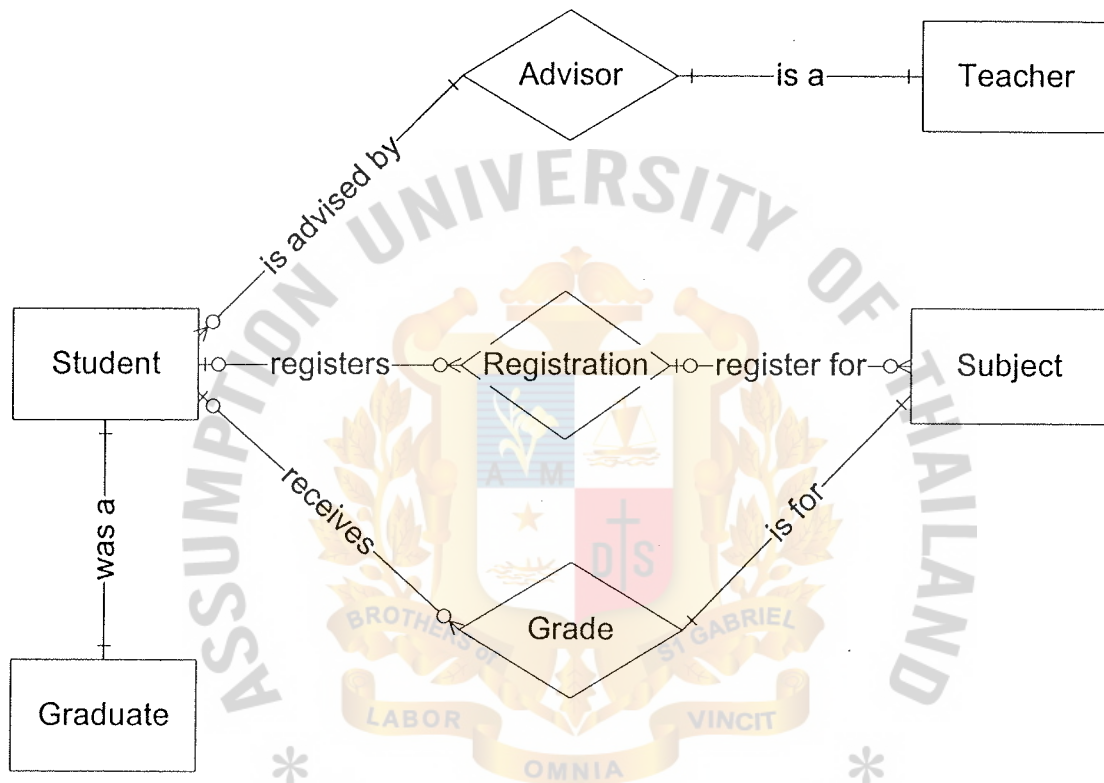


Figure 3.17. The Entity-Relationship Diagram of the Proposed System.

3.2.7 Input Design

The input design of the proposed system comes from the users' requirements. From the user interview sections, the input design must follow the conclusion that the system must be user-friendly because the users are familiar with the old-style paperwork. Moreover, the input system must be very efficient. That is, the users should not have to deal with enormous amount of information that they have to enter. This will make input processes more efficient, and the users will spend less time entering the information. The input should cover all required information following the database design. Some of the existing forms and reports contain excessive information, so it may not be included in the input of the system or in the database.

The proposed system uses Microsoft Access as a development tool. This tool is able to generate a GUI-based system. That is, it eliminates the task of creating the screen like the old-style conventional programming languages. The main input object is called a form. The form enables users to enter the information by filling the text box or other easy-to-use objects, so this eliminates the confusing input screens that are full of texts. The system's input screens including the user manual are shown in the Appendix B

3.2.8 Output Design

The output of the proposed system mainly deals with reports. As mentioned earlier, the reports requirement came from the user requirement. First, the system must be able to produce the existing reports that are presently done by dedicated officers. They have to type all the reports from the request of any department in the school. The users also have a new kind of report that they have just discovered, so the system has to be able to produce those reports.

The output design is to design the reports. The reports should not confuse readers. They should contain enough information, and be in the easy-to-read format. The format influences the reader's concentration. In the well-formatted reports, with a suitable header, easy-to-understand description, and appropriate emphasizing, such as underlines and indents, the reader will be attracted. Otherwise, the reader may not want to read or even look at the reports.

Another important thing about output design is the accuracy of the information included in the reports. The information, both retrieved from the table and calculated from the existing data must be accurate. Some of the reports are not only distributed internally, but are also distributed to other official organization, such as the ministry of education, universities, and other schools, so errors may damage the school's reputation.

In conclusion, the output design has to concentrate mainly on information accuracy and user-friendliness. The level of the details is also important. Some reports, such as student information, may need to be very detailed, but not all of the reports have to be detailed. This depends on the type of report, and the reader. The executives always want an overview of the information and a conclusion, without all the details, but the low-level operators need reports that contain enough information. The system's reports are shown in Appendix C.

3.3 Hardware and Software Requirement

The proposed system needs a LAN (Local Area Network) to enable system sharing, so the users can work concurrently at different computers. The program has to be stored in a powerful computer because the system has to be shared with other computers. The sharing may affect the overall performance of the system. For example, the users may use more time to retrieve data. Other computers that access the system can be less powerful than the application server. In the proposed system, the computers

are divided into 2 classes, a server and workstations. Both use Microsoft Windows 98 as the operating system. The system configuration is shown in figure 3.18, and the hardware and software requirement are as follows:

Hardware requirement and specifications

PC Server

Intel PentiumII 400 MHz

128 MB Memory

8.4 GB Hard Disk Drive

50x CD-ROM internal

10/100 Mbps LAN card

15" Monitor

Keyboard 104 keys, 2 I/O ports, 1 parallel port, 1 mouse

PC Workstation

Intel Celeron 333 MHz

32 MB Memory

4.3 GB Hard Disk Drive

50x CD-ROM internal

10/100 Mbps LAN card

15" Monitor

Keyboard 104 keys, 2 I/O ports, 1 parallel port, 1 mouse

Network Peripheral

An 8-port hub

Cabling system

Printer

HP LaserJet 6L

Software requirement

3 licenses of Microsoft Windows 98 Thai Edition

3 licenses of Microsoft Office 97 Professional Thai Edition

The student registration system

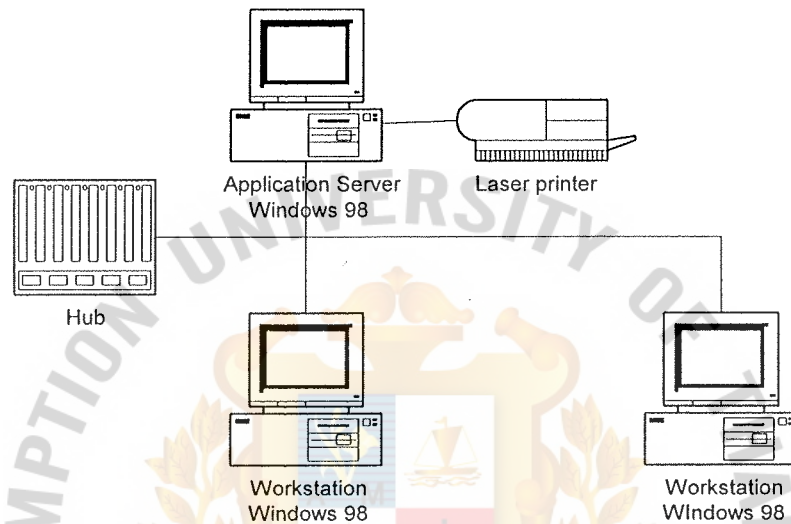


Figure 3.18. The System Configuration of the Proposed System.

3.4 Security and Controls

The registration system is very important, and can be viewed as the most important function of the school. It keeps a lot of important information, such as student information and grade information. The information will be given to the appropriate people only. Unauthorized access to the system must be prevented. The unauthorized people may want to change information or disclose important information to gain some benefit from the information. For example, a student may want to change their grade for a better performance.

There are 2 parts of providing security to the proposed system, physical security and logical security. Both are important. If the two types of securities do not support each other, the invader will have a chance to get access to the system.

3.4.1 Physical security

Physical security is the term used to describe protection provided outside the computer system. The physical security includes preventing the system from disasters, such as floods and fire. The disaster prevention deals with the design of the operation room, where the users work with the system. The room should not be on the ground floor because the ground floor of the school always has a problem with floods. To prevent fire, every room in the school has automatic fire checking system that will expel water if the temperature exceeds the limit. In the computer room, that is not a good idea because the water can destroy the computer system. Instead of water, there are some chemical substances used especially to extinguish a fire, and the fire extinguisher should be filled with those chemicals.

The operational room should be locked and guarded because invaders may try to break into the room, and steal the information or destroy the system by damaging the computers. Also, the users themselves could damage the system unintentionally. They may collide with the computer because of bad arrangement of the computer. To prevent this, the computers must be put on appropriate tables with sufficient space. The wiring of the system must be tied together to prevent the users from tripping over the computers' cables. Moreover, drinks and food should not be allowed into the room because they may damage the computers.

3.4.2 Logical security

The logical security policy of the proposed system is separated into 2 levels, identification and authentication.

Once the users want to access the system, they have to supply their login names. This is the identification method of the proposed system to tell the system who they claim to be. After they enter the login names, the next step is to authenticate that they are really who they are. This process prevents intrusion of unauthorized people that may know the login names, by letting the users enter their passwords. The password is secret. The users must not tell their password to others. The system uses 2 processes, identification and authentication, together for the logical security. The users must pass these 2 processes, which means they have to supply correct login names and passwords, before they can gain access to the system.

There is some advice about passwords. The password should not contain only characters. It should be comprised of characters, numbers, and special characters, such as ! and #. In addition, it should not be any words in the dictionary. It should contain both capital letters and small characters. Moreover, it must be something far from the users, not their names, kids' names, or pets' names because the invaders may be familiar with those names, so they can guess easily. Finally, the good password will be useless if the users write down or note their good password on paper and place the paper in an easy-to-find place, such as on the table. If the invader can break through the physical security, and see these notes, they will easily enter the system instead of using more time to guess the password.

3.5 Cost-Benefit Analysis

3.5.1 Cost Analysis

Development cost

Application server with Windows 98 and Office 97	50,000 Baht
PC workstations with Windows 98 and Office 97	60,000 Baht
Network peripheral	10,000 Baht
Printer	20,000 Baht
Student Registration System	<u>20,000 Baht</u>
Total development cost	<u>160,000 Baht</u>

Annual operating cost

Users' annaul salary (3 users 6,000 baht each/month)	216,000 Baht
Maintenance cost	<u>10,000 Baht</u>
Total operating cost	<u>226,000 Baht</u>

3.5.2 Benefit Analysis

The benefits of the proposed Student Registration System are both tangible and intangible. Tangible benefits are those benefits that can be quantified. Such benefits are, for example, cost saving, increased throughput, and decreased response time. Intangible benefits are those benefits that are difficult or impossible to quantify. Such benefits are, for example, better services for students, and elimination of job steps.

Tangible benefits

The benefits are shown in terms of reducing cost by year. With manual operation, the office of the registrar needs at least 6 officers to handle requests from students each year. In the opening days of school in both semesters, the office has to hire 6 more part-time workers for the registration process. For better throughput, the office can produce beneficial reports, such as reference letters and transcripts.

Approximately 10 reports more than the manual system can be produced per day, so in one year the system can produce 2,400 reports more. Moreover, the proposed system will decrease human errors, such as mistyping reports. The decreased human errors will save costs, such as papers used in the system. The tangible benefits of the proposed system are as follows:

Excessive officers' annual salary (3 officers 6,000 baht each/month)	216,000 Baht
Part-time workers' wages (3,500 baht each/month and 3 months in a year)	126,000 Baht
Reduction of human errors (estimated)	10,000 Baht
Better throughput (2,400 reports a year, 20 baht each)	<u>48,000 Baht</u>
Total annual benefits	<u>400,000 Baht</u>

Intangible benefits

- Students can achieve better service from the office of the registrar. They can wait for half an hour for their requested documents at the office instead of turning in the request forms and waiting for 2 or 3 weeks. They can also browse their information through the office's computer if allowed.
- The staff will work more effectively and efficiently. The redundant processes, such as retyping the same type of documents, are removed, so the officers save so much time that they can concentrate more on their works. Moreover, the works can be done faster because of computers.
- The system increases the school's reputation for using high technology. Nowadays, school's registration system is not widely used, so the use of both hardware and software technology can catch people's attention.

- The school's personnel have to learn how to use the technology, so it enhances vision of using the technology.
- The system helps the school to manage resources more efficiently. Papers are used inappropriately. For example, when the executives need some information, the officer or the secretary has to prepare the document by typing or printing. With the system, the computers can replace the paper documents in some cases.
- The executives can access the information easily. In the existing system, if the executives need some information, they have to ask for the information step by step, and that takes a lot of time, probably 2 or 3 days. With the proposed system, the executives can easily retrieve the information through the computer.

3.5.3 Payback Analysis

The payback analysis technique is a method for determining if and when an investment in the project will pay for itself. The important factor is the payback period, the time when the benefits overtake the continuing costs. In this project, the discount rate is assumed to be 8%. Table 3.1 illustrates the proposed system's payback analysis, and Figure 3.19 shows the proposed system's payback period.

Table 3.1. The Proposed System's Payback Analysis (Unit = Baht).

Cash Flow Description	Year :					
	0	1	2	3	4	5
Development costs	-160,000					
Operating costs		-226,000	-226,000	-226,000	-226,000	-226,000
Discount factor	1	0.926	0.857	0.794	0.735	0.681
Time-adjusted costs		-209276	-193682	-179444	-166110	-153906
Cumulative time-adjusted costs	-160,000	-369,276	-562,958	-742,402	-908,512	-1,062,418
Benefits derived from operation	0	400,000	400,000	400,000	400,000	400,000
Discount factor	1	0.926	0.857	0.794	0.735	0.681
Time-adjusted benefits	0	370400	342800	317600	294000	272400
Cumulative time-adjusted benefits	0	370400	713200	1030800	1324800	1597200
Cumulative lifetime time-adjusted cost+benefit	-160,000	1,124	150,242	288,398	416,288	534,782

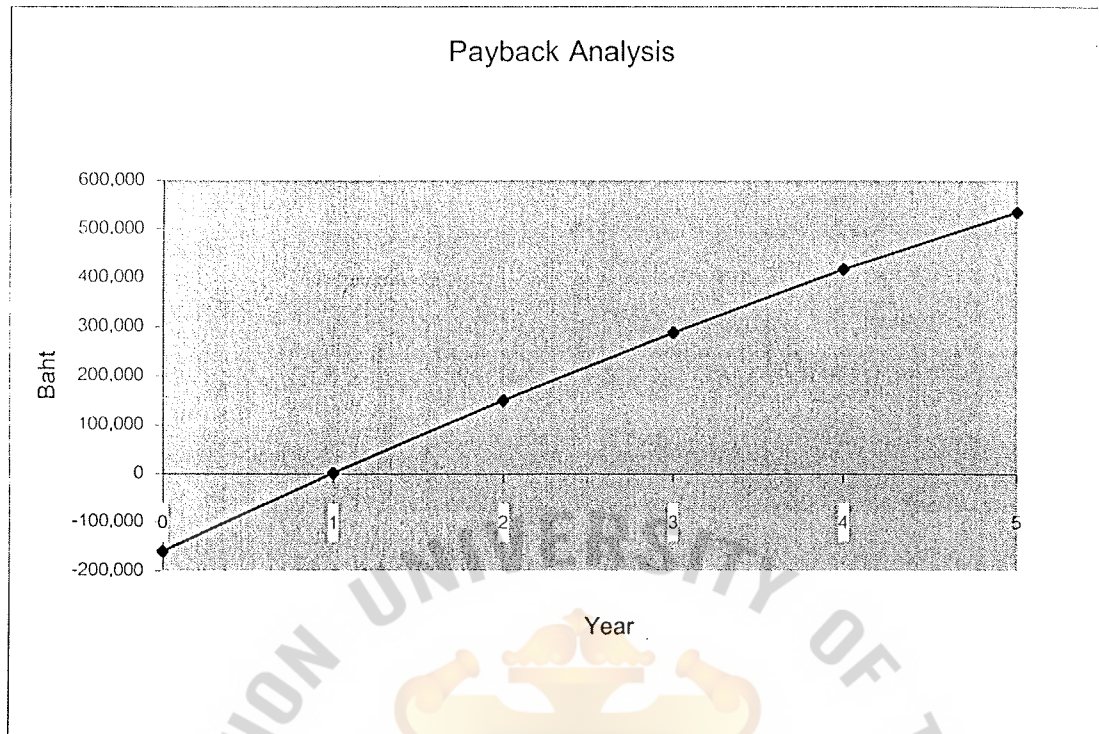


Figure 3.19. The Proposed System's Payback Period.

3.5.4 Return-on-Investment Analysis

The return-on-investment analysis is a technique to compare the lifetime profitability of alternative solutions or projects. The ROI can be calculated from the formula below.

$$\text{ROI} = (\text{Estimated lifetime benefits} - \text{Estimated lifetime costs}) / \text{Estimated lifetime costs}$$

The ROI of the proposed system can be calculated from Table 3.1.

$$\text{ROI} = (1,597,200 - 1,062,418) / 1,062,418$$

$$= 0.50$$

$$= 50\%$$

3.5.5 Net Present Value Analysis

The net present value of an investment can determine whether the project or the proposed system is worth developing or not. If the net present value of the system is positive, it means the investment is good. Otherwise, the system should not be implemented. The net present value can be calculated by subtracting the sum of the discounted costs from the sum of the discounted benefits.

The net present value of the proposed system can also be calculated from Table 3.1.

$$\begin{aligned} \text{NPV} &= 1,597,200 - 1,062,418 \\ &= 534,782 \text{ Baht} \end{aligned}$$

3.5.6 Break-Even Analysis

The break-even point is the point that the total costs of the proposed system and of the current system intersect. It represents where the system becomes profitable for the business.

Costs of the manual system are as follows:

Officers' annual salary (6 officers 6,000 baht each/month)	432,000 Baht
--	--------------

Part-time workers' wages (3,500 baht each/month and 3 months in a year)	126,000 Baht
---	--------------

Total annual cost of the manual system	558,000 Baht
--	--------------

Table 3.2 compares the cumulative cost of the proposed system with the cumulative cost of the manual system. In the Table 3.2, the year 0 operating cost comes from the operating cost of the existing system. Figure 3.20 illustrates the break-even analysis of the proposed system.

Table 3.2. The Break-Even Analysis (Unit = Baht).

Cash Flow Description	Year :					
	0	1	2	3	4	5
Proposed system						
Development costs	160,000					
Operating costs	558,000	226,000	226,000	226,000	226,000	226,000
Discount factor	1	0.926	0.857	0.794	0.735	0.681
Time-adjusted costs	718,000	209,276	193,682	179,444	166,110	153,906
Cumulative time-adjusted costs	718,000	927,276	1,120,958	1,300,402	1,466,512	1,620,418
Manual system						
Operating costs	558,000	558,000	558,000	558,000	558,000	558,000
Discount factor	1	0.926	0.857	0.794	0.735	0.681
Time-adjusted costs	558,000	516,708	478,206	443,052	410,130	379,998
Cumulative time-adjusted costs	55,8000	1,074,708	1,552,914	1,995,966	2,406,096	2,786,094

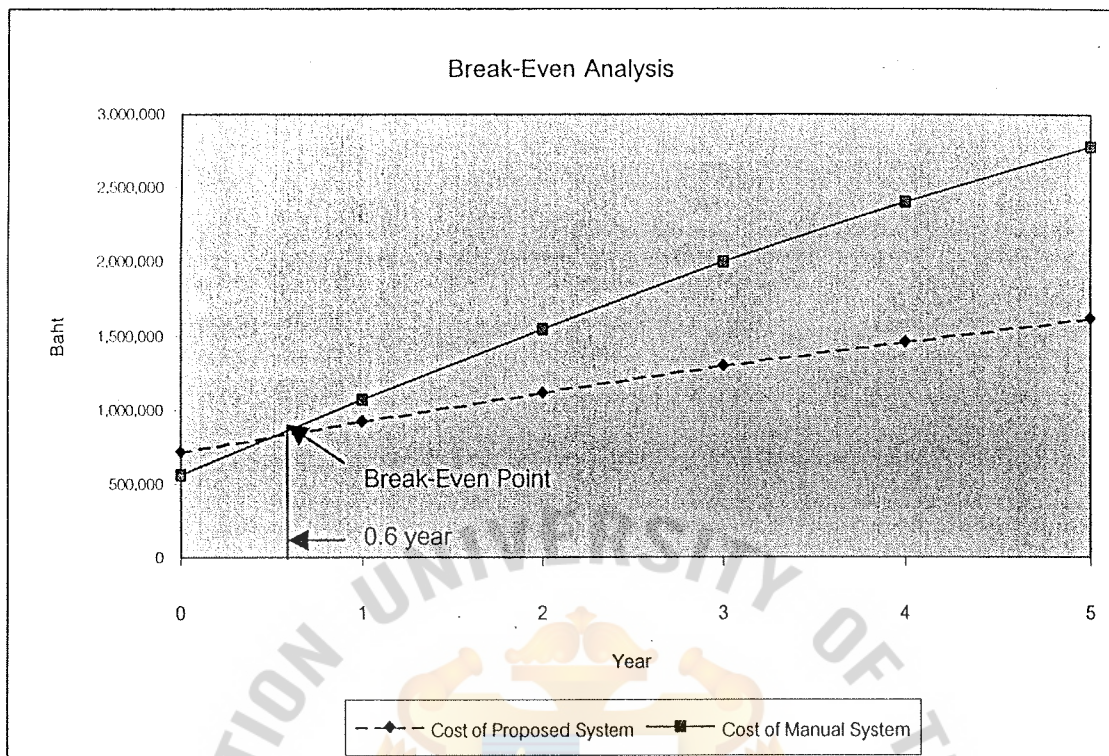


Figure 3.20. The Proposed System's Break-Even Analysis.

After doing several cost-benefit analysis techniques, it can be concluded that the proposed system is worth developing. From the payback analysis, the payback period of the system is approximately less than 1 year. That is, the benefits of the system will overtake the costs after the system has been developed for 1 year. This is very short payback period. Moreover, the return-on-investment of the system is 50%. This means that after 5 years of system operation or project lifetime, the return of the system investment is also high, or 50% of the costs. Finally, the net present value of the system is positive. In conclusion, the proposed system is a good investment for the school.

IV. PROJECT IMPLEMENTATION

System implementation is the construction of the new system and the delivery of the system into production, meaning day-to-day operation.

4.1 Overview of Project Implementation

The overview of the proposed system implementation is illustrated by the Gantt chart, in Figure 4.1. The chart shows the beginning and the end of the proposed system development period.



ID	Task Name	April				May				June				July			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	System Analysis																
1.1	Identify the area under study																
1.2	Establish the project plan																
1.3	Study and analyze the existing system																
1.4	Develop the system's context diagram																
2	Detailed Analysis and Design																
2.1	Develop the data flow diagrams																
2.2	Identify the data dictionary																
2.3	Database design																
2.4	Screen design																
2.5	Report design																
2.6	Program design																
3	Coding and Testing																
3.1	Programming																
3.2	Testing																
4	Implementation																
4.1	Documentation																
4.2	Installation																
4.3	Training																

Figure 4.1. Gantt Chart Showing the Proposed System Implementation.

The proposed system development is divided into 4 phases, system analysis, detailed analysis and design, coding and testing, and implementation. In general, the first phase, system analysis, includes a survey phase, a study phase, and an early definition phase in FAST methodology. The system developer must identify the area of study, and find information to support the idea. After the developer has enough supporting information, system scheduling is done. The project plan is the documentation of this task. Then, the existing system must be studied thoroughly in order to define the existing problems. The system must be analyzed. For example, what units or whom the system has to contact, what information the system needs, and what the basic requirements are. After understanding the overview of the system, the context diagram is developed.

In the detailed analysis and design, the developer has to work very close to the users in order to get thorough user requirement. The daily tasks have to be captured and summarized into the system process. The user interviews are arranged in order to get ideas and understand their work and procedures. The work flows are also studied. After receiving enough information and understanding, the data flow diagrams are developed in every level. This is to identify the system's processes. Then, the data dictionary is created in order to identify the system's data. Both documents are used in the system design phase. The system design includes database design, input and output design, interface design, and program design.

The first two phases, system analysis and detailed analysis and design, require 10 weeks to be accomplished. At approximately the ninth week, the hardware and software will be prepared. The reason is for the programmer to test the system in the real environment.

After the system design is finished, the developer can begin writing programs following the design. At this point, programming and testing can be done concurrently. After finishing some programs, the programmer can test the accuracy and performance of the programs. In this proposed system, system coding and testing require a month to complete.

The implementation phase, especially documentation, will begin after programs are coding and testing at one point. The programmer documents problems and solutions of the programs while coding and testing. After the programs pass the test, the programmer can write detailed documents, not only problems and solutions, but also user manuals. Documentation takes a full month to finish. It finishes at the same time as user training. The system installation requires one week. This includes setting up the computer system and the network system. Software, such as the operating system and application programs, is also included in the system installation task.

Finally, user training is the last task to be done. After the installation, the users have the real environment for working. The training has two parts. First, the users should understand basic computer concepts including basic computer operation because they have little knowledge about computers. The other training course is the system operation. That is, the users are taught how to operate or use the system. This should be done at the real working place, so they can actually do their work, and real problems will occur. After they see the problems, the programmer or trainer can help them solve the problems. They will see how to solve the problem, and they will be able to do it by themselves.

The user's manual and documents will be given to the users after the training is finished. The manual must be very highly detailed. The operation of the system must be explained step-by-step. The procedures should be numbered, and aligned in an easy-to-

read format. For the confusing operation, pictures and illustrations should be added because they may be easier to explain the complex operation. Language used in the manual should be easy to understand.

During early conversion from the manual system to the computer system, the users may need help from the system developer. The developer should accompany them until they can do their work by themselves. This is also important because if they do not understand how to operate the system, and nobody helps or gives them any advice, they will become bored, and not use the system anymore. With close supervision from the system developer, the relationship with the users is improved, and they will be more interested in the system because they will see the advantages of using the system.

4.2 Test Plan and Results

Testing is a process to certify that programs and the system are free of error. Error is captured through testing. This makes system testing very necessary for system development. It is included in the implementation phase because, at this phase, the actual functions or programs are written by following system design. However, logic is not always correct. In the proposed system, there are 3 levels of tests, function testing, program testing and system testing.

Function testing is the test performed on individual functions. After writing functions are finished, tests are conducted. The programmer creates sample data, and sees the results of each function. The functions being tested are those such as adding new information, editing and deleting information. After the test data is fed to the function, every function works properly. The adding operation correctly adds each record to the table. The editing operation makes changes to the existing record.

Program or unit testing is a test of all integrated functions in order to make sure that they work properly together. Sometimes each function works perfectly, and easily

passes stub tests, but produces a lot of errors when several functions are integrated to form a program. The errors may be from the inappropriate parameter passing. Therefore, the program has to be tested again after each function or module has passed the stub tests. Program tests are conducted in the proposed system when finishing the integration of modules to form a program. Each program is tested individually with the related sample data. The users, especially those who are responsible for the tested part, are involved in helping the developer test programs. For example, they supply test data, and see whether a program works properly. If there are any errors, they inform the programmer, and may help the developer in finding solutions. In the proposed system, the related users are satisfied with the results of every program test. They supply a different pattern of data, and the programs still work correctly.

System testing is a test that ensures that all programs integrated into the system still work properly. A system is from the integration of several related programs. After individual program tests are concluded, the system may still contain errors. A program may work correctly alone, but produce errors when integrated into the system. The system must be thoroughly tested to see if any programs produce wrong input or output to others. This type of testing involves all system users. They use their sample data to test the system. The sample data ranges from the fundamental data, such as student information, to all transactions raw data, such as registration information. The users can view the test results from all procedures. If errors occur, they inform the developer, and may also help with finding out reasons and solutions.

The results of the system testing should also satisfy the users because all errors and confusing procedures have been corrected and improved. The users should accept all the results from the system; reports' format, data accuracy in the database, and all procedures of the proposed system.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The proposed system is the student registration system for Bangkok Christian College. The project is to analyze, design, and develop the pioneer system for the school. The reason to develop the system is that BCC has a lot of students and personnel. The manual system should be replaced to increase productivity. The school has planned for conversion from the manual system to the computer system. The registration system is chosen to be the first system to be converted because such a system is the most important system for school management. It directly deals with the students, the most important entity in the school. After the proposed system works well, other systems, such as the financial system and the personnel system, will be developed.

The system development follows FAST system development methodology. The survey phase is done first, followed by a study phase, a definition phase, a configuration phase, a procurement phase, a design phase, a construction phase, and an implementation phase. The system runs under the Microsoft Windows 98 system. The development tools and database used are Microsoft Access 97.

The system analysis and design method for the proposed system is developing models. To understand the system's processes, the data flow diagrams (DFD) are developed from the context diagram to the diagrams at level 4. The data modeling technique used is the entity-relationship diagram (ERD). The software used for modeling the system is the CASE (Computer-Aided Systems Engineering) tool. The CASE tool used in the proposed system is the EasyCase.

The cost-benefit analysis is also done for the proposed system. There are 3 techniques applied to the system, and all of them show that the proposed system is

worth doing, and is a good investment. Those techniques are payback analysis, return-on-investment, and net present value.

The proposed system is divided into 5 subsystems, student information, subject information, registration information, teacher information, and grade information. Each subsystem is connected to others, producing either input or output. The information is kept in 7 tables, Student, Advisor, Teacher, Graduate, Registration, and Grade. The data dictionary is illustrated in Appendix A.

The subsystem is composed of forms and reports. Forms are used for inputting data to the system, searching for an individual record, editing or changing existing record, and displaying the existing information. That is, forms are main interfaces. Reports are used as the output of the system. There are several types of reports both for external agents, such as students, or universities, and internal agents, such as the executive board, or academic departments. The system contains 22 forms and 17 reports both in Thai and English. The input screens and user manual are illustrated in Appendix B. The reports are shown in Appendix C.

The system can be shared among the users through Local Area Network in the office of the registrar. The reports are also printed onto the shared laser printer connected to the application server.

The main security control for this proposed system is username and password. The users have to enter a valid username and correct password before gaining accesses to the system. The system has to be stored in a locked and guarded operating room to avoid invaders breaking into the room, because the information in the system is very important and secret.

After the system is used, the registration process and grade announcement are done faster than in the past. The office of the registrar can reduce its officers from 6 to 3

officers, and the part time workers are not required anymore. Unnecessary documents are replaced by the system screens. Messengers are less important because less documents are produced. The executive board can easily get information from the system.

5.2 Recommendations

After the system is put into the real environment for operation, there are interesting points that the developer should look at, and find the solutions in the next version of the system. The problems include future expansion and availability of the system, for example. Some of suggestions are listed below.

5.2.1 The proposed system views the user requirement as the overview of the school. However, there is difference between pratom levels (grade 1 to 6), and mattayom levels (grade 7 to 12). The procedures are similar, but not the same, so the connectivity of the pratom system and the mattayom system should be improved in order to continue the flow of data smoothly. The requirements should be more specific. Some attributes may be added to the system to strengthen the information.

5.2.2 Due to the increasing number of students, the computers and printers become unavailable for the users. The report production process is slowed down because 3 computers have to share a printer. Then the reports sent to the printer become bottlenecked. The system expansion is very important. New computers should be purchased. There should be a printer connected to each computer, so the reports can be printed on-demand.

5.2.3 The students and every academic department should deal with the system more. They should be able to prepare the information themselves instead of filling out the form for the officers to key their information into the system.

The suggested solution is to develop network infrastructure for the school. LAN should be available not only in the office of the registrar, but also in other departments. Then, the system can be shared with academic departments. Teachers can enter their information and their subject information into the system. The students should be able to change their information, such as names and addresses themselves, so there should be a computer system in front of the office for the students. However, with the involvement of the 2 parties, more strict security should be observed. Authorization should be applied, so the parties can view or edit the appropriate information, and they should not gain access to the restricted area.

5.2.4 High technology is cheaper, so it should be applied to the system to increase the efficiency of the system. High technology is such as a barcode system. In the next version of the system, it should be able to read the admission number from the ID card, so the information related to the number is retrieved. Students can just insert their ID card to the barcode system, and they can view the requested information.

5.2.5 In the future, the Internet will be very important. The future version of the system should be able to connect to the Internet. The system will be bigger because students will be given the access codes, and they will be treated as system users. When the system enter the Internet, the developer should consider the security measures because hackers are everywhere on the Internet. The registration and grade information are secret, and no one should be able to modify it.

5.2.6 Management of Information System (MIS) is becoming more popular as the new way of organization management. The student registration system is a small part of the school management system. The school should expand the system to cover all functions. The expansion depends on the priority of each function. The very important parts are finance and accounting, and they should be done first. Then, personnel systems and other systems, such as the library system, should be developed. The MIS needs well-defined infrastructure. The connectivity of each system should be identified because all functions are related to each other. For example, the financial system needs registration information to calculate the fees.

5.2.7 With the future expansion, as mentioned earlier, the software used should be changed. First, Microsoft Windows 98 is not a good operating system for a large system. It has trouble with security and performance. It should be changed to Microsoft Window NT. The server should also be upgraded. Instead of using a PC to be a server, a real server should be purchased. With new hardware and operating systems, the system will be more reliable. However, for a large system, Microsoft Access is also not a good choice for a system's database. The system should change to a more reliable database management system. In this case, the workgroup system, The database management system should be changed to Microsoft SQL Server. The development tool can still be Microsoft Access, but to overcome the limitations of Microsoft Access, Microsoft Visual Basic is a good choice to replace it. It is the most widely-used tool with extra features in system development.

5.2.8 User training is also necessary for the future expansion. After the users are used to the computerized system, they should be given an opportunity to go to high level training courses, so, they will be familiar with high technology. Future changes will only slightly affect the users because they will already be prepared for them. For example, if the system is going to be available on the Internet, the users who are familiar with the Internet will know how to work on the Internet.

5.2.9 For a large system, system administrators and database administrators are necessary. A system administrator is responsible for the system in general. For example, he has to plan for the users and plan group assignments and resources allocation. A database administrator is responsible for the database. He has to make sure the database is working at its best. Other responsibilities are tuning database performance, and backing up the database.



APPENDIX A
DATA DICTIONARY

DATA DICTIONARY

Table A.1. Student Table Schema.

Attribute Name	Description	Data Type	Width
StudentID	Student admission number	Text	5
StuTitle	Student's Title	Text	10
StuFNameT	Student's first name (Thai)	Text	20
StuLNameT	Student's last name (Thai)	Text	20
StuFNameE	Student's first name (English)	Text	15
StuLNameE	Student's last name (English)	Text	20
DoB	Student's Date of birth	Date	-
Gender	Student's Gender	Text	6
Rel	Student's Religion	Text	15
Nation	Student's Nationality	Text	15
StAddr	Street Address	Text	10
Soi	Soi	Text	20
Street	Street	Text	20
Tumbol	Tumbol	Text	20
Ampur	Ampur	Text	20
City	City	Text	20
PostCode	Post code	Text	5
Tel	Telephone number	Text	10
OldSch	Student's last school	Text	30
OldDeg	Student's last degree achieved	Text	20
FatherFName	Student's father's first name	Text	20

Table A.1. Student Table Schema (continued).

Attribute Name	Description	Data Type	Width
FatherLName	Student's father's last name	Text	30
MotherFName	Student's mother's first name	Text	20
MotherLName	Student's mother's last name	Text	30

Table A.2. Subject Table Schema.

Attribute Name	Description	Data Type	Width
SubjCode	Subject code (Thai)	Text	6
SubjNameT	Subject name (Thai)	Text	50
SubjCodeE	Subject code (English)	Text	10
SubjNameE	Subject name (English)	Text	50
Credit	Credit for the subject	Number	-

Table A.3. Teacher Table Schema.

Attribute Name	Description	Data Type	Width
TeacCode	Teacher code	Text	4
TeacFName	Teacher first name	Text	20
TeacLName	Teacher last name	Text	20

Table A.4. Advisor Table Schema.

Attribute Name	Description	Data Type	Width
StudentID	Student admission number	Text	5
Year	Academic year	Text	4
TeacCode	Teacher code	Text	4
Level	Level of class (Thai)	Text	3
Room	Student's current room	Text	1
Grade	Level of class (English)	Text	2

Table A.5. Graduate Table Schema.

Attribute Name	Description	Data Type	Width
StudentID	Student admission number	Text	5
YearGrad	Academic year of graduation	Number	-
DegreeGrad	Level graduation (Thai)	Text	3
GradeGrad	Level of graduation (English)	Text	2

Table A.6. Registration Table Schema.

Attribute Name	Description	Data Type	Width
StudentID	Student admission number	Text	5
Year	Academic year	Text	4
Semester	Semester	Text	1
SubjCode	Subject code	Text	6

Table A.7. Grade Table Schema.

Attribute Name	Description	Data Type	Width
StudentID	Student admission number	Text	5
Year	Academic year	Text	4
Semester	Semester	Text	1
SubjCode	Subject code	Text	6
Grade	The final grade of the subject	Number	-
Remark	Remark of the record	Memo	-



APPENDIX B

USER MANUAL AND INPUT SCREEN

USER MANUAL AND INPUT SCREEN

1. Login Process

The first process that the user has to complete is logging into the system. When the system is started, the logon window will be shown. The user has to enter the username and password in the appropriate text boxes provided. After entering the username and password, the user click the Enter button to enter the system. The Exit button is for exiting from the system. The logon window is shown in Figure B.1.

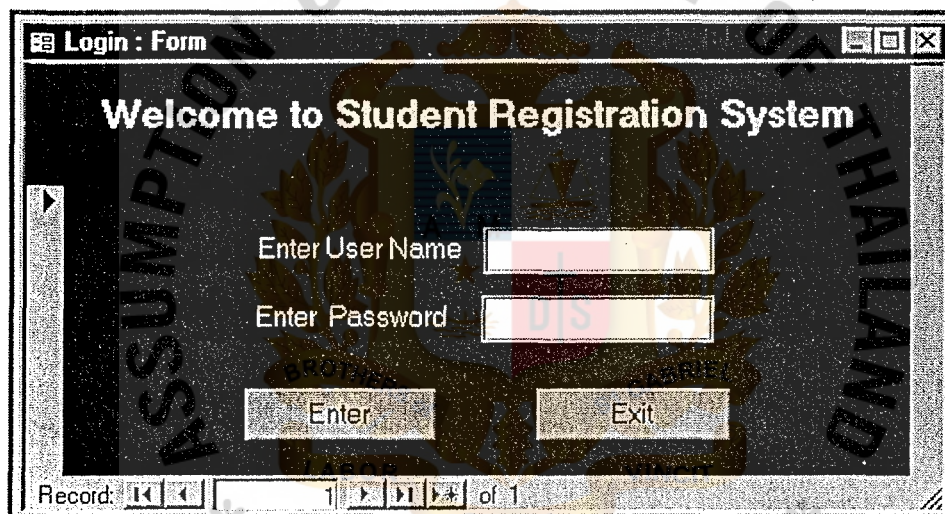
The image shows a screenshot of a Windows-style application window titled "Login : Form". The window has a dark background with a large, faint watermark of a university crest and the text "ASSUMPTION UNIVERSITY THAILAND" and "SINCE 1969". The main text in the window is "Welcome to Student Registration System" in a bold, yellow font. Below this, there are two text input fields: "Enter User Name" and "Enter Password". Below these fields are two buttons: "Enter" and "Exit". At the bottom of the window, there is a status bar that says "Record: 1 of 1" with navigation icons.

Figure B.1. Logon Window.

2. Student Registration System Main Menu

After the user types in a valid username and correct password, the user will enter the main menu of the system. There are 3 parts of the system. First, Maintain Information is for maintaining the fundamental information, such as student information, teacher information, and subject information. Maintain Registration is for maintaining the transactions of the system. The Registration includes registration information, grade information, graduate information and advisor information. The

Reports button is for the user to print out the system's reports. The main menu is shown in Figure B.2.

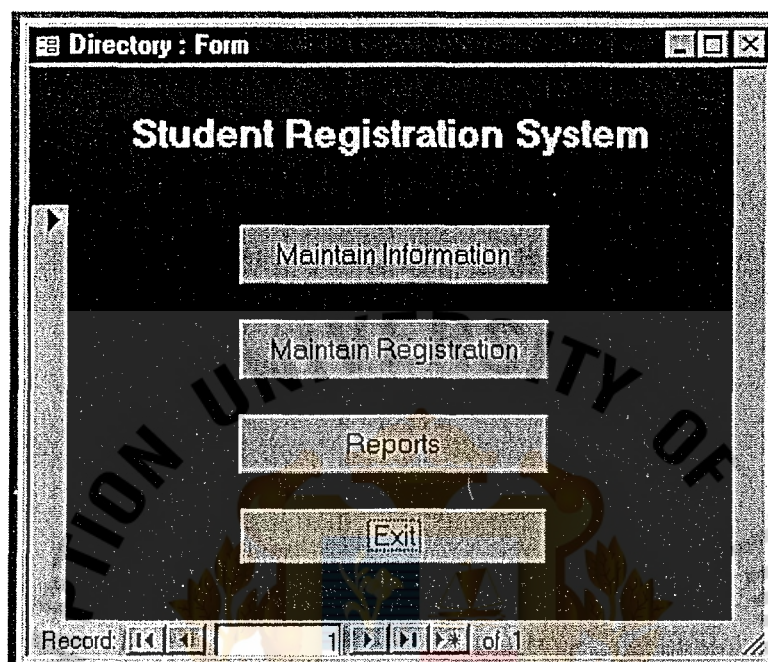


Figure B.2. Main Menu.

3. Maintain Information

The Maintain Information button is for maintaining the fundamental information of the system. The information includes student information, subject information, and teacher information. The user clicks Close to go back to the main menu. The Maintain Information window is shown in Figure B.3.

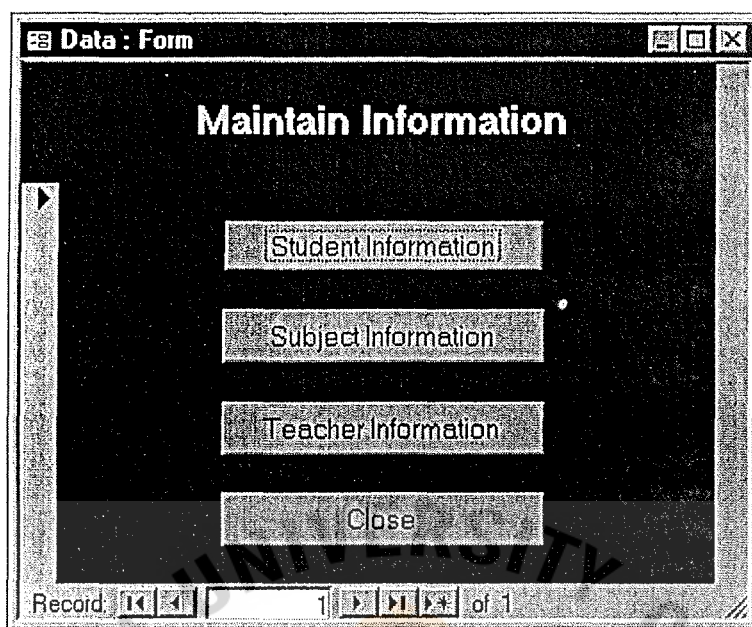


Figure B.3. Maintain Information Window.

4. Maintain Student Information

The largest part of the input screen in the system is maintaining student information. The reason is because student information is detailed, and it is the most important information in the system. The Maintain Student Information is shown in Figure B.4.

Maintain Student Information

Enter Student's Admission Number

Student's Name

Admission Number	<input style="width: 100%;" type="text" value="00001"/>		
Title	<input style="width: 50px;" type="text" value="นาย"/>	First Name (Thai)	<input style="width: 100px;" type="text" value="ปิยะพงษ์"/>
		Last Name (Thai)	<input style="width: 100px;" type="text" value="ผิวอ่อน"/>
		First Name (English)	<input style="width: 100px;" type="text" value="Piyaphong"/>
		Last Name (English)	<input style="width: 100px;" type="text" value="Pew-On"/>

History

Date of Birth	<input style="width: 100px;" type="text" value="1/1/69"/>	Gender	<input style="width: 50px;" type="text" value="ชาย"/>	Religion	<input style="width: 50px;" type="text" value="พุทธ"/>	Nationality	<input style="width: 50px;" type="text" value="ไทย"/>
Last School	<input style="width: 150px;" type="text" value="สวนกุหลาบ"/>			Last Degree	<input style="width: 100px;" type="text" value="ม.3"/>		

Address

House Number	<input style="width: 50px;" type="text" value="111"/>	Soi	<input style="width: 50px;" type="text"/>	Street	<input style="width: 100px;" type="text" value="สีลม"/>	Tumbol	<input style="width: 50px;" type="text" value="สีลม"/>
Ampur	<input style="width: 50px;" type="text" value="บางรัก"/>	City	<input style="width: 50px;" type="text" value="กรุงเทพฯ"/>	Postal Code	<input style="width: 50px;" type="text" value="10500"/>	Telephone Number	<input style="width: 100px;" type="text" value="2222222"/>

Parents

Father's First Name	<input style="width: 100px;" type="text" value="สมชาย"/>	Father's Last Name	<input style="width: 100px;" type="text" value="ผิวอ่อน"/>
Mother's First Name	<input style="width: 100px;" type="text" value="สมหญิง"/>	Mother's Last Name	<input style="width: 100px;" type="text" value="ผิวอ่อน"/>

Figure B.4. Maintain Student Information Window.

The student information is divided into 4 groups, Student's Name, History, Address, and Parents information. In the first part, Student's Name, the user fills in the admission number, title, student's name (both Thai and English). The next section, History, the information needed in this section is the student's personal information, such as date of birth, religion, nationality, and gender. The default value of gender is male because BCC is an all-male school. The default value of religion and nationality are Buddhist and Thai respectively. The history includes the last school, and the last degree of the student. The Address group requires the student's address information,

such as street address, street, city, and etc. The user just fills in the suitable boxes. The last group is Parents' information. The information includes parents' names.

When the form is opened, it will automatically retrieve the information of the first record in the database. If a new record will be added, the user has to click the Add button. All text boxes in the form will be cleared. After filling in the form, the new record should be saved by clicking the Save button. This button is also used when the user wants to update the existing information.

For updating or retrieving an individual record, the user has to type the admission number in the box labeled Enter Student's Admission Number, and pushes enter. Then, the specific record will be retrieved, and shown in the form. Then the user can make changes to the information. The Undo button is used when the user mistypes, and wants to restore the last value before updates. If the user is satisfied with the changes, the record is saved by clicking the Save button.

If the specific record is to be deleted, the user retrieves the record, and clicks the Delete button. The deleted record will be removed from the database. Finally, the user clicks Close to close the form, and goes back to the Maintain Information window.

5. Maintain Subject Information

The Maintain Subject Information is used to handle the subject information. The subject information is subject code, subject name both in Thai and in English, and credit for the subject. The Add button is used to enter new records to the database, and the record can be saved to the database by clicking Save.

As usual, the first record in the table will be retrieved when the window is opened. To search for a specific record, the admission number must be entered to the text box labeled Enter Teacher Code. The record can be deleted by clicking Delete. The Undo button is for restoring the value before updates. After making changes, the record

can be saved by clicking Save. To return to the Maintain Information window, the user clicks Close. The Maintain Subject Information window is shown in Figure B.5.

The screenshot shows a software window titled "Subject" with a subtitle "Maintain Subject Information". Inside the window, there is a section labeled "Enter Subject Code" with an empty text box. Below this, there are five rows of data entry fields: "Subject Code (Thai)" with the value "n101", "Subject Name (Thai)" with the value "ไทย 1", "Subject Code (English)" with the value "THA101", "Subject Name (English)" with the value "Thai 1", and "Credit" with the value "2.0". At the bottom of the window, there are five buttons: "Add", "Delete", "Save", "Undo", and "Close". A status bar at the bottom of the window displays "Record: 1 of 4" with navigation icons.

Figure B.5. Maintain Subject Information Window.

6. Maintain Teacher Information

The teacher information is the teacher code and the teacher's name. The Add button is used to enter new record to the database, and the record can be saved to the database by clicking Save.

As usual, the first record in the table will be retrieved when the window is opened. To search for a specific record, the teacher code must be entered to the text box labeled Enter Teacher Code. The record can be deleted by clicking Delete. The Undo button is for restoring the value before updates. After making changes, the record can be

saved by clicking Save. To return to the Maintain Information window, the user clicks Close. The Maintain Teacher Information window is shown in Figure B.6.

The screenshot shows a software window titled "Teacher" with a subtitle "Maintain Teacher Information". The window contains a form with the following fields and values:

- Enter Teacher Code: [Empty text box]
- Teacher Code: 0001
- Teacher First Name: Alan
- Teacher Last Name: Smith

Below the form are five buttons: Add, Delete, Save, Undo, and Close. At the bottom of the window, there is a record navigation bar that says "Record: 1 of 11" with navigation icons.

Figure B.6. Maintain Teacher Information Window.

7. Maintain Registration and Grade

The window will be shown after the user clicks at the Maintain Registration button in the main menu. There are 4 functions, Maintain Advisor, Maintain Registration, Maintain Grade, and Maintain Graduates. These functions will be explained in detail later. The Maintain Registration window is shown in Figure B.7.

As usual, the first record in the table will be retrieved when the window is opened. To search for a specific record, the admission number must be entered to the text box labeled Enter Student's Admission Number, and the Next button is used to find the next matching records. If no record matches, the program will alert the user with the message "No matches". If the user wants to transfer the registration information for the subjects for which the grades are already reported, the user can click Registration.

The record can be deleted by clicking Delete. The Undo button is for restoring the value before updates. After making changes, the record can be saved by clicking Save. To return to the Maintain Registration window, the user clicks Close. The Maintain Grade Information window is shown in Figure B.10.



Grade

Maintain Student's Score

Enter Student's Admission Number

Admission Number

Semester

Year

Subject Code

Score

Remark

Record: of 4

Figure B.10. Maintain Grade Information Window.

11. Maintain Graduate Information

The graduate information is added very year. It is to keep the information of the students who already graduated. The information is composed of the student's admission number, the academic year of graduation, and the level of graduation in both Thai and English. The Add button is used to enter new records to the database, and the record can be saved to the database by clicking Save.

As usual, the first record in the table will be retrieved when the window is opened. To search for a specific record, the admission number must be entered to the text box labeled Enter Student's Admission Number. The record can be deleted by clicking Delete. The Undo button is for restoring the value before updates. After making

changes, the record can be saved by clicking Save. To return to the Maintain Registration window, the user clicks Close. The Maintain Graduate Information window is shown in Figure B.11.

Graduate

Maintain Graduate Information

Enter Admission Number

Admission Number

Year Graduate

Degree Archeive

Grade Graduate

Add Delete Save Undo Close

Record: 1 of 2

Figure B.11. Maintain Graduate Information.

12. Reports

In the main menu, if the user want to generate any reports, the Reports button is clicked. The Reports window shows 5 categories of the system reports, Student reports, Teacher reports, Subject reports, Registration reports, and Grade reports. The user can click Cancel to return to the main menu. The Reports window is shown in Figure B.12.

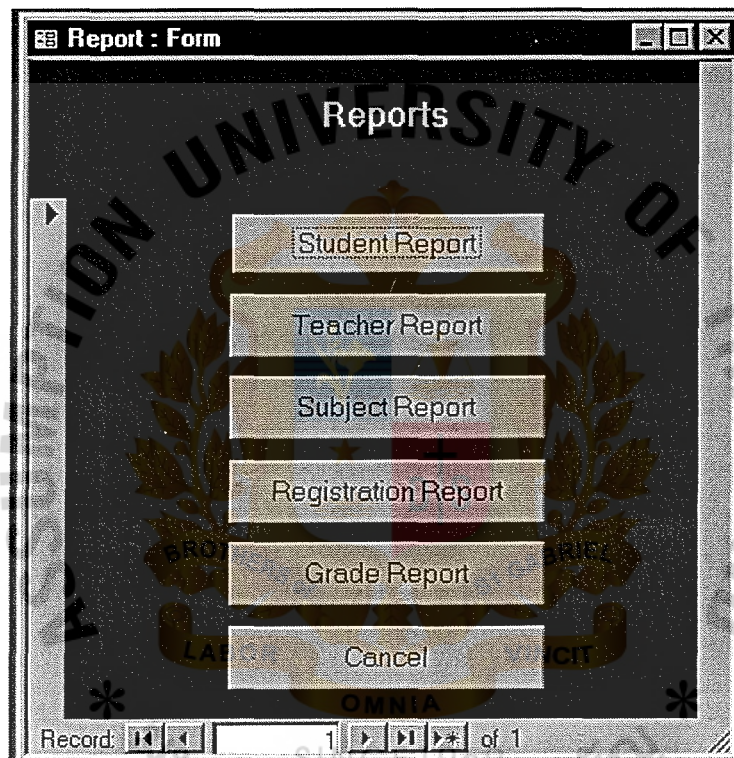


Figure B.12. Reports Window.

13. Student Report

There are 4 types of student reports, reference letters, student information, student lists by room, and graduate lists. The Student Report window is shown in Figure B13. The Cancel button is clicked to return to the Reports Window.

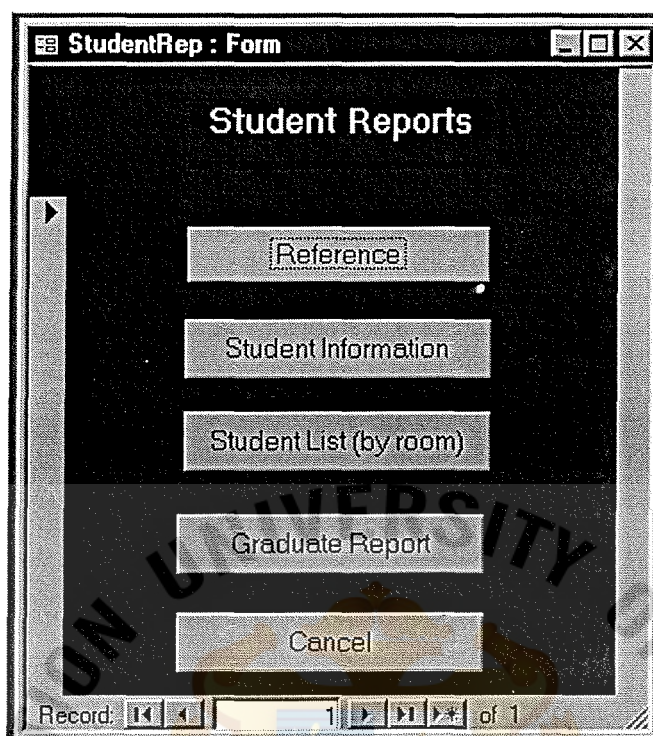


Figure B.13. Student Report Window.

14. Reference

The Reference button in the Student Report Window is for printing the reference letters. There are 2 boxes to fill in. The box labeled Enter Admission Number is one of the conditions needed. It identifies the student information. Next, the academic year is entered. For English, the academic year must be, for example, 1999. In Thai, the user must enter 2542 instead.

The English button is to preview the reference letter in English before printing. The Thai button is for the Thai reference letter. Cancel is used for returning to the Student Report Window. The Reference Report Window is shown in Figure B.14.

PrintRef : Form

Print The Reference Document

Enter Admission Number

Enter Academic Year

English Thai Cancel

Record: 1 of 1

Figure B.14. Reference Report Window.

15. Student Information

The student information includes all detailed information. The report contains one student's information. The condition needed in the window is only the student's admission number. The Cancel button is for returning to the Student Report Window. The Student Information Report Window is illustrated in Figure B.15.

PrintStudent : Form

Print Student Information

Enter Admission Number

Cancel

Record: 1 of 1

Figure B.15. Student Information Report Window.

16. Student Lists

The student lists can be printed out both in Thai and in English. From figure B16, the user has to specify academic year and level as conditions. Then, for English, the user enters the grade of the students, and clicks English to preview the lists. For the Thai language, the user enters a level, such as Mattayom1, and clicks Thai. When finishing the process, the user clicks Cancel to go back to Student Information Report Window.

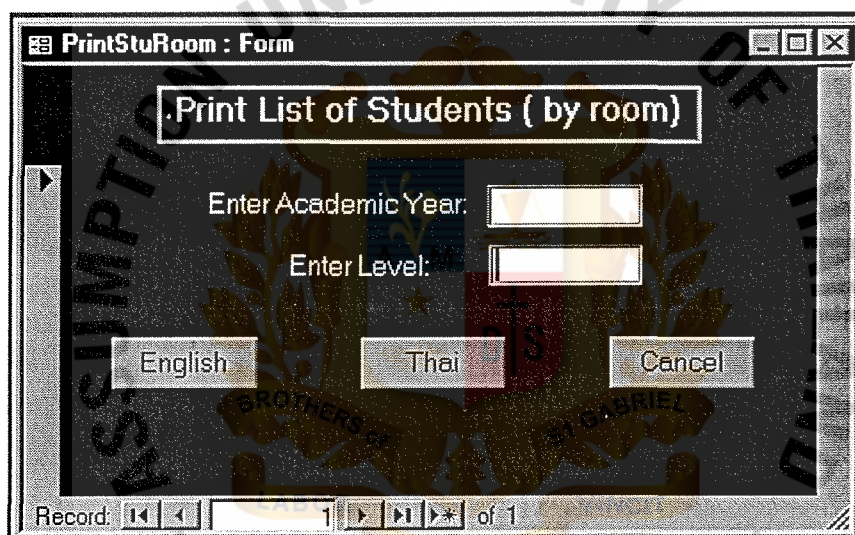
The image shows a software window titled "PrintStuRoom : Form". Inside the window, there is a subtitle ".Print List of Students (by room)". Below this, there are two input fields: "Enter Academic Year:" and "Enter Level:". Underneath these fields are three buttons: "English", "Thai", and "Cancel". At the bottom of the window, there is a status bar that says "Record: 1 of 1" with navigation icons. The background of the window has a faint watermark of a university crest.

Figure B.16. Student List Report Window.

17. Graduate Report

The students graduating in a particular year can be listed by entering the academic year. The user clicks English for previewing the English version, and Thai for the Thai version. Cancel is used for returning to the Student Information Report Window.

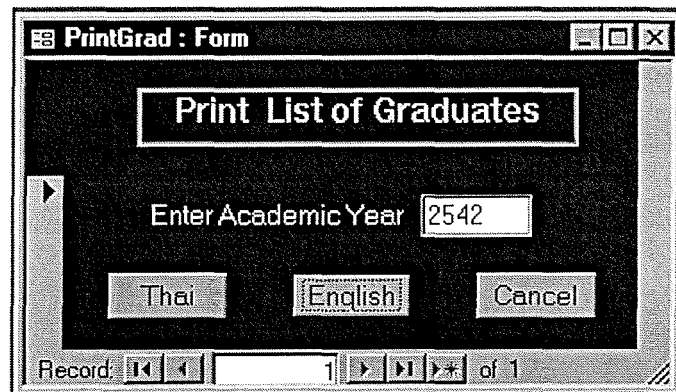


Figure B.17. Graduate Report Window.

18. Teacher Reports

There are 2 teacher-related reports, advisor and teacher lists. The user can choose the 2 reports from the Teacher Reports Window illustrated in Figure B.18.



Figure B.18. Teacher Reports Window.

19. Advisor Report

The advisors to classrooms can be previewed and printed at the Advisor Report Window illustrated in Figure B.19. The search condition required is academic year. After entering the year, the user has to click Preview to preview the report.



Figure B.19. Advisor Report Window.

20. Subject Report

The subject lists are available in both Thai and English. The lists are all subjects which are taught in BCC. Cancel is used for going back to the Reports Window. The Subject Report Window is illustrated in Figure B.20.

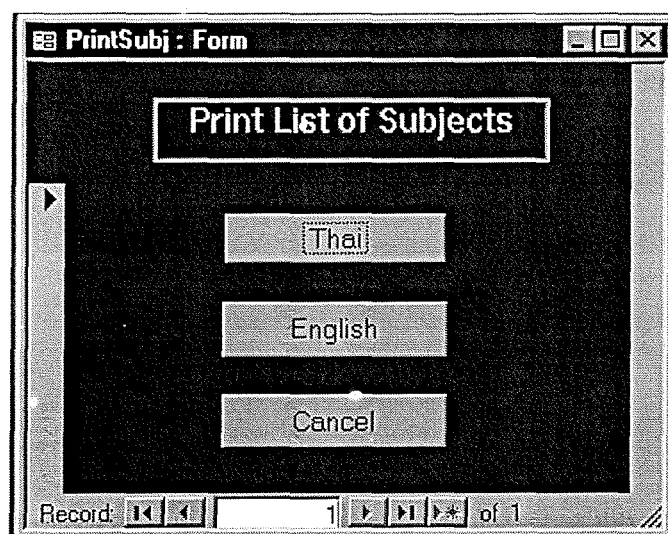


Figure B.20. Subject Report Window.

21. Registration Report

The report is to show what subjects a student registers for in each semester. The user has to enter the student's admission number, academic year and particular semester for the search condition. Then, the user has to click Preview. The Registration Report Window is shown in Figure B.21.

 A screenshot of a software window titled "PrintReg : Form". The window has a dark background with a white border. At the top, there is a title bar with the text "PrintReg : Form" and standard window control buttons (minimize, maximize, close). Below the title bar, there is a white rectangular box containing the text "Print Registration Information". In the center of the window, there are three input fields stacked vertically, each with a label to its left: "Enter Admission No.", "Enter Academic Year.", and "Enter Semester". Below the input fields, there are two buttons: "Preview" and "Cancel". At the bottom of the window, there is a status bar that says "Record: 1 of 1" with navigation icons.

Figure B.21. Registration Report Window.

22. Grade Report

The report is to show subjects and grades that a student studies each semester. The report also shows the grade point average of the student. The user has to enter the student's admission number for the search condition. Then, the user has to click Preview. The Grade Report Window is shown in Figure B.22.

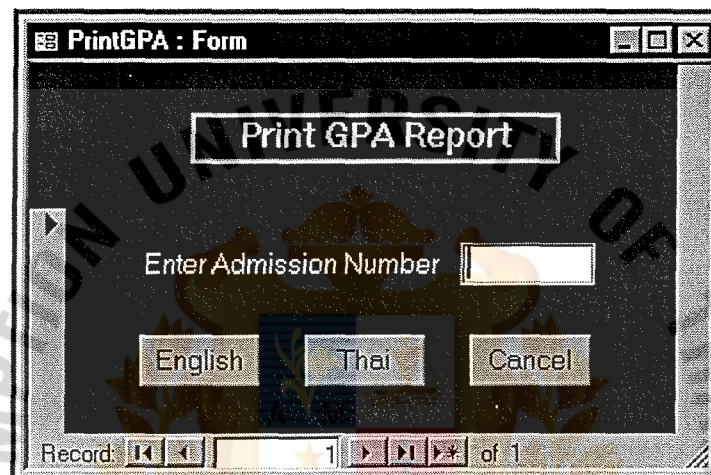


Figure B.22. Grade Report Window.

The reports of these forms are illustrated in the Appendix C.



โรงเรียนกรุงเทพคริสเตียนวิทยาลัย

แท่งมูลนิธิสภาคริสตจักรในประเทศไทย

35 ถนนประมวญ สี่ลม กรุงเทพฯ 1050

โทร. 6379020 โทรสาร 236020



Bangkok Christian College

The Foundation of The Church of Christ in Thailand

35 Pramuan Rd., Bangkok 1050

Tel. 6379020 Fax. 2360203

ใบรับรองการเป็นนักเรียน

วัน 30 เดือน กันยายน พ.ศ 2542

ข้าพเจ้าขอรับรองว่า นาย ปิยะพงษ์ ผิวอ่อน เลขประจำตัว 00001
เกิดวันที่ 1 เดือน มกราคม พ.ศ. 2512 กำลังเรียนอยู่ชั้น ม.1 ปีการศึกษา 2542
ของโรงเรียนนี้ และเป็นผู้มีความประพฤติเรียบร้อย

ลงชื่อ

(นายรัชชัย สัจกุล)

อาจารย์ใหญ่

Figure C.1. Example of Student's Reference Letter (Thai).

โรงเรียนกรุงเทพคริสเตียนวิทยาลัย

แห่งมูลนิธิสภาคริสตจักรในประเทศไทย

35 ถนนประมวญ สีลม กรุงเทพฯ 1050

โทร. 6379020 โทรสาร 236020



Bangkok Christian College

The Foundation of The Church of Christ in Thailand

35 Pramuan Rd., Bangkok 1050

Tel. 6379020 Fax. 2360203

To whom it may concern:

This is to verify that Piyaphong Pew-On

Whose admission number is 00001 , is presently enrolled in grade 7
at Bangkok Christian College.

We find him to be a fair student and would like to recommend him without any
reservation.

Sincerely Yours,

(Mr.Thawatchai Sajjakul)

Director

Figure C.2. Example of Student's Reference Letter (English).

Student Information			
Admission Number	Title	First Name (Thai)	Last Name (Thai)
00001	นาย	ปิยะพงษ์	ผิวอ่อน
Date of Birth	Religion	Nationality	Gender
1/1/69 พุทธ		ไทย	ชาย
Street	Street Address	Tumbol	Soi
สีลม	111	สีลม	บางรัก
City	Postal Code	Telephone Number	
กรุงเทพฯ	10500	2222222	
Father Name	Mother Name		
สมชาย	สมหญิง		ผิวอ่อน

Figure C.3. Example of Student Information Report.

List of Students

Academic Year 2542 Level ม.1

Room Admission No. Student Name

1

00005	นาย วัฒนา	ภูโอบอ้อม
00006	นาย อภิชาติ	สิงห์มณีชัย
00007	นาย อภิชาติ	คำภู ณ อยุธยา
00008	นาย บารมี	ประพุกศักดิ์พิทักษ์
00009	นาย บุญชัย	ศรีวานิชภูมิ
00010	นาย บุญศักดิ์	ภูรินันทกร

3

00002	ด.ช. เนติพงษ์	ศรีทองอินทร์
-------	---------------	--------------

4

00001	นาย ปิยะพงษ์	ผิวอ่อน
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Figure C.4. Example of the List of Students Report (Thai).

<i>List of Students</i>			
<i>Academic Year</i>		1999 <i>Grade 7</i>	
<i>Room</i>	<i>Admission No.</i>	<i>Student Name</i>	
1	00005	Wattana	Poo-Ob-Orm
	00006	Apichart	Singmaneechai
	00007	Apichit	Kambhu Na Ayudhaya
	00008	Baramee	Prapusakpitak
	00009	Boonchai	Srivanichpoom
	00010	Boonsak	Purinunthakorn
3			
	00002	Natipong	Sritong-In
4			
	00001	Piyaphong	Pew-On

Figure C.5. Example of the List of Students Report (English).

List of Graduates

Year of Graduation

2542

Student ID	Degree Archeived	Student Name	
00011	ม.6	นาย จักฤษ	นนทโกวิท
00012	ม.6	นาย จันทวุฒิ	กิตติวันนากุล
00013	ม.6	นาย ชาญวุฒิ	ชวนนท์
00014	ม.6	นาย ชรินทร์	อ่อนสุวรรณ
00015	ม.6	นาย อธิธิพล	วิชากุล
00016	ม.6	นาย จตุพล	เกียรติราบิน
00017	ม.6	นาย เกริกชัย	ปัญญาบารมี
00018	ม.6	นาย นรินทร์	จรัสเรนศกุล
00019	ม.6	นาย ณัฐพิธ	รุ่งสวัสดิทรัพย์
00020	ม.6	นาย ณัฐพล	วงศ์ปรีดี

Figure C.6. Example of the List of Graduates Report (Thai).

List of Graduates

Year of Graduation 1999

StudentID	Grade Finished	Student Name	
00011	12	Chakrid	Nondakovit
00012	12	Chantawoot	Kittiwannakul
00013	12	Chanvit	Chavanont
00014	12	Charin	Onsuwan
00015	12	Ittipon	Wichakul
00016	12	Jatupol	Kiatrabin
00017	12	Krirkchai	Panyabaramee
00018	12	Narin	Charastanetkul
00019	12	Natapit	Roonsawasdisup
00020	12	Natpahol	Wongpreedee

Figure C.7. Example of the List of Graduates Report (English).

List of Teachers

<i>Teacher Code</i>	<i>Teacher First Name</i>	<i>Teacher Last Name</i>
0001	Alan	Smith
0002	Kevin	Campbell
0003	Oliver	Bierhoff
0004	Brian	Robson
0005	Jesper	Blompquist
0006	Ryan	Giggs
0007	Thierry	Bonalair
0008	Alan	Rogers
0009	Roberto	Baggio
0010	Roberto	Muzzi
0011	David	Ginola
0012	เกษม	สวัสดี
0013	มนตรี	สกุลจิตรานนท์
0014	รุ่งนภา	ชุตีมาพงศ์รัตน์
0015	กฤต	วิกวานตโนรส

Figure C.8. Example of the List of Teachers Report.

List of Subjects (Thai)

<i>Subject Code (Thai)</i>	<i>Subject Name (Thai)</i>
ค101	คณิตศาสตร์
ง011	งานบ้าน
ท101	ไทย 1
ท102	ไทย 2
ท103	ไทย 3
ท104	ไทย 4
พ011	สุขศึกษา
พ101	พลานามัย1
ว101	วิทยาศาสตร์
ศ101	ศิลป์ 1
ส101	ประเทศของเรา

Figure C.9. Example of the List of Subjects Report (Thai).

List of Subjects (English)

Subject Code (English) Subject Name (English)

MATH101	Math
WORK011	House Works
THA101	Thai 1
THA102	Thai 2
THA103	Thai 3
THA104	Thai 4
PE011	Physical Education
PE101	Physical Education 1
SCI101	Science
ART101	Arts 1
SOC101	Our Country

Figure C.10. Example of the List of Subjects Report (English).

Registration			
00005	วัฒนา	ภูโอบอ้อม	
Subject Code		Subject Name	
ค101		คณิตศาสตร์	
ง011		งานบ้าน	
ท101		ไทย 1	
พ011		สุขศึกษา	
พ101		พลานามัย1	
ว101		วิทยาศาสตร์	
ศ101		ศิลป์ 1	
ส101		ประเทศของเรา	

Figure C.11. Example of Student’s Registration Report.

รายงานคะแนนเฉลี่ย

00005 วัฒนา ภูโอบอ้อม

Year Semester Subject Code Subject Name Credit Score

2542

1

พ011 สุขศึกษา .5 2

ง011 งานบ้าน 1.0 3

ค101 คณิตศาสตร์ 1.5 1

ว101 วิทยาศาสตร์ 1.5 3

ศ101 ศิลป 1 .5 1

พ101 พละน่าย1 .5 4

ส101 ประเทศของเรา 1.0 4

ท101 ไทย 1 2.0 3

คะแนนเฉลี่ย 2.65

Figure C.12. Example of the Student's GPA and Scores Report (Thai).

Grade Point Average

00005 Wattana Poo-Ob-Orm

Year	Semester	Subject Code	Subject Name	Credit	Score
------	----------	--------------	--------------	--------	-------

2542

1

PE011	Physical Education	.5	2
WORK011	House Works	1.0	3
MATH101	Math	1.5	1
SCI101	Science	1.5	3
ART101	Arts 1	.5	1
PE101	Physical Education 1	.5	4
SOC101	Our Country	1.0	4
THA101	Thai 1	2.0	3

Grade Point Average 2.65

Figure C.13. Example of Student's GPA and Scores Report (English).

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