DATA MANAGEMENT SYSTEM ON PROJECTS, RESEARCHES, AND INVENTIONS, IN THE SECTION OF INNOVATION AND INVENTION DEVELOPMENTS RESEARCHES, WANGKLAIKANGWON INDUSTRIAL AND COMMUNITY EDUCATION COLLEGE

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A THEMATIC PAPER SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE
(TECHNOLOGY OF INFORMATION SYSTEM MANAGEMENT)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2014

Thematic Paper
entitled

DATA MANAGEMENT SYSTEM ON PROJECTS, RESEARCHES, AND INVENTIONS, IN THE SECTION OF INNOVATION AND INVENTION DEVELOPMENTS RESEARCHES, WANGKLAIKANGWON INDUSTRIAL AND COMMUNITY EDUCATION COLLEGE

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was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Science
(Technology of Information System Management)
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ACKNOWLEDGEMENTS

The thematic paper had received kindly assisted from Assistant Professor Dr. Sotarat Thammaboosadee, Major advisor of thematic paper and Dr. Chanattha Thongsuk, Co-advisor of the Thematic Paper for their consults, suggestion and recommendation on writing until finish. My gratitude and appreciation shall be upon them on this opportunity.

Thanks to directors, teachers, personal education, and students at the Wangklaikangwon Industrial and Community Education College for their supports and assistances.

Also, thanks to colleagues at the Management Information Technology Systems, the Faculty of Engineering, Mahidol University for their supports and assistances.

This is indispensable, my gratitude to my parents who always concern and support my education especially being the main driven for me to achieve this study.

Benchamach Ratphitak

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ABSTRACT

The aim of this study was to examine the process concerning the information management system of students projects, teachers' researches and institution inventions at Wangklaikangwon Industrial and Community Education College. Available information was generally in the form of large volumes of documents and books collected and recorded through the use of a document program system such as MSword. It was not a functional system, and as a result, it caused problems when searching for documents. It was found that the collected documents were damaged, lost, or incomplete, and individual searchers had to spend much time searching as well as there being no dissemination of such information. The Data Management System on student projects, teachers' researches, and institution inventions were developed to support information collection by way of a web application access through the internet which is able to assist in the management and analysis of problems, while also facilitating and allowing for a more rapid and accurate response for teachers, educational personal, and students of the college, as well as providing academic support as a part of verification of education quality. The sample group in the research consisted of 5 officers who were worked to support data center administrators. Data was collected using questionnaires with a prescribe 5 levels scale for evaluation. The system users, which consisted of 20 professors and 20 students, were satisfied with the development programs after using information management system. The result showed satisfaction with the Data Management System related to student projects, teachers' researches, and institution inventions was at a high level. Therefore, it could be concluded that the management system of project information in the form of web application through the internet that was developed could be actually applied, while effectively responding to the requirements of users.

KEY WORDS: DATABASE/ INFORMATION OF MANAGEMENT / INVENTIONS/ RESEARCH/ WEB APPLICATION

148 pages

ระบบจัดการข้อมูลโครงการ งานวิจัยและสิ่งประดิษฐ์ ส่วนงานวิจัยพัฒนานวัตกรรมและสิ่งประดิษฐ์ วิทยาลัยการอาชีพวังไกลกังวล

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บทคัดย่อ

การจัดการข้อมูลโครงการ งานวิจัยและสิ่งประดิษฐ์ ของวิทยาลัยการอาชีพวังไกลกังวล โดยทั่วไปลักษณะของการจัดเก็บข้อมูลจะอยู่ในรูปของเอกสารรูปเล่มซึ่งมีอยู่จำนวนมาก เอกสารจะถูกเก็บไว้ที่แต่ละแผนกวิชา การสรุปเก็บรวบรวมข้อมูลมีการใช้โปรแกรมสำเร็จรูประบบ แต่ยังไม่เป็นระบบ ทำให้เกิดบัญหาในการค้นหาเอกสาร ซึ่งพบว่าเอกสารชำรุด และ สูญหายไม่สมบูรณ์ และใช้เวลามากในการค้นหา รวมถึงไม่มีการจัดการเผยแพร่ข้อมูลดังกล่าว ระบบจัดการข้อมูลโครงการ งานวิจัยและสิ่งประดิษฐ์นี้จึงถูกพัฒนาขึ้นเพื่อช่วยในการจัดเก็บข้อมูลโดยพัฒนาให้อยู่ในรูปแบบของเว็บแอพพลิเคชั่น ผ่านเครือข่ายระบบอินเทอร์เน็ต ให้มีความสามารถในการจัดการข้อมูล และสืบค้นข้อมูล เพื่ออำนวยความสะดวก รวดเร็ว และถูกต้องให้แก่คณะครู บุคคลากร นักเรียน นักศึกษาของวิทยาลัยฯ และการให้บริการทางวิชาการซึ่งเป็นส่วนหนึ่งในการรองรับการประคุณภาพการศึกษา โดยกลุ่มตัวอย่างในการวิจัยเป็นเจ้าหน้าที่งานศูนย์ข้อมูลผู้ใช้งานในส่วนของผู้ดูแลระบบ จำนวน 5 คน และผู้ใช้งานระบบประกอบไปด้วย ครู อาจารย์ จำนวน 20 คน และนักเรียน นักศึกษา จำนวน 20 คน โดยการทำการประเมินความพึงพอใจในการเข้าใช้งานระบบจัดการข้อมูล โดยใช้แบบสอบถาม กำหนดมาตราส่วนประเมินค่า 5 ระดับ ซึ่งผลการประเมินความพึงพอใจของ ระบบจัดการข้อมูลโครงการ งานวิจัยและสิ่งประดิษฐ์ ส่วนงานวิจัยพัฒนานวัตกรรมและสิ่งประดิษฐ์ วิทยาลัยการอาชีพวังไกลกังวล อยู่ในระดับ มาก จึงสามารถสรุปได้ว่าระบบจัดการข้อมูลโครงการ ในรูปแบบของเว็บแอพพลิเคชั่น ผ่านเครือข่ายอินเทอร์เน็ท ที่ได้รับการพัฒนาขึ้นมานั้นสามารถนำไปใช้งานและสามารถสนองตอบต่อความต้องการของผู้ใช้งานได้อย่างมีประสิทธิภาพอย่างแท้จริง

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CHAPTER I
INTRODUCTION

1.1 Background and rationale of the problem

Nowadays technological advancements have been developed exceedingly, especially the technologies that are involved in facilitating daily lifestyles. No matter if they are in business, medicine, education, and other organizations, technologies were brought and adapted to use in the organizations. They consist of communication technology, computer technology, especially in communication technology or Internet network technology that are regarded as large data sources and help people to access various data according to their demands conveniently and quickly, and data management technology, which many organizations have adapted to support in storing data that are abundant and have the tendency to continuously increase. This is done for the purpose that data can be stored in a systematic manner, which will help in facilitating the data access and data management with accuracy and efficiency.

Wangklaikangwon Industrial and Community Education College, a college in affiliation of the Ministry of Education, Vocational Education Commission, arranges education for students of Vocational Certificate level, and High Vocational Certificate level in a total of 11 disciplines. The management structure is divided into 4 sections, which are the academic section, planning and co-operation section, student affairs section and resources management section. There are 60 government teachers, government officers and special teachers, 30 education personnel, and a total of 1,800 students. As for the learning management, in each year the College specifies that teachers are to execute teachers' research that can be brought for beneficial uses in solving problems and increasing efficiency in learning management, or according to various objectives. Year 3 Vocational Certificate students and Year 2 High Vocational Certificate students have produced projects, which are a part of the education's completion according to the program, as well as created inventions in order to integrate the learning based on various subjects. The assignation of producing projects,

researches and inventions is a direction that the Vocational Education Commission has specified to support the Educational Quality Assurance. In the general arrangements, the kind of data storage on the College's projects, researches, and inventions is often in the form of documents, which has a large quantity. The documents were stored in locations according to the subject's department. For a summary on data accumulation, a computer program was used. However, it was still not systematic, thus problems occurred during data searches, which were found that documents were damaged, lost and uncompleted, and the searches were time-consuming.

Statistics on produced projects, researches and inventions in the last 3 years

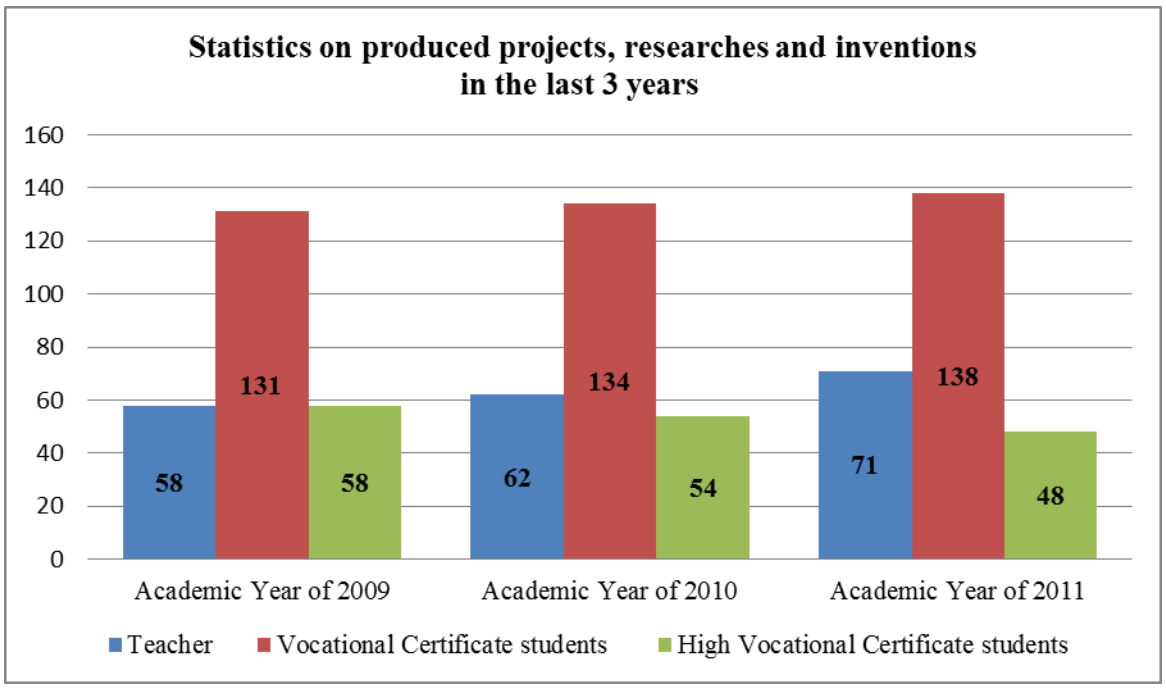

Figure 1.1 Statistics on produced projects, researches and inventions in the last 3 years.

From the statistics on produced researches and projects during the 2009 – 2011 academic years of the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, it was displayed there was a great deal of works produced in each academic year, and have

the tendency to increase. Nevertheless, the problem about publicizing works was found, which the College did not arrange in this part. The regulation of External Quality Assurance in Education has stated that:

Indicator 4: Works that are the students' vocational projects or inventions that were brought for beneficial uses The empirical data source is a database that compiles the students' vocational projects or inventions that were managed by the original affiliation, which has a process in selecting and gathering data systematically (there is identification of the types of the works, names of the works or the students who are the works' owners, academic year or the duration carried out, the works' quality level or awards received), or at least is an database that is operated by the College itself and has been distributed or reported to the public, such as publicizing on the College's website or in public relations pamphlets, etc. (Office for National Education Standards and Quality Assessment, 2011).

Indicator 5: Works that are innovations, creative inventions, or teachers' researches that were brought for beneficial uses

1. Media and Innovation Database of the Bureau of Vocational Education Standards and Qualification, Media and Innovation Standards group, for vocational education colleges affiliated with the Office of Vocational Education Commission.

2. Database of the Office of the Private Education Commission that displays works of innovation, creative inventions, or teachers' researches for private schools in the vocational education category.

3. Database or support documents of exterior organizations portraying that works of innovation, creative inventions, or teachers' researches that were brought for beneficial uses, or received awards (Office for National Education Standards and Quality Assessment, 2011).

From the stated problem, the organizer sees as appropriate to develop a Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, by developing to stay in the Web Application format that has the ability to organize data and search for data in the sections of projects, researches and inventions through Internet system network in order to facilitate

convenience, speed, and precision for teachers, personnel, students of the College, and providing academic services, which is a part of the Education Quality Assessment.

1.2 Research objectives

1) To develop a Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College.

2) To study the users' satisfaction of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College.

1.3 Scope of research

1) Population used in the study are composed of 3 groups, which include

- Teachers of Wangklaikangwon Industrial and Community Education College, in the academic year of 2013.
- Education personnel of Wangklaikangwon Industrial and Community Education College, in the academic year of 2013.
- Students of Wangklaikangwon Industrial and Community Education College, in the academic year of 2013.

2) Sample groups used in this study are composed of 3 groups, which include

- Teachers of Wangklaikangwon Industrial and Community Education College since 1 October 2013 to 31 March 2014, by selecting 20 people to be the sample group to use the system.
- Education personnel and data center officers of Wangklaikangwon Industrial and Community Education College since 1 October 2013 to 31 March 2014, by selecting 5 people to be the sample group to look after the system.

- Students of Wangklaikangwon Industrial and Community Education College since 1 October 2013 to 31 March 2014, by selecting 20 people to be the sample group to use the system.

3) Tools used in the study

- The usage of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College.

- Satisfaction of the system administrators and system users of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College.

1.4 Terminology definitions

1) Data Management System means a system that uses a computer to assist in compiling, storing or managing data on projects, researches and inventions, in order to receive data that are systematic, and can be used in decision makings quickly and with accuracy

2) Administrator refer to education personnel at the data center of Wangklaikangwon Industrial and Community Education College, affiliated with the Vocational Education Commission

3) Users refer to teachers and students of Wangklaikangwon Industrial and Community Education College, affiliated with the Vocational Education Commission

4) Data Management System on projects, researches and inventions means a system that the researcher developed to use in the data management on projects, researches and inventions in the form of a database to increase efficiency in working and distributing academic services to the general public

5) Satisfaction refers to good feelings of the system administrators and system users that they have toward the Data Management System on projects,

researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College

1.5 Expected benefits and application

1) Acquires a Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College in increasing the efficiency of a systematic data storage

2) Support to facilitate in data storage and quick data search

3) Support in Education Quality Assessment in the section of projects, researches and inventions

4) Can use as a guide in adapting to use as a Data Management System in other sections of Wangklaikangwon Industrial and Community Education College

CHAPTER II
LITERATURE REVIEW

In the study of developing the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, the developer has studied diverse theoretical principles, researches and technologies that are related that can be adapted to use and increase the efficiency of the mentioned Data Management System, which consists of the following topics:

2.1 General knowledge about projects, researches and inventions, and education quality assurance

2.2 Researches that are related

2.3 Theories that are related

2.4 Technologies that are related

2.5 Conclusion

2.1 General knowledge about projects, researches and inventions, and education quality assurance

2.1.1 Project

1) Definition of project

The Royal Institute Dictionary 1982 defined the term “Project” as a plan or outline that is specified.

Educators, marketers, and lawyers gave many definitions of the project’s meaning, which were in the same direction. It was concluded that

Project is an activity or work plan that is one free unit and is able to be analyzed, planned, and executed, as well as having obvious features of a starting point and an end point, by which the plan for various affairs must indicate objectives according to the specified duration.

Project is beforehand planning that is created with a system consisting of many small activities that require resources to implement, and is anticipated for a compensation that is worthwhile. Each project has goals to manufacture or provide services to increase the capacity of the work plan.

Project means a small work plan, operations plan, or activities plan that will be implemented, by having clear objectives in operations, a starting duration, and regulations in implementation to serve as a implementation guide to be in line with the determined goals.

Therefore, a project is an important part of planning that will make organizations achieve objectives according to their goals.

2) Benefits of projects

Writing projects require suggesting opinions that are correct, reasonable, and show details clearly without considering the person who is executing the project in order to operate works that can accomplish objectives as anticipated. Projects that are correct and clear will help to create a variety of benefits for organizations, including

- Helps to facilitate readers in understanding the contents clearly and correctly according to the project writer's intention(s).
- Helps to save time for the person who approves by being able to make decisions from spending a short time reading.
- Helps in the project's operation according to the determined objectives and goals.
- Is a demonstration of the project writer's work experiences.

3) Features of a good project

Project is arranging activities in a systematic manner to operate the organization's duties in order to achieve goals with efficiency. A good project naturally delivers worthwhile efficiency of the operation and compensation that the organization or institute will receive, which will be brought to develop such organizations. Features of a good project are as follows:

- Can meet the demands or solve problems of the organization or institute.

- Has clear objectives and goals, and can operate and implement works.
- The project details must harmoniously conform to and relate to each other. In other words, project objectives must be in line with principles and reasons, and the work operations must be in line with the objectives.
- The project details can be easily understandable, and convenient to operate according to the project.
- Is a project that can be implemented, conforms to the organization's work plan, and can be followed to evaluate results.
- The project must be defined based from real data, and is data that has been thoroughly analyzed.
- The project must be appropriately supported in resources and management.
- The project must have a period of time to operate. That is to say, start and finish dates of the project must be identified.
- Can follow up and evaluate results

4) Types of research in each project course

(Boonreang Kajornsilp) has classified researches that are suitable for teaching in each Project course as 3 types, which are

- Survey research project is a research that aims at the study and compilation of data that occurs in the present time. It is survey of opinions toward a particular matter, or toward various events that already happened, such as the students' opinions toward the decisions to buy bakery products.
- Experimental research project is a research that aims at creating new situations and studying the consequent results, such as in creating a plant food formula, a new formula that make plants grow better than the food formulas that are sold in markets, the independent variable that created a new situation is the new fertilizer, and the dependent variable is the weight or height of the plant.
- Research and development project is a research that aims at creating new knowledge, products, or technologies by using scientific means and there are constant developments focusing on bringing the results to the users. Therefore, a co-operation is created between researchers and the research's users or

the target group, such as the invention of a pineapple-stirring machine is a laborsaving machine of the OTOP housewives group, thus allowing more production power for making stirred pineapples.

2.1.2 Research

1) Definition of research

There are various definitions given to this term as follows.

Poj Sapienchai stated, “Research is a problem-solving method that has a trustworthy planning system in order to create reliable knowledge”.

Anan Srisopha stated, “Research is clear process of searching knowledge from problems in a systematic manner. It involves hypothesis testing that portrays relations between causes and effects, which conforms to the aims of the particular matters, in order to forecast or observe the changes once controlling one thing to be stable”.

Best gave the definition, as “Research is a plan or analysis process that is objective. It has a systematic structure, records of reports, and results conclusion as regulations or theories, in order to be used to explain, predict or control various occurrences”.

Kerlinger gave the definition, as “using information in the hypothesis investigation about relations of natural occurrences through regular controls in a systematic manner”.

The Pan Pacific Science Congress 1961 at the United States of America has separated the meaning of RESEARCH as follows.

R - Recruitment and relationship means training people to acquire knowledge, as well as gathering knowledgeable people and operating together in connections and coordination.

E - Education and efficiency means the researcher must have education, knowledge, and high capabilities in researching.

S - Sciences and stimulation is the science that needs to be proven in order to research for the truth and the researcher must have stimulation power to generate the initiation and enthusiasm to research further.

E - Evaluation and environment the researcher must know how to evaluate results of whether the research that is in the process generates any benefits that are worthwhile continuing for, and must know how to use various tools and equipment in the research.

A - Aim and attitude has aims or goals that are definite and has good attitudes toward the results of the research.

R - Result the obtained results of the research must be accepted, no matter if they are positive or negative, because they are results that are obtained from systematic and reliable research.

C - Curiosity the researcher must have curiosity, interest, and eagerness in the research all the time, even though there is not much curiosity.

H - Horizon once the research results appear, they can be used to inform and understand those problems, similar to an emergence of a bright light. If a bright light does not emerge, the researcher must further proceed until a light is found, which is to say that the research results must generate peace for the community.

In conclusion, research is a reliable and systematic process used as a tool in searching for knowledge about various occurrences that are interested.

2) Types of research

The classification of research types can be made in many ways depending on the criteria or principles that the classifier will use to classify. The ways in classifying according to various criteria are as follows (Boontham Kijpridabarisut, 1992).

Types of research that are categorized based on benefits of using the results. Researches that are categorized according to this criterion can be classified into 3 types as follows.

- Basic or pure research – This type of research is a research to expand broader knowledge boundaries. It is generating new theories and ideas that support academic matters to be more complete, such as an analysis aiming to find nutrients in bananas, by only looking at bananas are composed of what nutrients. This type of research is time-consuming and is beneficial once taken for further research.

- Applied research – This type of research aims at bringing results to use for improving society conditions and human livelihoods to be better. For instance, from Basic Research results, it was discovered that teaching by using slides to supplement will make students interested in learning and can remember things longer. The teacher then brought the results of this research to test and find the efficiency of teaching, and observe whether this makes students more interested and can really remember the lessons taught or not. If it turns out that there is efficiency, it will make the teacher bring this to use in teaching, thus generating benefits for the students further.
- Action research – This type of research has the objective to develop new skills or new methods and use them to solve problems that directly occur in working. It is a research study about various problems in working by hoping to improve and amend the working conditions to be better. In fact, this type of research is one type of Applied Research, but it is different from general Applied Researches in that Action Research will study specific locations and organizations, and the research results cannot be referable to other groups or population.

Types of research are categorized according to objectives and methods of presenting data. Researches that are categorized based on this criterion can be classified into 5 types as follows.

- Exploratory research is a research that needs to compile basic information to find various facts about specific matters. There is no hypothesis formulation and no analysis of data comparison with different variables.
- Descriptive research is a research that wants to find answers of the what and how more than wanting to find answers of the why, as well as having no estimate of any occurrences in the future. The data analysis may also have comparison of the differences between the variables that were studied.
- Explanatory research is a research that tries to indicate or explain which variable(s) has relations or is related to any variable(s). It also looks at what are the characteristics of those relations and are they reasons of one another.
- Predictive research is a research that tries to indicate or predict occurrences in the future by utilizing the relations between the variables that were studied.

- Diagnostic research is a research to find the causes of the problems that happened, in order to correctly fix and prevent them from happening again.

Types of research are categorized according to the research methodologies. Researches that are categorized based on this criterion can be classified into 3 types as follows.

- Historical research is a research that uses scientific methodologies in the kind of studying historical facts in order to detect academic history in various academic disciplines, comprehending the events that occurred, and finding relations between events in the past and present in order to predict future events.
- Descriptive research is a research that uses methodologies to describe occurrences or events that took place in regards to what were they and what were the characteristics. It aims to search for facts and situations in the current status quo, as well as finding the relations of operations, ideas or attitudes by emphasizing on current stories as important.
- Experimental research is a study to seek facts by experimenting under the control of related variables with systematic plans and definite objectives, and can be repeated again to prove or test the results as well.

Types of research are categorized according to the general research methodologies. Researches may be categorized based on general research methodologies, which are classified into 6 types.

- Experimental research
- Historical research
- Expost facto research is a research that studies from the effect(s) toward the cause(s), which both the cause(s) and effect(s) already happened earlier. The study method will begin from specifying effect(s), or the dependent variable, and then search for the cause(s), which is the independent variable that leads to the effects. An example is the study of factors that influenced Thai men to make a living in the Middle East countries.
- Survey research is a study that searches into facts that currently appear in regards to what are they, what has happened, descriptions of the

apparent status for acknowledgement, and may compare with the current status appearing in various characteristics.

- Ethnographic research is a research that aims to explain the circumstances or occurrences that happened overall on whether there were any history and developments.

- Evaluative research is a research that aims to specify the value or success level of the activities, and make suggestions for further activities. Generally, Evaluative Researches will aim at finding 3 answers of the main problem, which are :

A. How successful will that project be?

B. How efficient will that project be?

C. Should the activities based from that project be continued or not?

3) Research procedures

- Selecting the problem for research the research will begin with there is a problem that has happened and needs the research results to solve that problem. Researchers or the faculty of the researchers that are specialized with that problem will be assigned to execute a research in that subject. Many problems may occur, but the important and urgent problems will be prioritized and selected to start a research first.

- Research planning and design mean the step of defining the problem by studying related data and research in order to conclude the boundaries of the problem through creating a clear research hypothesis, and as a guide to inform on the further procedures.

- Research planning and design is planning that will be put into practice according to the type and methods that are appropriate to the nature of the subject to be executing a research about. That is designing or choosing appropriate research methods, such as Experimental Research or Survey Research.

- Creating and testing research tools a good research needs tools that are precise, reliable, and suitable for the research methods. They may be tests, questionnaires, observations, or measurements from other scientific tools. The tools must be able to gather desired data completely.

- Data compilation is a compilation process according to the desired methodological techniques to acquire data. Compilation of some data can be very dangerous. Researchers must be careful and thorough.
- Data processing is bringing the obtained raw data into statistical process and method, or mathematics. It is categorization, accuracy check, search for the mean, and significance testing.
- Data analysis and interpretation the researcher must bring the results obtained from Data Processing to analyze in order to interpret and transform results from the obtained data to be easily understandable and inform the research results, which may be facts or tendencies.
- Writing research report generally, a research must be a document after the research was completed and the data analysis and interpretation came out clearly. Documents of research reports may be called by other names, such as thematic papers, thesis, dissertation, etc. Writing research reports is in academic format and is divided into chapters that arrange the contents according to the research procedures. There is proposal of information on the approaches and all of the research's important points, which will need to refer to various data.
- Presentation of the research results research results resentation is another step that will inform interested persons on what was obtained from the research, what was found from the research, as well as suggesting further usages of the research results.
- Follow up on using the research results the researcher is the knowledgeable person in the subject that oneself has executed a research more than anyone else, and can see the problem and ways to solve the problem. Therefore, following the results and taking the research results for use in order to learn whether users can use the research results correctly or not, whether it went along the line of what the researcher proposed or not, and whether there are any precision or unexpected problems that need to be solved or not.

2.1.3 Invention

1) Definition of invention

(Thepnimit Pinijnuek, 2010) Invention is work, produce, product, process, procedure, method, measure, or system, including various outstanding product designs as well as technologies, that was proven to be beneficial to the country and world society in science, medicine, and public health.

(Boontueng Nannha, 2002) Invention is creation of one thing that never exists. It may be a simple tool to use in living, a creation of new production processes or a creation of complex machines. In creating inventions, it may be produced from a need that wants to meet a desire or created from coincidence, which some have evolutions. Therefore, invention is creation of works, which may be in the product form for utilities.

2) Types of invention

- Invention to improve quality of life is an equipment/tool that facilitates in living, assisting, protecting, and alleviating accidents as well as in health, which enhances quality of life. It focuses on creativity, tools and equipment that facilitates in living.

- Invention to earn a living is a machinery, tool, or equipment that is invented to promote and support in making a living in various fields, such as industry, agriculture, commerce, home economics, and arts. Inventors are to execute works of invention that can be used in earning a living in various fields, such as machinery, tool, or equipment.

- Invention of finished products a finished product is a created invention that is completed and ready to use. Invention procedures or usage methods of the finished product can be demonstrated clearly.

- Invention in energy and environment a tool, machinery, or equipment that is used in the energy production to increase the efficiency of energy usage, decrease energy usage, or conserve the environment through research and development. There are research results indicating that the invention can be used as a concrete object with real benefits.

- Invention in the type of intellect that creates an economy This is a tool or equipment that is invented, created or developed from traditions, cultures, values or intellect to build the economy, and can be promoted, supported and developed for commercial production processes.

- Invention to develop innovation and technology is an inventive work of the young generation who experienced the young generation's inventions competitions, which were arranged by the Vocational Education Commission, Office of the Private Education Commission, National Research Council of Thailand, Ministry of Science, or Office of the Higher Education Commission. There are further developments in innovation and technology, which are brought into commerce or passed on the technology.

2.1.4 Education quality assurance

1) Definition of education quality assurance

The term "Assurance" in English is composed of 2 words, which are "Insure" and "Assure".

"Insure" aims at life insurances, accident insurances, and non-life insurances.

"Assure" aims at providing confidence to the money owner that the product of the organizaiton will have good quality.

Therefore, Quality assurance of the school's education is giving evidence and information to the people that personnel in the school work to their fullest potential to make parents, students, and the public confident that students will be good as specified in the syllabus and education quality standards. Moreover, it can be carried out to generate education quality according to the roles and duties of teachers in the Internal Quality Assurance System and External Quality Assurance System, along with constant developments.

Constitution of the Kingdom of Thailand, B.E. 2540 (1997), Section 81 has specified that the government must provide education, support the private sector to provide education to achieve "knowledge alongside morality", and provide law relating to national education, which led to the National Education Act, B.E. 2542 (1999). This resulted in a major reform in education that aims at education quality, which has specified to provide the Education Quality Assurance System to improve the quality and standards of education at all levels (National Education Act, B.E. 2542 (1999): Section 47).

It can be summed up that Education Quality Assurance means the management and operation based on the normal tasks of the schools to improve the students' quality continuously, generate confidence to the clients in education, both the direct clients such as students and parents, and indirect clients such as establishments, citizens and the overall community.

2) Importance of Education Quality Assurance

According to general practice, the definition of education quality standards will be determined by groups of persons, experts or experienced persons in the Thai education system (Murgatroyd, Stephen and Morgan, Colin 1994 : 45). In accordance with the National Education Act, B.E. 2542 (1999), it was specified that the Ministry of Education, Religion, and Culture shall determine the education standards (National Education Act, B.E. 2542 (1999): Section 31) by having the Education Religion, and Culture Council, the Basic Education Commission, and the Higher Education Commission to propose according to the ranks of the work line (National Education Act, B.E. 2542 (1999): Section 34).

Regarding the investigation and evaluation of education on how much it follows the education quality standards, the National Education Act, B.E. 2542 (1999) specified that original affiliations and schools shall have Internal Quality Assurance System and regarded the Internal Quality Assurance as a part of the education management process that must be operated continuously (National Education Act, B.E. 2542 (1999): Section 48). Furthermore, External Quality Assurance of every school shall be performed at least once in every 5 years, by which the Office for National Education Standards and Quality Assessment is the operator (National Education Act, B.E. 2542 (1999): Section 49).

2.2 Related research

Prasert Kerdchaiyawong (2008) has studied the development of an Online Information Management System on Lanna Culture, designed the structure of Lanna culture data to cover Lanna Kadee and local intellect, and developed tools that built and improved the information website on Lanna culture. Tools that were used in

developing the system consisted of PHP language and Relational Database System, by using the MySQL Database System. The system development used an Open-Source program, which facilitated all program writers in being able to access and amend the program to improve and edit the website as desired. After planning the data structure, developing the system, testing and improving the system, the researcher sent out a questionnaire to the system users asking them to use the system for testing once again. From the questionnaire enquiring the system users, it was found that the aforementioned system can be brought to use in efficiently improving information on the website and was easy to use. Apart from this, planning before developing the website obtained the data structure that covered content on Lanna culture, obtained tools to help building and improving the information website on Lanna culture, promoted access to data and supported the conservation of Lanna arts and culture in order to inherit as heritage for the next generation.

Sureelawan Suwannarak (2008) invesitgated the product information system for sales services. This research has the objective to develop a product information system for sales services of Air Thai Company Limited, which is a dealer of air-conditioners, that works on the company's internal network by storing air-conditioners data in catagories. Moreover, it can be used in searching for data conveniently and quickly, protects from loss of data, and also promotes the sales staff's decisions in selecting air-conditioner for customers. The method of developing this product information system used the principles of the Information System Development Life Cycle. It started from studying the various problems that happened, and discovered that the product information lacked completeness and were often mismatched. From there, analysis and design of a new information system took place, which the developed information system that consisted of 4 minor systems including usage rights examination system, records and adjustments system, data investigation system, and the system that promotes decision-making in air-conditioners selection. The system development used PHP language and the MYSQL Database Management System under the Microsoft Windows 2000 Operating System. Results acquired from this research allowed sales staff to quickly and conveniently search for information, save searching time, can record and adjust data correctly, and reduce errors and data

conflicts. Nevertheless, the system can calculate the suitable size of air-conditioners as well.

Puangrat Jinpol and Sunya Tabaniyom (2009) studied the development of a document management system by using distributed database on Web technology. The aim is to serve as a channel in communicating about receiving and sending documents between organizations of schools in the Southern region technology network, which are situated at different locations. The developed system helped in reducing the costs to contact between organizations and to make document copies, generated speed and convenience in sending and receiving documents, stored documents systematically and easily for searching, controlled the rights to use, had the 2 languages menu system, can increase unlimited branches, and users can adjust the startup settings of the system. The system was developed by using the Adobe ColdFusion 8 program in developing the Web Application, and using the Microsoft SQL 2005 program as the Database Management System. Internet network was utilized in connecting databases. From evaluation of the users' satisfaction with questionnaire, it was concluded that the developed system has efficiecy in a good level, can be used, and saves costs according to the objectives.

Komyut Chaiyawong (2009) This research presents website system development of database of researchers in Loei Rajabhat University Research and Development Institute. The benefits received from website system development were to support personnel in university and general people to search research information that were studied in the university. The developed system can help users to search information, presents information and searched details. It consists of personal information, educational information, research project information and publishing work information in primary system development by designing system development to enable experts to tests functionality. The experiment was tested in the sample group of professors and staff in the university and reported to work performance by using tool for development, such as, PHP programming language, database MySQL, instant program Dreamweaver and instant program Photoshop. For the results of web system development and database website of researchers in Loei Rajabhat University Research and Development Institute, the sample group of professors and staff in the

university had tested by using information searching system. The results obtained from the search by the sample group were correct following effective usage.

Rossukon Pinthong (2011) studied about management of research and project data. The aim is to promote searches for research and project data with efficiency, accuracy and speed. This project will be a system development to stay in the form of Web application for easy usage. It was developed by bringing the web server program, database server, and asp.net program as elements in the program development, in order to manage the program with efficiency.

2.3 Related theories

2.3.1 System Development Life Cycle: SDLC

System Development Life Cycle (SDLC) is a methodology used in developing the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College. The SDLC is a method that has clear procedures. There are various procedures as follows (Siriluck, 2002: 31)

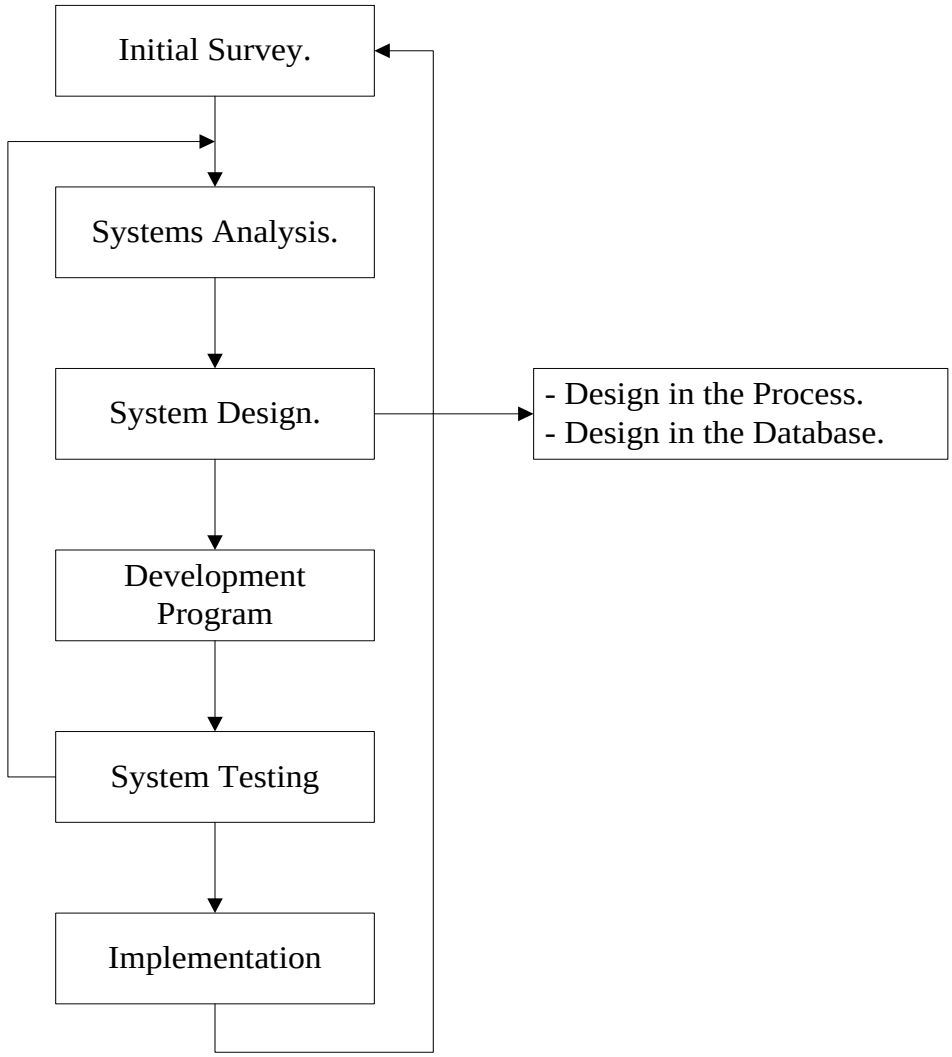

Figure 2.1 System Development Life Cycle: SDLC

Figure 2.1 displays the System Development Life Cycle, which is a life cycle portraying the various activities in each procedure from beginning until completion. This System Development Life Cycle will comprehend the basic activities and various details in the development system, by having 6 procedures as follows.

- Initial Survey is a study of the operational procedures and problems of working, in order know what the system users need. This is to serve as a guide in data analysis and as a way to operate to achieve the desired results, through using data compilation from various report documents that are related, or using interviews.

- System Analysis Definition is a procedure that defines the boundaries of the problem, causes of the problem from current operations, and probability of building a new system. Moreover, it defines the demands between system analysts and users, specifies various equipment and technologies by concluding data from the Preliminary Investigation as comprehensible regulations.
- System Design is divided into 2 sections including process design and database design. This involves analyzing the demands obtained from step 2 in detail, in order to develop as a Logical Model, which consists Data Flow Diagram, Process Data Description, and Data Model. The model is in the form of ER Diagram, which portrays the details of operating in the system, and involvements or relations with any subject.
- Development is a system development by creating an instruction set or writing programs to build a system that can function according to the designed system.
- System Testing is a procedure of testing the system before operating it for real use.
- Implementation of the New System and Results Evaluation is an operational procedure of installing and testing the completely developed system, as well as training system users to be able to operate works by using this new system. Furthermore, it also involves evaluation of the system's operation.

In developing the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, the 6 operational procedures of the Information System Development Life Cycle were used as a direction to study the work system.

2.3.2 Satisfaction search

Satisfaction, according to a dictionary in behavioral science, means the state of feeling of an individual that is happy, complacent, and delighted when one's desire or stimulus has been fulfilled. As for the definition in psychology, it means the feeling in the initial stage when attaining purposes and the feeling in the final stage

when accomplishing goals through motivation (Montchai, 2002: 318). Generally, the term means appreciation, favor, or approval of what is seen or felt (Available on: www.stou.ac.th).

Thus, satisfaction or contentment is an important experiment variable that is widely used in the results evaluation of the developed systems in information technology experimental researches, including general experimental researches, information system researches, and researches in teachings by computers. The reason is because it is the results evaluation regarding the quality in the feature of the overall system that is not complex. It is an enquiry of feelings, attitudes, or likings about the developed system or equipments, which has no consideration criteria of whether certain points should be asked or what are the boundaries of the questions, because it is an overall enquiry. However, there are 2 directions to use in defining the main points of the questions that are widely used as follows.

- The direction of overall evaluation, such as enquiring about the input, process, and output by thoroughly inspecting each section on whether there are any messages that can be asked from the users about the satisfaction of using the developed system or equipment from the research, and about the input, process, and output. It can be said that this direction is a direction that is mostly used in satisfaction evaluations.
- The direction of using evaluation theories, such as adapting the CIPP Model or Alkin Model, etc. by determining the existing evaluation theories in satisfaction evaluations. For instance, if adapting the CIPP Model, it is a satisfaction investigation of users about context, input, process and product.

For data compilation, questionnaires are preferrably used more than interviews, by acting with sample groups that are the direct users in order to evaluate satisfaction of users after using. The results acquired from the evaluation will be the index indicating satisfaction of the sample group in order to bring the obtained results for further system changes. Regarding the statistics used in analyzing satisfaction obtained from questionnaires, the mean, median, mode, and standard deviation may be used, as well as using the statistics on satisfaction comparisons of users in each group.

Criteria for average scores interpretation

Interpretation of satisfaction levels by using average scores as a measure following criteria to analyze as the concept of Best W. John that use Normal Distribution to divide persons. The persons who were in the highest and lowest level were always a minority in society. The persons in the middle level had similar number. Using the average of scores as an indicator was performed by specifying score level for dividing into 5 levels by determining ranks of measurement as follows.

Average score 4.50 - 5.00 means 'Highest level' of satisfaction

Average score 3.50 - 4.49 means 'High level' of satisfaction

Average score 2.50 - 3.49 means 'Moderate level' of satisfaction

Average score 1.50 - 2.49 means 'Low level' of satisfaction

Average score 1.00 - 1.49 means 'Lowest level' of satisfaction

2.3.3 Database Management System

Database System is a system that compiles various related data together in a systematic manner and has obvious relations between various data. The database is systematically composed of many data files that have related data and allows users to efficiently use and look after these data by having a software similar to a medium between users and various programs relating to the database usage. It is called Database Management System or DBMS.

Database Management System or DBMS is a software that manages the database by facilitating users in the creation, adjustment, data access, and management about Physical File Organization.

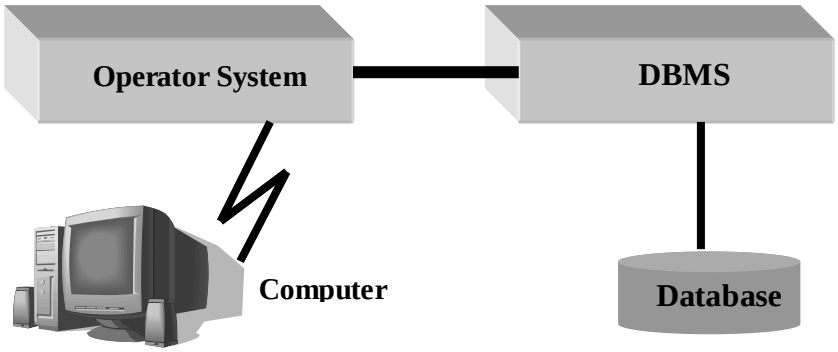

Figure 2.2 Structure of database management system and the operating system.

From figure 2.2, it can be seen that users can access data in the database through the DBMS, by which users may write applied programs or Query languages in the part of File Management, in order to pull out the database into the database to store in the buffer for data processing.

The aim of the DBMS is to assist in improving programs that can work easier, faster with accuracy and reduce costs. Mostly, DBMS that are currently used will present connections between data in the form of relation, which is simple to use since the data structure is not complex and has suitable languages, such as SQL.

1) Importance of Database

Apart from facilitating in operating faster, using the computer systems to evaluate data results enables precision in data processing as well. For instance, in the case of a hospital's database system, when a patient urgently needs a special blood type, a blood donor of the same blood type is crucially needed by using the database to search for a blood donor that has the qualifications, which are the donor must weigh more than 45 kg, did not donated blood over the past 90 days, and the donor should reside near the hospital, etc. Apart from this, the database system also has significance in other following areas.

Efficiency in the Database Management System helps the management flow efficiently and achieves more goals, such as the chancellor wants to know the number of instructors or personnel that retire in each year, the discipline instructors that retired, and whether there are any disciplines lacking in the future. The database system can provide answers to the directors.

Data enquiry The Database Management System has a language used in the enquiries for instant data enquiries although the programmer did not write enquiry commands on some items. Specialized users can use the commands to acquire answers immediately as well. For example, in the case of the patients' database system, if the director wants to know the number of patients that happened from motorcycle accidents, the enquiry command may simply be used.

Access to data Database Management System properly provides the service to access data, has a security system, as well as good management of data, and because the Database Management System has a function of giving the rights to access data in which external users is not able to access data if they are not

given the rights from the system administrators. Moreover, it reduces data that are in conflict with the Database Management System, assists in lessening clashes or conflicting data, thus making data more complete.

2) Necessity to use the Database Management System

- Data Independence Control makes the program free from the physical and logical data structure, and reduces the maintenance cost.
- DBMS has an Integrity Control of data in the file system. Previously, data accuracy was controlled by programs. However, a new concept will be controlled by the DBMS. This Integrity Rule will be stored in the database. Every time data is pulled out to be adjusted, the DBMS will examine the probability of the data before storing in the database.
- DBMS has a data security control system. DBMS will not allow any programs to access low-level data without passing through the DBMS.
- DBMS has a way to access data with Query Optimization. DBMS Query Optimizer decides on the path to access data in which users do not have to worry about performance.

2.4 Related technologies

2.4.1 PHP - The Language used in the system development

PHP language is a language program that can be used in the Internet network system, has high capabilities and is widely used. It can be legally downloaded for free. Apart from this, PHP language is able to work with MySQL Database program, which is also a program available for free download.

PHP is a scripting language. Various commands will be stored in text format, and may be written in the HTML language or used freely. Yet, real usage is mostly with along with the HTML language. Therefore, writing this program requires decent knowledge in the HTML language. However, we can use applied programs to facilitating in creating works, such as Macromedia, Dreamweaver, or Editor programs, (programs that facilitate in writing diverse programs) such as EditPlus, Macromedia, Homesite, etc. These programs will help in classifying words, such as commands,

general words, variables, etc. to have different colors to be convenient in observation, and there are numbers indicating lines, which allow convenience in editing.

PHP is a language that has evaluation of the server, by acting as a tool that allows us to create HTML document files that have dynamic movements, or are called Dynamic HTML. Servers that have evaluation before sending data to the users' devices are called Server Side Includes (SSI). Operating in this manner enables higher speed in the operation as well.

PHP language has the following benefits and limitations.

- Is a free program (Can download from the Internet legally)
- Can be used with a variety of databases such as MySQL
- Evaluates program results faster than using other programs
- Can operate on many Operating Systems

2.4.2 MySQL

MySQL is a Database Management System program that is responsible for storing data systematically and supporting SQL commands (SQL = Structured Query Language). It is a tool for data storage that is to be used with other integrated equipment or programs to acquire the Operating System that supports the users' demands. For instance, it can be operated with the Web Server to provide services for the scripting language that operates on the Server. Examples of the Server-Side Script include PHP language, ASP language, or GSP language, etc. Moreover, it can be operated with Application Programs, such as Visual Basic language, Java language, or C language, etc.

MySQL is an Open Source Database System for managing the Database System through SQL. This program was developed by MySQL AB Company in Sweden, and it is available in both free and business versions.

2.4.3 Web Server

The Web Server's basic operation will be sending the webpage, which is stored in the Server, to the Web Browser in the devices that requested. Most of the data in the webpage will be in the form of tags in HTML language and scripts that operate on the client side, such as JavaScript. However, for using the database system

along with the webpage when the Web Browser requested to the Web Server, the PHP will act as a medium in pulling the data from the database, and organizing into HTML scripts in the format that the Web Browser can understand, as shown in figure 2.3.

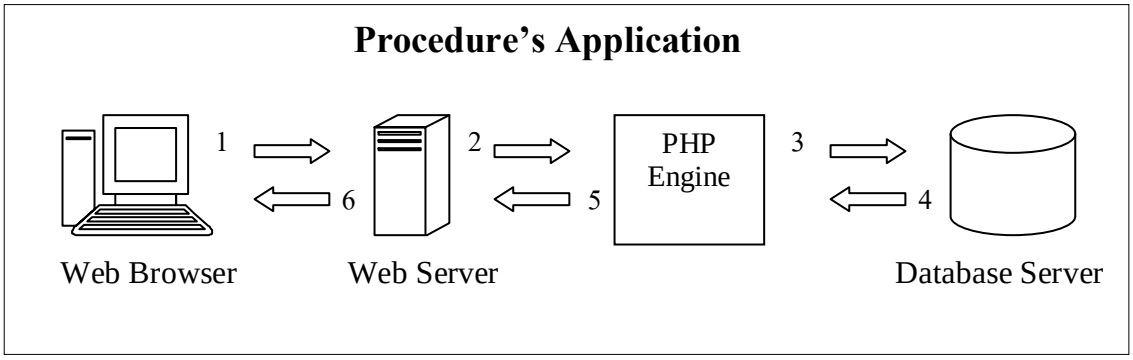

Figure 2.3 Procedures of the web application's operations.

Figure 2.3 explains the web Application's procedure that has connections with the database as follows.

1. The Web Broswer requests the webpage with the HTTP protocol to the Web Server.

2. Once the Web Server receives the request, it will call the requested file and send to the PHP Engine to process data.

3. In the case of scripts having commands to connect to the database and create the Query to read or process database results, the PHP Engine will make connections and send the Query to the Database Server (it means MySQL in this case).

4. The Database Server will send results of the Query back to the PHP Engine.

5. After the PHP Engine brought the data obtained from the Database Server to process data, it will create results in the form of HTML and send back to the Web Server.

6. The Web Server will send the results in HTML format back to the Web Browser to display the results.

2.5 Conclusion

From the results of studying related documents and researches, it can be conluded that the researcher has an idea to bring knowledge obtained from studying to adapt and use as elements in developing the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College. The system to be developed shall have completion, efficiency, flexibility and ability to bring the aforementioned system to real use according to the objectives stated in Chapter 1. After that, a study was investigated regarding the languages to be used in developing the system, in order to study the probability of using in the system development with the researcher's organization. Once studied the meanings, definitions, and probability of bringing the advantages of the network and languages that are used, development to increase the system's efficiency can be started. It is necessary to return to use the System Development Life Cycle to allow the system development at this time to be possible in a systematic manner, and prevent problems from happening during the system development. Moreover, once the researcher developed the system in order, it is essential to study the satisfaction of the system users, system administrators, and technical experts to learn about the attitudes and satisfaction toward the system that the researcher developed, in order to increase the efficiency of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, on whether satisfaction was generated or not.

CHAPTER III
MATERIALS AND METHODOLOGY

In the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, the researcher has operational procedures and methodology in the following formats.

3.1 Procedures for data management system

3.2 Preliminary investigation

3.3 System analysis

3.4 System design

3.5 Population and sample groups

3.6 Data compilation

3.7 Methodology to evaluate satisfaction

3.8 Research schedule

3.1 Procedures for data management system

In the construction of tools, the researcher has studied and analyzed the data of the former system, as well as the users' demands. These were then experimented, data was gathered, and results were concluded from experiementing both the old system and the new system. In this research, the researcher has developed the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College. The tools used are divided into 2 sections, which are

1) The Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, and

2) Questionnaire to measure the satisfaction of system users in order to compare the qualities of both the former system and the new system that is to be developed. The system development and evaluation has the following procedures.

For developing the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, the following programs relating to the development were chosen.

- Windows 7 Operating System
- Appserv 2.5.10 Program to use in creating Web Servers
- Adobe Photoshop CS5 Program to use in creating and editing photos
- Adobe Flash CS5 Program to use in creating animations and motion images
- Adobe Dreamweaver CS5 to use in creating Web Applications
- Web Browser to use the Internet
- Microsoft Word 2010 Program to use in creating documents
- Microsoft Visio 2010 to use in creating system design tools

The procedures of developing the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College.

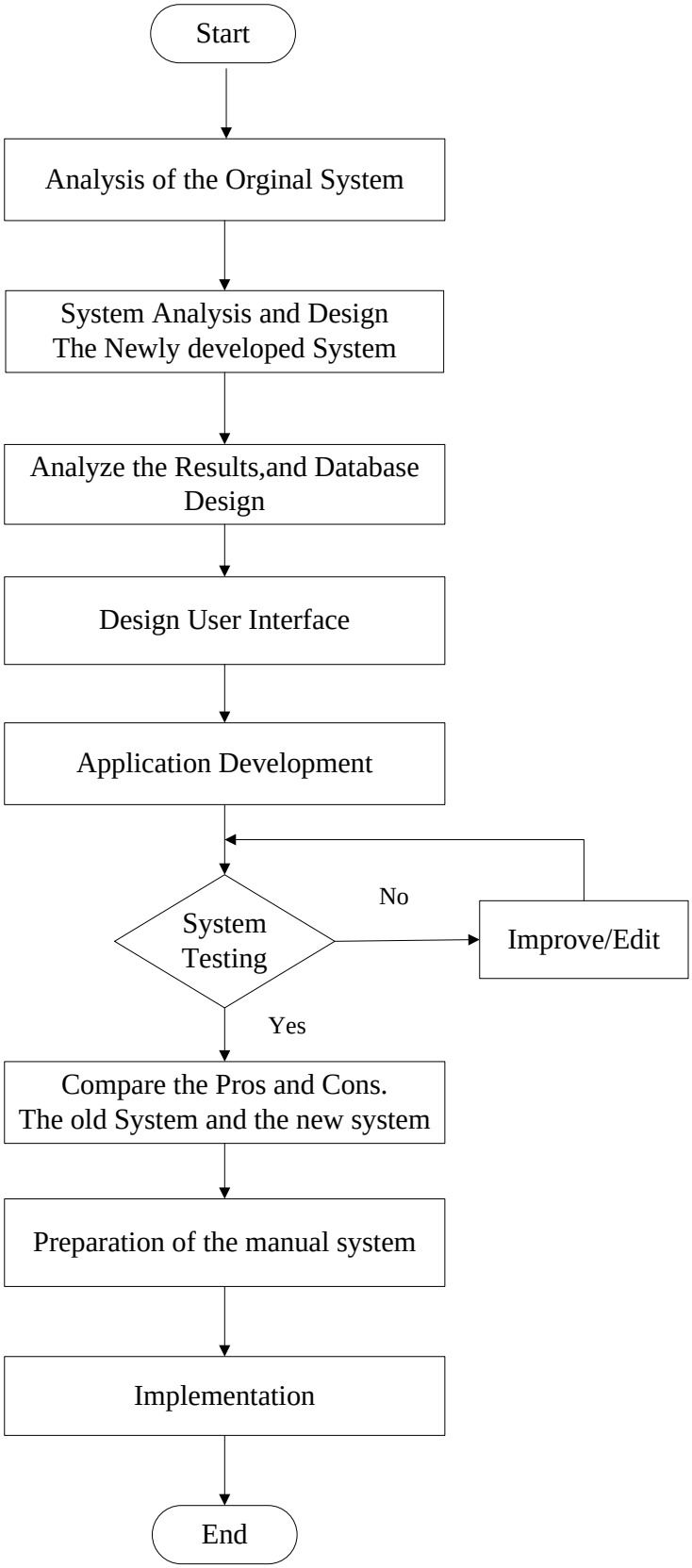

Figure 3.1 System Development procedures

Figure 3.1 displays the procedures of developing the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College. It started with designing the system and analyzing operational procedures. After that, system data was analyzed, and the results obtained from the system were used to create the database. Once all data were completely analyzed, the design and development of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College began. In this step, the developed program will be examined by technical experts regarding the suitability to operate, and accuracy in the system's duties and operations. After completing the development, a manual on the system operations must be created and used in the satisfaction evaluation that the users have toward the system. The development used the creation and design methods according to the System Development Life Cycle (SDLC) for information systems, by which the procedures and methods are classified into 6 steps as shown in figure 2.1

3.2 Preliminary investigation

A study of the operational procedures and operational issues in the former system of data storage on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College. This is to observe the flaws and errors of the data management, and the most important part, which is the part of data storage in the file format. The former system is only filing in the document format, and summaries on the operation results in the document format were saved in computer devices. Nevertheless, there is a lack of a channel to distribute the mentioned documents, which affected the efficiency of operations and Education Quality Assurance.

In the analysis and system design, the researcher has carried out by interviewing relating officers, teachers, and students, and designing the questionnaire

to use in analyzing and designing the system to cover the operations and has maximun efficiency. From studying the former system, the details can be explained as follows.

The operation of creating a Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, through the Internet network can be divided into 3 main parts of operations, which are

A. The part of education personal, who are the system administrators,

B. The part of teachers, and

C. The part of students

There is a lack of flexibility in the former system. Although the data storage system through computers were brought to use, with computer programs including data storage, saving, adding, editing, or changing data, it was still difficult to use on the users' side. Therefore, a traditional document system was returned to be used, in which the operating steps are explained as follows.

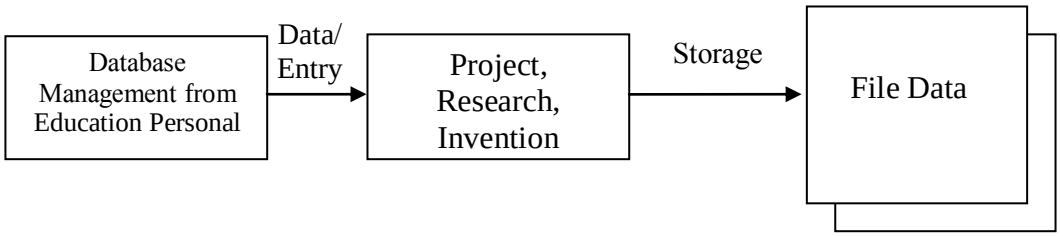

Figure 3.2 Operation of the former system

In the structure of the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, the researcher would like to explain the part that involves the demands to develop an information system to manage data on projects, researches, and inventions. The section of innovation and invention developments researches is one of the units in planning and co-operation that has the following duties and responsibilities.

1) Promote and support students and personnel in the college about research, development of various knowledge, technology, innovation, and inventions,

in order to be useful in education management, career, and overall benefits of the society, community, and region.

2) Analyze, research and evaluate results of using syllabuses, achievements, learning management, usage of tools, materials and equipment, educational durable objects, usage of buildings, other events relating to learning management, and evaluation of arranging trainings and activities in the college.

3) Gather and distribute results of analyses, researches, and evaluations of learning management, innovation and inventions, school development, management, career development, as well as academic works of teachers and education personnel.

4) Co-ordinate and co-operate with various units, both inside and outside the school

5) Arrange operation schedules, propose projects, and report operations according to rankings

6) Look after, preserve, and be responsible for the school's assets as assigned and perform other tasks as assigned

From the fact that the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, was assigned to compile and distribute results of analyses, researches, and evaluations of learning management, innovation and inventions of Wangklaikangwon Industrial and Community Education College, which the amount of documents on projects, researches, and inventions in each year are excessive and accumulated over time, the filing system in the form of documents therefore needed to find storage space and be properly organized. Moreover, searches for referencing or researching were difficult and time-consuming. In addition, it was discovered that documents were damaged or lost from searching, and is still lacking a distribution channel of the documents as stated.

However, the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, has brought computer programs and computers to save and store data, but since the mentioned system did not genuinely respond to the users' needs, there were delays in searching reports, adding data, editing data, which were essential and affected data

storage on projects, researches, and inventions. There are various problems regarding the current data storage.

A. Data on projects, researches, and inventions were in the document format only. The time period caused the documents to be damaged and lost, and also difficult in searching.

B. Data of projects, researches, and inventions were saved in computer programs, but not in the systematic manner. The data details that were stored cannot be used to create information for presenting works.

C. There is no statistical report on data of projects, researches, and invetions.

D. Report summaries in each academic year could not be instantly made. It required time to investigate.

E. Defining the problem, aims, and goals are as follows.

- Problem definition – Data on projects, researches, and inventions that are in the responsibility of the section of innovation and invention developments researches in data storage and distribution as mentioned do not have a system that can efficiently support the operation.

- Aim – The Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, through the Internet network is able to systematically compile data, has efficiency, and can distribute projects, researches, and inventions, in the section of innovation and invention developments researches.

- Goal – To develop the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, in which teachers, education personnel, and students can access to use the system through personal computer devices that can connect to the Internet network system.

3.3 System Analysis

1) Defining the system administrators' demands that were obtained from data compilation of the demands, which are the ability to manage the users' data and data on projects, researches, and inventions, as well as able to manage the Web Application's operation.

2) Defining the users' demands that were obtained from data compilation of the demands, which are the ability to log-in/out from the system, and the ability to add, edit, and delete project data (in the student's section), and the ability to add, edit, and delete research data (in the teachers' section).

3.4 System Design

The ability of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College

- Can log-in to the system and log-out from the system
- Can manage data on projects, researches and inventions
- Can search for data on projects, researches and inventions
- Can display data on projects, researches and inventions
- Can show comments throught the website
- Can show reports on projects, researches and inventions
- Can assess satisfaction in using the system through the Internet network

1) The diagram illustrates the operational structure of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, The system can be divided into The system has the ability to use the system in different ways in figure 3.3

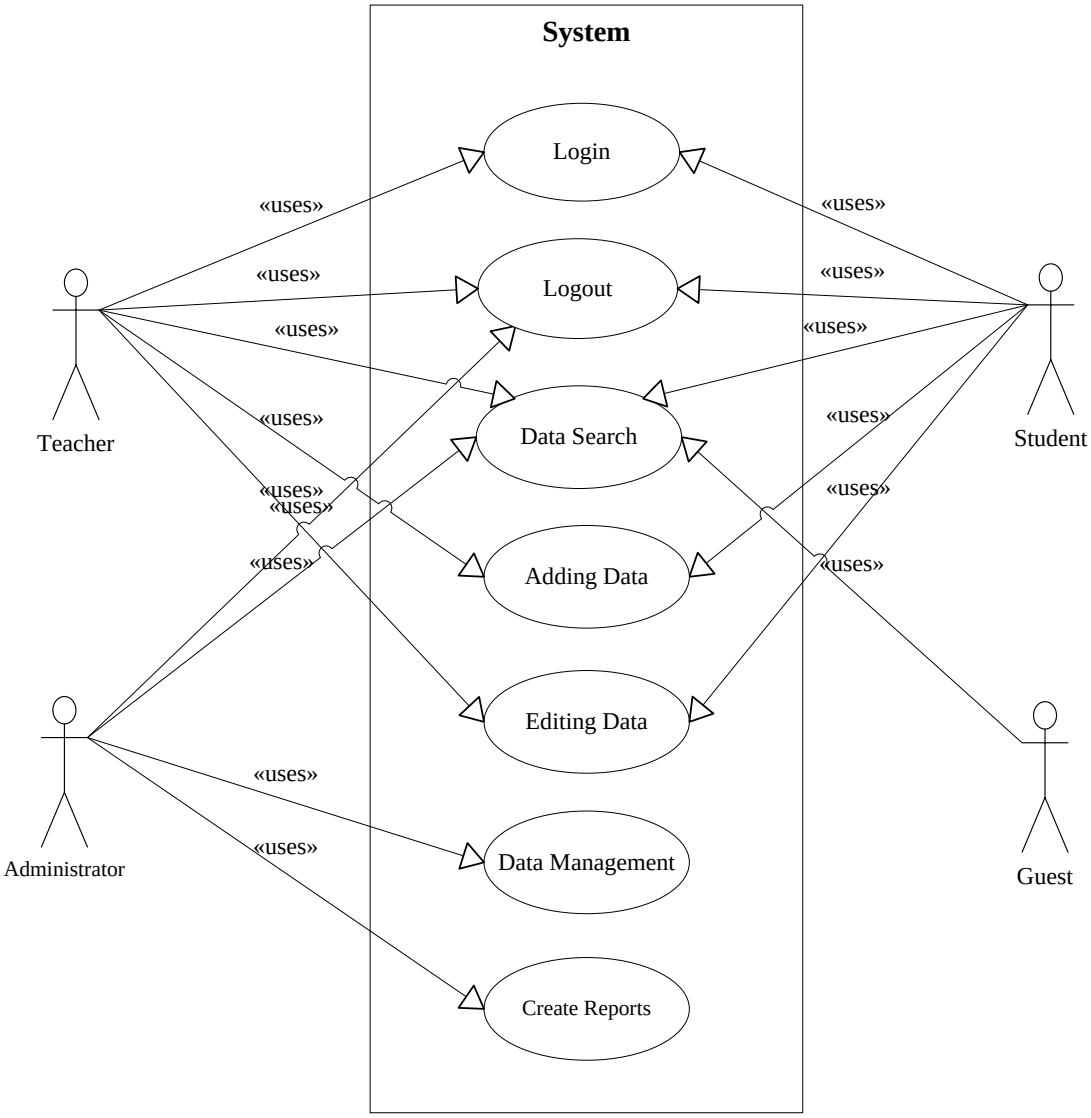

Figure 3.3 Use case diagram.

2) The diagram illustrates the operational structure of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, regarding the system log-in of administrators, teachers, and students, as shown in figure 3.4

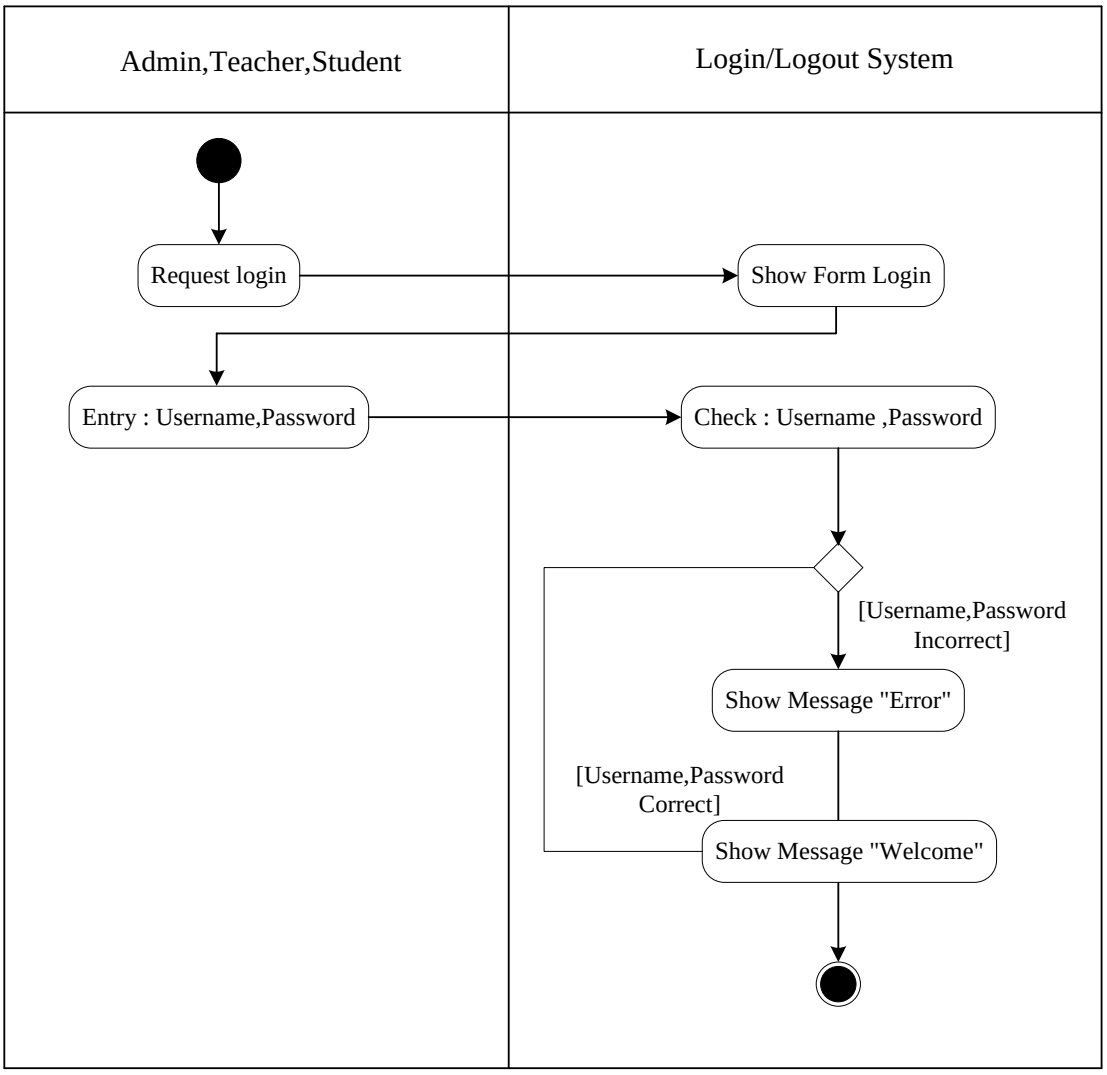

Figure 3.4 Operational structure of the developed system in the system log-in section.

Figure 3.4 portrays the operational structure of the program verifying the system log-in, and verifying the users. Before using to the system, logging in to the system needs to be completed first, and the system is divided into 2 levels of users consisting of system administrators and system users (system users are teachers and students). Users in each level are able to log-out from the system when they want to finish using. Moreover, the system will verify the content parts that the users have the rights to access, and thus display those particular content parts.

3) The diagram illustrates the operation of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, regarding adding data of the administrators, teachers, and students, as shown in figure 3.5

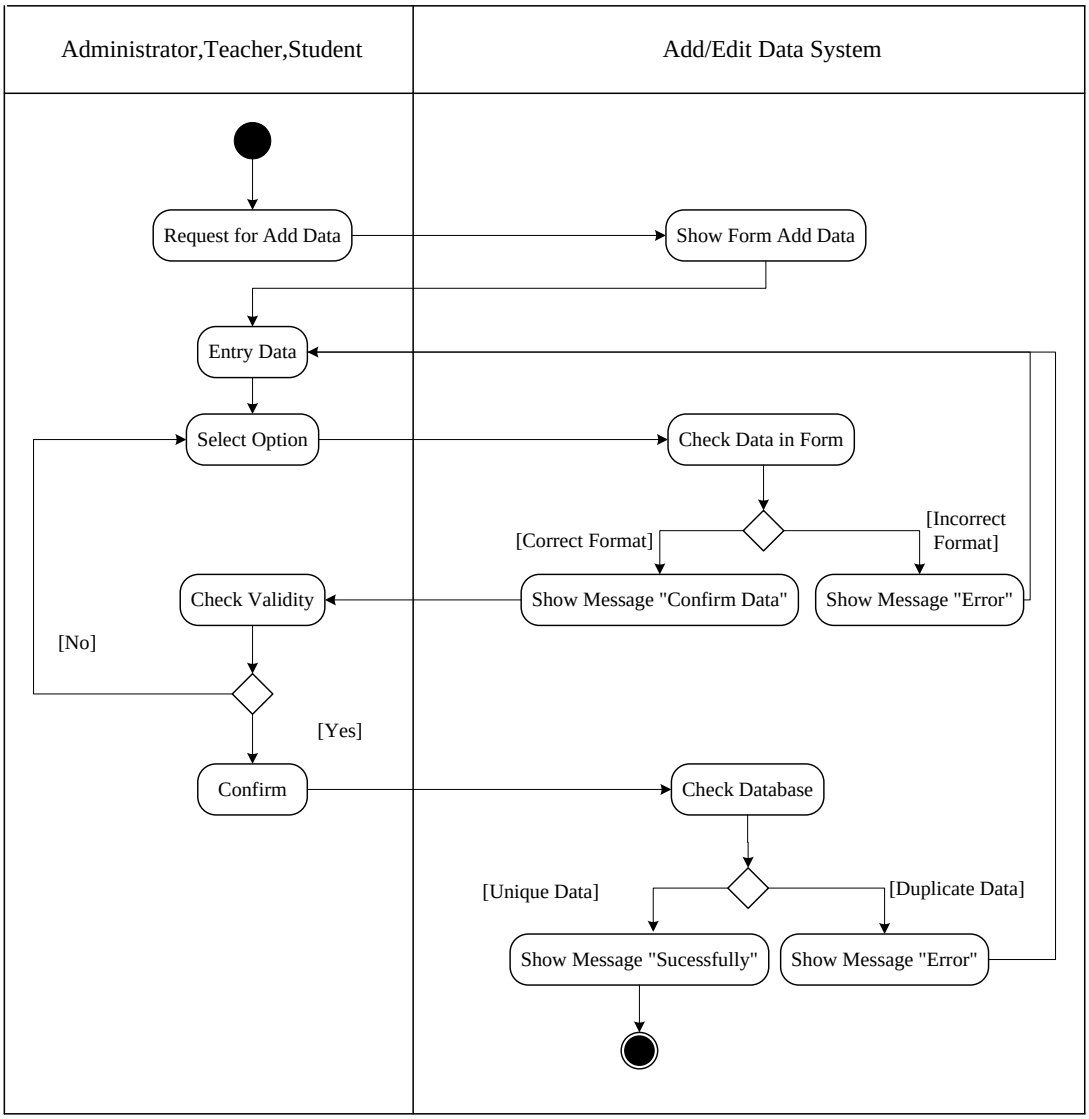

Figure 3.5 Operational structure of the developed system in the section of adding data.

Figure 3.5 shows the operational structure of the developed system in the section of adding data, by which data is received and verified to match to the part that the system indicates, and displays the confirmation message before saving the data.

4) The diagram illustrates the operation of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, regarding showing reports, as shown in figure 3.6

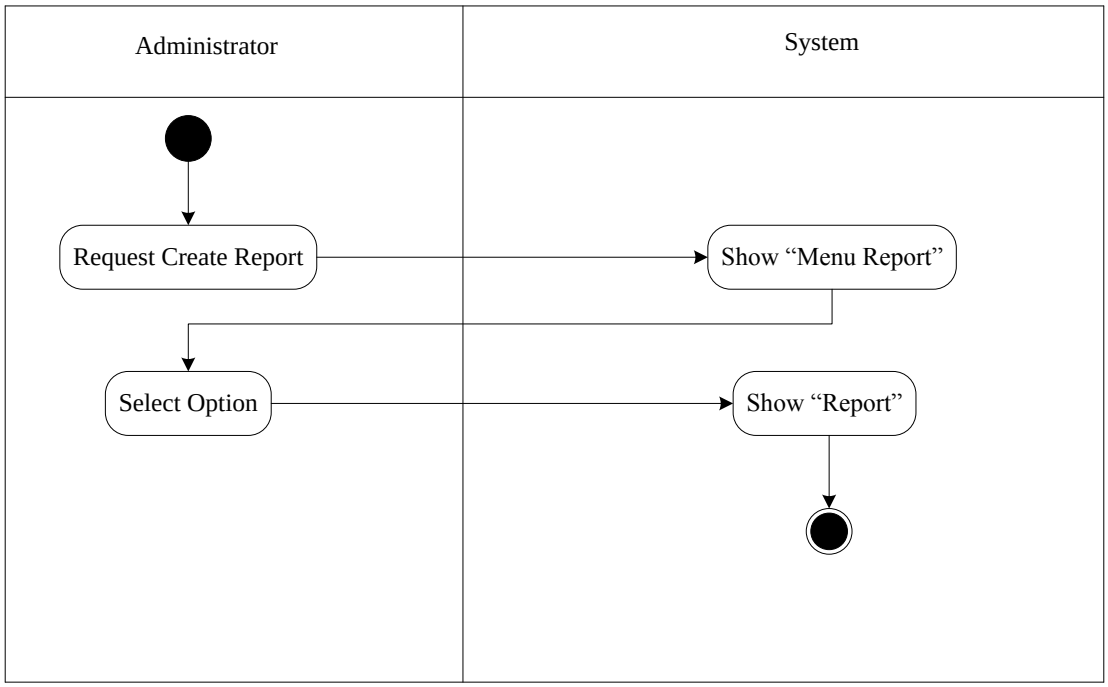

Figure 3.6 Operational structure of the developed system in the section of showing reports.

Figure Image 3.6 portrays the operational structure of the developed system in the section of showing reports, by which the system can show data about the number of projects, researches, and inventions from the menu selection.

After analyzing the system, this step must set the structure of the Operating System. It is selecting the hardwares and softwards that are suitable to the work. The hardwares are consisted of the following computers.

A. The Server computer has the following features.

- Microcomputer is no less than Pentium 4
- RAM is more than 1 GB
- Hard disk has a capacity no less than 40 GB

B. The Client computer has the following features

- Microcomputer is no less than Pentium 4
- RAM is more than 512 MB
- Hard disk has a capacity no less than 40 GB

C. In softwares, they are composed of

- Microsoft Windows XP Operating System or higher
- MySQL Database Management System
- Web development programs, such as Dreamweaver
- Web Server programs
- Browser programs, such as Explorer Browser Version 6 or higher

5) From the step, Database design begins the Design Data Flow Diagram is shown, which is a diagram showing the flow of data from the starting point to the end point of the operation, as well as data processing in each step of the system management. The Data Flow Diagram of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, has the design process through using the DFD (Data Flow Diagram), as shown in figure 3.7

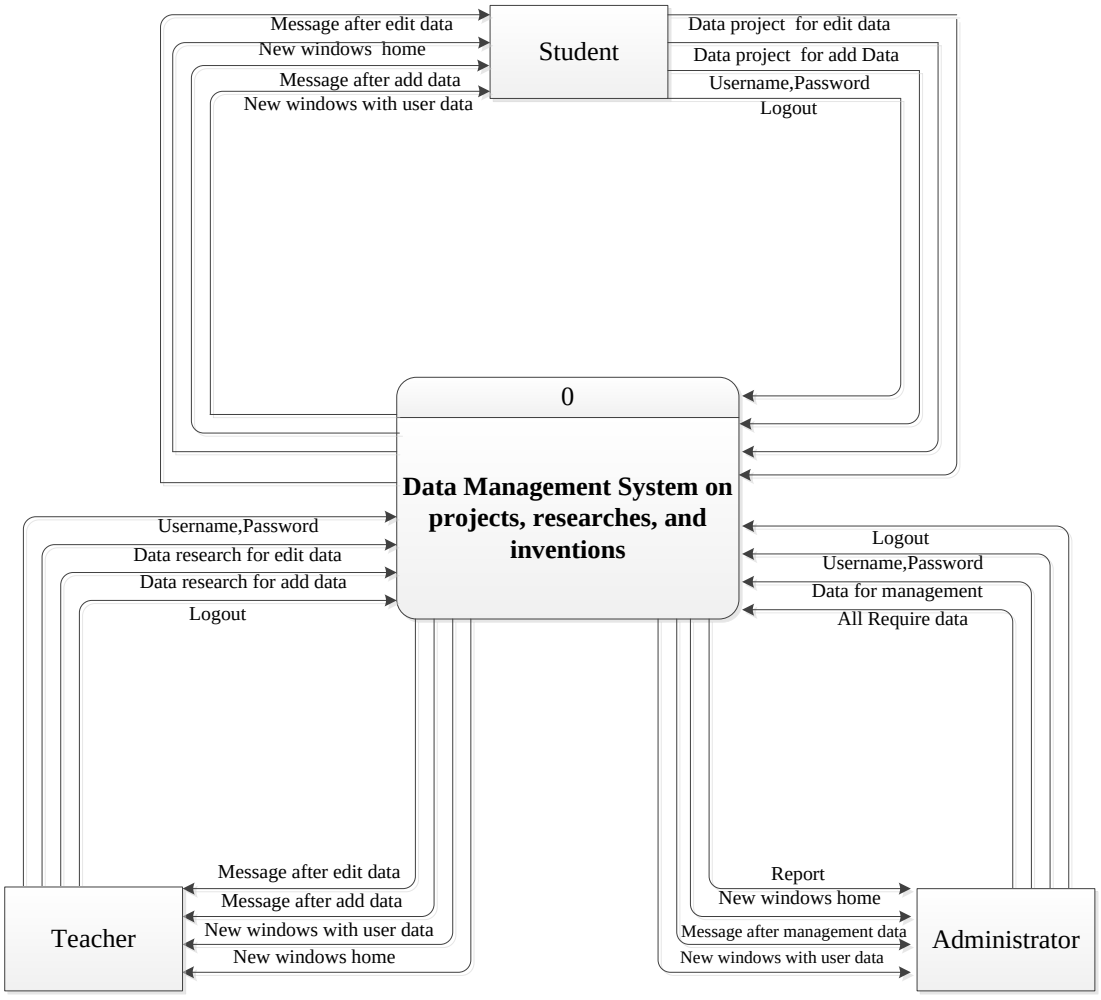

Figure 3.7 Context diagram
(Data flow diagram level 0).

Figure 3.7 portrays the Context Diagram of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College. It shows the main Operating System of the program, and displays relations of various External Entities as follows.

A. Administrators are the users with the highest level in the system, have the duty to manage basic data for the system, such as users' data, news data, project data, and research and invention data. System administrators can manage all parts of the system as follows.

1) Edit personal data of system administrators
2) Manage, add, delete, edit data of system users
3) Manage, add, delete, edit teachers' data
4) Manage, add, delete, edit students' data
5) Manage, add, delete, edit news data
6) Manage matters of reports

B. General users are system users of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College. They consist of teachers and students in using the system for managing, adding, deleting and editing data on projects, researches and inventions. This can be displayed from the process of designing the DFD: Data Flow Diagram, which is a diagram displaying the flow of data in the system at various levels. The Data Flow Diagram is the overall image of the diagram displaying the flow of data in the whole system, as shown in figure 3.8

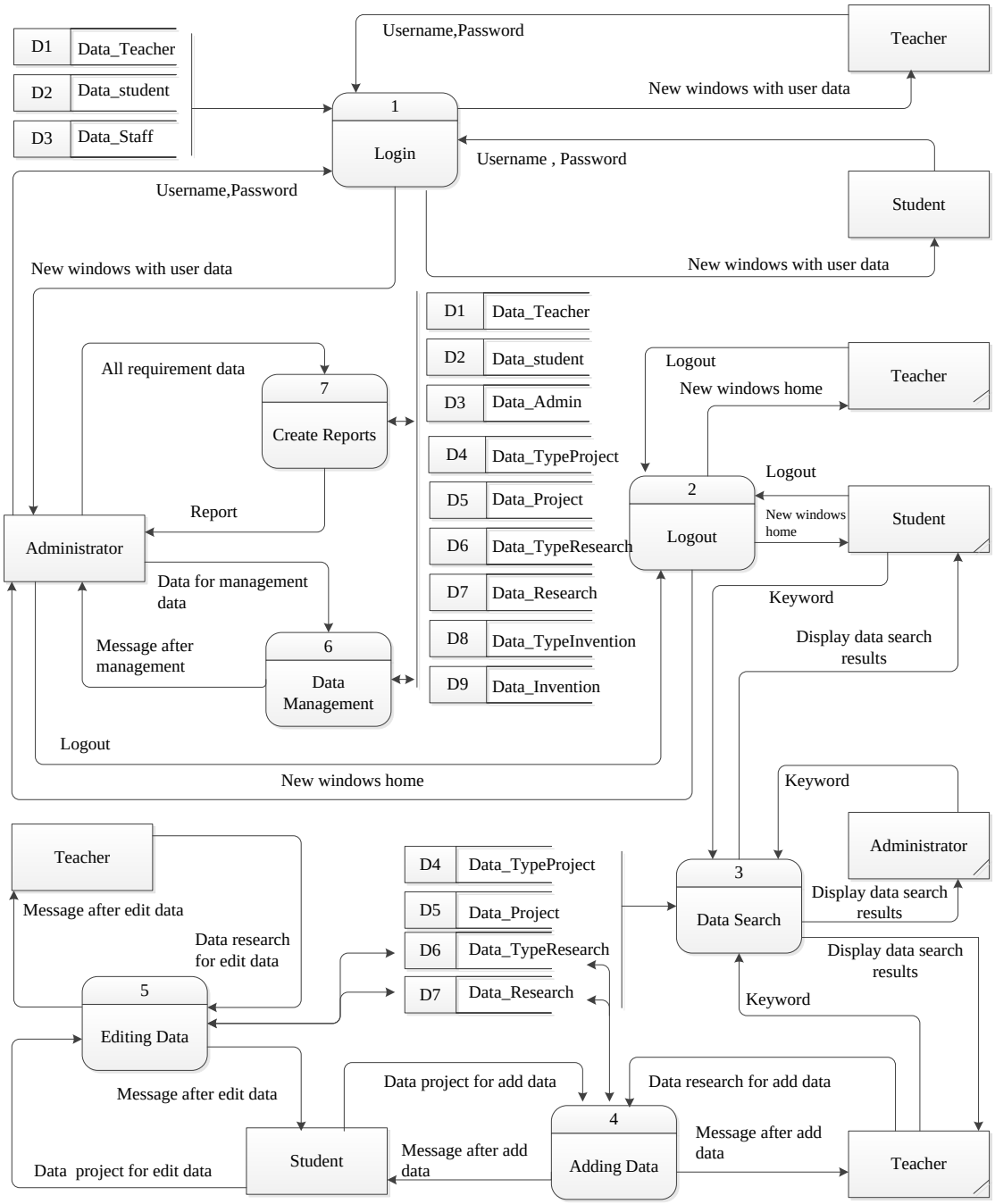

Figure 3.8 Data flow diagram level 1.

Figure 3.8 form data flow diagram Level 1 Consists of the login process, logout process, data search process, adding data process, editing data process, data

management process, and create report process in form data flow diagram Level 2 of each process is shown in figure 3.9

DFD Fragment Level 2

DFD Fragment Level 2 Process 1 – Log-In

Process 1.1 : Verify data entry

Process 1.2 : Confirm system entry

Process 1.3 : Verify data

Process 1.4 : Display the result of system entry

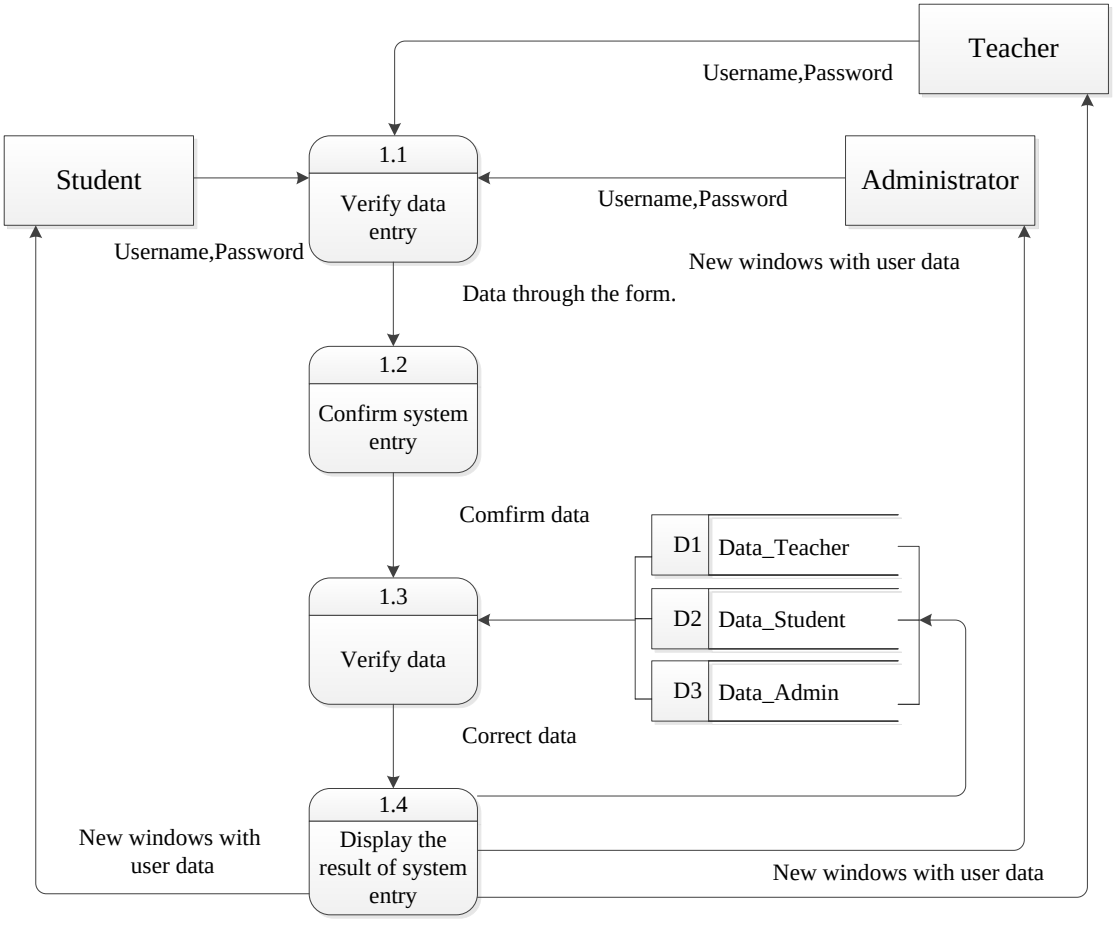

Figure 3.9 Data flow diagram level 2 Process 1.

Figure 3.9 form data flow diagram level 2 process 1 is system log-in consists of the verify data entry process, confirm system entry process, verify data process , and display the result of system entry process.

DFD Fragment Level 2 Process 2 – Log-Out

Process 2.1 : Display warning message of leaving the system

Process 2.2 : Confirm leaving the system

Process 2.3 : Display the result of leaving the system

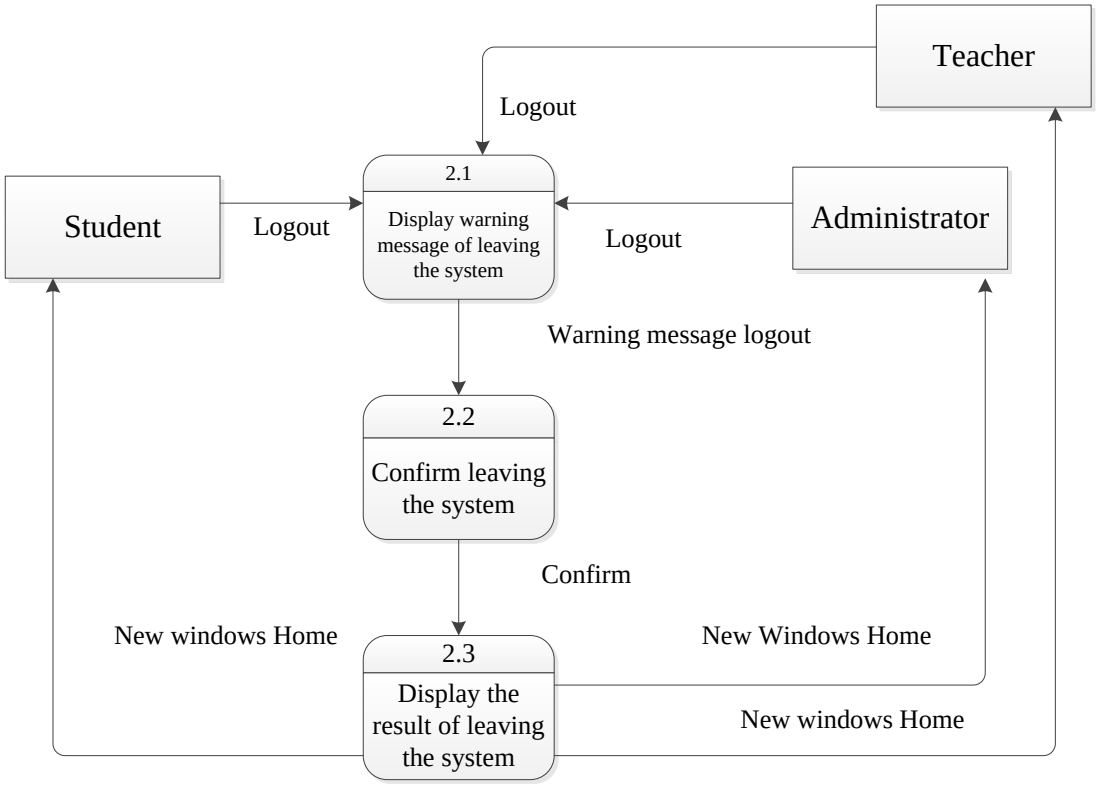

Figure 3.10 Data flow diagram level 2 Process 2.

Figure 3.10 form data flow diagram level 2 processes 2 is system log-out consists of the display warning message of leaving the system process, verify confirm system entry process, and display the result of leaving the system process.

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DFD Fragment Level 2 Process 3 – Data Search

Process 3.1 : Verify data entry

Process 3.2 : Confirm data search

Process 3.3 : Search for data

Process 3.4 : Display data search results

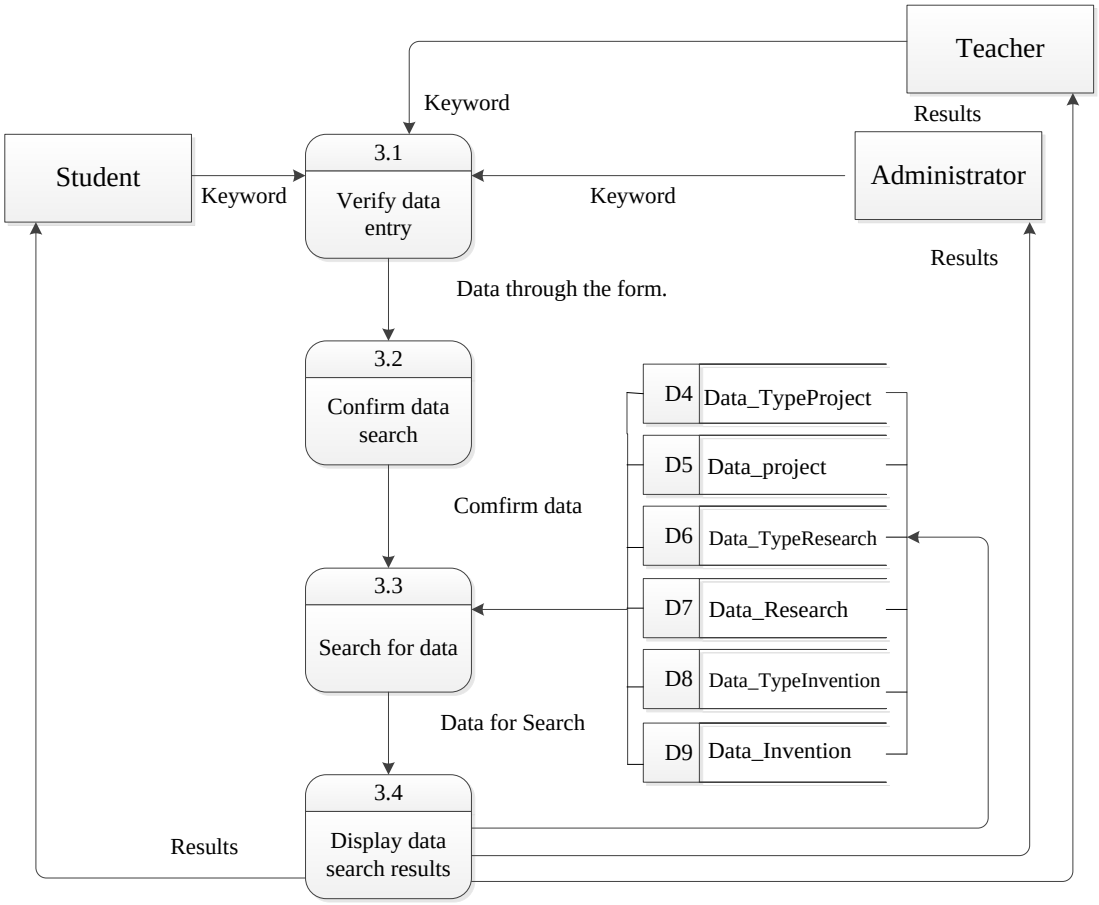


Figure 3.11 Data flow diagram level 2 Process 3.

Figure 3.11 form data flow diagram level 2 process 3 is data search consists of the verify data entry process, confirm data search process, search for data process, and display data search results process.

DFD Fragment Level 2 Process 4 – Adding Data

Process 4.1 : Verify data entry

Process 4.2 : Confirm adding data

Process 4.3 : Verify data

Process 4.4 : Save data

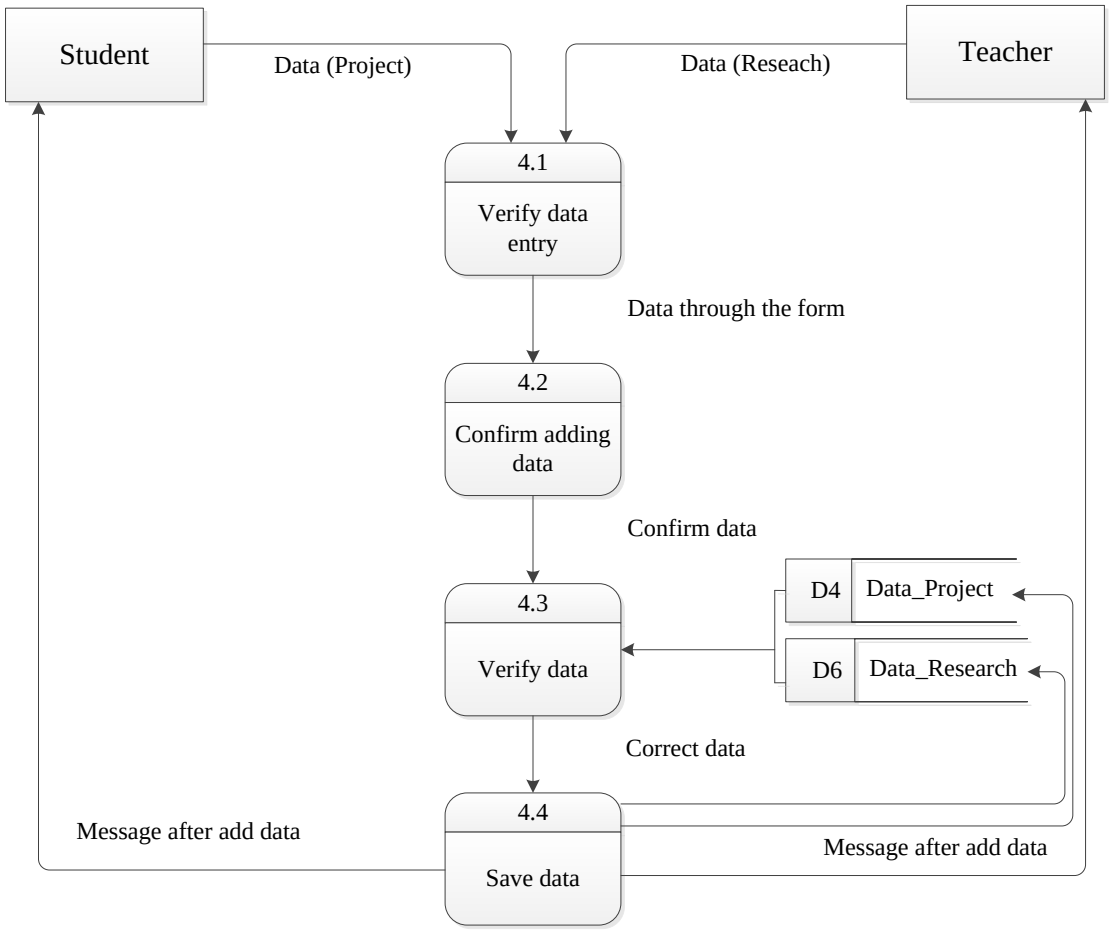


Figure 3.12 Data flow diagram level 2 Process 4.

Figure 3.12 form data flow diagram level 2 process 4 is adding data consists of the verify data entry process, confirm adding data process, verify data process, and save data process.

DFD Fragment Level 2 Process 5 – Editing Data

Process 5.1 : Display data

Process 5.2 : Verify data entry

Process 5.3 : Confirm system entry

Process 5.4 : Verify data

Process 5.5 : Display the result of system entry

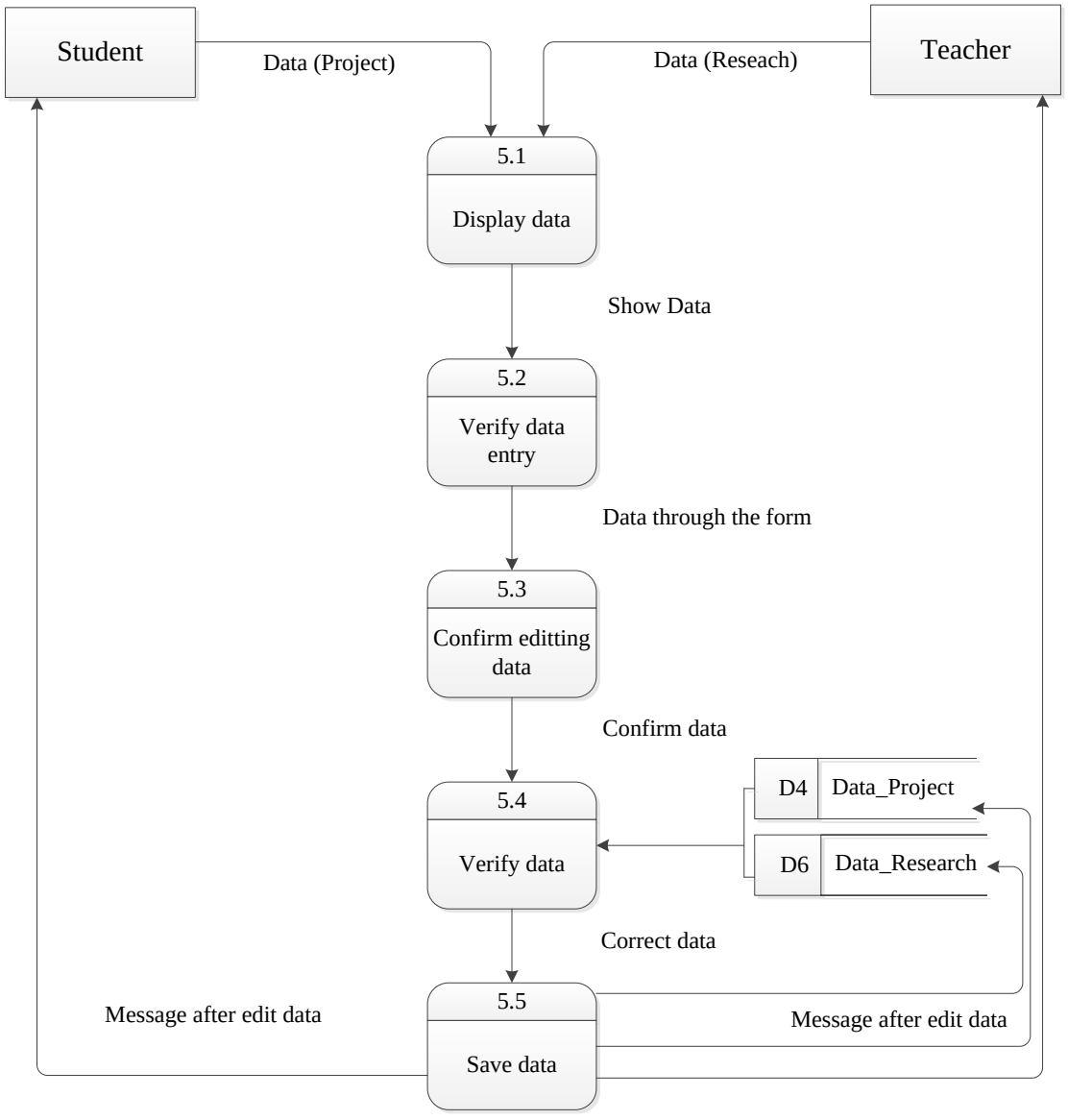


Figure 3.13 Data flow diagram level 2 Process 5.

Figure 3.13 form data flow diagram level 2 processes 5 is editing data consists of the display data process, verify data entry process, confirm system entry process, verify data, and display the result of system entry.

DFD Fragment Level 2 Process 6 –Data Management

Process 6.1 : Display data

Process 6.2 : Verify data entry

Process 6.3 : Confirm data management

Process 6.4 : Verify data

Process 6.5 : Save data

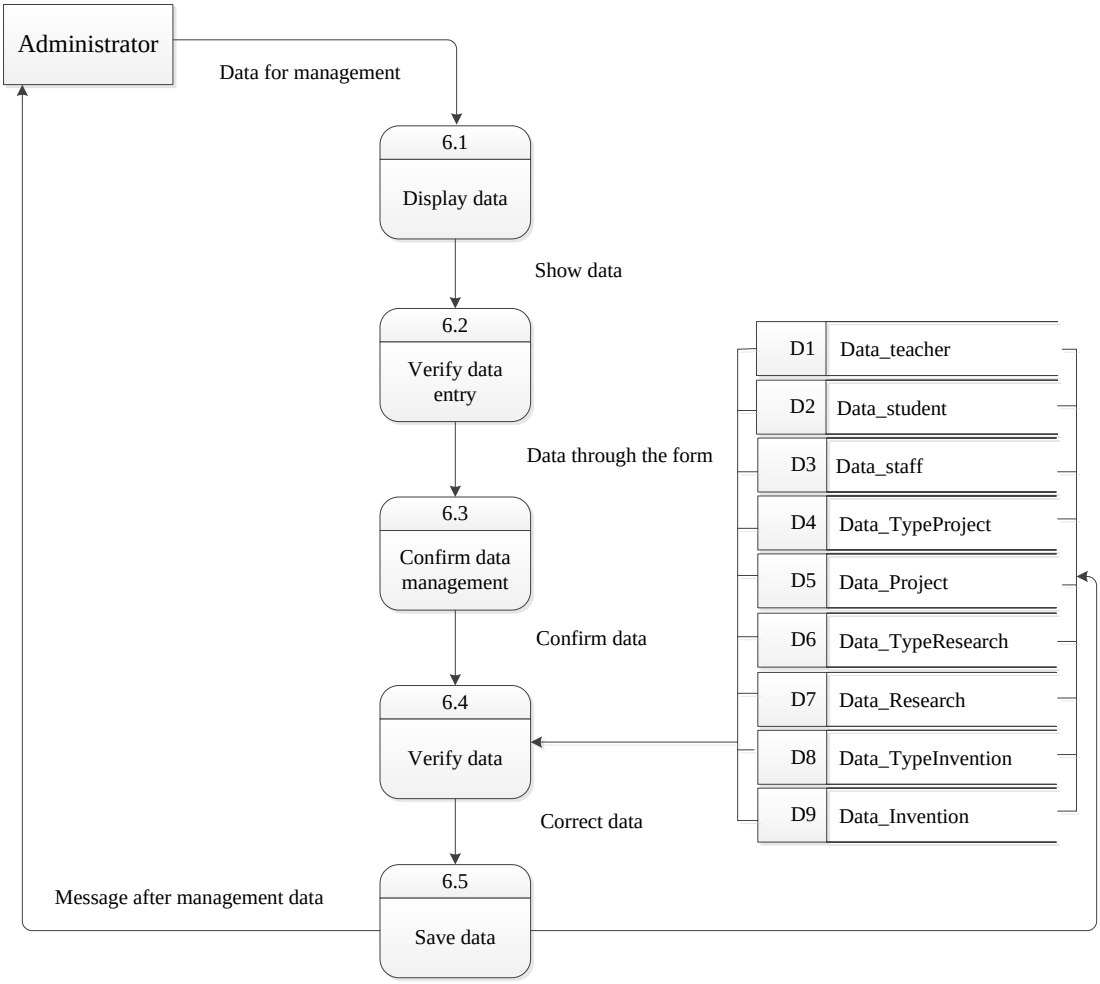


Figure 3.14 Data flow diagram level 2 Process 6.

Figure 3.14 form data flow diagram level 2 processes 6 is data management consists of the display data process, verify data entry process, confirm data management process, verify data, and save data.

DFD Fragment Level 2 Process 7 – Create Reports

Process 7.1 : Select the report menu

Process 7.2 : Display the report's details

Process 7.3 : Type the report

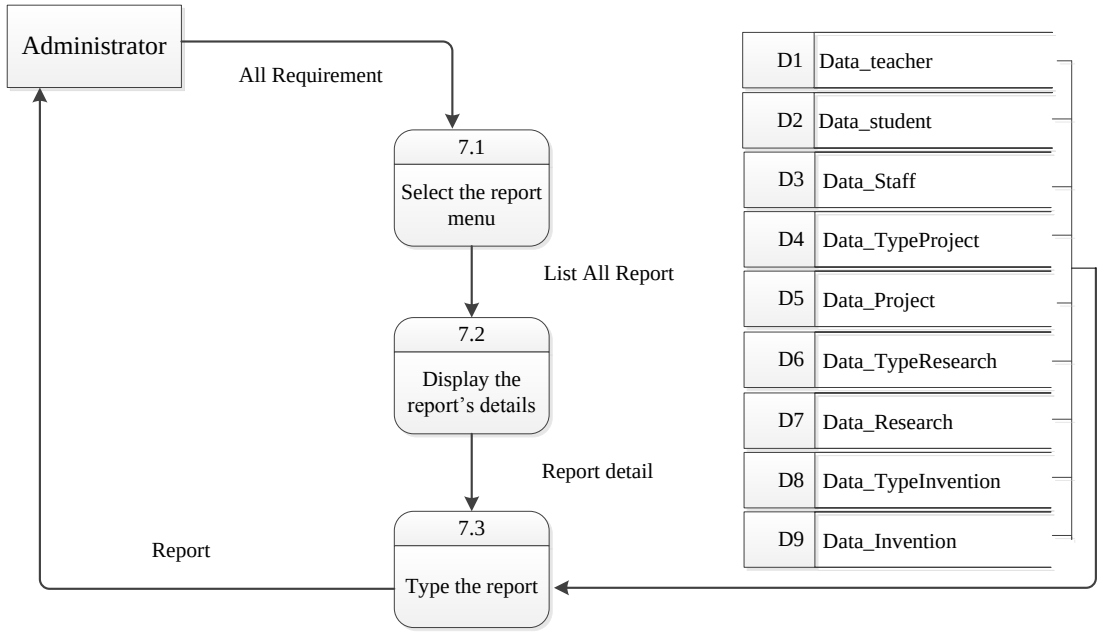


Figure 3.15 Data flow diagram level 2 Process 7.

Figure 3.15 form data flow diagram level 2 processes 7 is create reports consists of the select the report menu process, display the report's details process, and type the report.

7) Database Design

After the design data flow diagram, next step is to design the database used to develop the entity–relationship model (ER model) is a data model for describing the data or information its process requirements, in an abstract way that lends itself to

ultimately being implemented in a database such as a relational database, as shown in figure 3.16

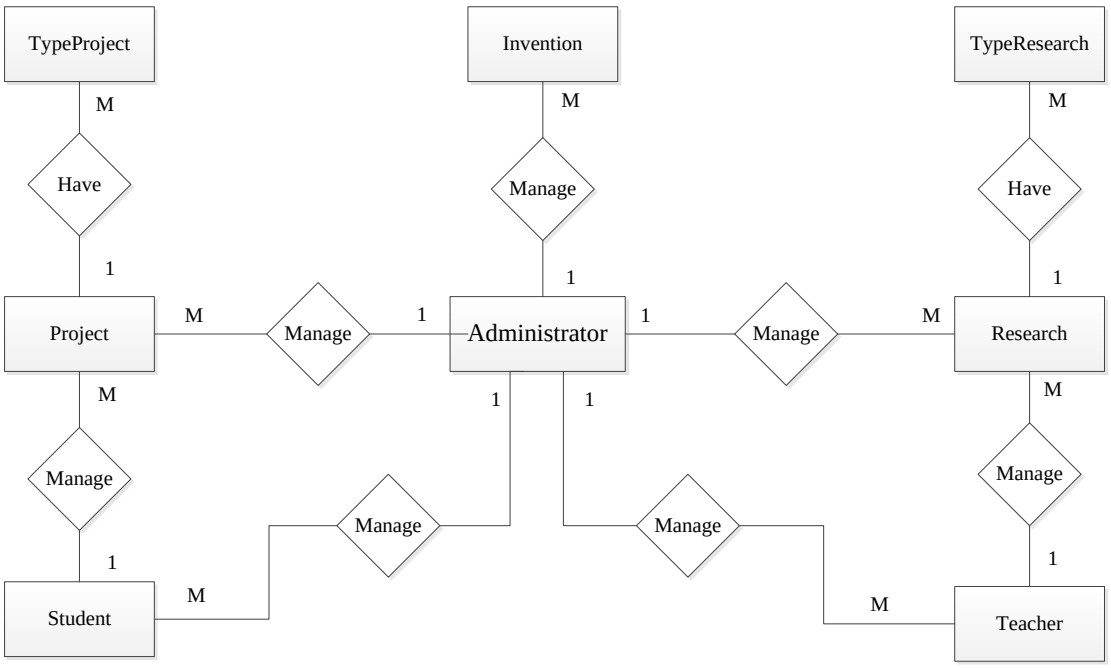


Figure 3.16 Display the model of the relations between data (ER-Model).

Figure 3.16 displays the model of the relations between data (ER-Model), the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, which was obtained from system analysis by using the Context Diagram, and Data Flow Diagram. The diagram can be displayed in the format of a Data Dictionary that is used data storage of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College. (Dictionary Shown in Appendix 1)

8) Screen Design for System Administrators and Users

In the design of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, various data relating

to the entire system were gathered as previously analyzed and the system users were divided into 3 groups.

A. System administrators Users in this group can access and use details of the entire data consisting of data on projects, researches, and inventions, and users' data.

B. Teachers are responsible for managing the teachers' data and research data.

C. Students are responsible for managing the students' data and project.

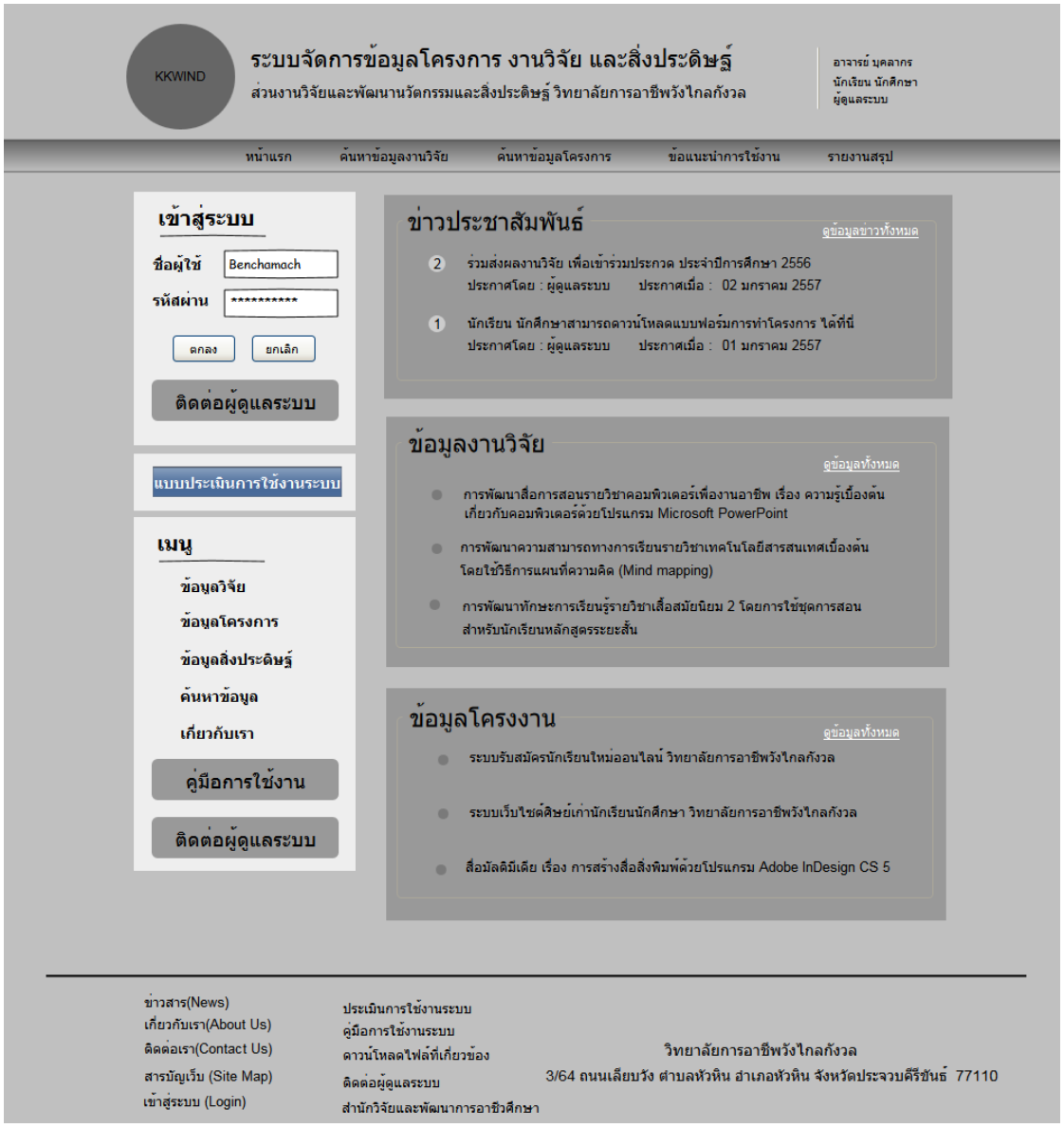


Figure 3.17 Screen design for system's first page.

From figure 3.17 the system entry screen design is a protection of data from the outside, which the users entering the system will be divided into system administrators and system users consisting of teachers and students.

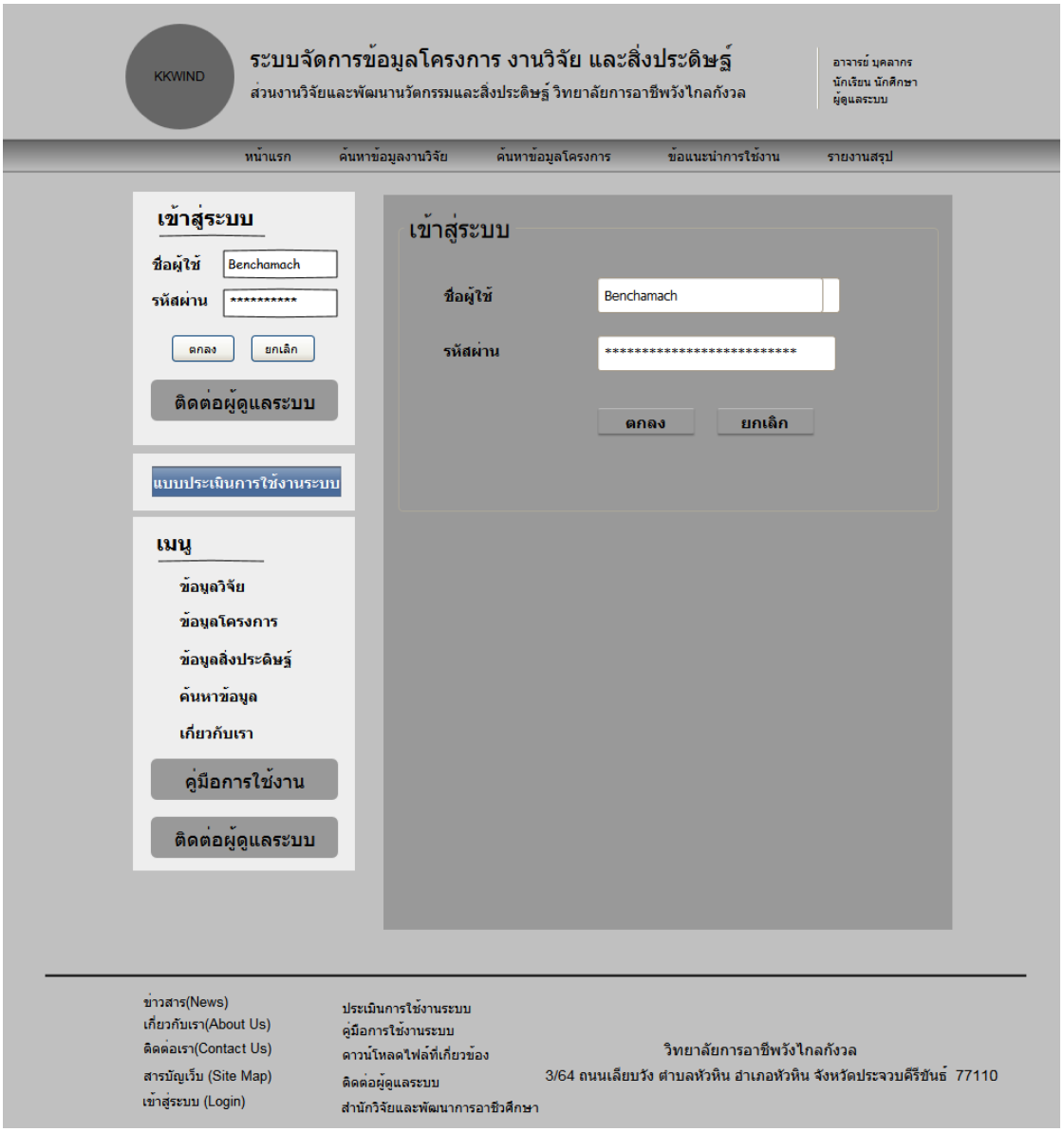


Figure 3.18 Screen design for system login

From figure 3.18 the system entry screen design is a protection of data from the outside, which the users entering the system will be divided into system

administrators and system users consisting of teachers and students. From the mentioned levels of usage, the main objectives for data access are different, which will be classifed based on the demands in knowing such details.

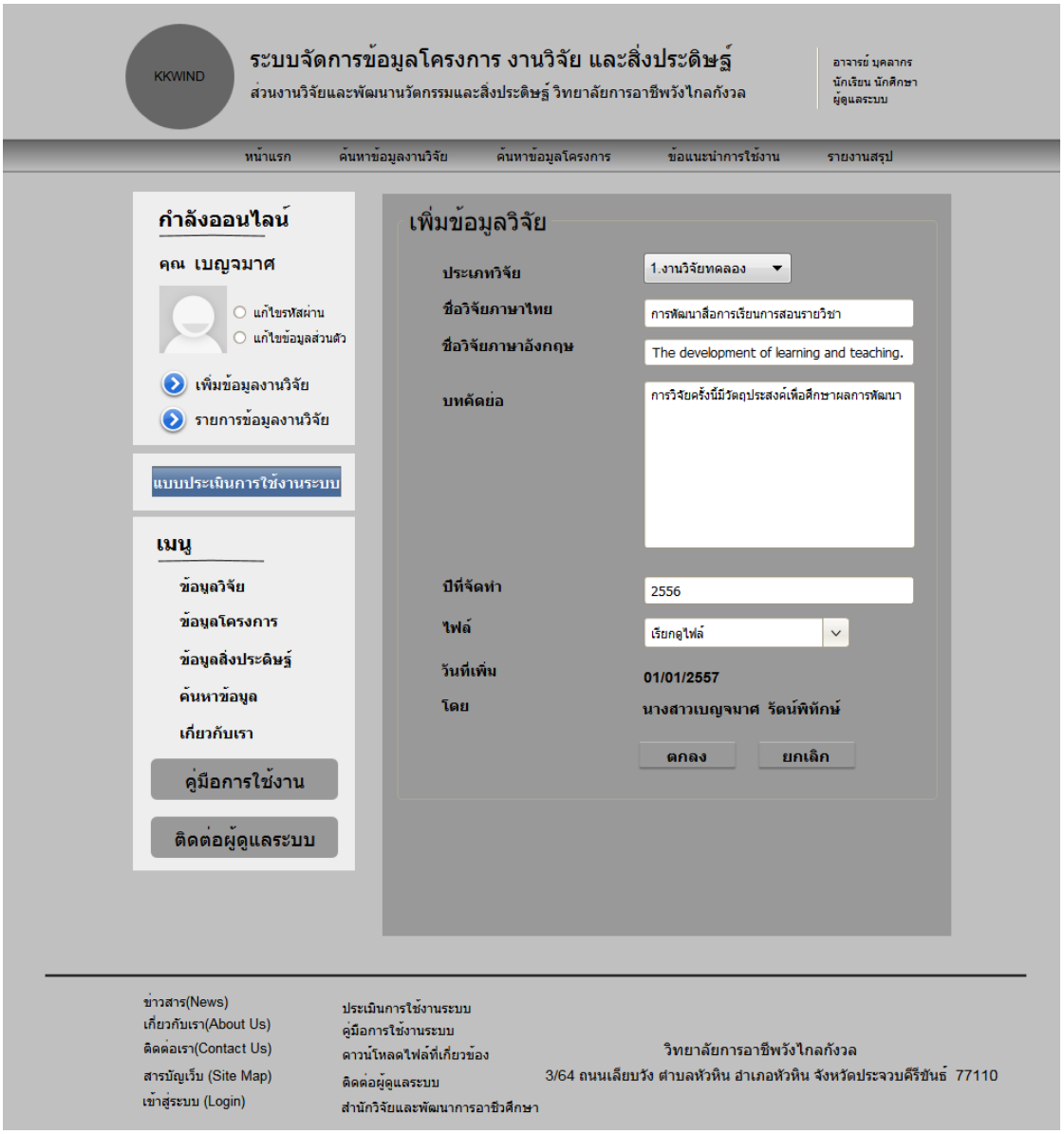


Figure 3.19 Screen design for the system users.

From figure 3.19 the screen design for system users will navigate system users to the operating menu, which is composed of editing passwords, editing personal

data, and adding data on projects or researches, as well as managing the stated data.

Figure 3.20 Screen design for homepage of administrator.

From figure 3.20 the screen design for after logging in, the system will display administrator's name while the system is working. Homepage will display menu for selection.

In the development of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, it was developed by using the Microsoft Windows 7 Operating System. In the Web Server section, the Appserv program package and PHP language program were used. In the system development, webpage creation, and Graphic User Interface, the Dreamweaver program was used. As for the Data Management program, MySQL was used.

Apart from this, in this information system development as stated, it was developed according to the specified format. Therefore, it was sent through the Internet network system of Wangklaikangwon Industrial and Community Education College, and sent back for the experts to examine and bring the obtained suggestions for further improvements of the developed system. Moreover, it was sent back for the experts to examine until a developed system is acquired along with testing it with the system users group, in order to bring the discovered problems and obstacles to fix and improve.

3.5 Population and sample groups

1) Population used in the study are composed of 3 groups, which include

- Teachers of Wangklaikangwon Industrial and Community Education College, in the academic year of 2013.
- Education personnel of Wangklaikangwon Industrial and Community Education College, in the academic year of 2013.
- Students of Wangklaikangwon Industrial and Community Education College, in the academic year of 2013.

2) Sample groups used in this study are composed of 3 groups, which include

- Teachers of Wangklaikangwon Industrial and Community Education College since 1 October 2013 to 31 March 2014, by selecting 20 people to be the sample group to use the system.

- Education personnel and data center officers of Wangklaikangwon Industrial and Community Education College since 1 October 2013 to 31 March 2014, by selecting 5 people to be the sample group to look after the system.
- Students of Wangklaikangwon Industrial and Community Education College since 1 October 2013 to 31 March 2014, by selecting 20 people to be the sample group to use the system.

3.6 Data compilation

1) Data was compiled to find the satisfaction of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, by using questionnaires with the sample groups.

2) The researcher has compiled data to study the satisfaction toward the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, of the sample groups that used the system. This step was processed according to the following procedures.

A. Prepared the system operation manual that the researcher developed from the Server computer, tested the system, examined the operational procedures, and accuracy of data processing.

B. Suggested directions to use. The researcher explained the aims of this research along with suggesting the system's usage instructions to the sample groups. This was done by specifying the duration of testing the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College.

C. Compiled data. After the researcher installed and suggested usage instructions to the sample groups based on the specified duration, the researcher then brought the generated assessment to enquire the sample groups that

used the system. Later, the obtained results from the questionnaires were calculated and statistically analyzed.

Bringing the results obtained from the questionnaires regarding satisfaction of the operator and users of the Data Management System on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, for further analysis to find the satisfaction of the developed system.

3.7 Methodology to evaluate satisfaction

1) The tool used in evaluating the system is the evaluation satisfaction toward the developed system, which was divided into the following 4 function.

A. Functional Requirement Test

B. Function Test

C. Usability Test

D. Security Test

2) From this research, the researcher used the following statistics to analyze data.

Analyzing the quality of the tool used in the research

A. Mean is a summation of the observation or the value of the sample that is obtained from investigating every values of the data, and divided by the amount of data sample, as shown in equation (3-1).

$$\bar{x} = \frac{\sum x}{n} \qquad (3\text{-}1)$$

whereas $\bar{x}$ = mean

$\sum x$ = summation of total scores

x = result of scores

n = number of people in the sample group

B. Standard Deviation is a statistic used in studying the extent of the data's deviation, by using along with the Mean, which will inform how

far apart are the data in terms of values. In the case where the 2 Means are equal, but have different S.D. values, it is considered that the Mean with the lesser S.D. value is the suitable Mean and is more wanted. If the data has high deviation, the S.D. value will be high in value as well. However, if the data has no deviation, the result of the S.D. value will be, as shown in equation (3-2).

$$S.D. = \sqrt{\frac{n\sum x^2 - \left(\sum x\right)^2}{n(n-1)}} \qquad (3\text{-}2)$$

whereas S.D. = Standard Deviation

$\sum x$ = summation of total scores

x = result of scores

n = number of people in the sample group

3.8 Research schedule

In the study of developing the Data Management System on projects, researches, the developer has operational procedures and duration of operation for achieve the development objectives and effectively.

Table 3.1 Research Schedule

Study Phase	Timeline (2013- 2014)					
	Nov	**Dec**	**Jan**	**Feb**	**Mar**	**Arp**
1) System study and data collection	←	→				
2) Analysis and Design System		←	→			
3) Study related technologies			←	→		
4) Deployment System				←	→	
5) Testing System				←	→	
6) Preparation of documents					←	→
7) User evaluates the satisfaction.					←	→

CHAPTER IV
RESULTS

Development results of Data management system on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College, that information are derived from design and development. Performance and data analysis aim to determine the system efficiency according to objectives of research. In other words, the developed system allows user to manage information of projects, researches and inventions. It also helps to indicate users satisfaction if they are at a high level. The researchers have described the findings as the following sequence.

4.1 Development results of data management system on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College.

4.2 Study results of administrators' satisfaction of data management system on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College.

4.3 Study results of teachers' satisfaction of data management system on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College

4.4 Study results of students' satisfaction of data management system on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College

4.5 Conclusion of system satisfaction.

4.1 Development results of data management system on projects, researches, and inventions, in the section of innovation and invention developments researches, Wangklaikangwon Industrial and Community Education College.

System rights are divided by 3 user groups including administrator, teacher, and student. Development results are as follows:

1) System homepage shows menu items including Login, News, Databases (Data of projects, researches, and inventions) About Us, Contact Us, and working items related to the system as shown in figure 4.1

Figure 4.1 System homepage.

Figure 4.1 when entry to the system homepage via URL: http://www.kkwindmdata.com, the user can login to the system by clicking on menu Login เข้าสู่ระบบ or other menus as needed.

2) On login screen, the user must correctly specify a username, password, user status for login to the system as shown in figure 4.2

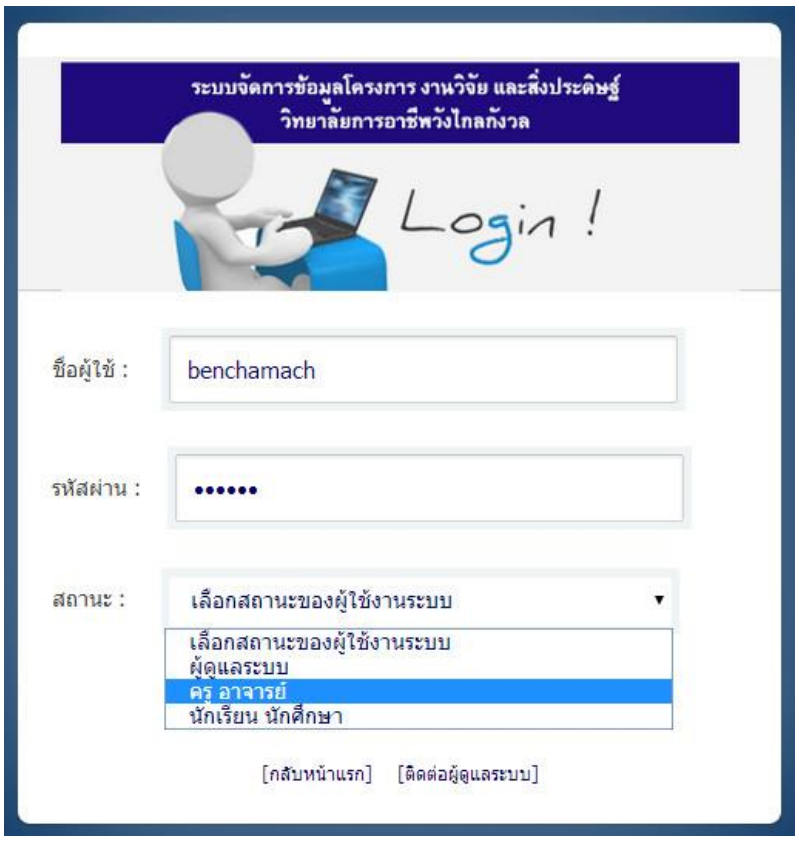


Figure 4.2 Login page.

Figure 4.2 the user can pass the login process by completing username, password, and selecting user status which consists of administrator, teacher, and student. This is the main window serving for managing users' personal information or related information.

3) Homepage of user (Teacher and Student), after entering to the system, the user can manage personal information or project data (for student), can manage research data (for teacher) as shown in figure 4.3

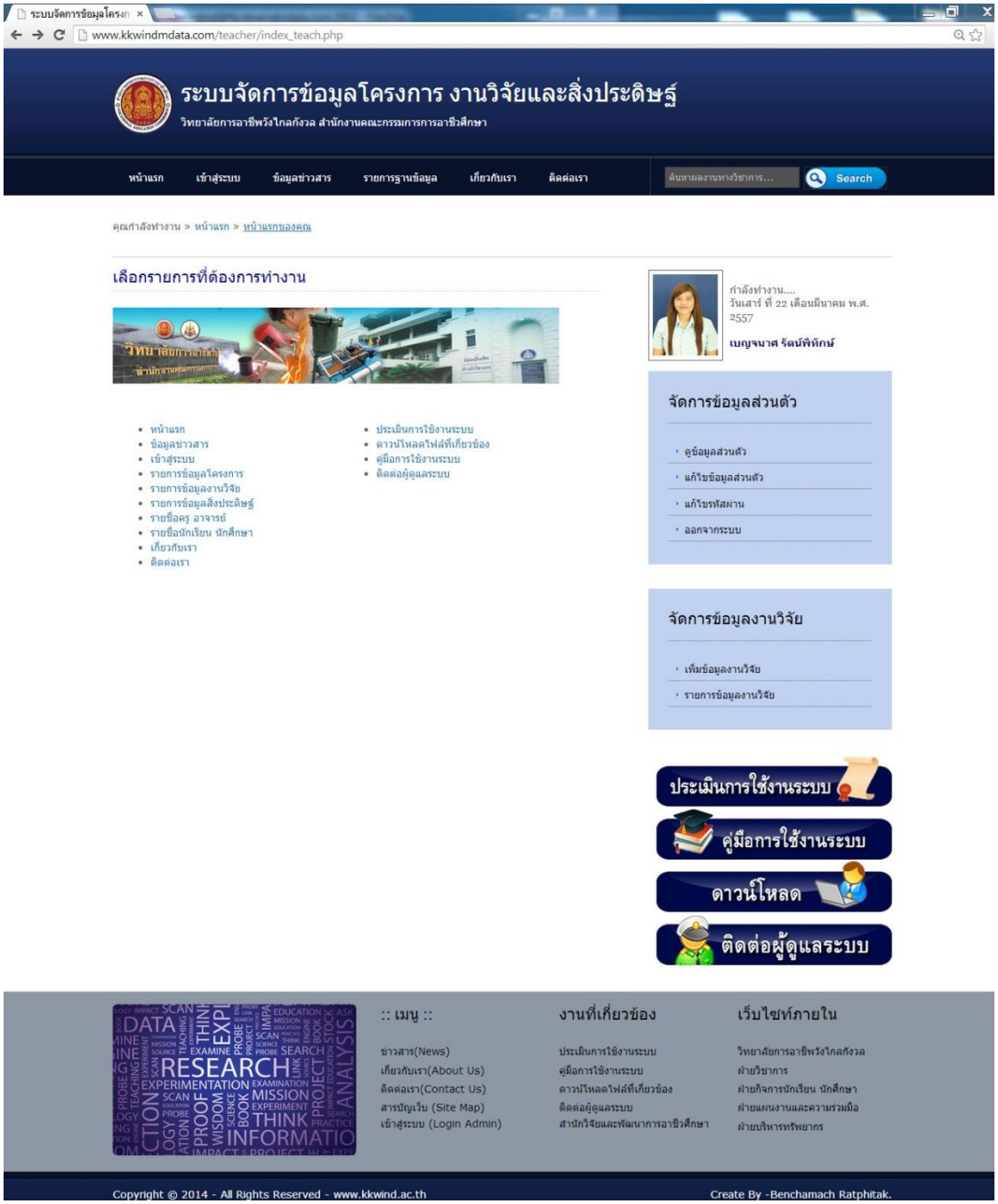


Figure 4.3 User homepage.

Figure 4.3 after passing the login page, the user homepage of teacher and student will show items for personal data management which consist of view user profile, edit user profile, edit password, and logout. Research data management items (for teacher) consist of add research data and research data list.

4) Teacher and Student must manage their profile in personal data managing page as shown in figure 4.4

Figure 4.4 Personal data managing page for teacher and student.

Figure 4.4 when the user wants to manage the profile, the user can retrieve his own personal data from menu view user profile ดูข้อมูลส่วนตัว which will show

personal data of the user but the data cannot be edited on this page. The user can select menu edit user profile แก้ไขข้อมูลส่วนตัว or edit password. แก้ไขรหัสผ่าน In case of edit user profile and edit password, the user must complete all fields then the data can be saved.

5) Data adding page for teacher and student can be used for adding project data (for student) or adding research data (for teacher) as shown in figure 4.5

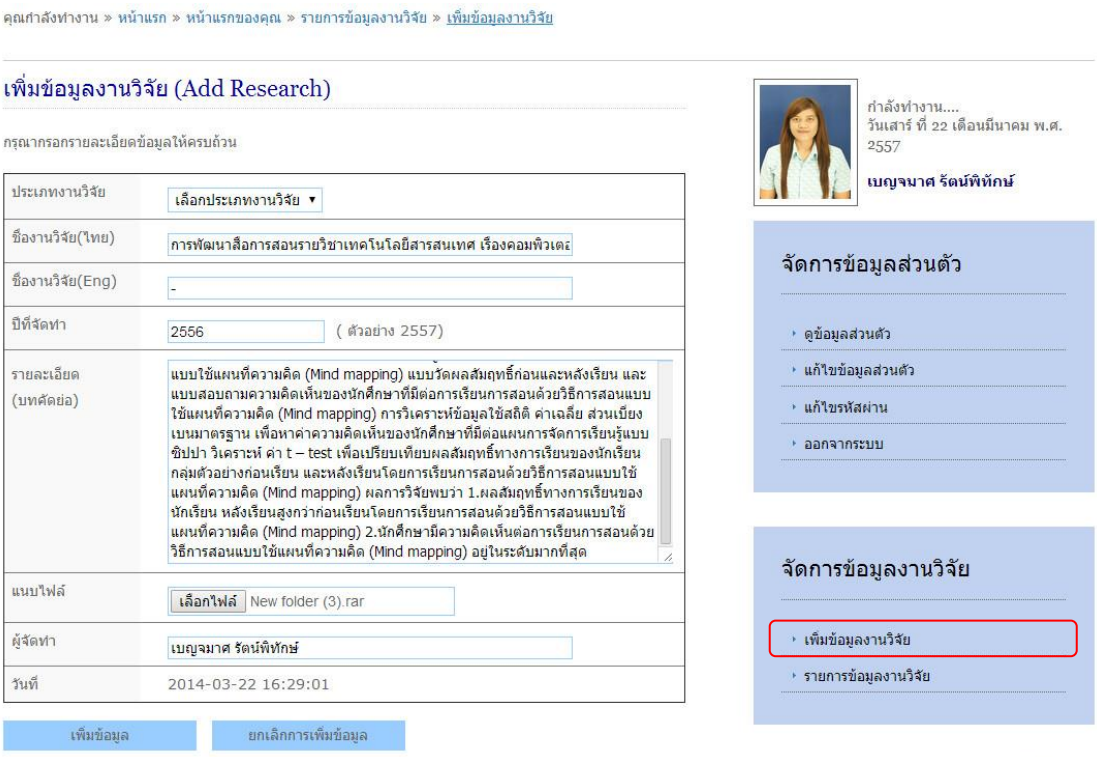


Figure 4.5 Data adding page for user.

Figure 4.5 when the user (teacher) wants to add data, the user can select menu add research data เพิ่มข้อมูลงานวิจัย . The system will display data box for the user to enter details as follows: Research Category, Research Title in Thai language, Research Title in English language, Year of Production, Research Detail, Attachment,

Producer (the system will display the user's first and last name) and the current date and time. The user must complete all fields then the data can be saved.

6) Data managing page for teacher and student can be used for managing project data (for student) or managing research data (for teacher) as shown in figure 4.6

Figure 4.6 Data managing page for user.

Figure 4.6 when the user (teacher) wants to manage data, the user can select menu of research data list รายการข้อมูลงานวิจัย . The system will display all users' research into a sequence by date the research revised and lists for updating and deleting data.

7) Data detail viewing page for teacher and student can be used for viewing data details as shown in figure 4.7

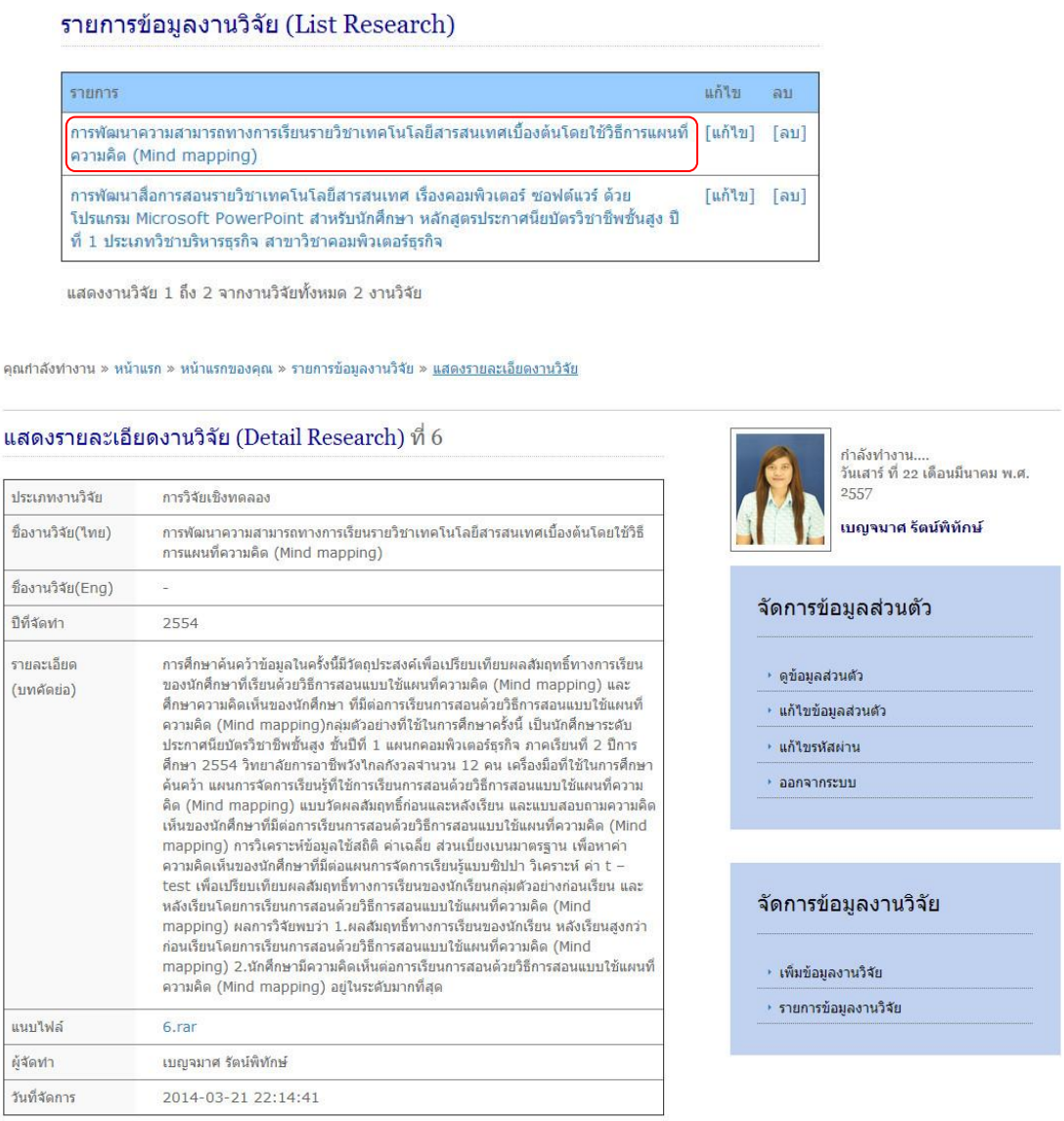


Figure 4.7 Data detail viewing page.

Figure 4.7 when the user wants to view data details, the user can select research title or project name. All data shown in data detail viewing page cannot be edited. This page is for viewing and displaying data only.

8) Data detail editing page for teacher and student can be used for editing data details as shown in figure 4.8

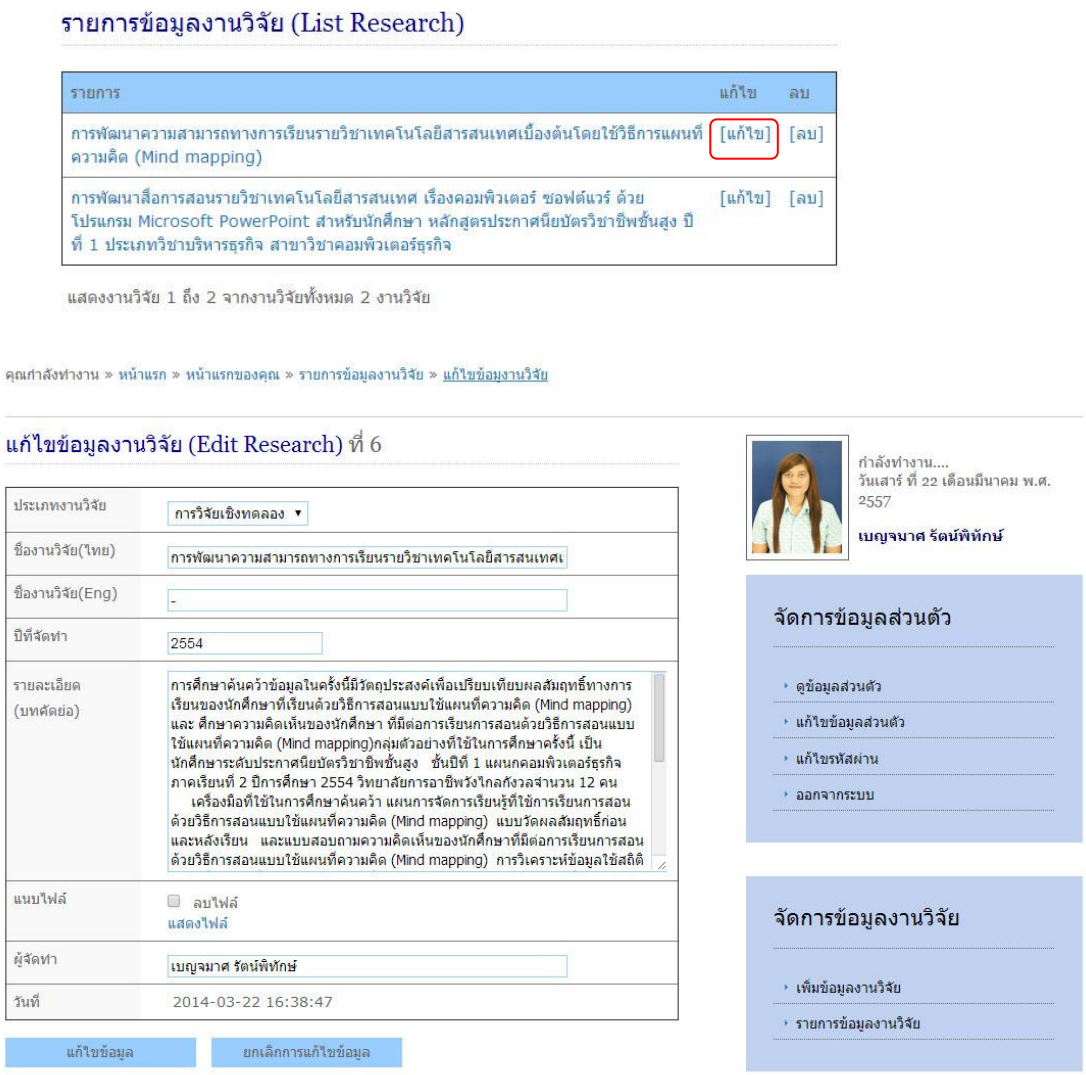


Figure 4.8 Data detail editing page.

Figure 4.8 when the user wants to edit data details, the user can select menu edit [แก้ไข] in research list or project name. All data fields must be filled completely. date of editing will be shown by current time and cannot be revised.

9) Data detail deleting page for teacher and student can be used for deleting data as shown in figure 4.9

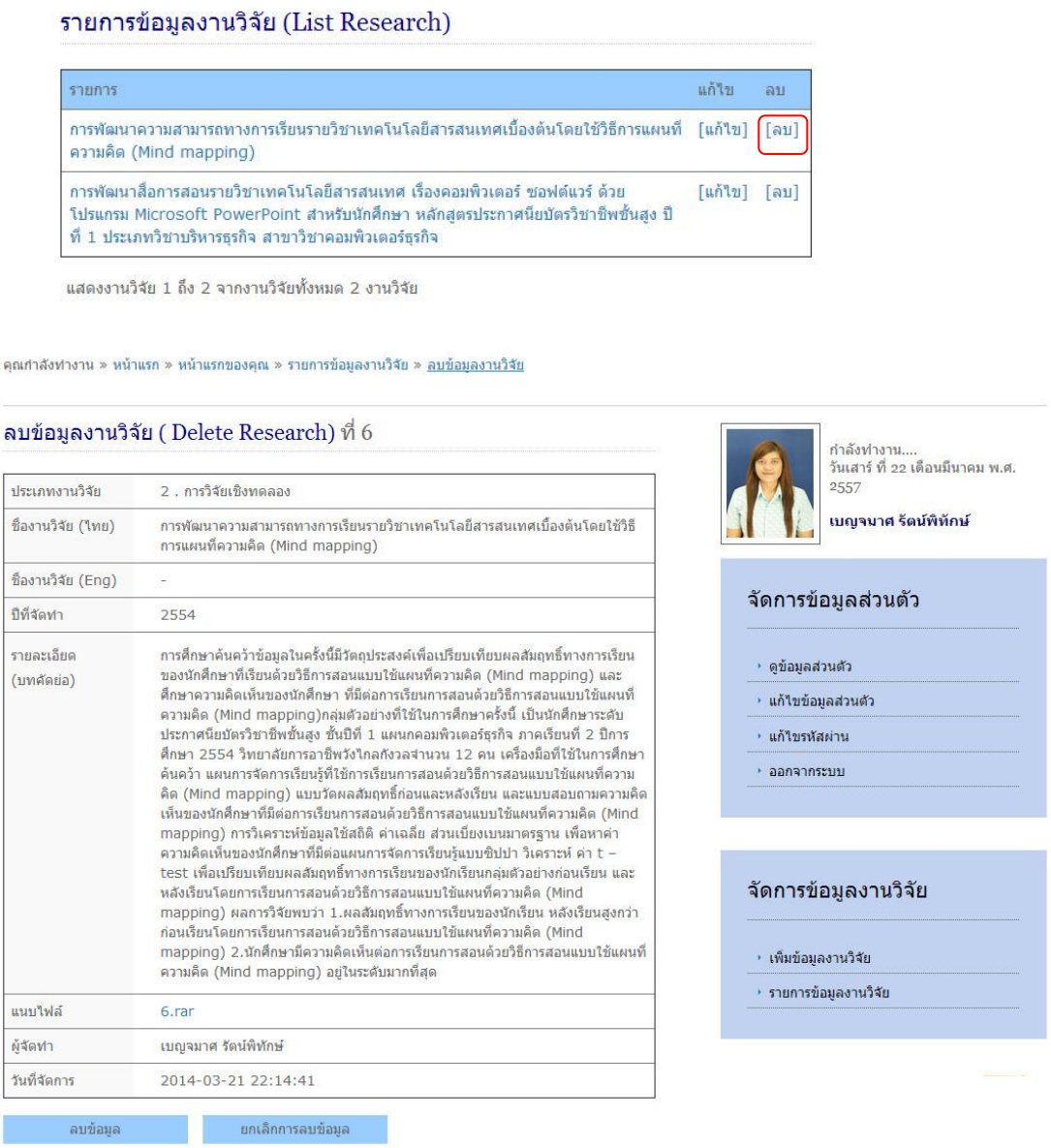


Figure 4.9 Data detail deleting page.

Figure 4.9 when the user wants to delete data details, the user can select menu Delete [ลบ] in research list or project name. When select the deleting list, the system will display data detail so that the user can review and reconfirm for deleting.

10) Homepage of user (in case the user is administrator), after entering into the system, Administrator can manage date related to the system as shown in figure 4.10

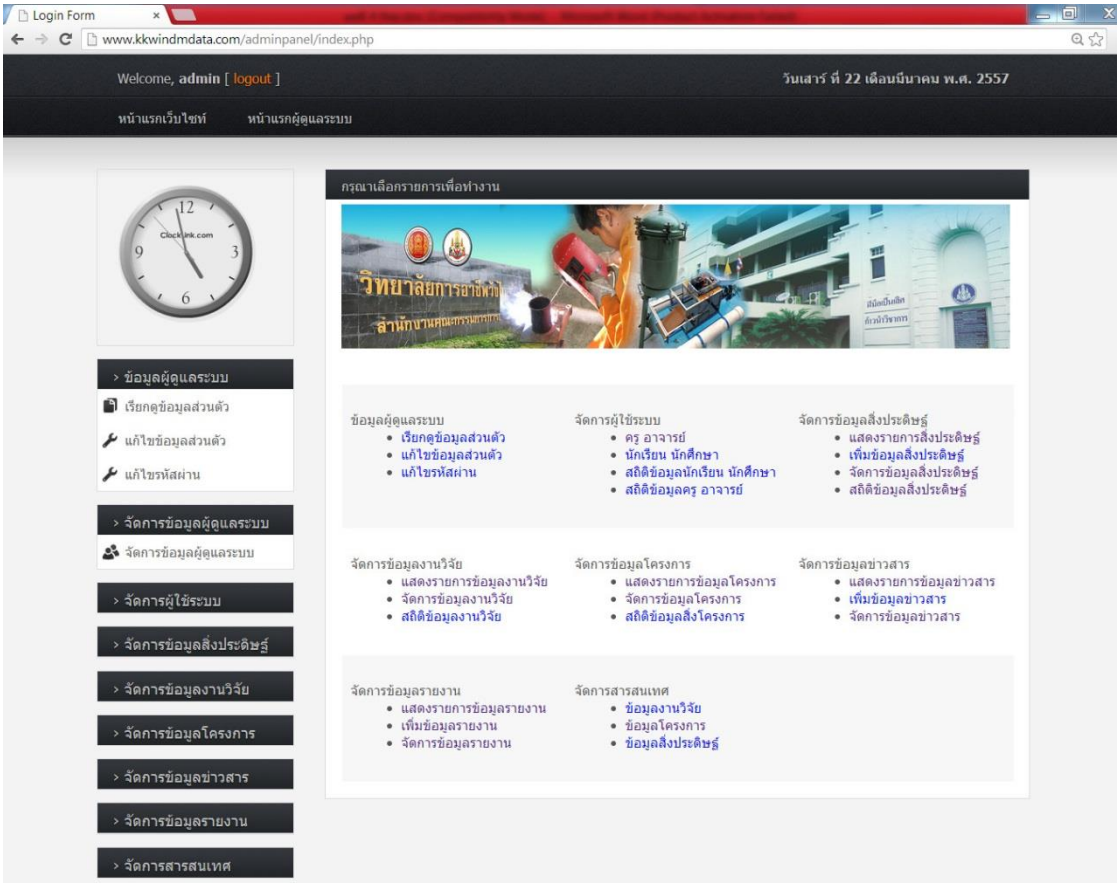


Figure 4.10 Homepage of administrator.

Figure 4.10 after logging in, the system will display administrator's name while the system is working. Homepage will display menu for selection as follows: Administrator data managing (This will be activated in case the user name and password is permitted for data managing.), Administrator's personal data managing, User's personal data managing, Invention data managing, Project data managing, News data managing, Report data managing, and Information managing.

11) Administrator data managing page allows administrator to add or delete data of general administrator as shown in figure 4.11

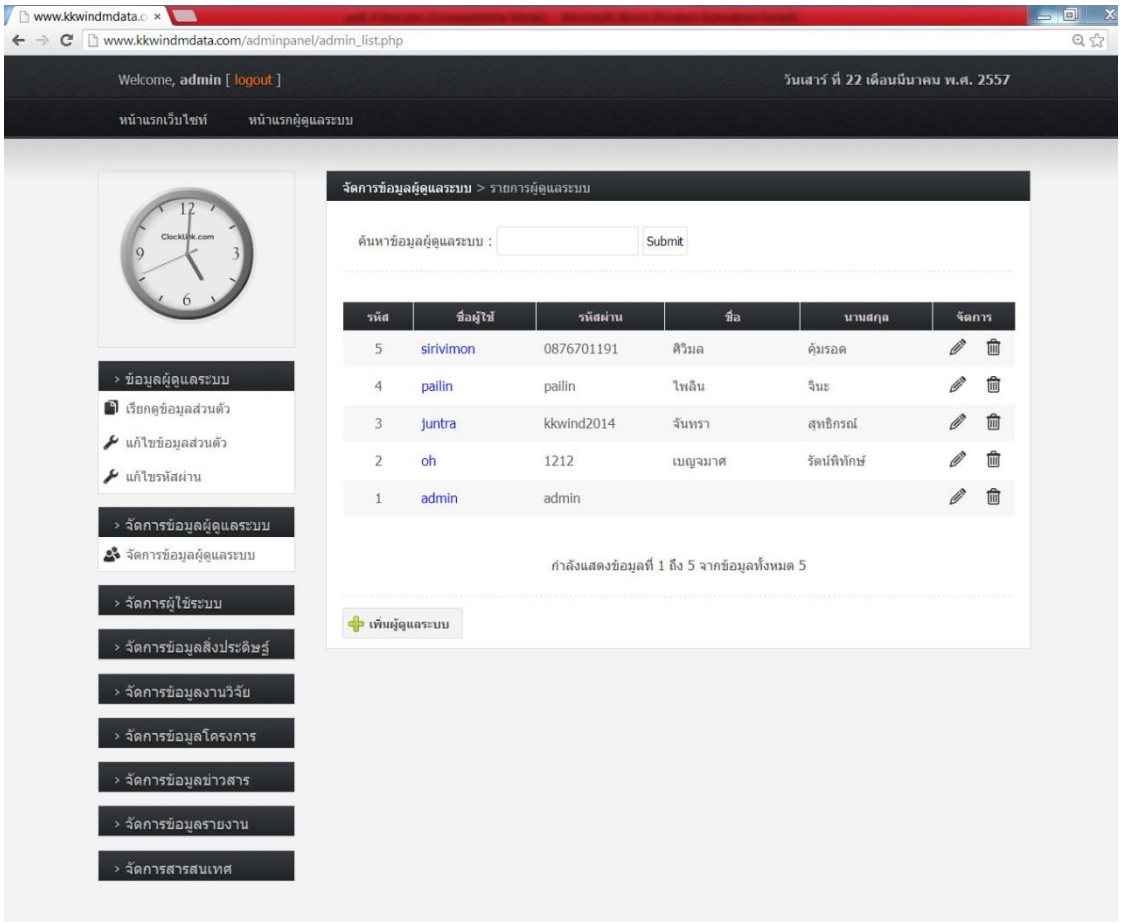


Figure 4.11 Administrator data managing page.

Figure 4.11 the authorized administrator can select menu manage administrator data จัดการข้อมูลผู้ดูแลระบบ and the system will display all list of administrator by sorting administrator's code. The authorized administrator can select user name for viewing administrator's detail or click at administrator list to edit the data or click at administrator list to delete the data.

12) Administrator's personal data managing page allows administrator to edit personal data or change password as shown in figure 4.12

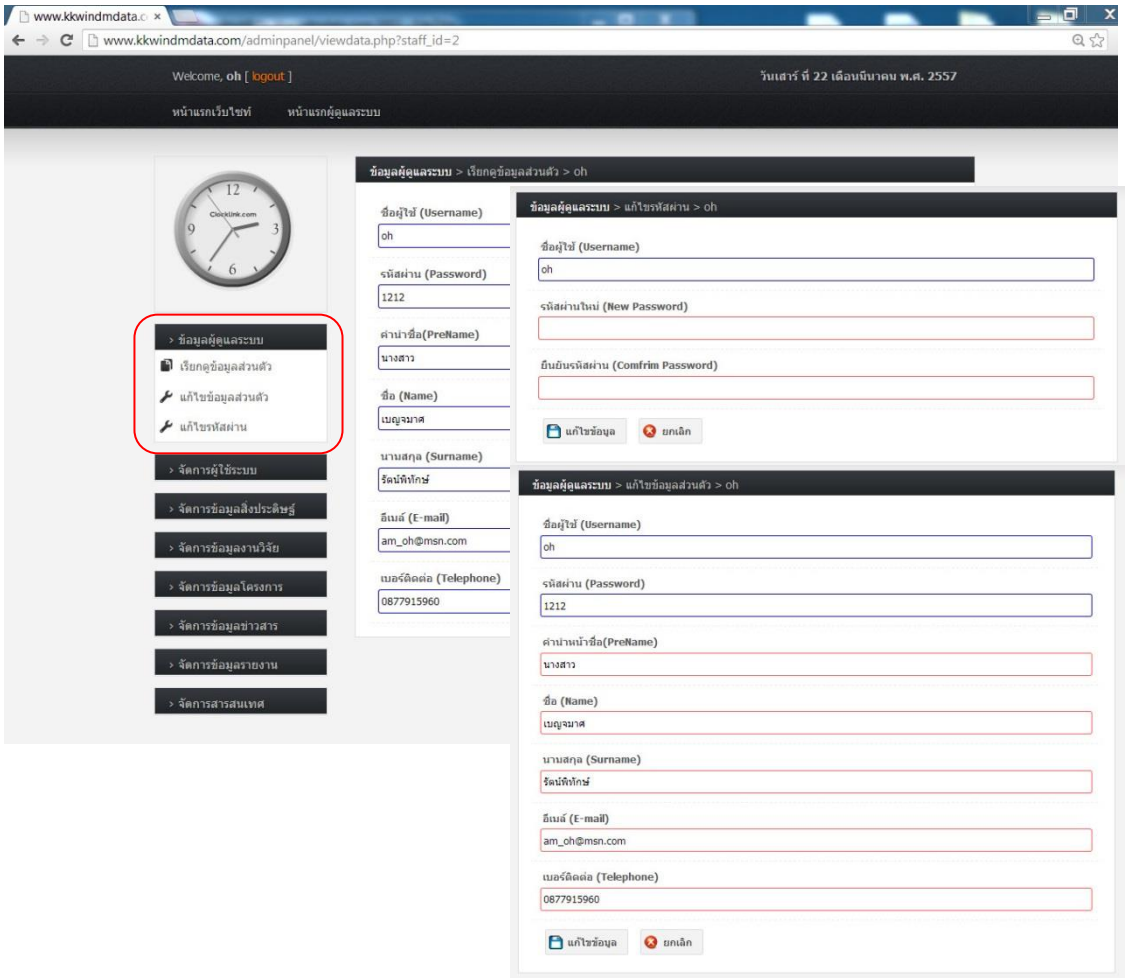


Figure 4.12 Administrator's personal data managing page.

Figure 4.12 after logging in the system, Administrator can view personal data by clicking menu view personal Data เรียกดูข้อมูลส่วนตัว to see detail of personal data which cannot be edited in this page. If the administrator wants to edit personal data, click edit personal data แก้ไขข้อมูลส่วนตัว , and the system will display the original data. The Administrator must complete all fields, and then the data can be saved. In case of changing password, click change password แก้ไขรหัสผ่าน , and the system will display username. The Administrator must fill a new password in the new password field, and fill it again in the confirm new password field. Both passwords must be matched, and then the data can be saved.

13) User's personal data managing page contains data of teacher, data of student, and statistics including number of system's users as shown in figure 4.13

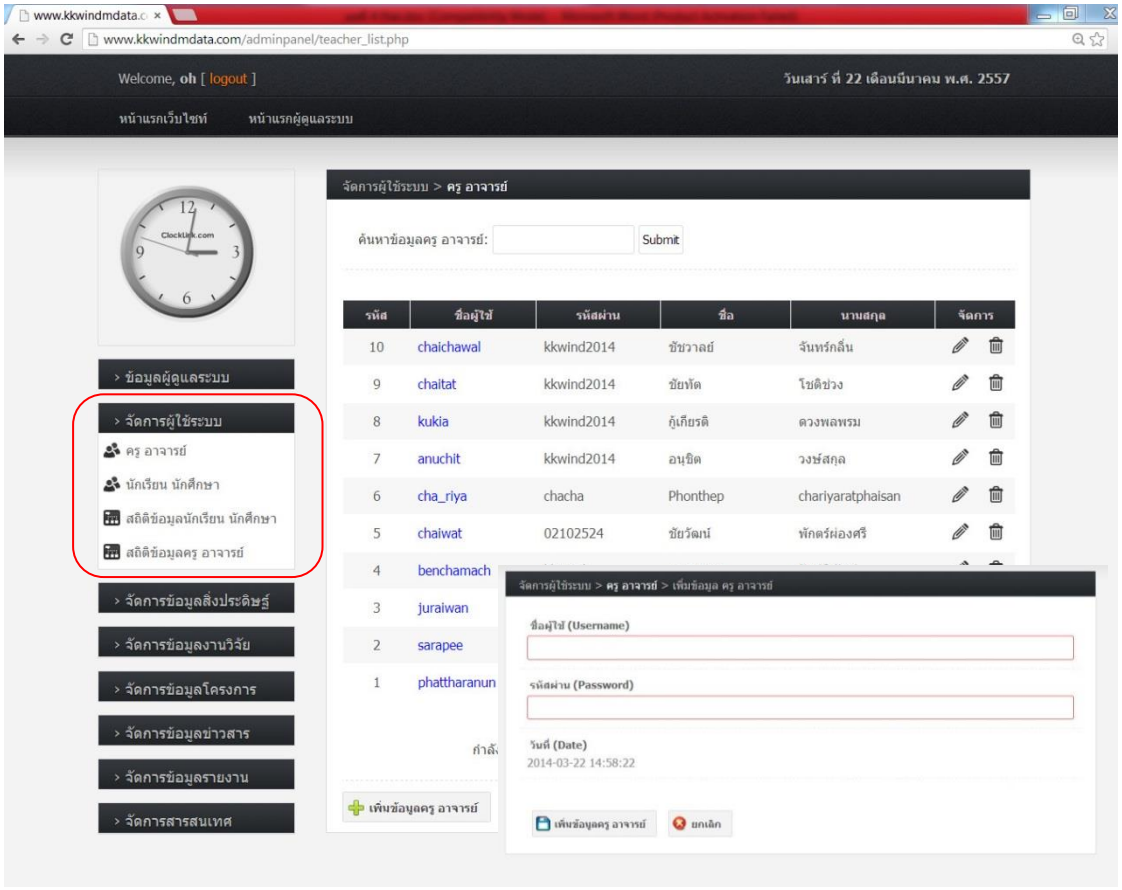


Figure 4.13 User's personal data managing page.

Figure 4.13 administrator can manage user's data by selecting menu user data managing ครู อาจารย์ . The system will display all list of teacher sorting by teacher's code. The Data can be also searched by filling the username or the teacher name. Administrator can select the item at each username to view the data detail of the teacher or click at the teacher list to edit data and click at the teacher list to delete data. To add data, select menu add administrator เพิ่มผู้ดูแลระบบ , a new teacher can be added by filling a username and password.

14) Invention data managing page contains invention listing menu, Invention data adding menu, Invention data managing menu, and Invention data statistics menu as shown in figure 4.14

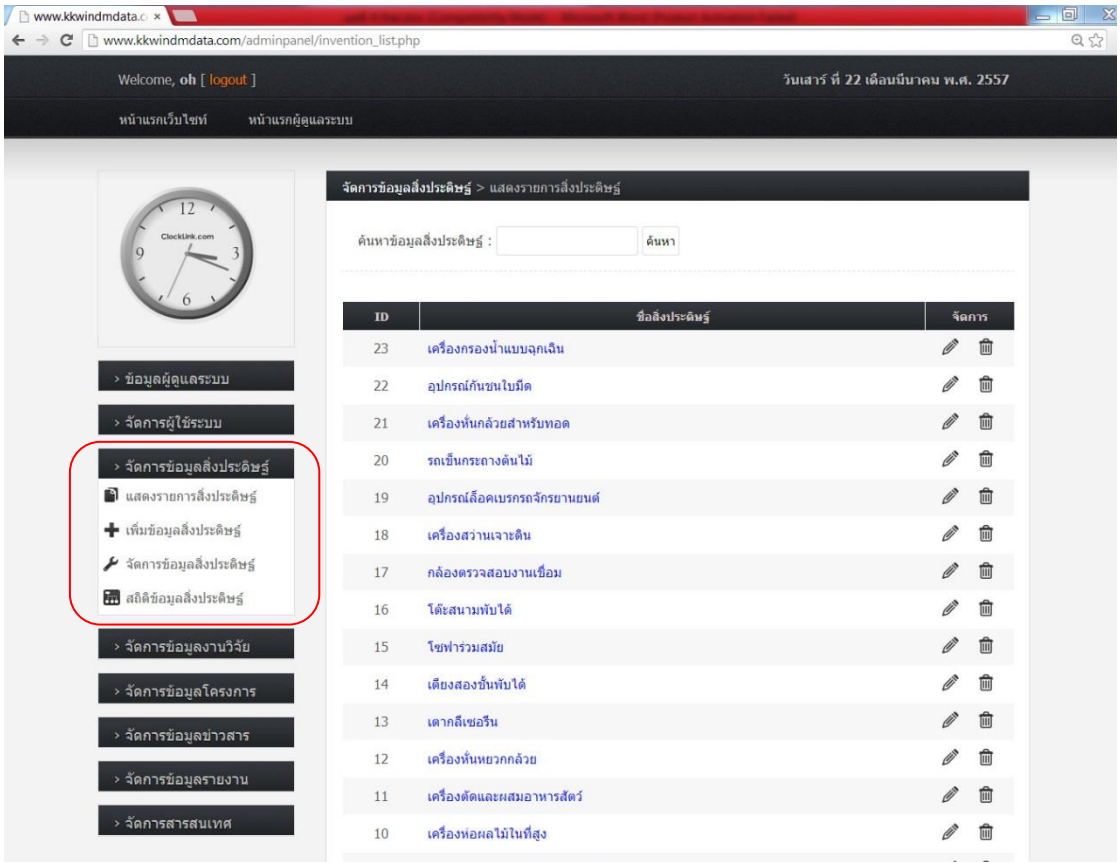


Figure 4.14 Invention data managing page.

Figure 4.14 administrator can manage invention data by going to invention data managing page, selecting menu invention listing แสดงรายการสิ่งประดิษฐ์ ,the system then will display all invention list sorting by invention code. The data can be also searched by filling the invention name. Administrator can select the item at the invention name to view the data detail of the invention or click at the invention list to edit data and click at the invention list to delete data. To add data, select menu add invention เพิ่มข้อมูลสิ่งประดิษฐ์ , a new invention can be added by filling the complete details so the data can be saved. In menu invention data statistics

สถิติข้อมูลสิ่งประดิษฐ์ , it will display the number of all inventions by type of invention.

15) Research data managing page contains research listing menu, Research data adding menu, Research data managing menu, and research data statistics menu as shown in figure 4.15

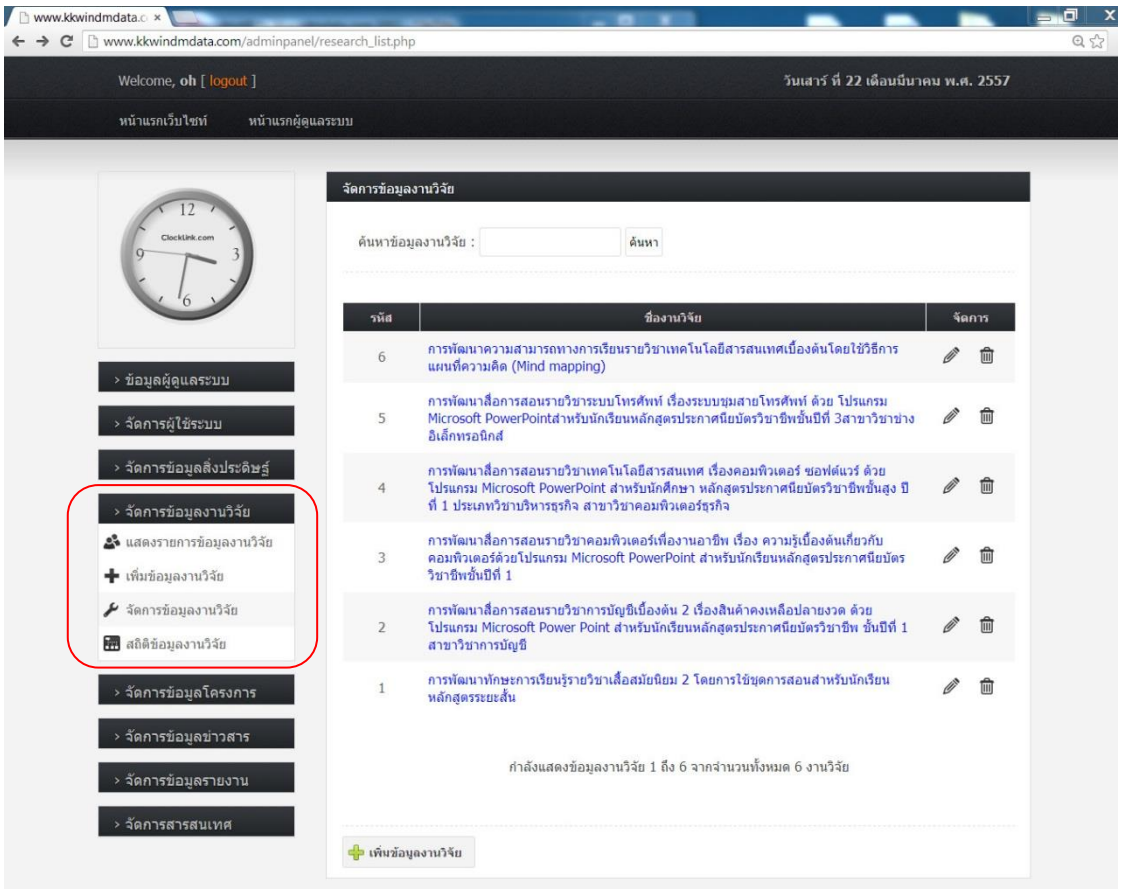


Figure 4.15 Research data managing page.

Figure 4.15 administrator can manage research data by going to research data managing page, selecting menu research data managing จัดการข้อมูลงานวิจัย , the system then will display all research list sorting by research code. The data can be also searched by filling the research name. Administrator can select the item at the research name to view the data detail of the research or click at the research list to

edit data and click at the research list to delete data. To add data, select menu add research เพิ่มข้อมูลงานวิจัย , a new Research can be added by filling the complete details so the data can be saved. In menu research data statistics สถิติข้อมูลงานวิจัย , it will display the number of all researches by type of research.

16) Project data managing page contains project listing menu, Project data adding menu, Project data managing menu, and project data statistics menu as shown in figure 4.16

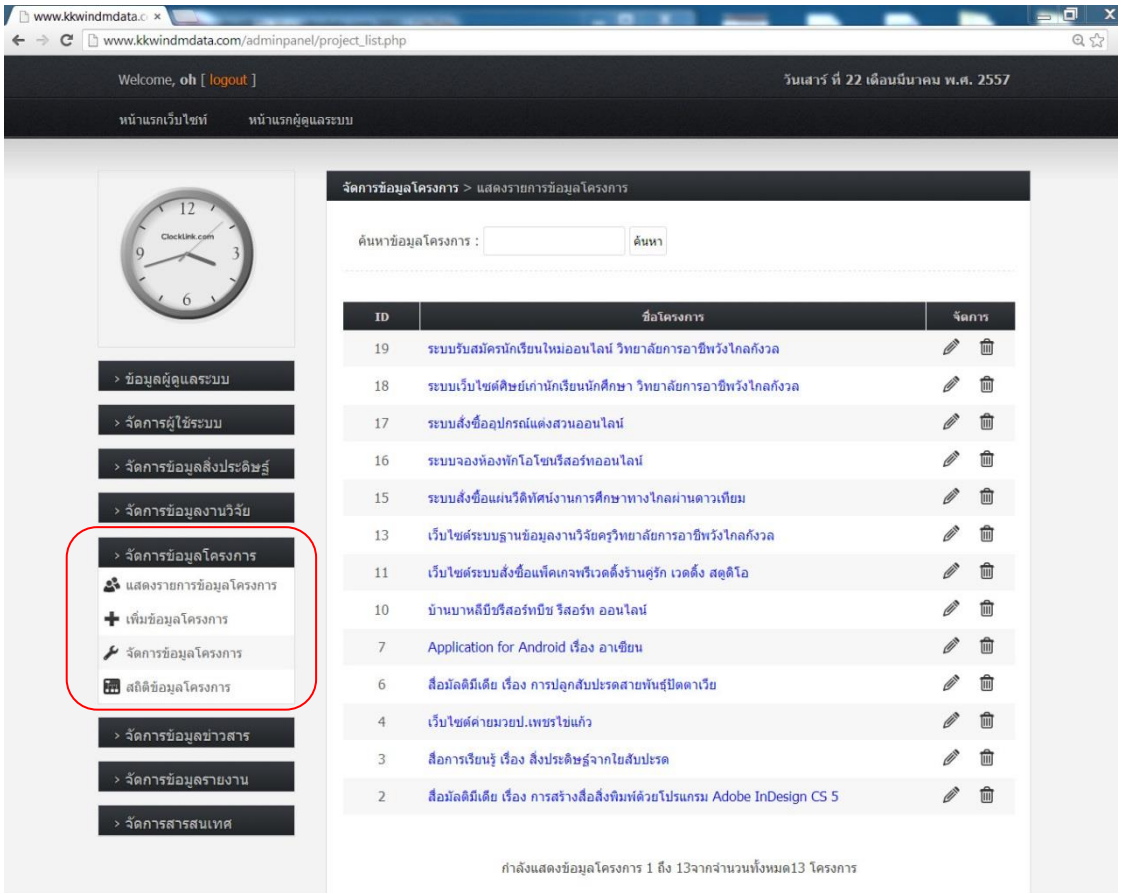


Figure 4.16 Project data managing page.

Figure 4.16 administrator can manage project data by going to project data managing page, selecting menu project data managing จัดการข้อมูลโครงการ , the system then will display all project list sorting by project code. The data can be also

searched by filling the project name. Administrator can select the item at the project name to view the data detail of the project or click at the Project List to edit data and click at the project list to delete data. To add data, select menu add project เพิ่มข้อมูลโครงการ , a new project can be adding by filling the complete details so the data can be saved. In menu project data statistics เพิ่มข้อมูลโครงการ , it will display the number of all projects by type of project.

17) News data managing page contains news listing menu, News data adding menu, and news data managing menu as shown in figure 4.17

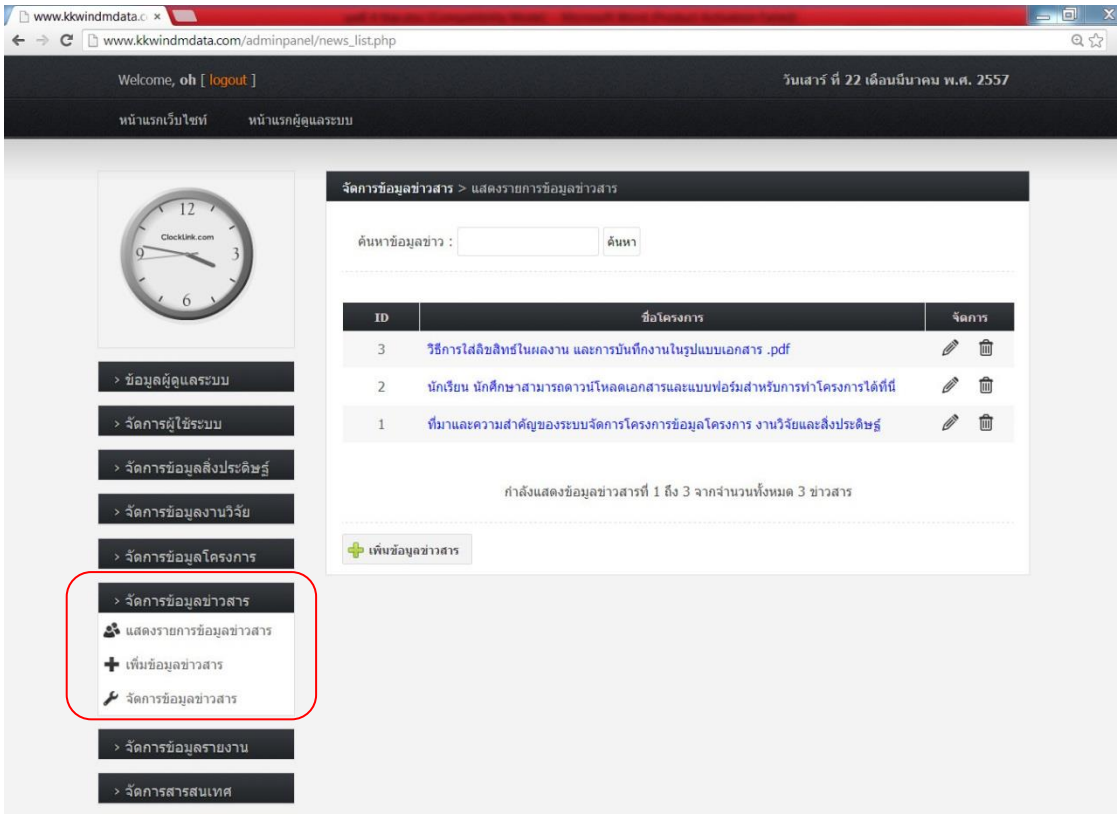


Figure 4.17 News data managing page.

Figure 4.17 administrator can manage news data by going to news data managing page, selecting menu news data managing จัดการข้อมูลข่าวสาร , the system then will display all news list sorting by news code. The data can be also

searched by filling the news title name. Administrator can select the item at the news title name to view the data detail of the news or click at the news list to edit data and click at the news list to delete data. To add data, select menu Add News เพิ่มข้อมูลข่าวสาร a new news can be adding by filling the complete details so the data can be saved.

18) Report data managing page contains report listing menu, Report data adding menu, and report data managing menu as shown in figure 4.18

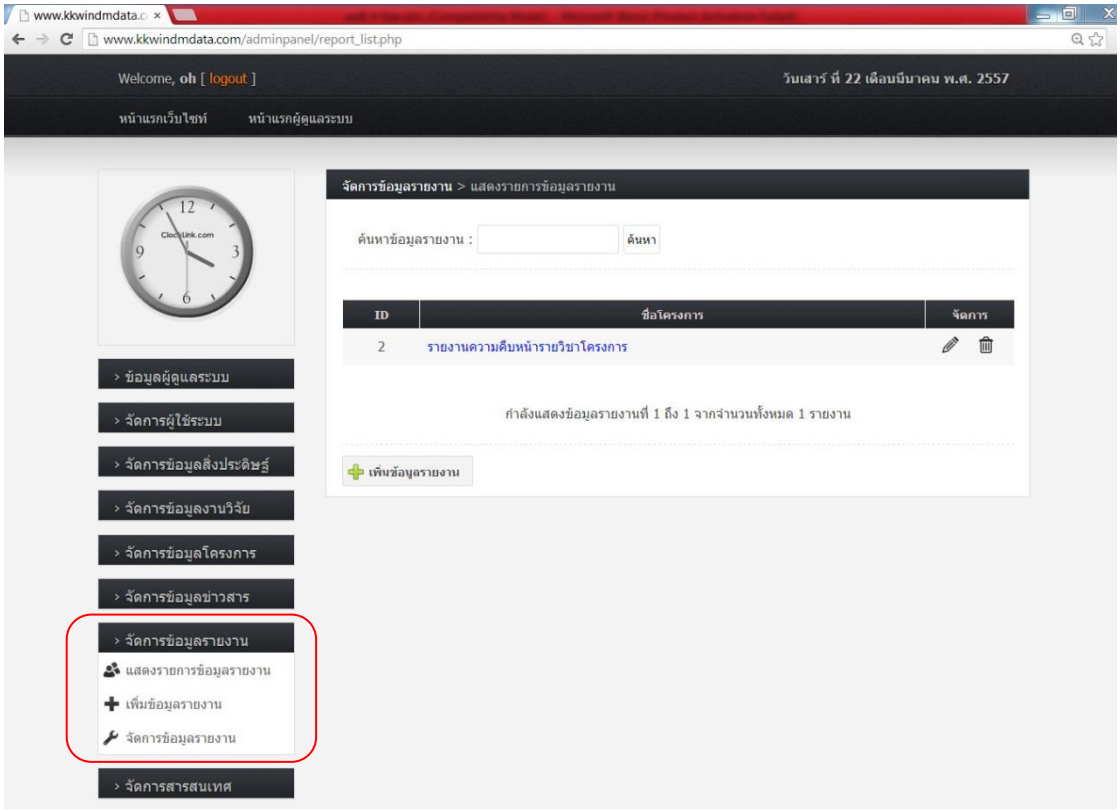


Figure 4.18 Report data managing page.

Figure 4.18 administrator can manage report data by going to report data managing page, selecting menu report data managing จัดการข้อมูลรายงาน, the system then will display all report list sorting by report code. The data can be also searched by filling the report name. Administrator can select the item at the report

name to view the data detail of the report or click at the report list to edit data and click at the report list to delete data. . To add data, select menu add report เพิ่มข้อมูลรายงาน a new report can be adding by filling the complete details so the data can be saved.

19) Information managing page contains research information, Project information, and invention information as shown in figure 4.19

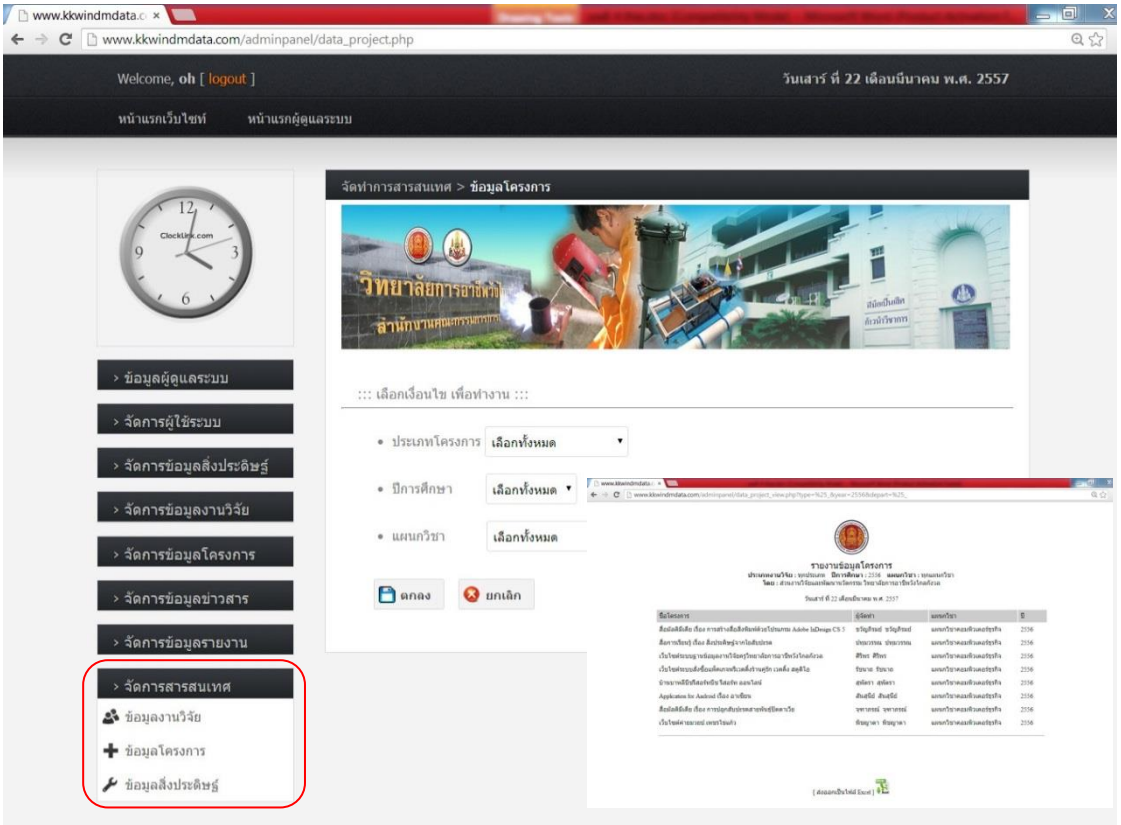


Figure 4.19 Information managing page.

Figure 4.19 administrator can manage information by going to information managing page, and selecting the desired information (for example, project information), the system then will display condition list including type of project, academic year, and department. If no condition is selected, the system will display all. The system will display project information by the selected condition. Administrator

can choose menu export as excel File [ส่งออกเป็นไฟล์ Excel] to export the data in excel format for further use.

4.2 Study results of administrators' satisfaction of data management system on projects, researches, and inventions, in the section of innovation and invention developments researches,Wangklaikangwon Industrial and Community Education College.

Section 1 Results of the developed system satisfaction assessment in various aspects represented by the average ($\bar{x}$) and the standard deviation (S.D.) based on the assessment of system satisfaction of 5 administrators are summarized as follows.

Table 4.1 Table of respondents' gender (Administrator)

No.	Gender	Quantity	Percentage
1.	Male	1	20.00
2.	Female	4	80.00
	Total	**5**	**100.00**

Based on Table 4.1 showing gender of respondents (Administrator), it is found that there are 5 respondents including 1 male (20%) and 4 females (80%).

Table 4.2 Table of respondents' age (Administrator)

No.	Age	Quantity	Percentage
1.	21 – 30 years old	3	60.00
2.	Above 41 years old	2	40.00
	Total	**5**	**100.00**

Based on Table 4.2 showing age of respondents (Administrator), it is found that there are 5 respondents including 3 persons with 21-30 years old (60%) and 2 persons with above 41 years old (40%).

Table 4.3 Table of respondents' highest education level (Administrator)

No.	Highest Education Level	Quantity	Percentage
1.	Bachelor's Degree	4	80.00
2.	Master's Degree	1	20.00
	Total	**5**	**100.00**

Based on Table 4.3 showing respondents' highest education level (Administrator), it is found that there are 5 respondents including 4 persons with bachelor's degree (80%) and 1 person with master's degree (20%).

Table 4.4 Table of respondents' computer capability (Administrator)

No.	Computer Capability	Quantity	Percentage
1.	Fair	1	20.00
2.	Good	1	20.00
3.	Excellent	3	60.00
	Total	**5**	**100.00**

Based on Table 4.4 showing respondents' computer capability (Administrator), it is found that there are 5 respondents including 1 person with fair capability (20%), 1 person with good capability (20%) and 3 persons with excellent capability (60%).

Table 4.5 Table of respondents' computer and internet network usage frequency (Administrator)

No.	Usage Frequency	Quantity	Percentage
1.	Every day/ Week	5	100.00
	Total	**5**	**100.00**

Based on Table 4.5 showing respondents' computer and internet network usage frequency (Administrator), it is found that all 5 respondents use computer and internet network every day a week (100%).

Section 2 Administration's satisfaction assessment of data management system on projects, researches and inventions.

Functional Requirement Test is an assessment to verify how much the developed system is accuracy and efficiency to meet the needs of its users. Results of administrator's satisfaction assessment are shown in Table 4.6

Table 4.6 Results of administration's satisfaction assessment in functional requirement test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. System suitability in data displaying	4.80	0.45	Highest
2. System suitability in system accessing	4.80	0.45	Highest
3. System suitability in data adding transaction	4.60	0.55	Highest
4. System suitability in data editing transaction	4.60	0.55	Highest
5. System suitability in data deleting transaction	4.60	0.55	Highest
6. System suitability in data detail displaying transaction	4.80	0.45	Highest
7. System suitability in overall operation	4.60	0.55	Highest
Total Average	**4.69**	**0.38**	**Highest**

Based on table 4.6 showing the results of administration's satisfaction assessment of information management system of projects, researches and inventions, it appears that the total average of Functional Requirement Test result is 4.69 which means the satisfaction is in highest level. Based on the top 3 highest score of assessment, it is found that the administrators provide the highest level of satisfaction in system suitability in data displaying, system suitability in system accessing, and system suitability in data detail displaying transaction ($\bar{x}$ = 4.80,4.80,4.80, S.D.=0.45, 0.45, 0.45) and provides the lowest level of satisfaction in system suitability in data adding transaction, system suitability in data editing transaction, system suitability in

data deleting transaction, and system suitability in overall operation ($\bar{x}$ = 4.60, S.D.=0.55).

Functional Test is an assessment to verify how much the developed system is accuracy and efficiency and how good the system functions can perform. Results of administrator's satisfaction assessment are shown in Table 4.7

Table 4.7 Results of administration's satisfaction assessment in functional test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. System accuracy in data adding, editing, and deleting	4.20	0.45	High
2. System accuracy in data verifying	4.00	0.70	High
3. System accuracy in data searching	4.20	0.45	High
4. System accuracy in user access verifying	4.20	0.45	High
5. System accuracy in summary report issuing	4.20	0.45	High
6. System accuracy in overall operation	4.00	0.70	High
Total Average	**4.13**	**0.30**	**High**

Based on table 4.7 showing results of administration's satisfaction assessment in Functional Test, it appears that the total average is 4.13 which means the satisfaction is in high level. Based on the top 3 highest score of assessment, it is found that the administrators provide the highest level of satisfaction in system accuracy in data adding, editing, and deleting, system accuracy in data searching, and system accuracy in user access verifying ($\bar{x}$ =4.20,4.20,4.20, S.D.=0.45,0.45,0.45), and provide the lowest level of system accuracy in data verifying and system accuracy in overall operation ($\bar{x}$ = 4.00, S.D.=0.70).

Usability Test is an assessment to verify how the developed system usable. Results of administrator's satisfaction assessment are shown in table 4.8

Table 4.8 Results of administration's satisfaction assessment in usability test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. Easy-to-use of system	4.60	0.55	Highest
2. Convenience of Menu selection	4.60	0.55	Highest
3. Clarity of message and image displayed on the screen	4.80	0.45	Highest
4. Suitability of font color, background and placement	5.00	0.00	Highest
5. Suitability of data volume displayed on each screen	4.60	0.55	Highest
6. Suitability of data field position	4.40	0.55	High
7. Standardization of screen design	4.40	0.55	High
8. Easy-to-understand of wording on screen	4.40	0.55	High
9. Convenience and ease of use of overall system	4.80	0.45	Highest
Total Average	**4.62**	**0.18**	**Highest**

Based on Table 4.8 showing results of administration's satisfaction assessment in Usability Test, it appears that the total average is 4.62 which means the satisfaction is in highest level. The administrators provide the highest level of satisfaction in suitability of font color, background and placement, clarity of message and image displayed on the screen, and convenience and ease of use of overall system ($\bar{x}$ = 5.00,4.80,4.80 S.D.=0.00,0.45,0.45), and provide the lowest level of satisfaction in suitability of data field position, **s**tandardization of screen design, and easy-to-understand of wording on screen ($\bar{x}$ = 4.40, S.D.=0.55).

Security Test is an assessment to verify how much the developed system's data security is. Results of administrator's satisfaction assessment are shown in Table 4.9

Table 4.9 Results of Administration's Satisfaction Assessment in Security Test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. Determination of username and password for system authentication	4.20	0.48	High
2. Authentication before system accessing of users at different levels	4.20	0.48	High
3. Correctly Control of usage by user permissions	4.20	0.48	High
4. Suitability of overall system security	4.20	0.84	High
Total Average	**4.20**	**0.32**	**High**

Based on Table 4.9 showing results of administration's satisfaction assessment in Security Test, it appears that the total average is 4.20 which means the satisfaction is in high level. The administrators provide the highest level of satisfaction in determination of username and password for system authentication, authentication before system accessing of users at different levels, and correctly control of usage by user permissions ($\bar{x}$ =4.20,4.20,4.20 S.D.=0.48,0.48,0.48), and provide the lowest level of satisfaction in suitability of overall system security ($\bar{x}$ = 4.20, S.D.=0.84).

4.3 Study results of teachers' satisfaction of data management system on projects, researches, and inventions, in the section of innovation and invention developments researches,Wangklaikangwon Industrial and Community Education College.

Section 1 Results of the developed system satisfaction assessment in various aspects represented by the average ($\bar{x}$) and the standard deviation (S.D.) based on the assessment of system satisfaction of 20 teachers are summarized as follows.

Table 4.10 Table of Respondents' Gender (Teacher)

No.	Gender	Quantity	Percentage
1.	Male	13	65.00
2.	Female	7	35.00
	Total	**20**	**100.00**

Based on Table 4.10 showing gender of respondents (Teacher), it is found that there are 20 respondents including 13 male (65%) and 7 females (35%).

Table 4.11 Table of Respondents' Age (Teacher)

No.	Age	Quantity	Percentage
1.	21 – 30 years old	4	20.00
2.	31 – 40 years old	14	70.00
3.	Above 41 years old	2	10.00
	Total	**20**	**100.00**

Based on Table 4.11 showing age of respondents (Teacher), it is found that there are 20 respondents including 4 persons with 21-30 years old (20%), 14 persons with 31-40 years old (70%) and 2 persons with above 41 years old (10%).

Table 4.12 Table of Respondents' Highest Education Level (Teacher)

No.	Highest Education Level	Quantity	Percentage
1.	Bachelor's Degree	18	90.00
2.	Master's Degree	2	10.00
	Total	**20**	**100.00**

Based on Table 4.12 showing respondents' highest education level (Teacher), it is found that there are 20 respondents including 18 persons with bachelor's degree (90%) and 2 persons with master's degree (10%).

Table 4.13 Table of Respondents' Computer Capability (Teacher)

No.	Computer Capability	Quantity	Percentage
1.	Few	1	5.00
2.	Fair	5	25.00
3.	Good	9	45.00
4.	Excellent	5	25.00
	Total	**20**	**100.00**

Based on Table 4.13 showing respondents' computer capability (Teacher), it is found that there are 20 respondents including 1 person with few capability (5%), 5 persons with good fair capability (25%), 9 person with good capability (45%) and 5 persons with excellent capability (25%).

Table 4.14 Table of Respondents' Computer and Internet Network Usage Frequency (Teacher)

No.	Usage Frequency	Quantity	Percentage
1.	3-4 days/ Week	1	5.00
2.	5-6 days/ Week	5	25.00
3.	Every day/ Week	14	70.00
	Total	**20**	**100.00**

Based on Table 4.14 showing respondents' computer and internet network usage frequency (Teacher), it is found that all 20 respondents 1 person use computer and internet network 3-4 days per weeks (5%), 5 persons use computer and internet network 5-6 days per weeks(25%), and 14 persons use computer and internet every day a week (70%).

Section 2 Teacher's satisfaction assessment of data management system on projects, researches and inventions.

Functional Requirement Test is an assessment to verify how much the developed system is accuracy and efficiency to meet the needs of its users. Results of teachers' satisfaction assessment are shown in Table 4.15

Table 4.15 Results of Teacher's Satisfaction Assessment in Functional Requirement Test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. System suitability in data displaying	4.55	0.51	Highest
2. System suitability in system accessing	4.45	0.61	High
3. System suitability in data adding transaction	4.45	0.61	High
4. System suitability in data editing transaction	4.35	0.59	High
5. System suitability in data deleting transaction	4.35	0.59	High
6. System suitability in data detail displaying transaction	4.45	0.51	High
7. System suitability in overall operation	4.50	0.51	Highest
Total Average	**4.44**	**0.35**	**High**

Based on Table 4.15 showing the results of teacher's satisfaction assessment of data management system of projects, researches and inventions, it appears that the total average of Functional Requirement Test result is 4.44 which means the satisfaction is in high level. Based on the top 3 highest score of assessment, it is found that the teachers provide the highest level of satisfaction in system suitability in data displaying, system suitability in overall operation, and system suitability in data detail displaying transaction ($\bar{x}$ = 4.55,4.50,4.45, S.D.=0.51, 0.51, 0.51), and provides the lowest level of satisfaction in system suitability in data editing transaction and system suitability in data deleting transaction ($\bar{x}$ = 4.35, S.D.=0.59).

Functional Test is an assessment to verify how much the developed system is accuracy and efficiency and how good the system functions can perform. Results of Teachers' satisfaction assessment are shown in Table 4.16

Table 4.16 Results of Teachers' Satisfaction Assessment in Functional Test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. System accuracy in data adding, editing, and deleting	4.50	0.51	Highest
2. System accuracy in data verifying	4.25	0.72	High
3. System accuracy in data searching	4.25	0.72	High
4. System accuracy in user access verifying	4.50	0.51	Highest
5. System accuracy in summary report issuing	4.30	0.80	High
6. System accuracy in overall operation	4.50	0.61	Highest
Total Average	**4.38**	**0.51**	**High**

Based on Table 4.16 showing results of teacher's satisfaction assessment in Functional Test, it appears that the total average is 4.38 which means the satisfaction is in high level. Based on the top 3 highest score of assessment, it is found that the teachers provide the highest level of satisfaction in system accuracy in user access verifying , system accuracy in data adding editing and deleting , and system accuracy in overall operation ($\bar{x}$ =4.50,4.50,4.50, S.D.=0.51,0.51,0.61), and provide the lowest level of system accuracy in data verifying and system accuracy in data searching ($\bar{x}$ = 4.25, S.D.=0.72).

Usability Test is an assessment to verify how the developed system usable. Results of teachers' satisfaction assessment are shown in Table 4.17

Table 4.17 Results of Teachers' Satisfaction Assessment in Usability Test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. Easy-to-use of system	4.80	0.41	Highest
2. Convenience of Menu selection	4.65	0.49	Highest
3. Clarity of message and image displayed on the screen	4.55	0.51	Highest
4. Suitability of font color, background and placement	4.60	0.60	Highest
5. Suitability of data volume displayed on each screen	4.60	0.60	Highest
6. Suitability of data field position	4.45	0.60	High
7. Standardization of screen design	4.55	0.60	Highest
8. Easy-to-understand of wording on screen	4.65	0.49	Highest
9. Convenience and ease of use of overall system	4.75	0.45	Highest
Total Average	**4.62**	**0.30**	**Highest**

Based on Table 4.17 showing results of teachers' satisfaction assessment in Usability Test, it appears that the total average is 4.62 which means the satisfaction is in highest level. The teachers provide the highest level of satisfaction in easy-to-use of system, convenience and ease of use of overall system, and convenience of menu selection ($\bar{x}$ = 4.80, 4.75, 4.65 S.D. =0.41, 0.45, 0.49), and provide the lowest level of satisfaction in Suitability of data field position ($\bar{x}$ = 4.45, S.D. =0.60).

Security Test is an assessment to verify how much the developed system's data security is. Results of Teachers' satisfaction assessment are shown in Table 4.18

Table 4.18 Results of Teachers' Satisfaction Assessment in Security Test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. Determination of username and password for system authentication	4.55	0.61	Highest
2. Authentication before system accessing of users at different levels	4.40	0.50	High
3. Correctly Control of usage by user permissions	4.55	0.61	Highest
4. Suitability of overall system security	4.35	0.75	High
Total Average	**4.46**	**0.50**	**High**

Based on Table 4.18 showing results of teachers' satisfaction assessment in Security Test, it appears that the total average is 4.46 which means the satisfaction is in high level. The teachers provide the highest level of satisfaction in determination of username and password for system authentication, correctly control of usage by user permissions, and Authentication before system accessing of users at different levels ($\bar{x}$ =4.55,4.55,4.40 S.D.=0.61,0.61,0.50), and provide the lowest level of satisfaction in suitability of overall system security ($\bar{x}$ = 4.35, S.D.=0.75).

4.4 Study results of students' satisfaction of data management system on projects, researches, and inventions, in the section of innovation and invention developments researches,Wangklaikangwon Industrial and Community Education College.

Section 1 Results of the developed system satisfaction assessment in various aspects represented by the average ($\bar{x}$) and the standard deviation (S.D.) based on the assessment of system satisfaction of 20 students are summarized as follows.

Table 4.19 Table of Respondents' Gender (Student)

No.	Gender	Quantity	Percentage
1.	Male	3	15.00
2.	Female	17	85.00
	Total	**20**	**100.00**

Based on Table 4.19 showing gender of respondents (Student), it is found that there are 20 respondents including 3 male (15%) and 17 females (85%).

Table 4.20 Table of Respondents' Age (Student)

No.	Age	Quantity	Percentage
1.	Below 21 years old	15	75.00
2.	31 – 40 years old	5	25.00
	Total	**20**	**100.00**

Based on Table 4.20 showing age of respondents (Student), it is found that there are 20 respondents including 15 persons with below 21 years old (75%), and 5 persons with 31 – 40 years old (25%).

Table 4.21 Table of Respondents' Highest Education Level (Teacher)

No.	Highest Education Level	Quantity	Percentage
1.	Below Bachelor's Degree	20	100.00
	Total	**20**	**100.00**

Based on Table 4.21 showing respondents' highest education level (Student), it is found that all 20 respondents with below bachelor's degree (100%)

Table 4.22 Table of Respondents' Computer Capability (Student)

No.	Computer Capability	Quantity	Percentage
1.	Fair	13	65.00
2.	Good	3	15.00
3.	Excellent	4	20.00
	Total	**20**	**100.00**

Based on Table 4.22 showing respondents' computer capability (Student), it is found that there are 20 respondents including 13 persons with fair capability (65%), 3 persons with good fair capability (15%), and 4 persons with excellent capability (20%).

Table 4.23 Table of Respondents' Computer and Internet Network Usage Frequency (Student)

No.	Usage Frequency	Quantity	Percentage
1.	3-4 days/ Week	5	25.00
2.	5-6 days/ Week	12	60.00
3.	Every day/ Week	3	15.00
	Total	**20**	**100.00**

Based on Table 4.23 showing respondents' computer and internet network usage frequency (Student) it is found that all 20 respondents 5 persons use computer and internet network 3-4 days per weeks (25%), 12 persons use computer and internet network 5-6 days per weeks(60%), and 3 persons use computer and internet every day a week (15%).

Section 2 Student's satisfaction assessment of data management system on projects, researches and inventions.

Functional Requirement Test is an assessment to verify how much the developed system is accuracy and efficiency to meet the needs of its users. Results of students' satisfaction assessment are shown in Table 4.24

Table 4.24 Results of Student's Satisfaction Assessment in Functional Requirement Test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. System suitability in data displaying	4.55	0.51	Highest
2. System suitability in system accessing	4.60	0.75	Highest
3. System suitability in data adding transaction	4.55	0.61	Highest
4. System suitability in data editing transaction	4.60	0.60	Highest
5. System suitability in data deleting transaction	4.50	0.61	Highest
6. System suitability in data detail displaying transaction	4.40	0.75	High
7. System suitability in overall operation	4.40	0.50	High
Total Average	**4.51**	**0.28**	**High**

Based on Table 4.24 showing the results of teacher's satisfaction assessment of data management system of projects, researches and inventions, it appears that the total average of Functional Requirement Test result is 4.51 which means the satisfaction is in high level. Based on the top 3 highest score of assessment, it is found that the students provide the highest level of satisfaction in system suitability in data editing transaction , system suitability in system accessing ,and System suitability in data displaying ($\bar{x}$ = 4.55,4.50,4.45, S.D.=0.51, 0.51, 0.51), and provides the lowest level of satisfaction in system suitability in data detail displaying transaction ($\bar{x}$ = 4.40, S.D.=0.75).

Functional Test is an assessment to verify how much the developed system is accuracy and efficiency and how good the system functions can perform. Results of students' satisfaction assessment are shown in Table 4.25

Table 4.25 Results of Students' Satisfaction Assessment in Functional Test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. System accuracy in data adding, editing, and deleting	4.55	0.61	Highest
2. System accuracy in data verifying	4.50	0.76	Highest
3. System accuracy in data searching	4.35	0.67	High
4. System accuracy in user access verifying	4.40	0.60	Highest
5. System accuracy in summary report issuing	4.40	0.82	High
6. System accuracy in overall operation	4.25	0.64	High
Total Average	**4.41**	**0.33**	**High**

Based on Table 4.25 showing results of students' satisfaction assessment in Functional Test, it appears that the total average is 4.41 which means the satisfaction is in high level. Based on the top 3 highest score of assessment, it is found that the students provide the highest level of satisfaction in system accuracy in data adding editing and deleting , system accuracy in data verifying , and system accuracy in user access verifying ($\bar{x}$=4.55,4.50,4.40, S.D.=0.61,0.76,0.60), and provide the lowest level of System accuracy in overall operation ($\bar{x}$ = 4.25, S.D.=0.64).

Usability Test is an assessment to verify how the developed system usable. Results of students' satisfaction assessment are shown in Table 4.26

Table 4.26 Results of Students' Satisfaction Assessment in Usability Test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. Easy-to-use of system	4.35	0.67	High
2. Convenience of Menu selection	4.45	0.61	High
3. Clarity of message and image displayed on the screen	4.35	0.75	High
4. Suitability of font color, background and placement	4.60	0.50	Highest
5. Suitability of data volume displayed on each screen	4.70	0.47	Highest
6. Suitability of data field position	4.70	0.57	Highest
7. Standardization of screen design	4.80	0.41	Highest
8. Easy-to-understand of wording on screen	4.70	0.47	Highest
9. Convenience and ease of use of overall system	4.30	0.66	High
Total Average	**4.55**	**0.30**	**Highest**

Based on Table 4.26 showing results of students' satisfaction assessment in Usability Test, it appears that the total average is 4.55 which means the satisfaction is in highest level. The students provide the highest level of satisfaction in standardization of screen design , suitability of data volume displayed on each screen, and easy-to-understand of wording on screen ($\bar{x}$ = 4.80, 4.70, 4.70 S.D. =0.41, 0.47, 0.47), and Convenience and ease of use of overall system ($\bar{x}$ = 4.30, S.D. =0.66).

Security Test is an assessment to verify how much the developed system's data security is. Results of Students' satisfaction assessment are shown in Table 4.27

Table 4.27 Results of Students' Satisfaction Assessment in Security Test

Area of Assessment	Level of Satisfaction		
	($\bar{x}$)	S.D.	Meaning
1. Determination of username and password for system authentication	4.60	0.50	Highest
2. Authentication before system accessing of users at different levels	4.45	0.61	High
3. Correctly Control of usage by user permissions	4.30	0.73	Highest
4. Suitability of overall system security	4.25	0.72	High
Total Average	**4.40**	**0.36**	**High**

Based on Table 4.18 showing results of students' satisfaction assessment in Security Test, it appears that the total average is 4.40 which means the satisfaction is in high level. The students provide the highest level of satisfaction in determination of username and password for system authentication, Authentication before system accessing of users at different levels ,and correctly control of usage by user permissions, and ($\bar{x}$=4.60,4.45,4.30 S.D.=0.50,0.61,0.73), and provide the lowest level of satisfaction in suitability of overall system security ($\bar{x}$ = 4.25, S.D.=0.72).

4.5 Conclusion of system satisfaction.

The summary of the satisfaction assessment result by the system users, after the testing of this developed system in order to assess the efficiency of the system, it is able to summarized the assessment result in each field as shown in Figure 4.20

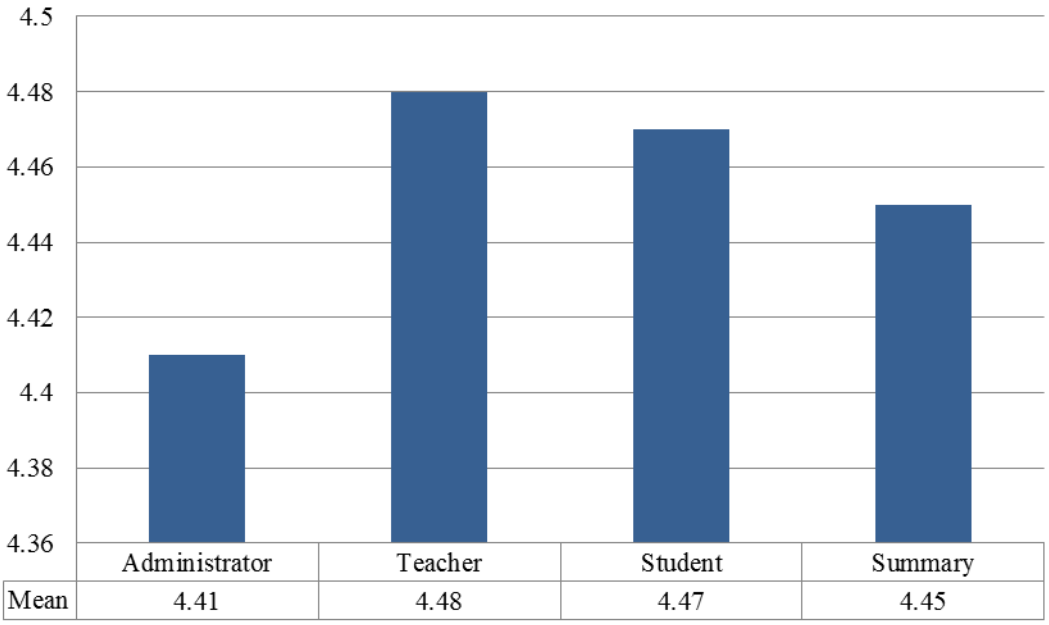


Figure 4.20 The summary of the satisfaction assessment of the system in all aspects

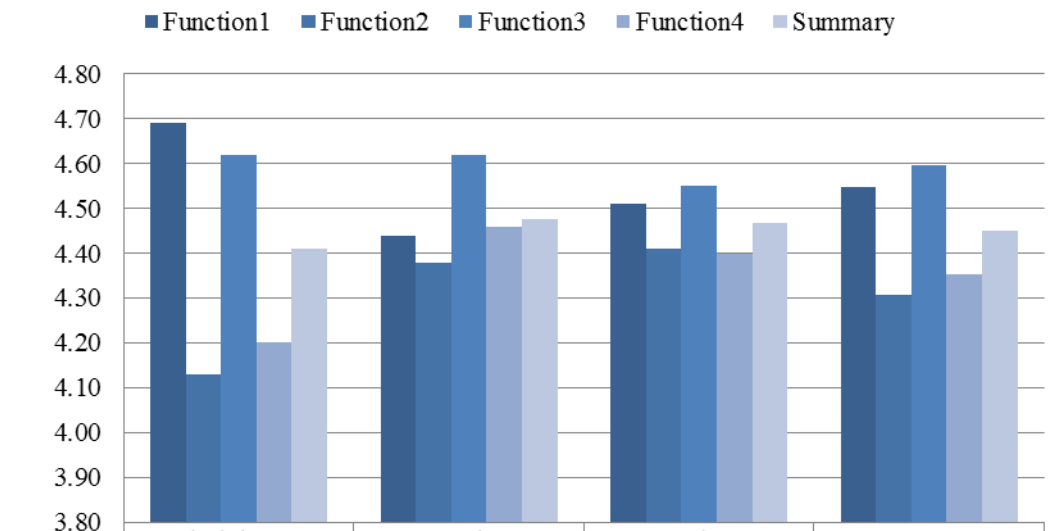
From Figure 4.20 the summary satisfaction assessment of the system in all aspects, the mean is 4.45 which means the satisfaction is in high level, it can be explain as follows

The result of the system assessment in administrator is in all aspects, it is found to have the efficiency at a high level.

The result of the system assessment in teacher is in all aspects, it is found to have the efficiency at a high level.

The result of the system assessment in student is in all aspects, it is found to have the efficiency at a high level.

And then summary of the satisfaction assessment of the system in each aspect as shown in Figure 4.21



	Administrator	Teacher	Student	Summary
Function1	4.69	4.44	4.51	4.55
Function2	4.13	4.38	4.41	4.31
Function3	4.62	4.62	4.55	4.60
Function4	4.20	4.46	4.40	4.35
Summary	4.41	4.48	4.47	4.45

Figure 4.21 The summary of the satisfaction assessment of the system in each aspects

From Figure 4.21, it can be explain as follows

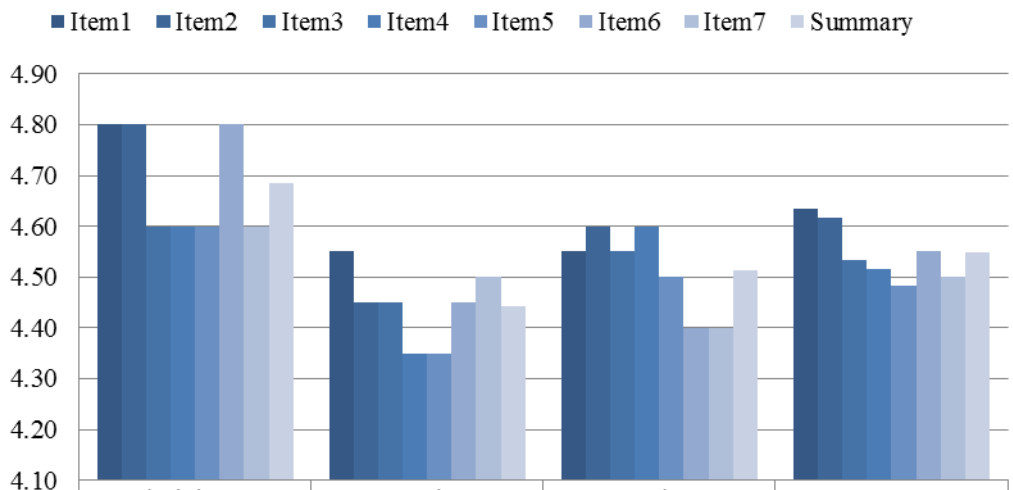
The result of the system assessment in Funtion1 is in terms of the functional requirement test, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Funtion2 is in terms of the functional test, it is found that the system has the efficiency at a high level.

The result of the system assessment in Funtion3 is in terms of the usability test, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Funtion4 is in terms of the security test, it is found that the system has the efficiency at a high level.

And then summary of the satisfaction assessment of the system in terms of the Functional Requirement Test as shown in Figure 4.22



	Administrator	Teacher	Student	Summary
Item1	4.80	4.55	4.55	4.63
Item2	4.80	4.45	4.60	4.62
Item3	4.60	4.45	4.55	4.53
Item4	4.60	4.35	4.60	4.52
Item5	4.60	4.35	4.50	4.48
Item6	4.80	4.45	4.40	4.55
Item7	4.60	4.50	4.40	4.50
Summary	4.69	4.44	4.51	4.55

Figure 4.22 The summary of the satisfaction assessment of the system in terms of the Functional Requirement Test

From Figure 4.22, it can be explain as follows

The result of the system assessment in Item1 of system suitability in data displaying, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Item2 of system suitability in system accessing, it is found that the system has the efficiency a highest level.

The result of the system assessment in Item3 of system suitability in data adding transaction, it is found that the system has the efficiency at a highest level.

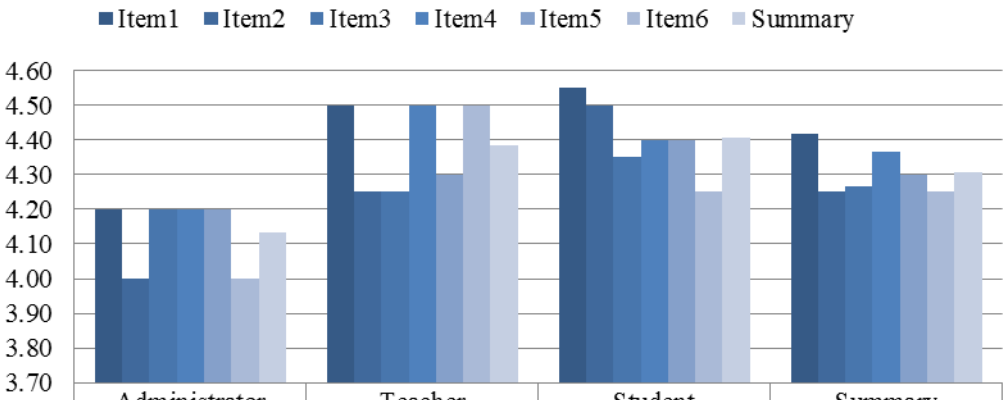
The result of the system assessment in Item4 of system suitability in data editing transaction, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Item5 of system suitability in data deleting transaction, it is found that the system has the efficiency at a high level.

The result of the system assessment in Item6 of system suitability in data detail displaying transaction, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Item7 of system suitability in overall operation, it is found that the system has the efficiency at a highest level.

And then summary of the satisfaction assessment of the system in terms of the Functional Test as shown in Figure 4.23



	Administrator	Teacher	Student	Summary
Item1	4.20	4.50	4.55	4.42
Item2	4.00	4.25	4.50	4.25
Item3	4.20	4.25	4.35	4.27
Item4	4.20	4.50	4.40	4.37
Item5	4.20	4.30	4.40	4.30
Item6	4.00	4.50	4.25	4.25
Summary	4.13	4.38	4.41	4.31

Figure 4.23 The summary of the satisfaction assessment of the system in terms of the Functional Test

From Figure 4.23, it can be explain as follows

The result of the system assessment in Item1 of system accuracy in data adding, editing, and deleting, it is found that the system has the efficiency at a high level.

The result of the system assessment in Item2 of system accuracy in data verifying, it is found that the system has the efficiency at a high level.

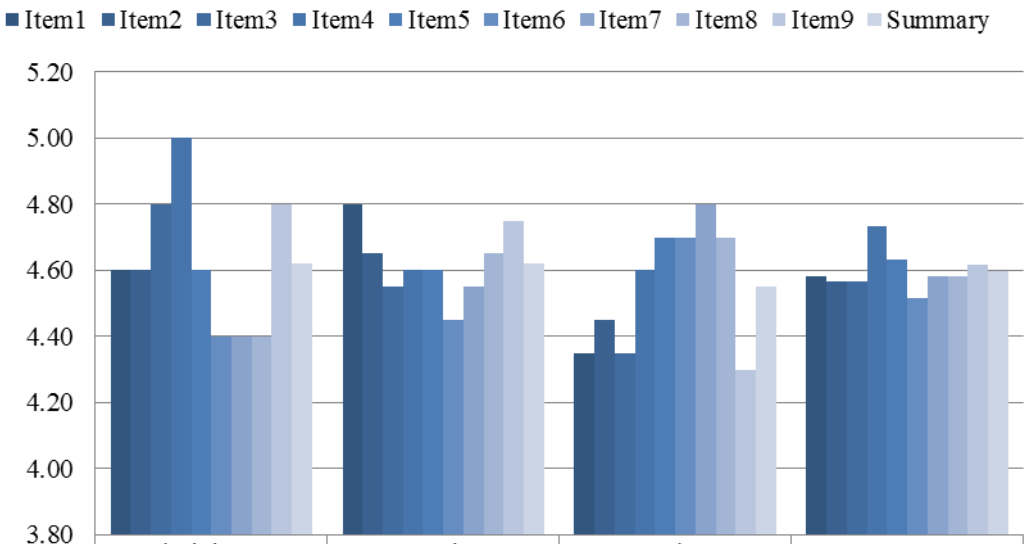
The result of the system assessment in Item3 of system accuracy in data searching, it is found that the system has the efficiency at a high level.

The result of the system assessment in Item4 of system accuracy in user access verifying, it is found that the system has the efficiency at a high level.

The result of the system assessment in Item5 of system accuracy in summary report issuing, it is found that the system has the efficiency at a high level.

The result of the system assessment in Item6 of system accuracy in overall operation, it is found that the system has the efficiency at a high level.

And then summary of the satisfaction assessment of the system in terms of the Usability Test as shown in Figure 4.24



	Administrator	Teacher	Student	Summary
Item1	4.60	4.80	4.35	4.58
Item2	4.60	4.65	4.45	4.57
Item3	4.80	4.55	4.35	4.57
Item4	5.00	4.60	4.60	4.73
Item5	4.60	4.60	4.70	4.63
Item6	4.40	4.45	4.70	4.52
Item7	4.40	4.55	4.80	4.58
Item8	4.40	4.65	4.70	4.58
Item9	4.80	4.75	4.30	4.62
Summary	4.62	4.62	4.55	4.60

Figure 4.24 The summary of the satisfaction assessment of the system in terms of the Usability Test

From Figure 4.24, it can be explain as follows

The result of the system assessment in Item1 of easy-to-use of system, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Item2 of convenience of menu selection, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Item3 of clarity of message and image displayed on the screen, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Item4 of suitability of font color, background and placement, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Item5 of suitability of data volume displayed on each screen, it is found that the system has the efficiency at a highest level.

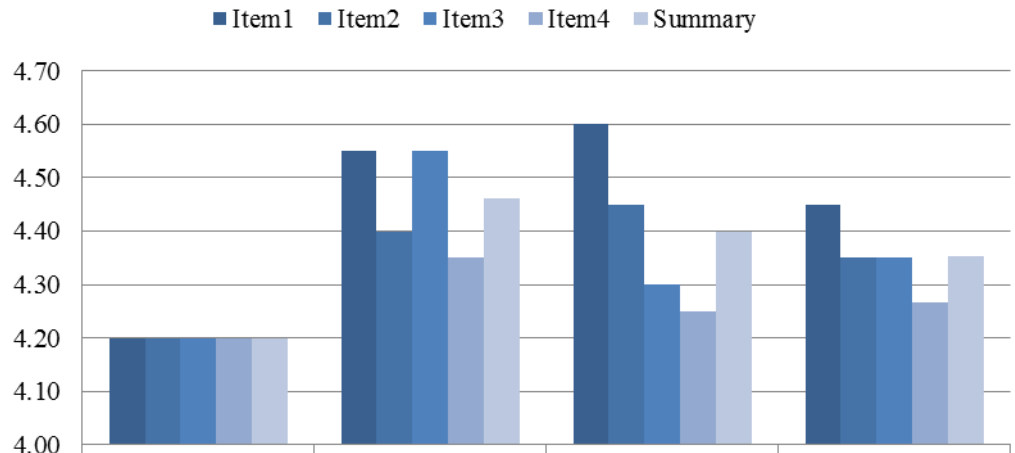
The result of the system assessment in Item6 of suitability of data field position, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Item7 of standardization of screen design, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Item8 of easy-to-understand of wording on screen, it is found that the system has the efficiency at a highest level.

The result of the system assessment in Item9 of convenience and ease of use of overall system, it is found that the system has the efficiency at a highest level.

And then summary of the satisfaction assessment of the system in terms of the Security Test as shown in Figure 4.25



	Administrator	Teacher	Student	Summary
Item1	4.20	4.55	4.60	4.45
Item2	4.20	4.40	4.45	4.35
Item3	4.20	4.55	4.30	4.35
Item4	4.20	4.35	4.25	4.27
Summary	4.20	4.46	4.40	4.35

Figure 4.25 The summary of the satisfaction assessment of the system in terms of the Security Test

From Figure 4.25, it can be explain as follows

The result of the system assessment in Item1 of determination of username and password for system authentication, it is found that the system has the efficiency at a high level.

The result of the system assessment in Item2 of authentication before system accessing of users at different levels, it is found that the system has the efficiency at a high level.

The result of the system assessment in Item3 of correctly control of usage by user permissions, it is found that the system has the efficiency at a high level.

The result of the system assessment in Item4 of suitability of overall system security, it is found that the system has the efficiency at a high level.

The summary of the development of information management system represents results of implementation and data analysis to find out satisfaction of

system users as the purpose of the research. In other word, the developed system can help the users, namely, professors and students, to manage project information, researches and inventions. In addition, the overall satisfaction level of the system users was in high level. The average of system administrator was equal to 4.41 representing the high level of satisfaction. The average of professors was equal to 4.48 representing the high level of satisfaction. And the average of students was equal to 4.47 representing the high level of satisfaction.

CHAPTER V
DISCUSSION AND CONCLUSION

The developed Data Management System of projects, researches and inventions of the Innovation and Invention Research and Development Division of Klaikangwon Industrial and Community Education College has been tested for application in Klaikangwon Industrial and Community Education College, and has been verified and assessed the system efficiency by experts and users. The comments of the experts and the users are also considered to improve the system operation to meet the needs of most applications. The summary of working is shown as follows.

5.1 Summary of the research result

5.2 Discuss the research result

5.3 Conclusion the research result

5.4 Suggestion from the research result

5.1 Summary of the research result

This research is the development of data management system of projects, researches and inventions of Klaikangwon Industrial and Community Education College, which focuses on being a model of web-based applications with capability of data management and information retrieval in projects, researches, and inventions through the internet network to facilitate a fast and accurate service for teachers, students, and personnel of the college, as well as provide technical support which is a part of the education quality assurance.

Tool used to assess the system is the assessment form of satisfaction with the developed system. This is assessed by system users including administrator, teacher, and student in 4 aspects.

- The suitability in the functioning of the system
- The correctness in the operation of the system

- In terms of conveniences and easiness of the use of the system and
- In terms of the security of the system

The researchers analyze the results and compare the satisfaction of the samples including teachers and students who are the system users. Arithmetic Mean or Mean and Standard Deviation methods are used to measure the distribution of data. According to satisfaction assessment of administrations, the mean is 4.41, the standard deviation is 0.30. According to satisfaction assessment of teachers, the mean is 4.48, the standard deviation is 0.42. According to satisfaction assessment of students, the mean is 4.47, the standard deviation is 0.30. It is found that assessment results of System suitability in system accessing, System accuracy in data adding, editing, and deleting, and Easy-to-use of system do not differ. When considering the results of system applications and system satisfactions assessment in each area, the compared statistics are shown as follows.

1) Basing on satisfaction assessment results of system suitability in system accessing, mean is 4.80 and S.D. is 0.45 from administrator group; mean is 4.45 and S.D. is 0.61 from teacher group; mean is 4.60 and S.D. is 0.51 from student group. When finding the average of the 3 groups, it appears that mean is 4.62 and S.D. is 0.52. This shows that the developed system has accuracy and meets the needs of system users in the highest level ranged from 4.50 to 5.00.

2) Basing on satisfaction assessment results of system accuracy in data adding, editing, and deleting, mean is 4.50 and S.D. is 0.51 from teacher group; mean is 4.55 and S.D. is 0.61 from student group. This shows that the developed system has accuracy and meets the needs of system users in the highest level ranged from 4.50 to 5.00.

3) Basing on satisfaction assessment results of easy-to-use of system, mean is 4.60 and S.D. is 0.55 from administrator group; mean is 4.80 and S.D. is 0.41 from teacher group. This shows that the developed system has accuracy and meets the needs of system users in the highest level ranged from 4.50 to 5.00. When bring the mean of each area into the statistical process to find the total average of mean, it is found that the mean of users including administrators, teachers and students is 4.45

and the S.D. is 0.34, which shows that the developed system has accuracy and meets the needs of system users in the high level.

5.2 Discuss the research result

Development of information management system of projects, researches and inventions of the Innovation and Invention Research and Development Division of Klaikangwon Industrial and Community Education College has been passed the assessment from the experts and improved from the comments of the system administrator and users. Its results can be discussed as follows.

1) This development of information management system of projects, researches and inventions of the Innovation and Invention Research and Development Division of Klaikangwon Industrial and Community Education College has accuracy and meets the needs of the system users because the researchers have developed the system by basing on 6 steps of System Development Life Cycle, studied the Database Management System, as well as studied the language used in application development. PHP is the language used in system development, and MySQL command is used in database management. Therefore the satisfaction assessment result is in high level and the developed system can be actually applied in one own division. The development of such system is also consistent with the research of Rossukon Pinthong (2011) who has studied data management of researches and projects, aiming to support researches and projects searching in efficiency, accuracy, and rapid way by developing the system in web-based application for ease of use.

2) Considering the satisfaction of the system users including administrators, teachers and students, it is found that the assessment results are in high level with their mean 4.41, 4.48 and 4.47 respectively. This partly results from the users' ability in accessing the data quickly and easily.

Therefore this development of information management system of projects, researches and inventions is regarded as a good development and useful to the agency in storing projects, researches and inventions data, and publishing academic works, as well as supporting the quality assurance of data storage and information dissemination that the Klaikangwon college has no supporting system. One more observation found is that the users' satisfaction in convenience and ease of

use is higher than other area because the information management system of projects, researches and inventions is developed in web-based application; the users therefore can access the system via internet network by using their portable devices. This considerably meets the users' requirement so the satisfaction assessment result is in highest level. In conclusion, the development of information management system of projects, researches and inventions allows a convenience, quick and responsive operation for the agency, so the data management with information system enhances efficiency of working.

5.3 Conclusion the research result

The result of satisfaction evaluation of Data Management System on projects, researches, and inventions was in high level. Therefore, it could be concluded that the management system of project information in the form of web application through internet network that had been developed could be actually applied and responded to requirements of users effectively.

5.4 Suggestion from the research result

1) The management should explain to personnel about the importance of information management systems of projects, researches and inventions, and encourage them to use the system in their operation.

2) The implementation should have regularly backup.

3) There should be an additional function in supporting guests coming to study the academic works. The system should be developed for information storing, browsing, and reporting of such browsing.

4) The system should be developed for various reporting formats to meet the users' needs and applicable in practice.

5) The developed system can be used efficiently, so system application training should be conducted and user manual should be documented for better understanding and more effective using.

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APPENDICES

APPENDIX A

ASSESSMENT OF SATISFACTION FOR THE USERS.

แบบประเมินความพึงพอใจ

ระบบจัดการข้อมูลโครงการ งานวิจัยและสิ่งประดิษฐ์
ส่วนงานวิจัยพัฒนานวัตกรรมและสิ่งประดิษฐ์ วิทยาลัยการอาชีพวังไกลกังวล
สำหรับผู้ใช้งานระบบ

ชื่อผู้วิจัย : นางสาวเบญจมาศ รัตน์พิทักษ์ รหัสนักศึกษา 5537930 EGTI/M (แผน ข)
สาขาวิชาเทคโนโลยีการจัดการระบบสารสนเทศ หลักสูตรวิทยาศาสตรมหาบัณฑิต
คณะวิศวกรรมศาสตร์ มหาวิทยาลัยมหิดล

ในฐานะที่ท่านเป็นผู้หนึ่งที่มีความเกี่ยวข้องกับการใช้ระบบที่พัฒนาขึ้นนี้ ขอได้โปรดพิจารณาและตอบคำถามตามความเป็นจริง เพราะคำตอบของท่านจะเป็นประโยชน์อย่างยิ่งต่อการพัฒนาระบบในครั้งนี้ เพื่อที่ผู้พัฒนาจะได้นำข้อมูลไปวิเคราะห์และประเมินความพึงพอใจของระบบต่อไป

ขอขอบพระคุณเป็นอย่างยิ่งที่ท่านได้กรุณาให้ความร่วมมือในการตอบแบบสอบถามในครั้งนี้

นางสาวเบญจมาศ รัตน์พิทักษ์

คำชี้แจง : แบบประเมินมีทั้งหมด 3 ตอน

ตอนที่ 1 ข้อมูลทั่วไปเกี่ยวกับผู้ตอบแบบสอบถาม

ตอนที่ 2 แบบประเมินความพึงพอใจที่มีต่อการพัฒนาระบบการจัดการข้อมูลข้อมูลโครงการ งานวิจัยและสิ่งประดิษฐ์ ส่วนงานวิจัยพัฒนานวัตกรรมและสิ่งประดิษฐ์ วิทยาลัยการอาชีพวังไกลกังวล โดยมีข้อคำถามทั้งหมด 26 ข้อ ในแต่ละข้อมีคำตอบให้เลือก 5 ระดับ คือ มากที่สุด มาก ปานกลาง น้อย น้อยที่สุด ให้ท่านพิจารณาว่ามีความพึงพอใจในการใช้งานระบบว่ามีประสิทธิภาพเพียงใด โดยทำเครื่องหมาย ✓ ในช่องที่ตรงกับความเห็นของท่าน เพียงช่องเดียวในแต่ละข้อ ระดับคะแนนกำหนดไว้ 5 ระดับ ดังนี้

คะแนน 5 หมายถึง มีความพึงพอใจใน **ระดับดีมาก**
คะแนน 4 หมายถึง มีความพึงพอใจใน **ระดับดี**
คะแนน 3 หมายถึง มีความพึงพอใจใน **ระดับปานกลาง**
คะแนน 2 หมายถึง มีความพึงพอใจใน **ระดับน้อย**
คะแนน 1 หมายถึง มีความพึงพอใจใน **ระดับน้อยมาก**

ตอนที่ 3 ข้อเสนอแนะเกี่ยวกับการพัฒนาระบบ

ตอนที่ 1 ข้อมูลทั่วไปเกี่ยวกับผู้ตอบแบบสอบถาม

1. เพศ ☐ 1) ชาย ☐ 2) หญิง

2. อายุ ☐ 1) ต่ำกว่า 21 ปี ☐ 2) 21 - 30 ปี

☐ 3) 31 - 40 ปี ☐ 4) 41 ปีขึ้นไป

3. ระดับการศึกษาสูงสุด

☐ 1) ต่ำกว่าปริญญาตรี ☐ 2) ปริญญาตรี

☐ 3) ปริญญาโท ☐ 4) ปริญญาเอก

4. ความสามารถในการใช้งานคอมพิวเตอร์

☐ 1) น้อยที่สุด ☐ 2) น้อย

☐ 3) ปานกลาง ☐ 4) มาก

☐ 5) มากที่สุด

5. ความถี่ในการใช้งานคอมพิวเตอร์และเครือข่ายอินเทอร์เน็ท

☐ 1) 1 – 2 วัน/สัปดาห์ ☐ 2) 3-4 วัน/สัปดาห์

☐ 3) 5 – 6 วัน/สัปดาห์ ☐ 4) ทุกวัน/สัปดาห์

ตอนที่ 2 แบบประเมินความพึงพอใจในการใช้งานระบบการจัดการข้อมูลข้อมูลโครงการ งานวิจัย และสิ่งประดิษฐ์ ส่วนงานวิจัยพัฒนานวัตกรรมและสิ่งประดิษฐ์ วิทยาลัยการอาชีพวังไกลกังวลแบบประเมินความพึงพอใจในการใช้งานระบบ

การประเมินความพอใจ		**ระดับความคิดเห็น**				
		5	**4**	**3**	**2**	**1**
1.	**ด้านความสามารถในการทำงานของระบบ (Functional Requirement Test)**					
1.1	ความเหมาะสมของระบบในการแสดงข้อมูล					
1.2	ความเหมาะสมของระบบในการเข้าใช้งาน					
1.3	ความเหมาะสมของระบบในการทำรายการเพิ่มข้อมูล					
1.4	ความเหมาะสมของระบบในการทำรายการแก้ไขข้อมูล					
1.5	ความเหมาะสมของระบบในการทำรายการลบข้อมูล					
1.6	ความเหมาะสมของระบบในการทำรายการแสดงรายละเอียดข้อมูล					
1.7	ความเหมาะสมของระบบในการทำงานโดยภาพรวม					

การประเมินความพอใจ		ระดับความคิดเห็น				
		5	4	3	2	1
2.	**ด้านความถูกต้องในการทำงานของระบบ (Function Test)**					
2.1	ความถูกต้องของระบบในการเพิ่ม แก้ไขและลบข้อมูล					
2.2	ความถูกต้องของระบบในการตรวจสอบข้อมูล					
2.3	ความถูกต้องของระบบในการค้นหาข้อมูล					
2.4	ความถูกต้องของระบบในการตรวจสอบการเข้าใช้งานของผู้ใช้งาน					
2.5	ความถูกต้องของระบบในการออกรายงานสรุป					
2.6	ความถูกต้องของระบบในการทำงานโดยภาพรวม					

การประเมินความพอใจ		ระดับความคิดเห็น				
		5	4	3	2	1
3.	**ด้านสะดวกและง่ายต่อการใช้งานระบบ (Usability Test)**					
3.1	ความง่ายต่อการใช้งานของระบบ					
3.2	ความสะดวกในการเลือกใช้รายการต่าง ๆ					
3.3	ความชัดเจนของข้อความ และภาพที่แสดงบนจอภาพ					
3.4	ความเหมาะสมของการใช้สีตัวอักษร พื้นหลังและการจัดวาง					
3.5	ความเหมาะสมของปริมาณข้อมูลที่นำเสนอในแต่ละหน้าจอ					
3.6	ความเหมาะสมของตำแหน่งช่องกรอกข้อมูล					
3.7	ความเป็นมาตรฐานเดียวกันในการออกแบบหน้าจอภาพ					
3.8	การใช้ถ้อยคำบนจอภาพสามารถสื่อสารเข้าใจง่าย					
3.9	ความสะดวกและความง่ายต่อการใช้งานของระบบโดยภาพรวม					

การประเมินความพอใจ		ระดับความคิดเห็น				
		5	4	3	2	1
4.	**ด้านการรักษาความปลอดภัยของระบบ (Security Test)**					
4.1	การกำหนดชื่อผู้ใช้และรหัสผ่านในการตรวจสอบผู้เข้าใช้ระบบ					
4.2	การตรวจสอบสิทธิ์ก่อนการใช้งานของผู้ใช้ระบบในระดับต่างๆ					
4.3	การควบคุมให้ใช้งานตามสิทธิ์ผู้ใช้ได้อย่างถูกต้อง					
4.4	ความเหมาะสมของระบบรักษาความปลอดภัยโดยภาพรวม					

ตอนที่ 3 ข้อเสนอแนะเกี่ยวกับการพัฒนาระบบ

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APPENDIX B
DATA DICTIONARY

Table B.1 Table of student (tbl_student)

Filed Name	Data Type	Width	Description	Key
stu_id	int	11	Student Code	(PK)
stu_username	varchar	20	Username	
stu_password	varchar	20	Password	
stu_titlename	varchar	10	Title Name	
stu_name	varchar	60	Name	
stu_surname	varchar	60	Surname	
stu_email	varchar	60	E-mail	
stu_department	varchar	20	Department	
set_edu	varchar	20	Education Class	

Table B.1 shows the details of the student. These include the Student Code, Username, Password, Title Name, Name, Surname, E-mail, Department and Education Class.

Table B.2 Table of teacher (tbl_teach)

Filed Name	Data Type	Width	Description	Key
teach_id	int	11	Teacher Code	(PK)
teach _username	varchar	20	Username	
teach _password	varchar	20	Password	
teach _titlename	varchar	10	Title Name	
teach _name	varchar	60	Name	
teach _surname	varchar	60	Surname	
teach _email	varchar	60	E-mail	
teach _department	varchar	20	Department	
teach _edu	varchar	20	Educational background	

Table B.2 shows the details of the teacher. These include the Teacher Code, Username, Password, Title Name, Name, Surname, E-mail, and Department and Educational background.

Table B.3 Table of administrator (tbl_staff)

Filed Name	Data Type	Width	Description	Key
staff_id	int	11	Admin Code	(PK)
staff_username	varchar	20	Username	
staff_password	varchar	20	Password	
staff_titlename	varchar	10	Title Name	
staff_name	varchar	60	Name	
staff_surname	varchar	60	Surname	
staff_email	varchar	60	E-mail	

Table B.3 shows the details of the administrator. These include the Admin Code, Username, Password, Title Name, Name, Surname, E-mail.

Table B.4 Table of project type (tbl_type_project)

Filed Name	Data Type	Width	Description	Key
t_project_id	int	11	Project Type Code	(PK)
t_project_name	varchar	60	Name Project Type	

Table B.4 shows the details of the project type. These include the Project Type Code and Name Project Type.

Table B.5 Table of research type (tbl_type_research)

Filed Name	Data Type	Width	Description	Key
t_research_id	int	11	Research Type Code	(PK)
t_research_name	varchar	60	Name Research Type	

Table B.5 shows the details of the research type. These include the Research Type Code and Name Research Type.

Table B.6 Table of invention (tbl_type_invention)

Filed Name	Data Type	Width	Description	Key
t_invention_id	int	11	Invention Type Code	(PK)
t_invention_name	varchar	60	Name Invention Type	

Table B.6 shows the details of the research type. These include the Invention Type Code and Name Invention Type.

Table B.7 Table of project (tbl_project)

Filed Name	Data Type	Width	Description	Key
project_id	int	11	Project Code	(PK)
stu_id	int	11	Student Code	(FK)
project_name_th	varchar	255	Project Thai Name	
project_name_en	varchar	255	Project English Name	
project_edition	varchar	10	Year of Edit	
project_subject	text	-	Abstract	
project_page	varchar	20	Number of Pages	
project_file	varchar	20	Project Files	
project_date	varchar	20	Date for Update	

Table B.7 shows the details of the project. These include the Project Code, Student Code, Project English Name, Project Thai Name, Year of Edit, Abstract, Number of Pages, Project Files and Date for Update.

Table B.8 Table of research (tbl_research)

Filed Name	Data Type	Width	Description	Key
research_id	int	11	Research Code	(PK)
teach_id	int	11	Teacher Code	(FK)
research_name_th	varchar	255	Research Thai Name	
research_name_en	varchar	255	Research English Name	
research_edition	varchar	10	Year of Edit	
research_subject	text	-	Abstract	
research_page	varchar	20	Number of Pages	
research_file	varchar	20	Research Files	
research_date	varchar	20	Date for Update	

Table B.8 shows the details of the research. These include the Research Code, Teacher Code, Research Thai Name, Research English Name, Year of Edit, Abstract, Number of Pages, Research Files and Date for Update.

Table B.9 Table of invention (tbl_invention)

Filed Name	Data Type	Width	Description	Key
invention_id	int	11	Invention Code	(PK)
admin_id	int	11	Admin Code	(FK)
invention_name_th	varchar	255	Invention Thai Name	
invention_name_en	varchar	255	Research English Name	
invention_edition	varchar	10	Year of Edit	
invention_subject	text	-	Abstract	
invention_page	varchar	20	Number of Pages	
invention_file	varchar	20	Invention Files	
invention_date	varchar	20	Date for Update	

Table B.9 shows the details of the invention. These include the Invention Code, Admin Code, Invention Thai Name, Research English Name, Year of Edit, Abstract, Number of Pages, Invention Files and Date for Update.

APPENDIX C

MANUAL

DATA MANAGEMENT SYSTEM ON PROJECTS, RESEARCHES, AND INVENTIONS, IN THE SECTION OF INNOVATION AND INVENTION DEVELOPMENTS RESEARCHES, WANGKLAIKANGWON INDUSTRIAL AND COMMUNITY EDUCATION COLLEGE

Manual for Administrator

Administrative users can apply the program through the web browser.

A. http://www.kkwindmdata.com or

B. http://www.kkwind.ac.th > MIS > ระบบจัดการข้อมูลโครงการ งานวิจัยและสิ่งประดิษฐ์

as shown in Figure C .1

Figure C.1 System Homepage.

From Figure C.1 when entry to the system homepage, user can login to the system by clicking on menu Login เข้าสู่ระบบ or other menus as shown in figure C.2

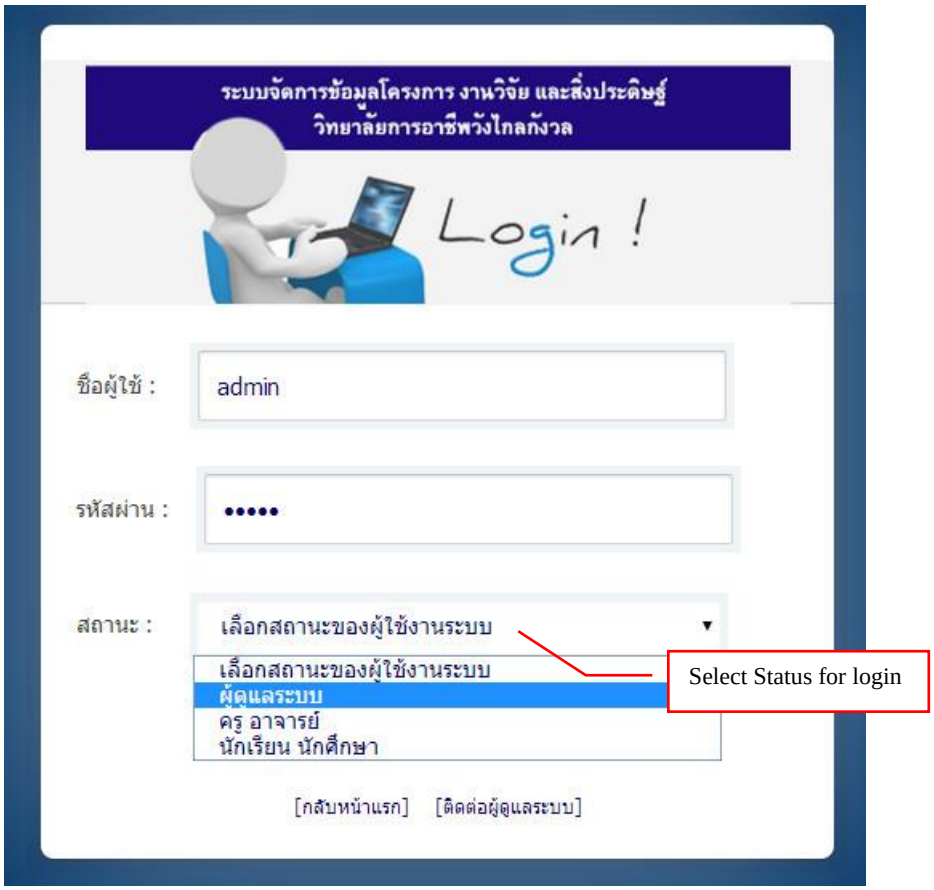

Figure C.2 Login user status administrator web page.

Figure C.2 the user can pass the login process by completing username, password, and selecting user status which consists of Administrator, This is the main window serving for managing users' personal information or related information, as shown in figure C.3

A. Data Management of administrator (For super admin) for manage administrator.
B. Profile management of administrator
C. Data Management of users (Teacher and student)
D. Data Management of inventions

E. Data Management of researches

F. Data Management of projects

G. Data Management of news

H. Data Management of report

I. Data Management of information

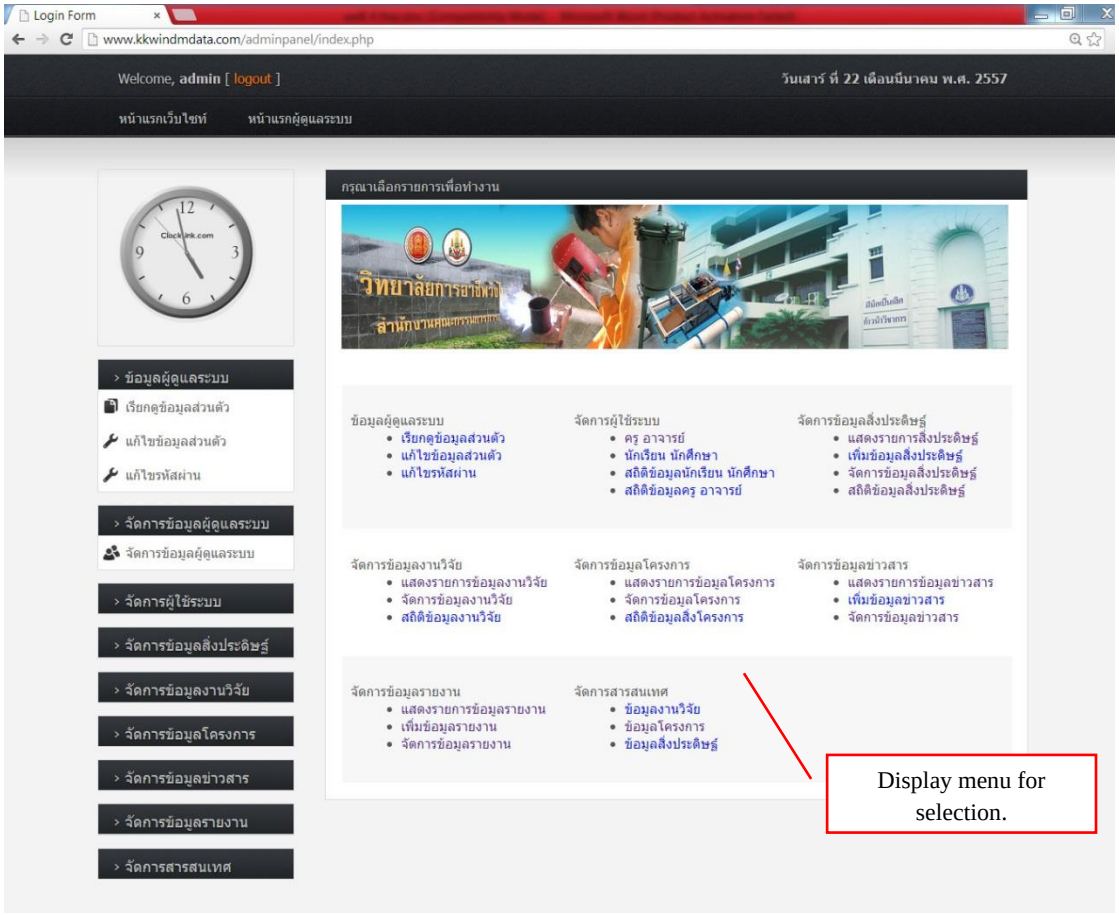

Figure C. 3 Main page display menu for administrator.

Figure C.3 after logging in, the system will display Administrator's name while the system is working. Homepage will display menu for selection as follows: Administrator Data Managing (This will be activated in case the user name and password is permitted for data managing.), Administrator's Personal Data Managing, User's Personal Data Managing, Invention Data Managing, Project Data Managing, News Data Managing, Report Data Managing, and Information Managing.

Administrator Data Managing Page allows Administrator to add or delete data of general administrator as shown in Figure C.4

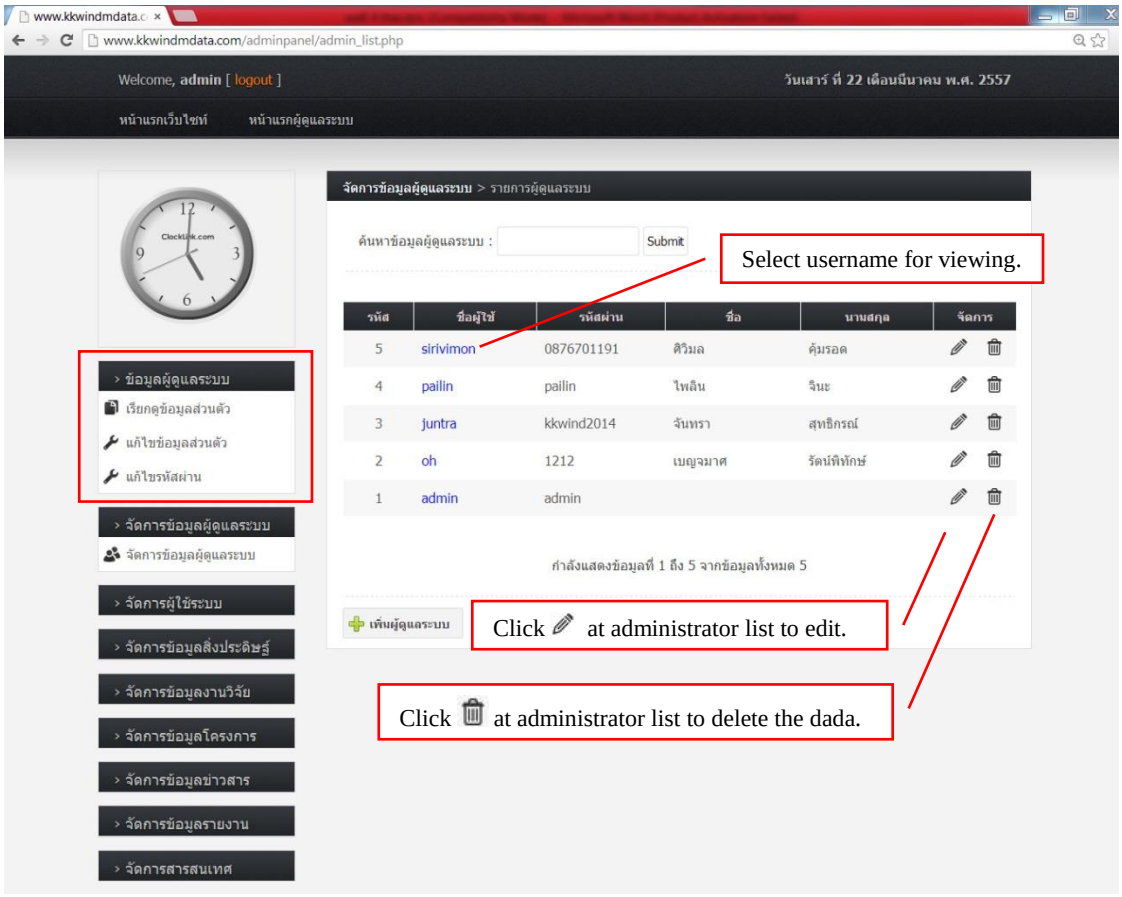

Figure C.4 Management data administrator web page.

Figure C.4 the authorized administrator can select menu Manage Administrator Data จัดการข้อมูลผู้ดูแลระบบ and the system will display all list of Administrator by sorting administrator's code. The authorized administrator can select user name for viewing administrator's detail or click at administrator list to edit the data or click at administrator list to delete the data.

Administrator's Profile Managing Page allows Administrator to edit personal data or change password as shown in Figure C.5

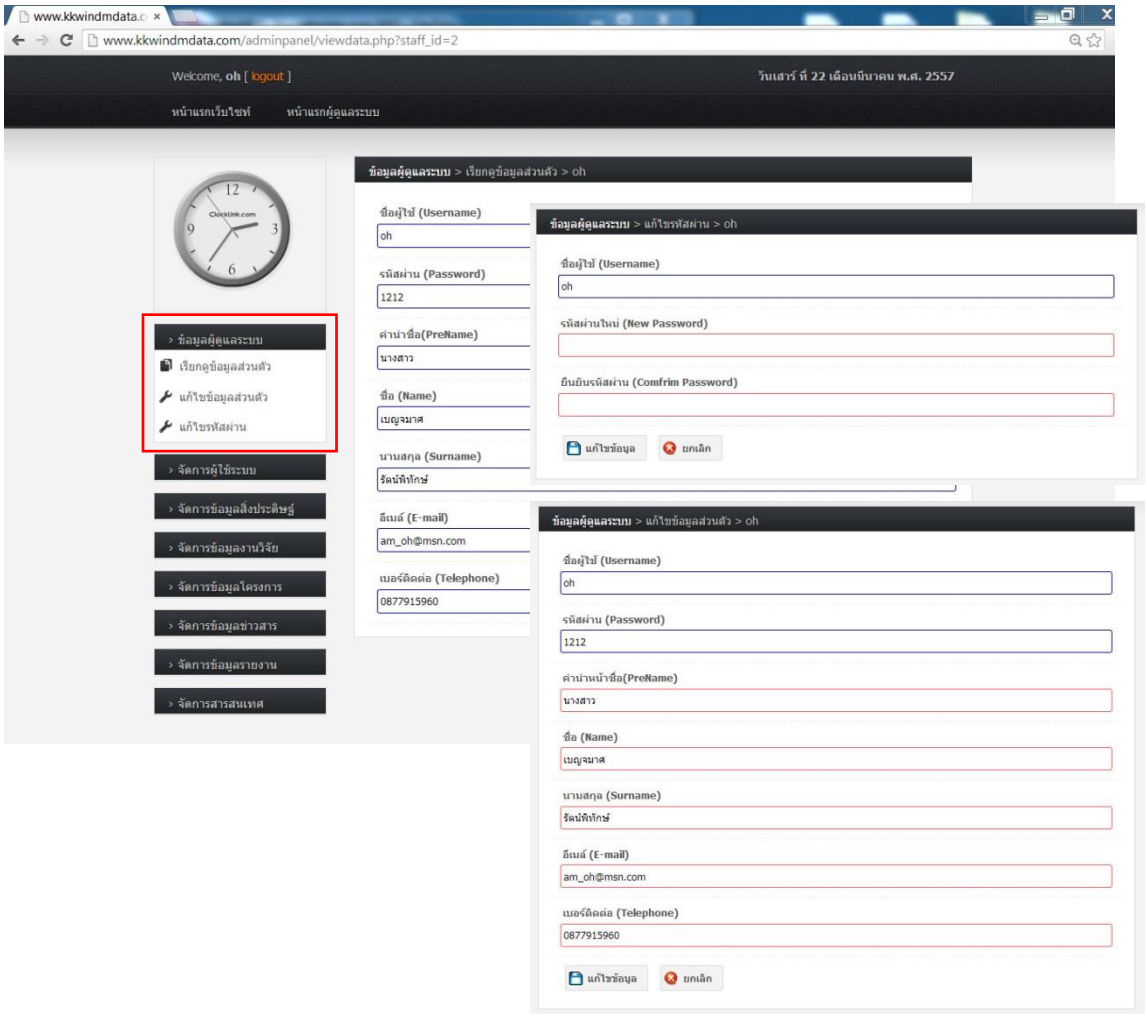

Figure C.5 Management profile administrator web page.

Figure C.5 after logging in the system, Administrator can view personal data by clicking menu View Personal Data เรียกดูข้อมูลส่วนตัว to see detail of personal data which cannot be edited in this page. If the Administrator wants to edit personal data, click Edit Personal Data แก้ไขข้อมูลส่วนตัว , and the system will display the original data. The Administrator must complete all fields, and then the data can be saved. In case of changing password, click Change Password แก้ไขรหัสผ่าน ,

and the system will display username. The Administrator must fill a new password in the New Password field, and fill it again in the Confirm New Password field. Both passwords must be matched, and then the data can be saved.

Administrator's Personal Data Managing Page contains data of Teacher, data of Student, and statistics including number of system's users as shown in Figure C.6

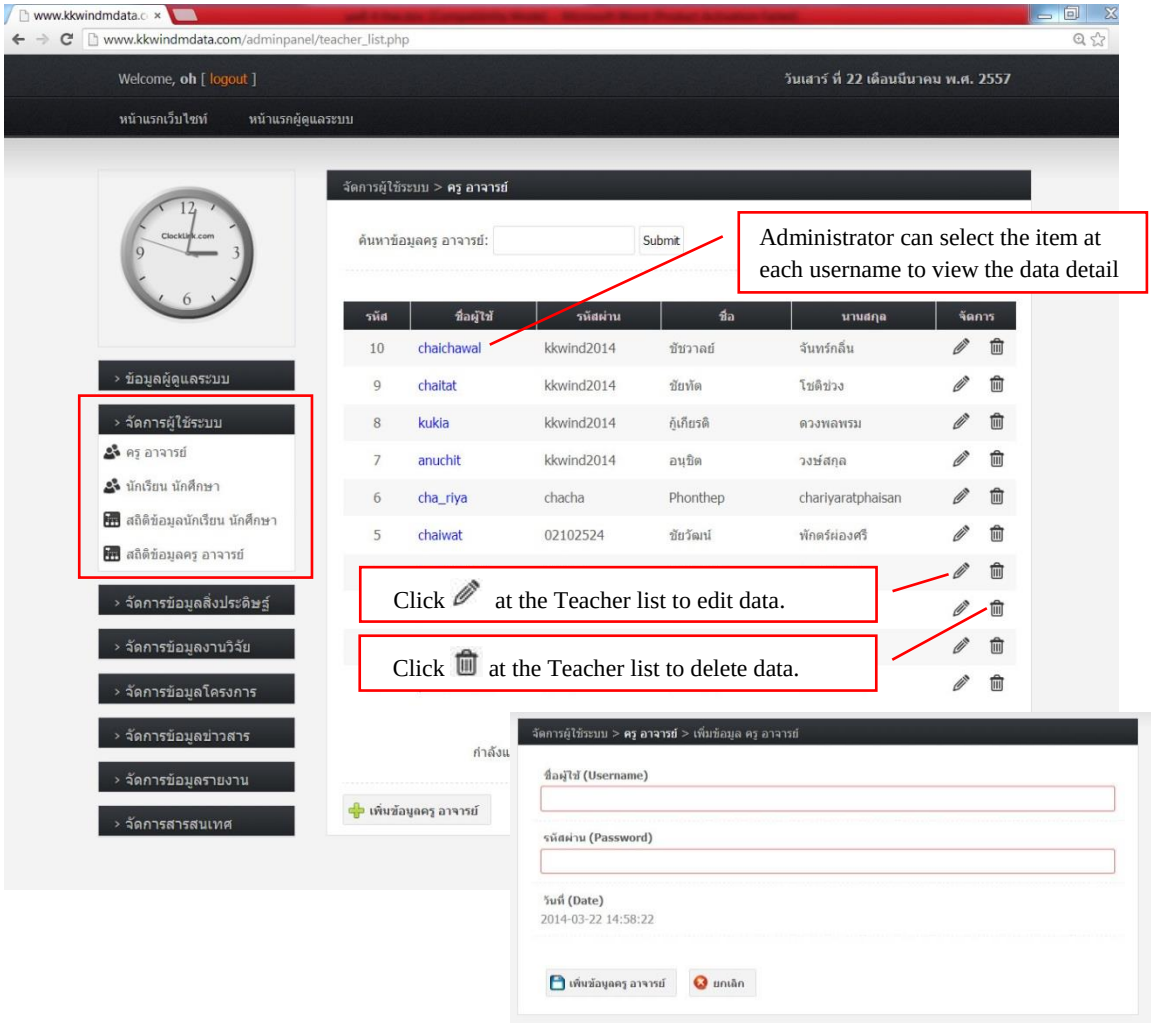

Figure C.6 Management data user web page.

Figure C.6 administrator can manage user's data by selecting menu User Data Managing ครู อาจารย์ . The system will display all list of Teacher sorting by

teacher's code. The Data can be also searched by filling the username or the Teacher name. Administrator can select the item at each username to view the data detail of the Teacher or click at the Teacher list to edit data and click at the Teacher list to delete data. To add data, select menu Add Administrator , a new Teacher can be added by filling a username and password.

Invention Data Managing Page contains Invention Listing menu, Invention Data Adding menu, Invention Data Managing menu, and Invention Data Statistics menu as shown in Figure C.7

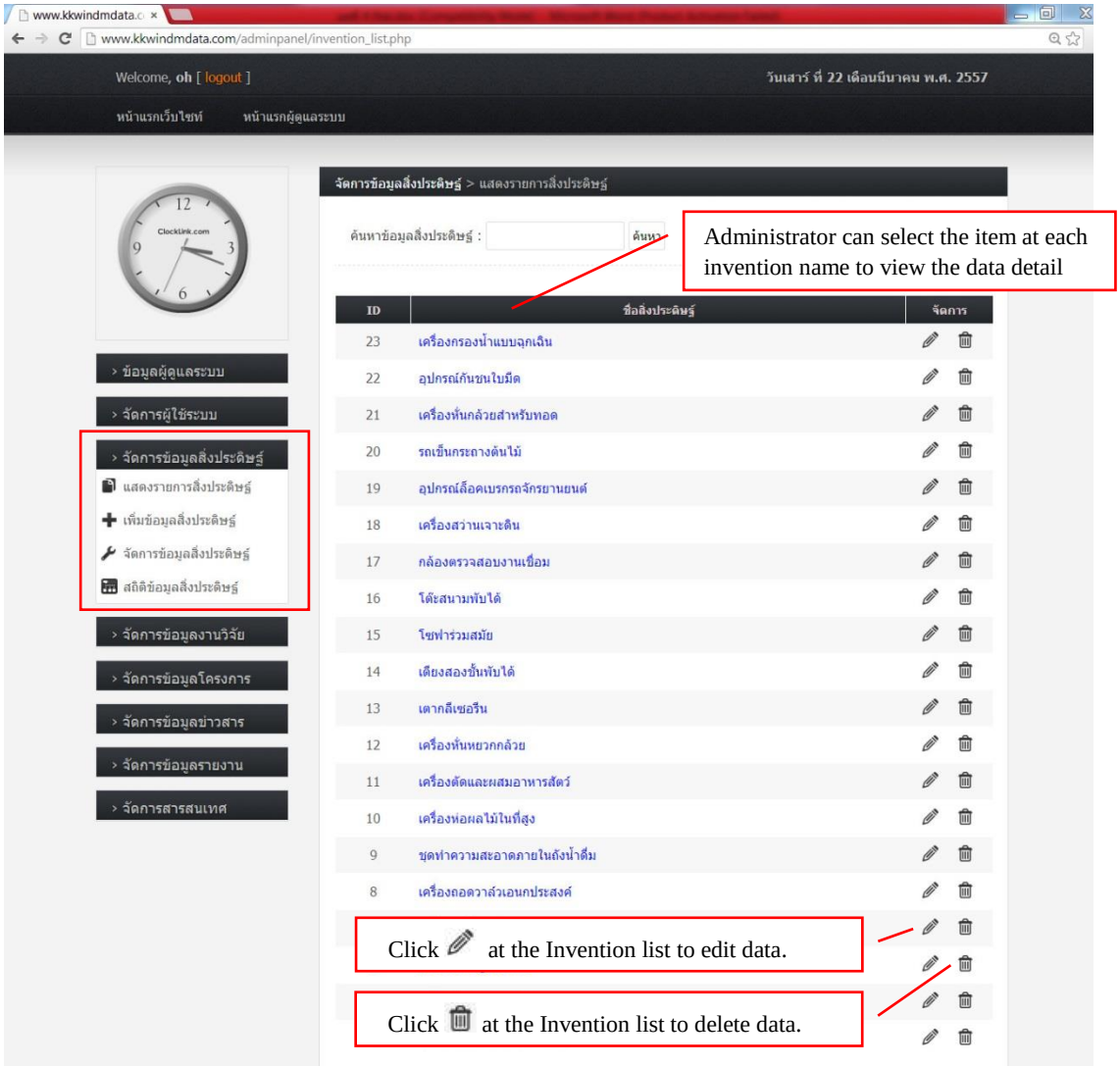

Figure C.7 Management data invention web page.

Figure C.7 administrator can manage invention data by going to Invention Data Managing page, selecting menu Invention Listing แสดงรายการสิ่งประดิษฐ์, the system then will display all invention list sorting by invention code. The data can be also searched by filling the invention name. Administrator can select the item at the invention name to view the data detail of the invention or click at the Invention List to edit data and click at the Invention List to delete data. To add data, select menu Add Invention เพิ่มข้อมูลสิ่งประดิษฐ์, a new Invention can be added by filling the complete details so the data can be saved. In menu Invention Data Statistics สถิติข้อมูลสิ่งประดิษฐ์, it will display the number of all inventions by type of invention.

Research Data Managing Page contains Research Listing menu, Research Data Adding menu, Research Data Managing menu, and Research Data Statistics menu as shown in Figure C.8

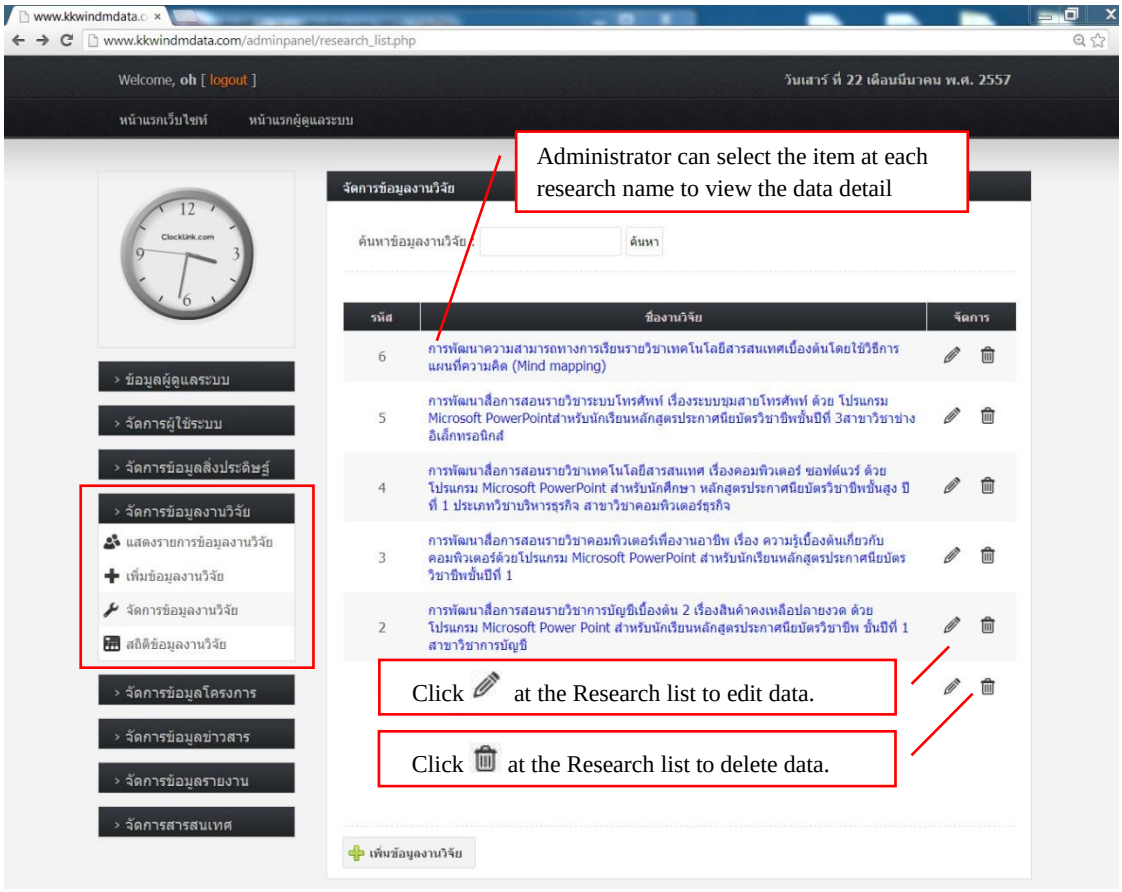

Figure C.8 Management data research web page.

Figure C.8 administrator can manage research data by going to Research Data Managing page, selecting menu Research Data Managing จัดการข้อมูลงานวิจัย , the system then will display all research list sorting by research code. The data can be also searched by filling the research name. Administrator can select the item at the research name to view the data detail of the research or click at the Research List to edit data and click at the Research List to delete data. To add data, select menu Add Research เพิ่มข้อมูลงานวิจัย , a new Research can be added by filling the complete details so the data can be saved. In menu Research Data Statistics สถิติข้อมูลงานวิจัย , it will display the number of all researches by type of research.

Project Data Managing Page contains Project Listing menu, Project Data Adding menu, Project Data Managing menu, and Project Data Statistics menu as shown in Figure C.9

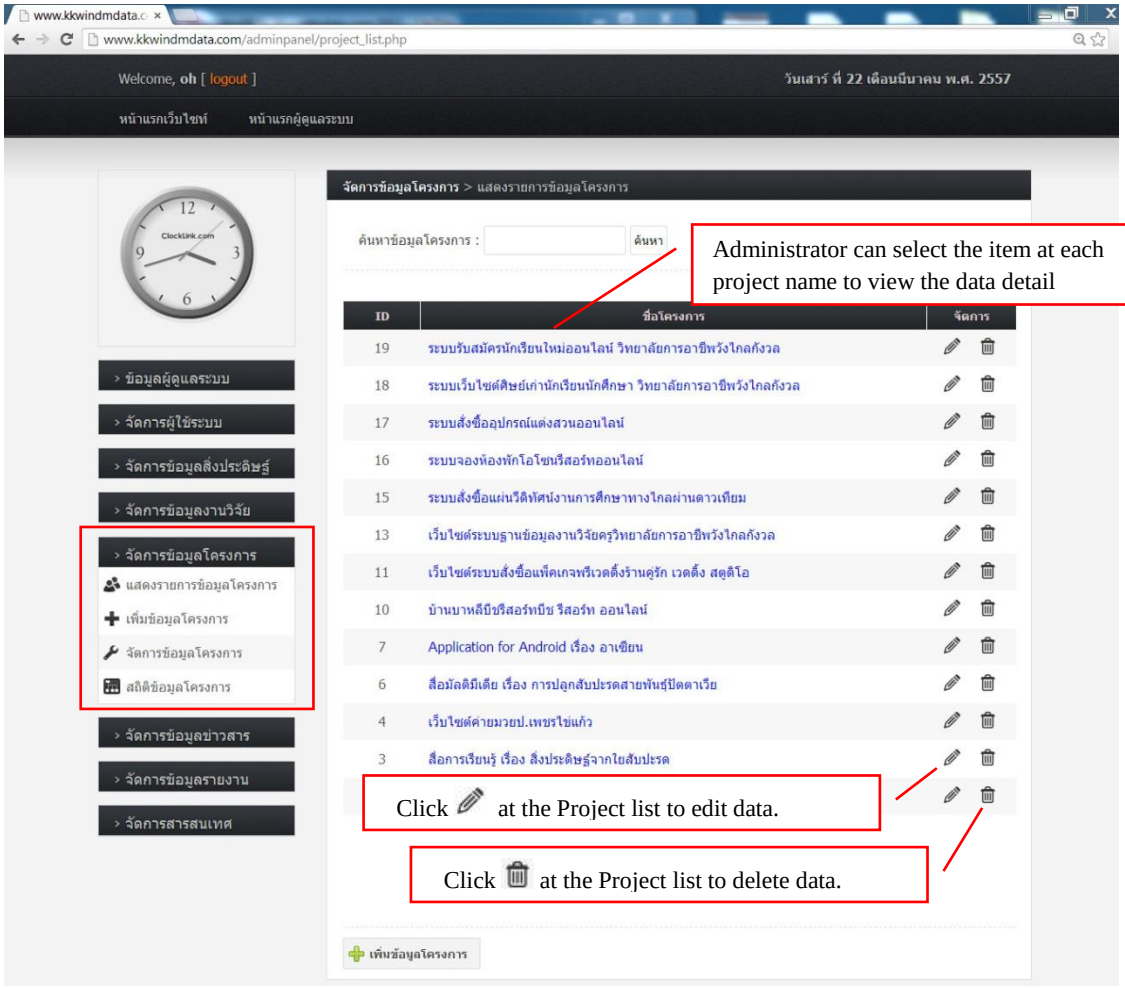

Figure C.9 Management data project web page.

Figure C.9 administrator can manage project data by going to Project Data Managing page, selecting menu Project Data Managing จัดการข้อมูลโครงการ , the system then will display all project list sorting by project code. The data can be also searched by filling the project name. Administrator can select the item at the project name to view the data detail of the project or click at the Project List to edit data and click at the Project List to delete data. To add data, select menu Add Project เพิ่มข้อมูลโครงการ , a new Project can be adding by filling the complete details so the data can be saved. In menu Project Data Statistics เพิ่มข้อมูลโครงการ , it will display the number of all projects by type of project.

News Data Managing Page contains News Listing menu, News Data Adding menu, and News Data Managing menu as shown in Figure C.10

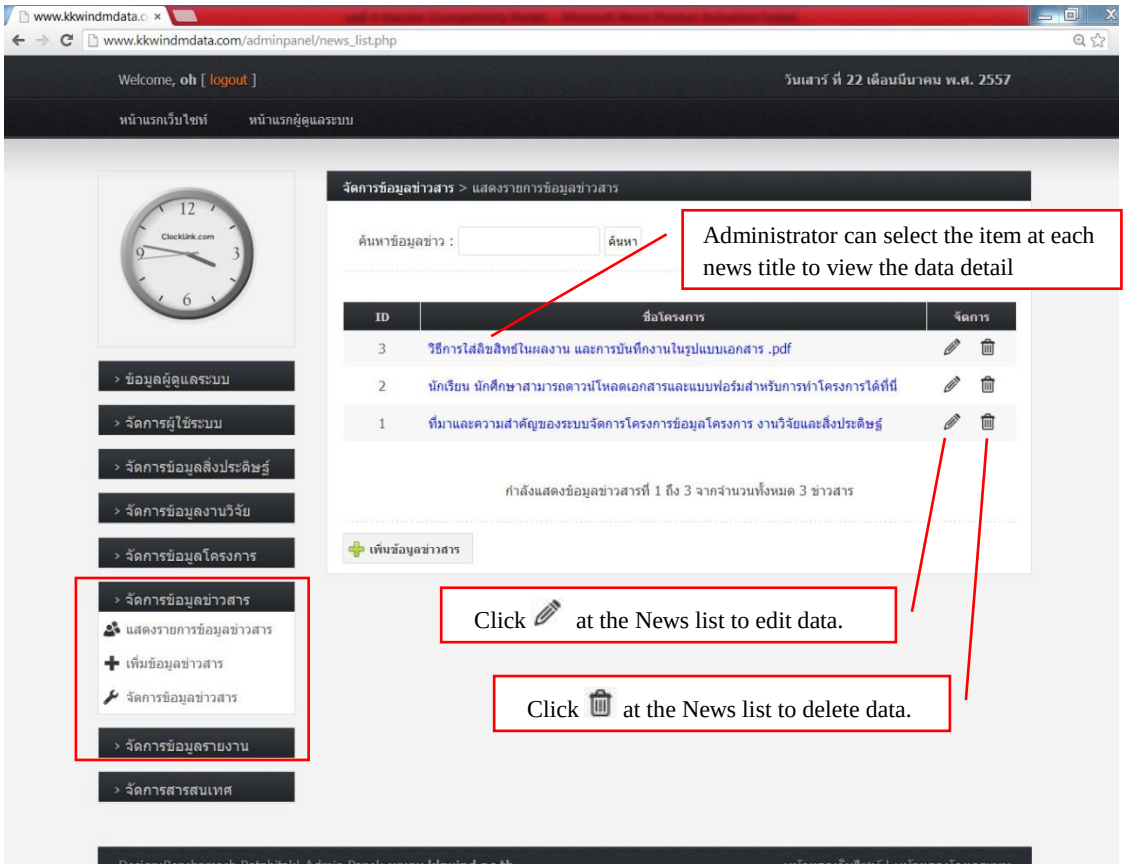

Figure C.10 Management data news web page.

Figure C.10 administrator can manage news data by going to News Data Managing page, selecting menu News Data Managing จัดการข้อมูลข่าวสาร , the system then will display all news list sorting by news code. The data can be also searched by filling the news title name. Administrator can select the item at the news title name to view the data detail of the news or click at the News List to edit data and click at the News List to delete data. To add data, select menu Add News เพิ่มข้อมูลข่าวสาร a new News can be adding by filling the complete details so the data can be saved.

Report Data Managing Page contains Report Listing menu, Report Data Adding menu, and Report Data Managing menu as shown in Figure C.11

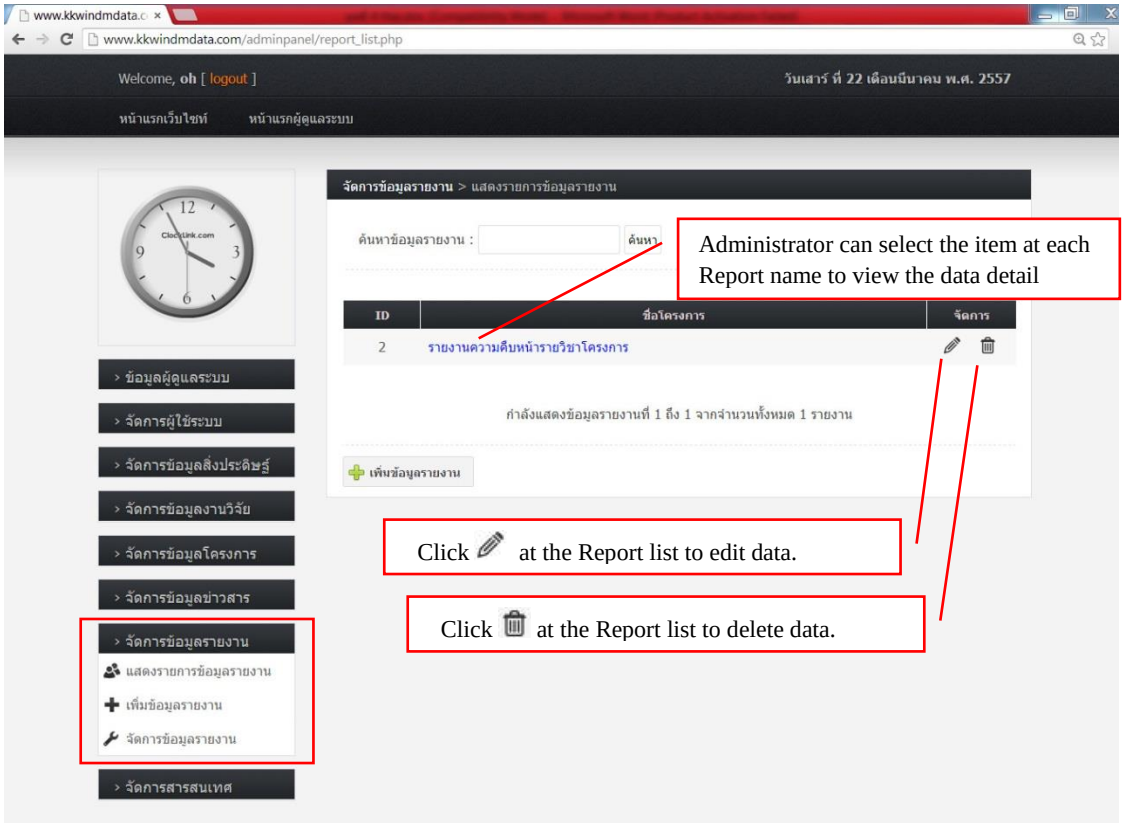

Figure C.11 Management data report web page.

Figure C.11 administrator can manage report data by going to Report Data Managing page, selecting menu Report Data Managing จัดการข้อมูลรายงาน , the

system then will display all report list sorting by report code. The data can be also searched by filling the report name. Administrator can select the item at the report name to view the data detail of the report or click at the Report List to edit data and click at the Report List to delete data. . To add data, select menu Add Report เพิ่มข้อมูลรายงาน a new Report can be adding by filling the complete details so the data can be saved.

Information Managing Page contains Research Information, Project Information, and Invention Information as shown in C.12

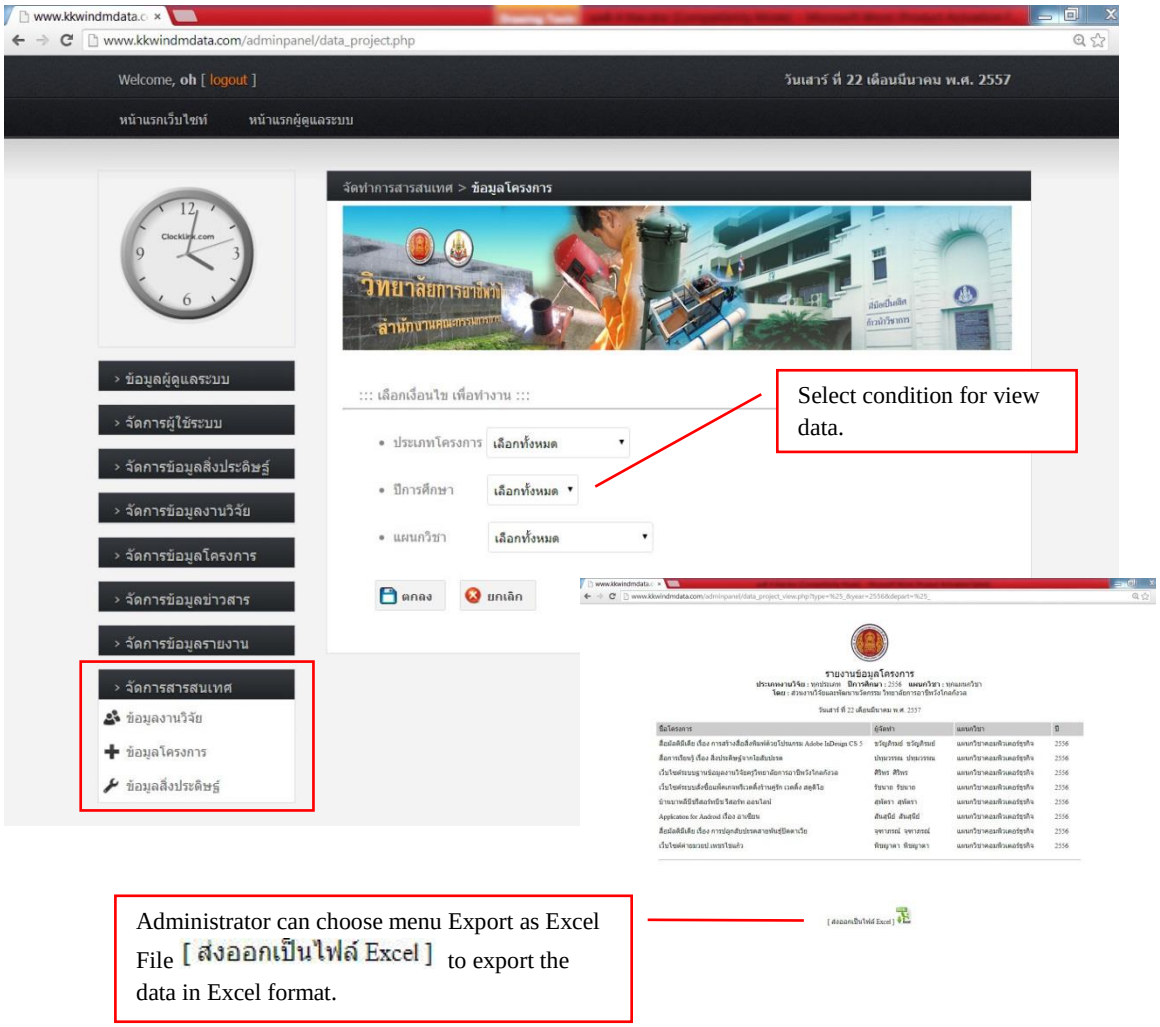

Figure C.12 Management data information web page.

Figure C.12 administrator can manage information by going to Information Managing Page, and selecting the desired information (for example, Project Information), the system then will display condition list including type of project, academic year, and department. If no condition is selected, the system will display all. The system will display Project Information by the selected condition. Administrator can choose menu Export as Excel File [ส่งออกเป็นไฟล์ Excel] to export the data in Excel format for further use.

Manual for Teacher and Student

On Login screen, the user must correctly specify a username, password, user status which consists of teacher or student as show figure C.13

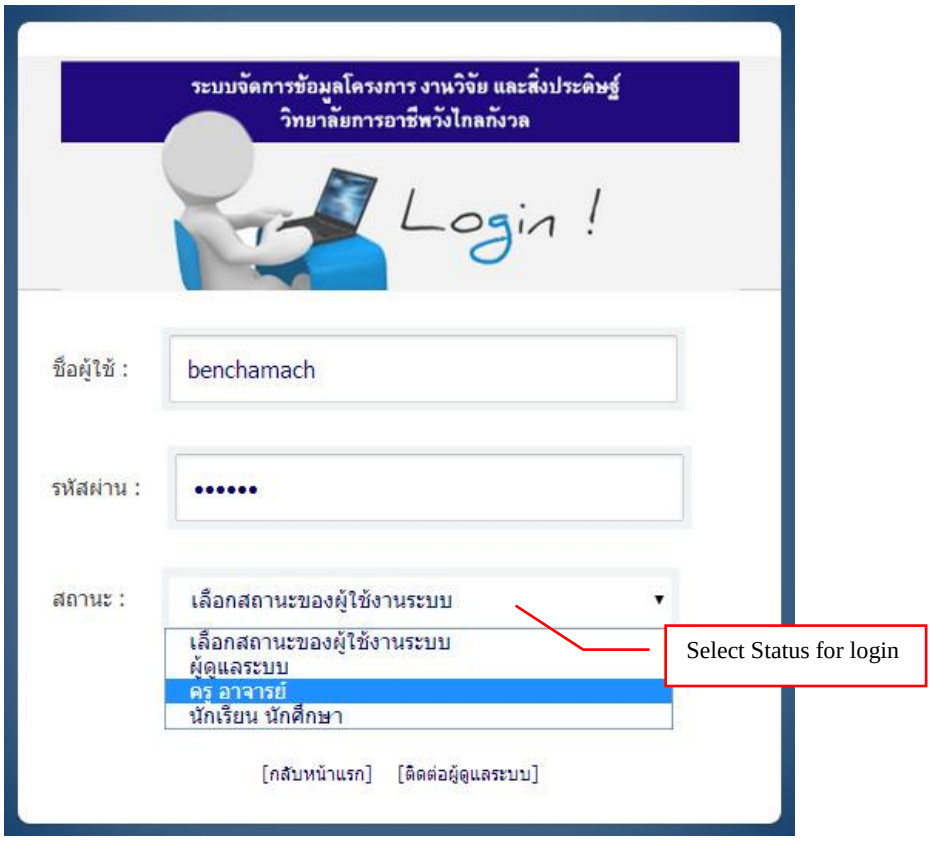

Figure C.13 Login user status teacher or student web page.

Figure C.13 the user can pass the login process by completing username, password, and selecting user status which consists of teacher, or student.

Homepage of user (Teacher and Student), after entering to the system, the user can manage personal information or project data (for Student), can manage research data (for Teacher) as shown in figure C.14

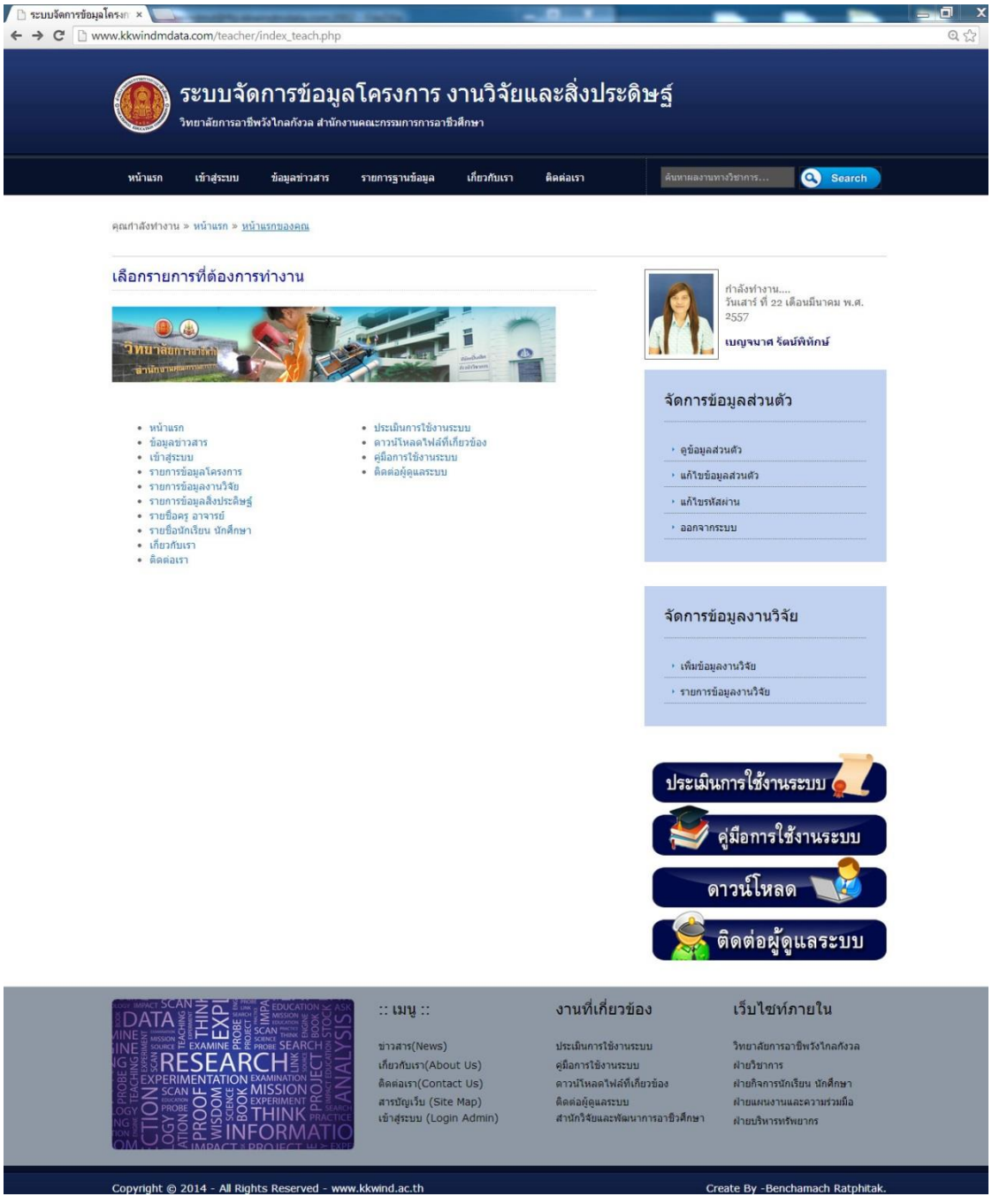

Figure C.14 Main page for user (Teacher or Student).

Figure C.14 after passing the login page, the user homepage of Teacher and Student will show items for personal data management which consist of View

User Profile, Edit User Profile, Edit Password, and Logout. Research data management items (for Teacher) consist of Add Research Data and Research Data List.

Teacher and Student must manage their profile in Personal Data Managing Page as shown in figure C.15

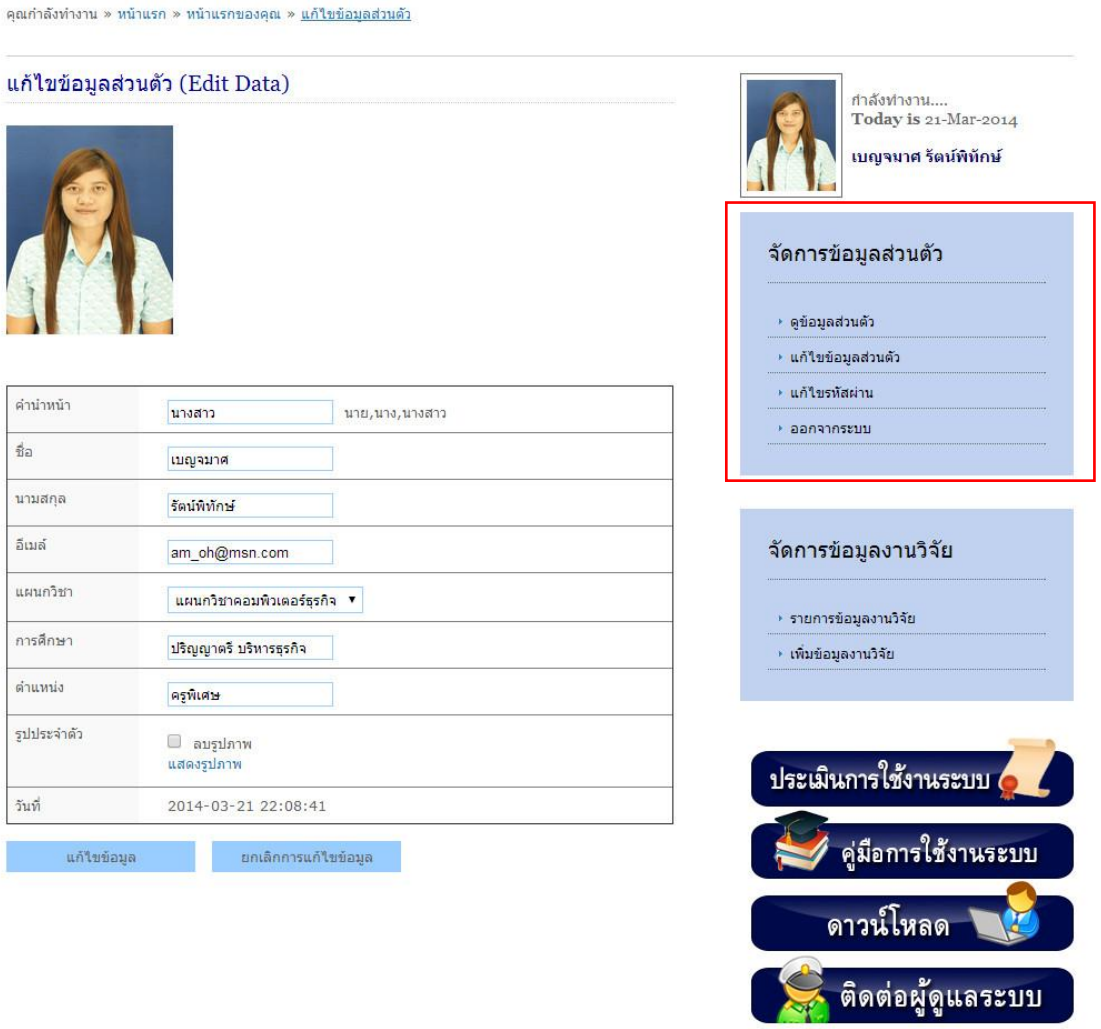

Figure C.15 Management profile data for teacher and student web page.

Figure C.15 when the user wants to manage the profile, the user can retrieve his own personal data from menu View User Profile ดูข้อมูลส่วนตัว which will

show personal data of the user but the data cannot be edited on this page. The user can select menu Edit User Profile แก้ไขข้อมูลส่วนตัว or Edit Password. แก้ไขรหัสผ่าน In case of Edit User Profile and Edit Password, the user must complete all fields then the data can be saved.

Data Adding Page for Teacher and Student can be used for adding project data (for Student) or adding research data (for Teacher) as shown in figure C.16

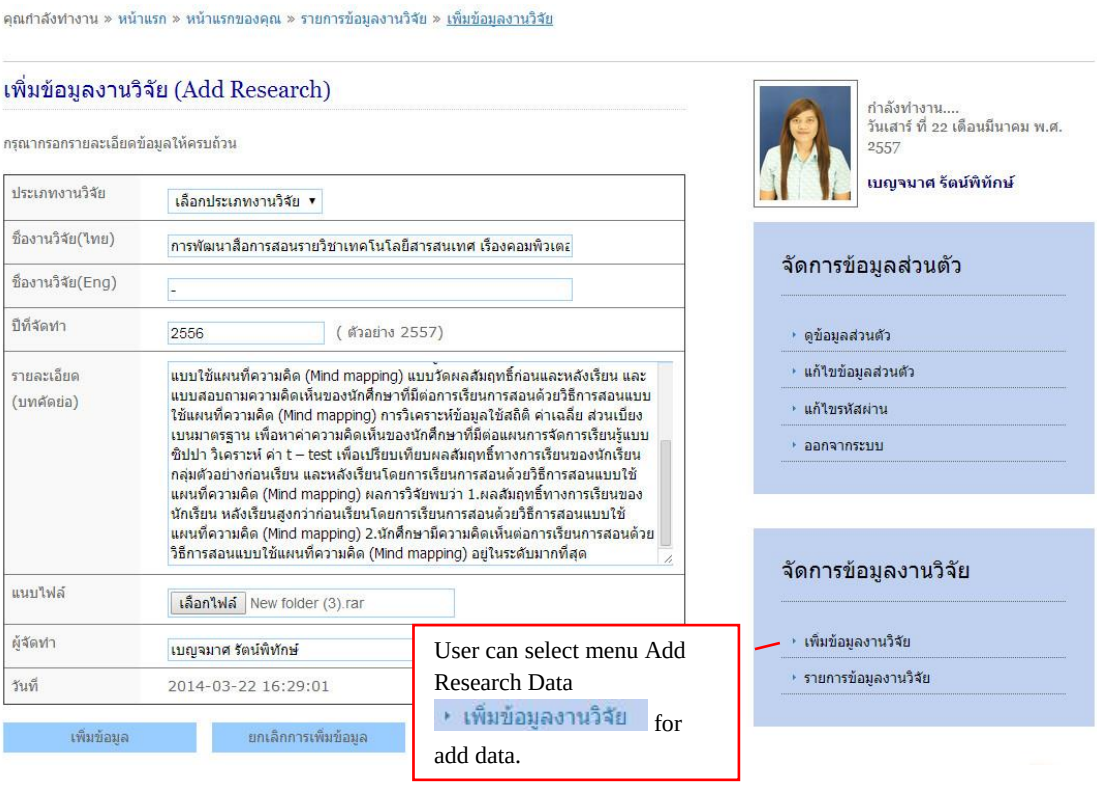

Figure C.16 Data adding data for teacher and student web page.

Figure C.16 when the user (Teacher) wants to add data, the user can select menu Add Research Data เพิ่มข้อมูลงานวิจัย . The system will display data box for the user to enter details as follows: Research Category, Research Title in Thai language, Research Title in English language, Year of Production, Research Detail, Attachment, Producer (the system will display the user's first and last name) and the current date and time. The user must complete all fields then the data can be saved.

Data Managing Page for Teacher and Student can be used for managing project data (for Student) or managing research data (for Teacher) as shown in figure C.17

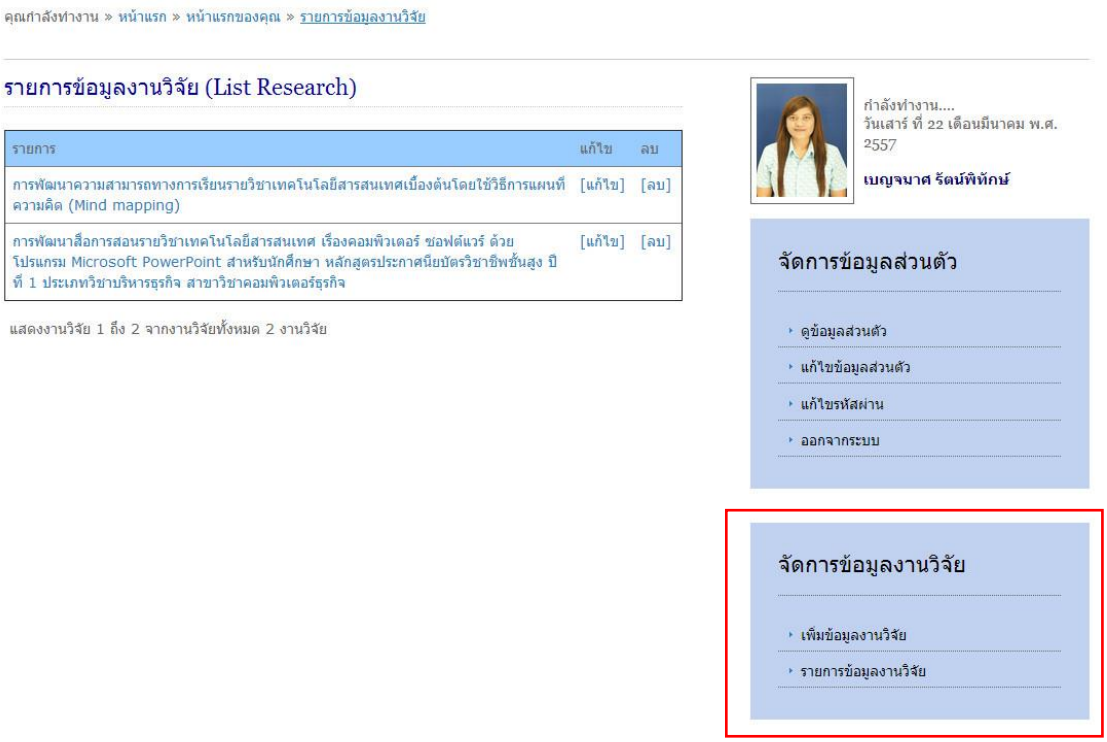

Figure C.17 Data managing for teacher and student web page.

Figure C.17 when the user (Teacher or Student) wants to manage data, the user can select menu of Research Data List รายการข้อมูลงานวิจัย . The system will display all users' research into a sequence by date the research revised and lists for updating and deleting data.

Data detail viewing page for teacher and student can be used for viewing data details as shown in Figure C.18

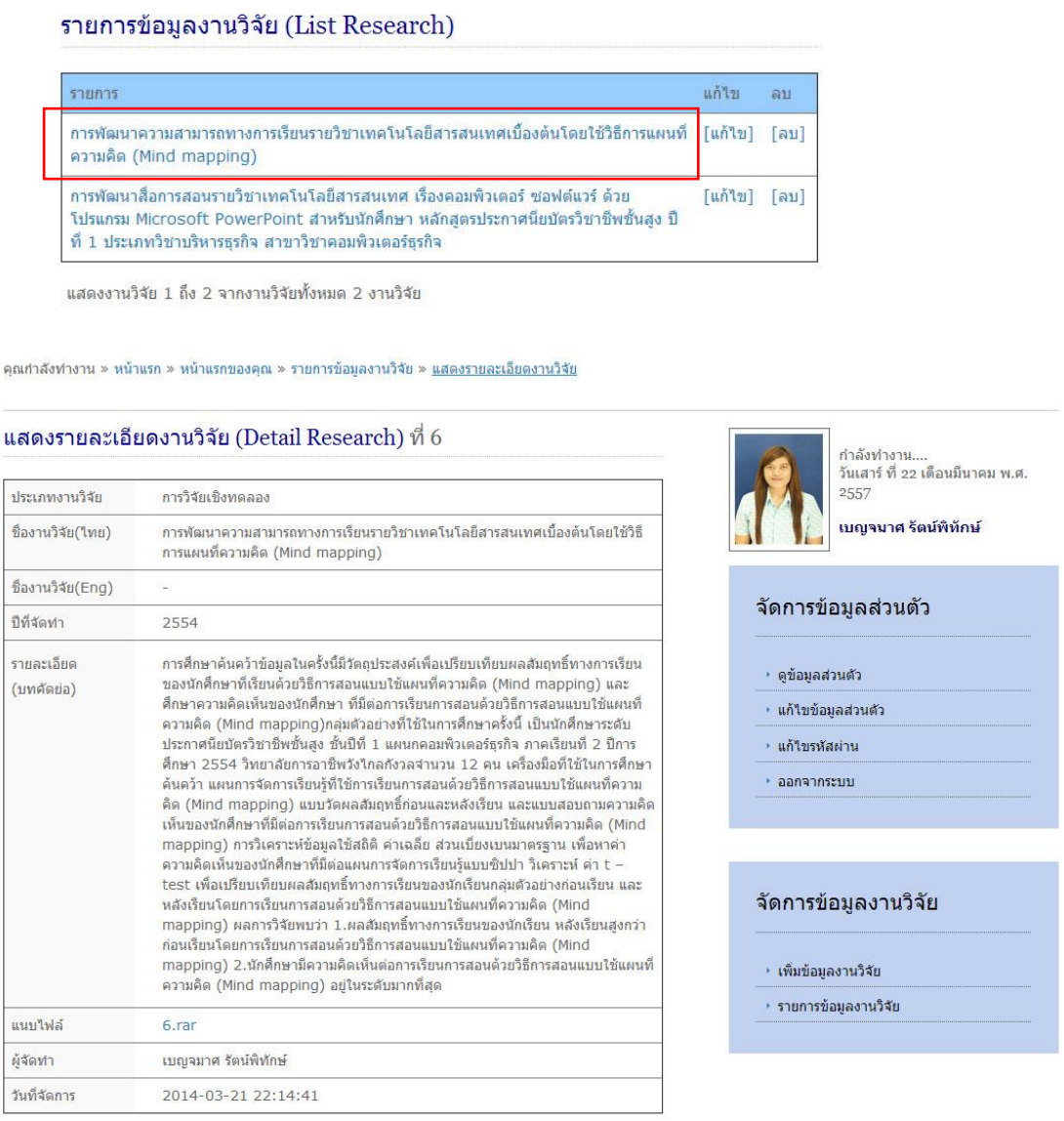

Figure C.18 Data detail viewing for teacher and student web page.

Figure C.18 when the user wants to view data details, the user can select Research Title or Project Name. All data shown in Data Detail Viewing Page cannot be edited. This page is for viewing and displaying data only.

Data Detail Editing Page for Teacher and Student can be used for editing data details as shown in figure C.20

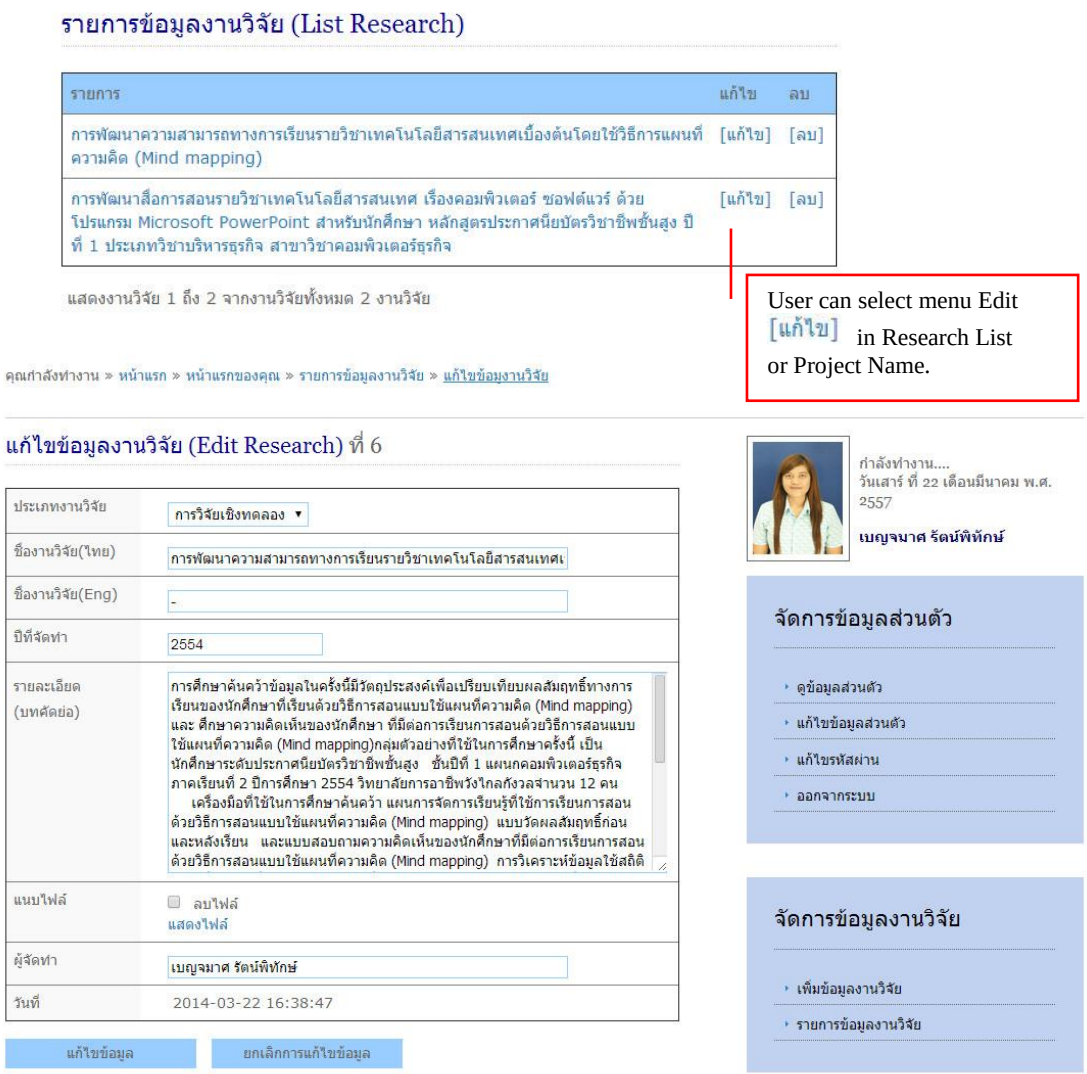

Figure C.20 Data editing for teacher and student web page.

Figure C.20 when the user wants to edit data details, the user can select menu Edit [แก้ไข] in Research List or Project Name. All data fields must be filled completely. Date of editing will be shown by current time and cannot be revised.

Data Detail Deleting Page for Teacher and Student can be used for deleting data as shown in figure C.21

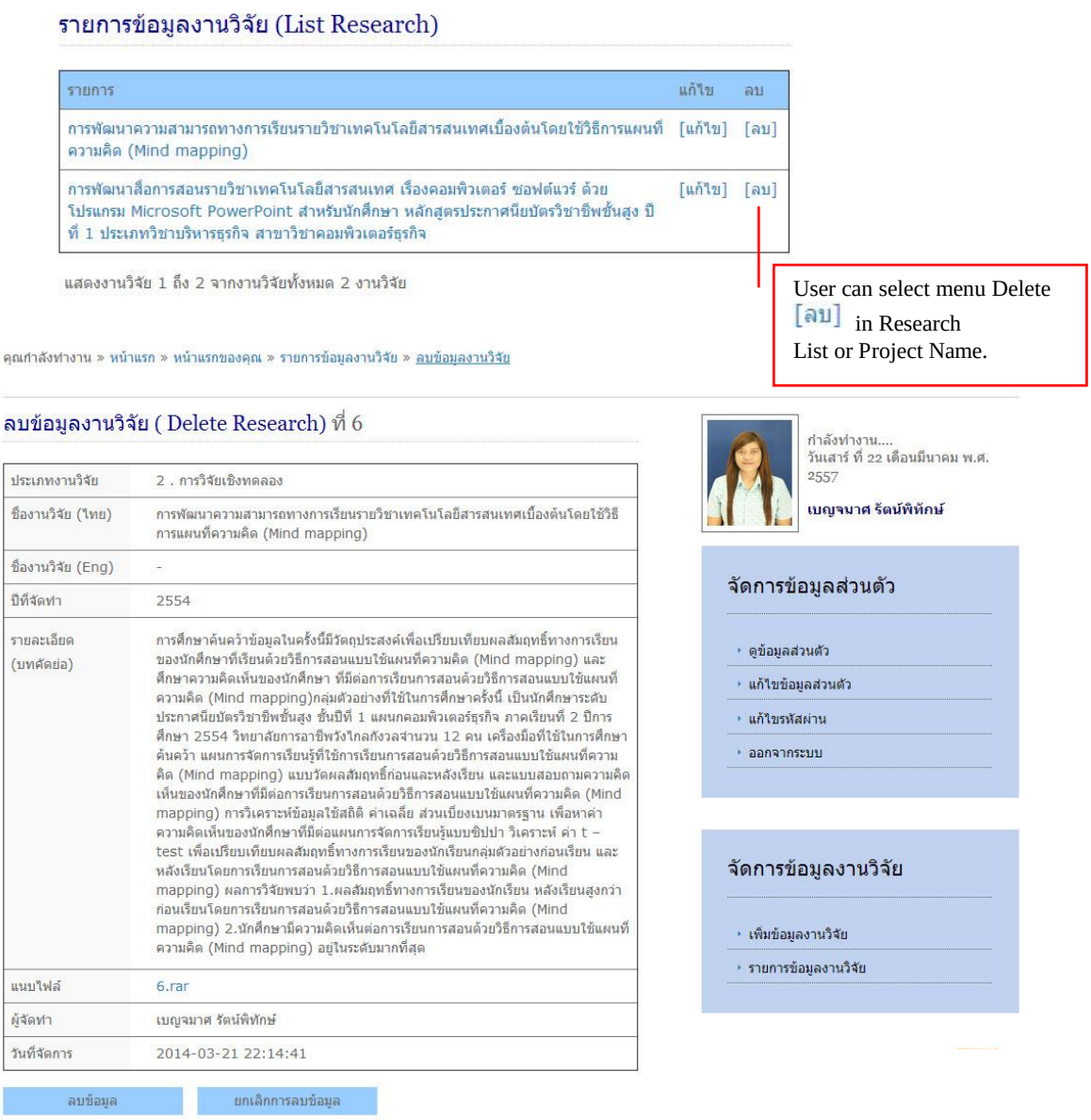

Figure C.21 Data deleting for teacher and student web page.

Figure C.21 when the user wants to delete data details, the user can select menu Delete [ลบ] in Research List or Project Name. When select the deleting list, the system will display data detail so that the user can review and reconfirm for deleting.

BIOGRAPHY

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