GUIDELINE FOR DEVELOPING AN EXAMINATION REPOSITORY SYSTEM BASED ON CLOUD COMPUTING TECHNOLOGY TO ASSESS ENGLISH AND INFORMATION TECHNOLOGY STANDARDS BEFORE GRADUATING FROM HIGHER EDUCATION

Suriya Pumchalerm

Digital Business Technology Department, Technology Digital and Innovation Faculty
Southeast Bangkok University
Corresponding author email: pumchalerm@hotmail.com

Received: May 15, 2024
Revised: June 12, 2024
Accepted: June 18, 2024

Abstract

The objective of this study is to (1) study guidelines for developing the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education (2) analysis and design an examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education and (3) assessment the appropriateness of the guidelines for developing the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education. There are two steps of this study, First step study guidelines from problem and requirement of stakeholder and design in examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education by system development life cycle sashimi waterfall and second step is assessment the appropriateness of the guidelines for developing the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education. The sample consisted of 90 person stakeholders that a knowledge about information technology of the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education by stratified random sampling. The tool used in close-ended questionnaire with five-point rating scale. Statistics used to analyze data are mean standard deviation and coefficient of variation. The results showed that: (1) the problems of traditional operations from the three groups of stakeholders survey, there are four factors are Staffs, Budget, Technology and Operation (2) analyzed and design to define guidelines for developing the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education consists of three diagrams are 1. Fishbone chart 2. use case diagram

3. architecture diagram and sequence diagram (3) appropriateness guidelines for developing the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education at a high level (Mean=4.02, S.D.=0.63) and low variance compared to the mean, which is moderately reliable (C.V. =13.18)

Keywords: Examination Repository System, Cloud Computing Technology, Measure English and Information Technology Standards

1. Introduction

Personnel with high potential are an important tool for the stable and sustainable development of the country. Therefore, if an organization hires talented people into any position, it will develop the organization to progress and create far-reaching ripples that affect the country's development. [1]. Furthermore, as technology has an increasingly larger role in the people's lives, as a major assistant and support in various jobs, everyday life becomes easier than ever [2]. Therefore, to improve quality of the people along the line of national development, technology is a major multiplier, especially in conjunction with personnel development through education, which will improve academic and professional wisdom of the people.

The important foundation that measures the progress of a nation is education. Because education is a clear process that can develop people. [3]. In the past decade, the trend of globalization led to social, cultural and economic changes in Thailand [4]. Thus, all sectors need more consciousness about human development. In such a case, learning management in educational institutes is a focal point of human development, to foster a foundation of knowledge in the learner. Still, learning management varies from one institute to another, a standard is needed, such as curriculum that needs to be systematically built, and reviewed by a central organization.

Educational assessment is needed because the teacher might not know whether there is any improvement in the learner's knowledge [5]. Such assessment is especially important if the assessment reflects the overall knowledge base of the learner. Various educational institutes host examinations to measure English and information technology skills prior to graduation as required by the Announcement of the Higher Education Commission B.E. 2016 [6]. While the announcement allows some leeway in terms of assessment, most institutes include professional and information technology skill assessment, using their own forms, or standard forms from the professional agencies. Self-built forms might have problems such as inexperienced staff or insufficient staff for work, expenses, or lack of technological or paperwork management tools.

The researcher therefore developed a cloud-based examination system to facilitate the assessment of English and information technology skills of the undergraduates prior to their graduation in terms of speed, correctness and standardization for pre-graduation English and information technology skills assessment. Result from this study could be used as a guideline and model for other higher education institutes, and

could be a contribution to the government policy pertaining to introduction of information technology in learning management, dubbed “Education 4.0” [7].

2. Objective

2.1 Study guidelines for developing the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education.

2.2 Analysis and design an examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education.

2.3 Assessment the appropriateness of the guidelines for developing the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education.

3. Research hypothesis

3.1 Collection of needs to be reflected in a diagram that is accurate and complete

3.2 Opinion on using the diagrams as a guideline for developing the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education has a high level of quality.

4. Related documents and research

4.1 Measurement and assessment

Measurement and assessment is a continuous process. It can be separated into 2 steps: measurement and assessment. After the measurement is completed, the assessment will be carried out as the next step. [8] Teaching and learning arrangements should examine the quality of students, teachers, and the teaching process. (Formative evaluation) periodically to determine whether the learners have the required qualifications and meet the teaching objectives? This measurement and evaluation process attempts to obtain information. To be used to analyze student performance in moving up to class level. Or promote and use it to develop and improve teaching and learning in the future

4.2 Examination Repository System

Examination Repository System is a source for collecting exams that have been evaluated for quality. That there are a large number of standards [9] from experts in the sciences related to exams put together in a systematic way. The aim is to facilitate and speed up the use of tests for measurement and evaluation [10]

4.3 Information System

Opas Iamsiriwong [11] explained that information refers to the results that result from the systematic processing of stored data. The results can be used for work or to support management decisions. Which can be said Information is processed data that is available according to the needs of users, such as balance sheets,

reports summarizing operating results. Or income estimates, etc. The important information is used to help make decisions in activities. Manage various areas such as finance, marketing, production or management, etc., which allows executives to solve problems or major problems in operations more efficiently.

4.4 System Development Life Cycle

There are many forms of information system development. Bhuvaneswari and Prabaharan [12] summarized 17 information system development methodologies and Srinuan Fongmanee [13] classified information system development methodologies into 2 main types. Namely, the traditional model and the new theoretical model.

4.5 Cloud Computing

Cloud Computing is a very important technology. As a result, users of information technology, whether at the personal or organizational level Have the freedom to choose software and information and communication technology equipment according to their own needs. This is to help reduce the complexity of any operations of the organization, which promotes management with higher efficiency and effectiveness [14]

4.6 Chaiya Akawang [15] developed a test bank and online examination system using an internet platform. For use in testing the standards for indicators of the core curriculum for basic education in the learning subjects that have a national knowledge test.

4.7 Kawinthorn Rath-at [10] has designed and developed an online test bank system using the php language in the form of a website that can manage text tests in both Thai, English and equations in science and mathematics. Can store test questions. Select exams Exam analysis and conduct examinations

5. Research Framework

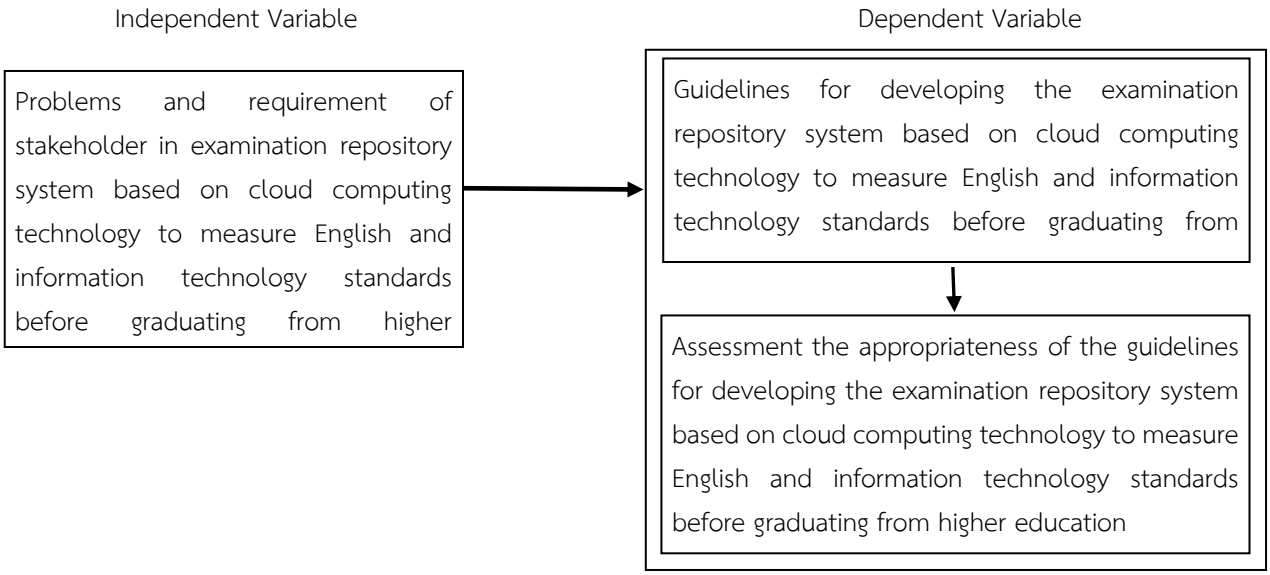

Figure 1. Research Framework

5.1 Research Tool

5.1.1 Interview form to find problems and needs of those involved with the system that has been synthesized from documents Textbooks and related research

5.1.2 Assessment the appropriateness of the guidelines for developing the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education. It is a 5-level questionnaire that has been checked for reliability (IOC) with a confidence value of 0.60.

5.2 Target Groups

5.2.1 Population: The research population is a population that is unlimited to stakeholders.

5.2.2 Sample group: The sample is a stratify random sampling, consisting of 90 stakeholders, obtained from dividing into 3 stakeholder groups (students, teachers, and staffs of higher education institutions) the group and 21 people of which 90 people were drawn by random chance.

5.3 Research methods

The research was divided into two phases, Phase 1: Examine of problems and needs. Using a concept of 6 level waterfall model for IT system development was used [16] as shown in figure 2

Phase 2: Assessment fishbone charts and UMLs obtained from system analysis and design to serve as a guideline for system development.

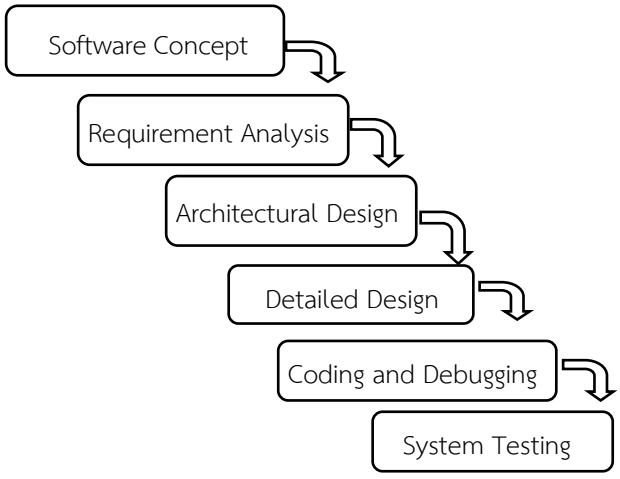

Figure 2. Sashimi waterfall model [16]

5.3.1 Software Concept: Examine problems and needs of relevant parties in examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education.

5.3.2 Requirement Analysis: Study of methods or procedures for use in design and development. The steps are as follows:

1) Examine problems and guideline through document and paper research.

2) Analyze and present the data using the fishbone diagram shown in Figure 3.

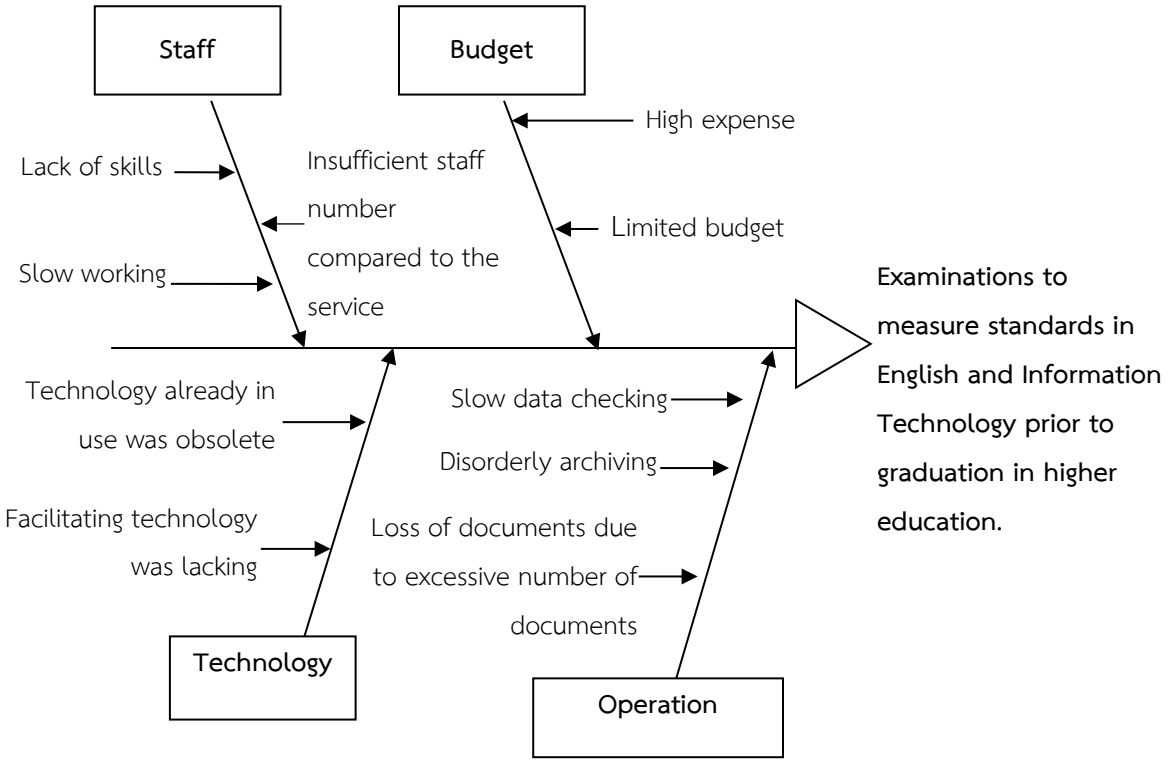

Figure 3. Fishbone Chart

3) Specify system requirements through document research.

4) Interview experts on applied computer and examination repository system based on cloud computing technology to measure English & information technology standards before graduating from higher education.

5.3.3 Architectural Design: Design the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education to explain the overall picture using the use case diagram shown in Figure 4.

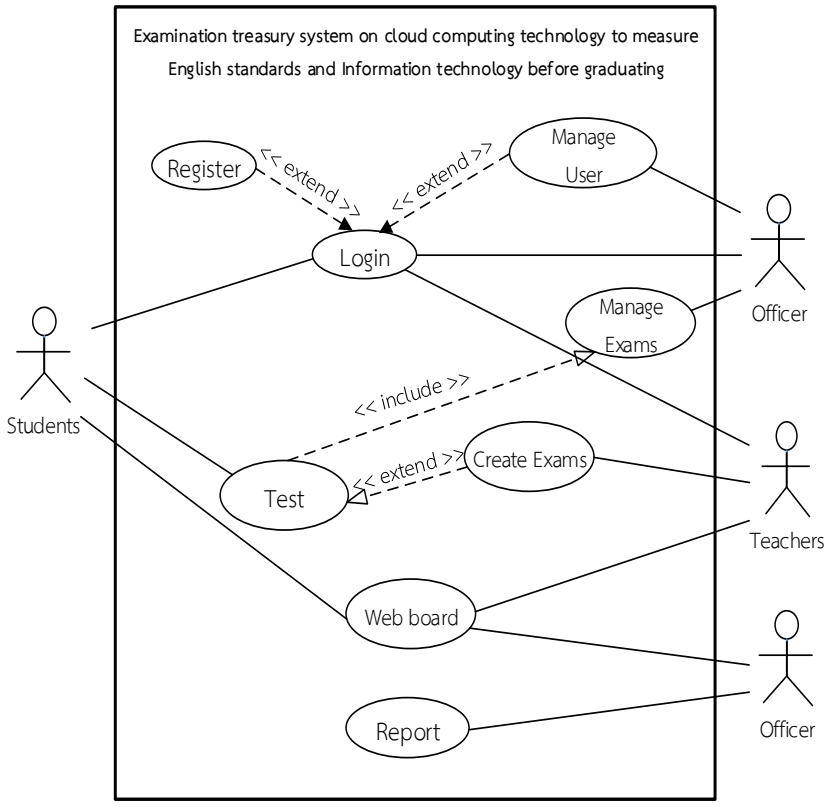

Figure 4. Use case Diagram

5.3.4 Detailed Design: Design details of the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education using the Unified Modeling Language :UML (for example this paper is sequence diagram in Figure 5-7

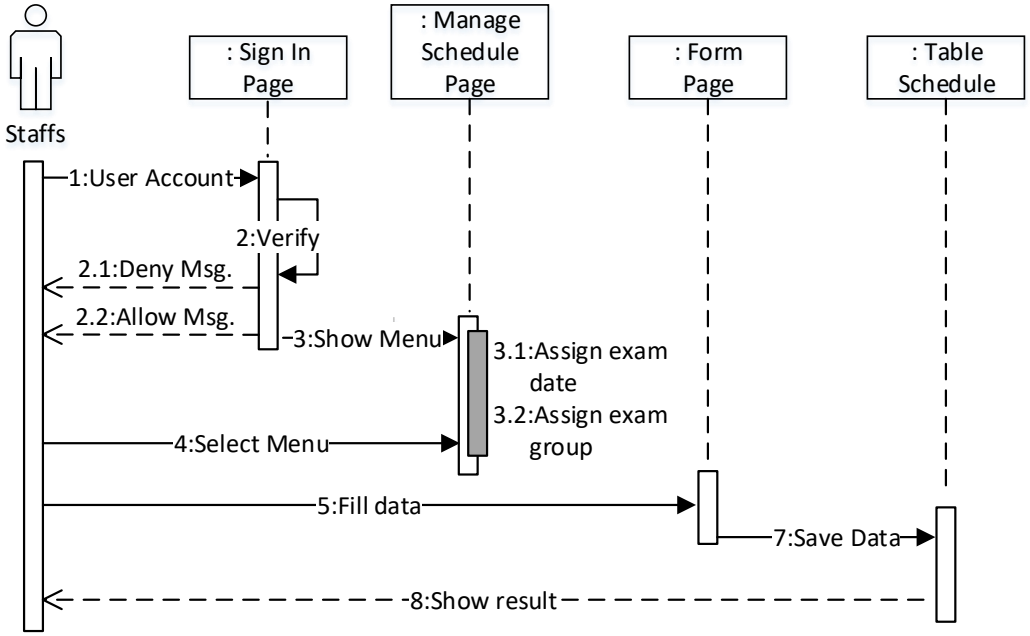

Figure 5. Sequence Diagram of Officer

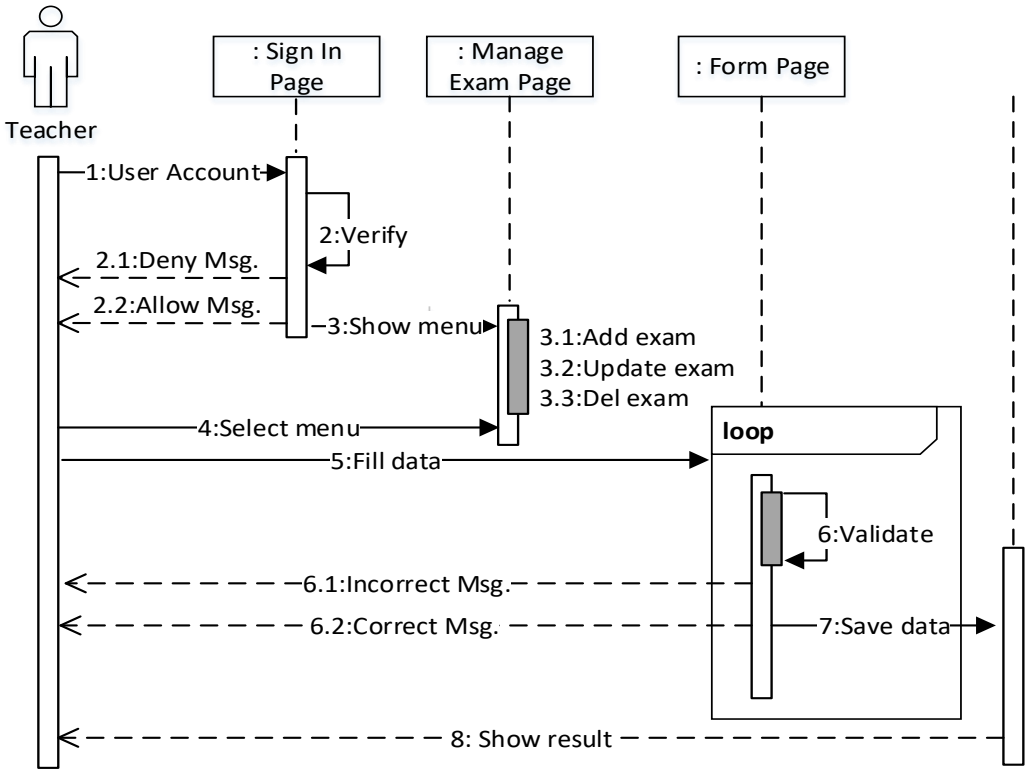

Figure 6. Sequence Diagram of Teacher

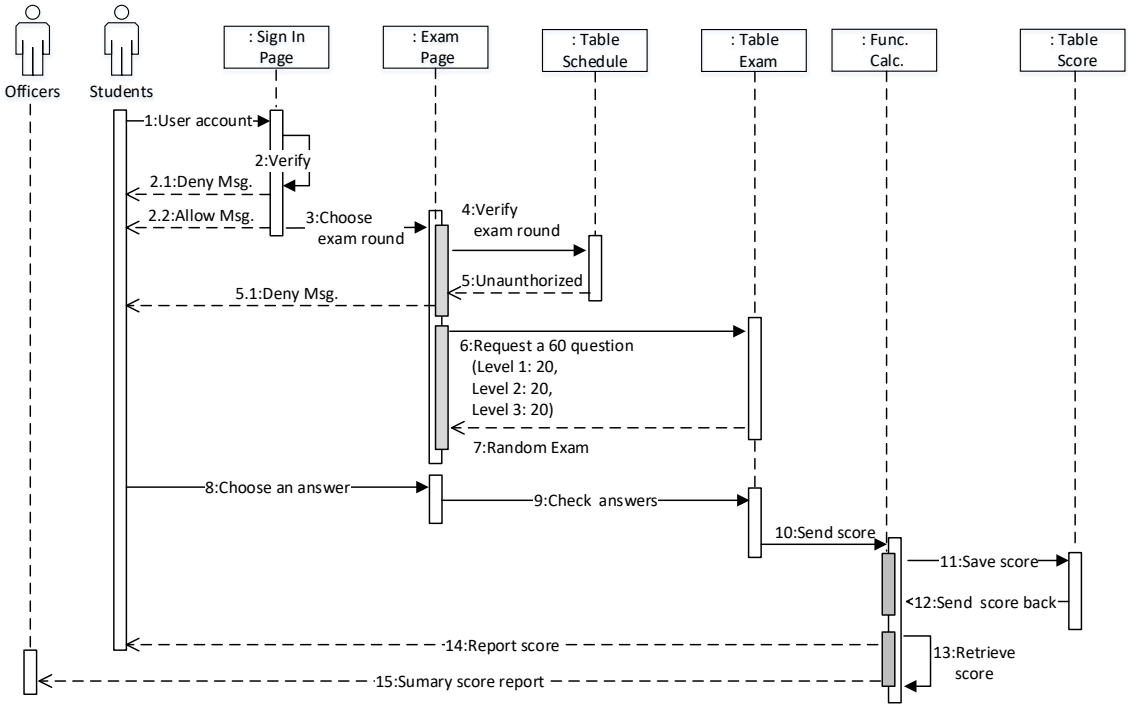

Figure 7. Sequence Diagram of Student

5.3.5 Coding and Debugging: write and edit commands using PHP, HTML, CSS and Java Script along with the MySQL database. During coding and debugging code, Developers can collaborate simultaneously through GitHub's cloud, helping them work faster and reduce errors.

5.3.6 System Testing: Assessed the design for examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education. The steps are as follows:

1) Create a survey form with four aspects of assessment [17].

2) Collect information from the sample group, comprising 90 stakeholder and classifying the sample group in round 1 into 2 groups: system users belonging to public and private higher education institutions. By choosing according to proportion according to the criteria of 25 percent of the population. The group of users of the system in the first round were users of the system under the area of 11 public higher education institutions and under the area of 9 private higher education institutions. Then, the sample group was classified in the second round into 3 sectors: students, teachers, and officer

3) Analyze and assessment suitability of the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education.

All three steps can use cloud technology. Can be used in operations to facilitate speed and be able to work simultaneously.

6. Statistics used in research

Including mean, standard deviation by comparing the results with the assessment criteria as follows:

The average 4.51 – 5.00 means the most opinion

The average 3.51 – 4.50 means the very opinion

The average 2.51 – 3.50 means the moderate opinion

The average 1.51 – 2.50 means the less opinion

The average 0.00 – 1.50 means the minimal opinion

Coefficient of Variation (C.V.) indicates high variance compared to the mean. (Unreliable) and low C.V. indicates low variance compared to the mean. (Reliable) with the assessment criteria as follows: [18]

C.V. value less than 10% means good quality

C.V. value between 10-15 % means medium quality

C.V. value higher than 15 % means the quality must be improved.

7. Research Result

Result of this study could be presented in accordance with the research purposes as follows:

7.1 Study of problems through documents, and research works pertaining to the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education, using the fishbone diagram, revealed that there were four problems in the pre-graduation English and IT skills assessment. The first was staff problem with three issues such as lack of skills, slow working, and insufficient staff number compared to the service. The second issue was the budget, as two was a limited budget, and high expense on office supplies. The third problem was technology: facilitating technology was lacking, and the technology already in use was obsolete. The fourth problem was operation with three issues: disorderly archiving, loss of documents due to excessive number of documents, and slow data checking as shown in Figure 3.

Analysis of the needs of the applied computer experts and relevant parties in the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education is shown in Figure 3.

7.2 Analysis of use case diagram showed that the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education had the officer part, with five sub-parts: (1) login (2) manage user (3) manage exam (4) webboard and (5) report. The second part was for the teacher with three sub-parts: (1) login, (2) create exam and (3) webboard. The last part is for the students with three sub-parts: (1) login (2) test and (3) webboard, and all detailwas shown in Figure 4 and the sequence diagram is shown in Figure 5-Figure 7.

7.3 Assessment of appropriateness of the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education, through 90 sampled participants, revealed that the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education was given a high rating, with following details:

Table 1: Average, standard deviation and appropriateness of the guidelines for developing the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education

Items	Assessment result		
	Mean	S.D.	Rating
1. Utility Standards			
1.1 The diagram can reflect the user problem.	4.10	0.61	High
1.2 The diagram can clearly show the user needs.	4.12	0.59	High
Total	**4.11**	**0.60**	**High**

Items	Assessment result		
	Mean	S.D.	Rating
2. Feasibility Standards			
2.1 The diagram can clearly show the system process	4.03	0.48	High
2.2 The diagram can be used as a programming guideline.	4.11	0.58	High
Total	**4.07**	**0.53**	**High**
3. Accuracy Standards			
3.1 The diagram uses the correct analysis and design symbols	4.03	0.47	High
3.2 The diagram meets standards.	4.01	0.49	High
3.3 The diagram can correctly explain the system process	4.00	0.45	High
Total	**4.01**	**0.47**	**High**
4. Propriety Standards			
4.1 Suitability of the diagram for system explanation	3.90	0.53	High
4.2 Suitability of translation from idea to diagram.	3.91	0.55	High
Total	**3.90**	**0.54**	**High**
Overall	**4.02**	**0.53**	**High**

According to Table 1, suitability assessment of the analysis and design for the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education revealed that utility was given a high rating ($\bar{x}$ = 4.11, S.D. = 0.60), feasibility ($\bar{x}$ = 4.07, S.D. = 0.53), accuracy ($\bar{x}$ = 4.01, S.D. = 0.47), and propriety ($\bar{x}$ = 3.90, S.D. = 0.54). Overall, suitability of the analysis and design for the the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education was given a high rating ($\bar{x}$ = 4.02, S.D. = 0.53) and C.V. = 13.18

8. Conclusion

8.1 The guidelines for development begin with education the problems and needs of the relevant parties in the the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education could be grouped into four groups:

8.1.1 Staff (Lack of skills, slow working and insufficient staff number compared to the service)

8.1.2 Budget (Limited staff and budget and office equipment expenses and high management costs)

8.1.3 Technology (Facilitating technology was lacking and technology already in use was obsolete and obsolete)

8.1.4 Operation (Slow data checking, Disordered archiving, Loss of documents due to excessive number of documents)

8.2 The guidelines for development the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education used the use case diagram and sequence diagram to explain the overall process. The use case diagram was used to explain the process of the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education. Three user groups were in the system (Teachers, students, and officer), Which had eight subsystems (1) login (2) manage user (3) register (4) creation exam (5) manage exam (6) test (7) web board, and (8) report. The sequence diagram showing the work of the 3 groups of people involved in the system, 3 Fictures.

8.3 Appropriateness assessment of the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education, as made by 90 persons related with the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education, by stratified random sampling (first layer was divided 3 groups and second layer was accidental sampling), revealed that the average rating for the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education was 4.02, and standard deviation was 0.63, and coefficient of variation has low variance compared to the mean, which is moderately reliable (C.V. =13.18)

Such as creating a system. System developers can use GitHub for writing code together. The examination repository system, once created, can be uploaded to the cloud system of the educational institution (Private Cloud) or a public cloud. It be able to support working simultaneously. Together without making the system unstable from processing and store large amounts of data**.** This is different from using information systems on the internet in general. The operating system is not flexible and does not adapt to the operating conditions of the computer resource system (processing, recording and storing data, etc.[19]

9. discussions

9.1 Interview of experts and relevant parties of the the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education, in order to collect system requirements, granted the researchers insight into system problems and requirements, which were then used to create the analysis and design framework for the the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education, using the fishbone diagram, context diagram, architectural diagram, Study of the problems and needs of the relevant parties concurred with the work by Pawanrant Deekasem et al. [20] about problems in storage of tools, technology and attendance/leave of the ambulance company in Ananda Mahidol Hospital. This work used the fishbone diagram to collect problems in equipment storage, data recording and attendance. After problems were discovered, the organization learned of the solutions and were able to minimize problems. This also concurred with the work by

Thanchuda Pannikul, Duangporn Sangkhamanee and Preedaporn Ngamsanga [21] or Efficiency Improvement in Manufacturing Process by Industrial Engineering Tools Case Study: Bicycle Assembly Factory, which brought industrial engineering tools such as the fishbone diagram and Expense and Cost Recovery System (ECRS) to solve problems in the factory. This work found that after improvement, the wasted time was reduced from 509 seconds to only 43 seconds, and the bike assembly rate went from one every 837 seconds to only 595 seconds (a 28.91% increase in speed).

9.2 Once the problems were identified by the relevant parties, system analysis and design were carried out in accordance with the IT system design principle that reflected the user needs through the use case diagram and structure diagram. This was the Object-Oriented method for reflection of the system, in concurrence with the work of Chaiyaphon Putthamonsiri [22]. The research process was split into steps, and the Software Development Life Cycle (SDLC) approach was used for system analysis and design. This also concurred with Sairung Weangsima [23] that used the UML a guideline for development of the Electronic Payment System in Fisheries Single Window. After the design guideline was developed, it was tested for suitability by relevant parties using the UML, and received a high suitability rating. This could be used as a guideline for designing the the examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education.

9.3 The assessment method was consistent with the work by Khemmanit Preeprem [24] that used the four-aspect evaluation standard [8] for assessment of the Information Technology Competency and Management Information Systems of Administrator under the jurisdiction of Nakhon Pathom Primary Educational Service Area Office I, which received a high suitability rating. Wannaporn Jitsangworn [25] likewise used the four-aspect evaluation standard for assessment of the efficiency of recording studio rental systems and Internet music equipment by using the concept of electronic service quality, and likewise also got a high rating. Saeed Mohammed Almueed's A Meta evaluation of School Counseling Program Evaluations [17] likewise used JCSEE's four-aspect evaluation to compare with the meta evaluation approach on American school counseling program assessments. This work found that the meta evaluation was inferior to the JCSEE's approach in terms of suitability assessment and quality reflection. This work showed that the JCSEE was reputable and could be used for performance and quality assessment.

10. Suggestions

10.1 The next phase, should take the analysis and design guideline to develop an examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education.

10.2 There should be a guideline for analysis and design of examination repository system based on cloud computing technology to measure English and information technology standards before graduating from higher education that can handle cross-platform use or designed to work on mobile devices or may use technology block chain is used to ensure the reliability of information

Reference

[1] J. A., "*Importance of Human Resources Development*," Lecture document for the Human Resources Development course, Human Resource Management Program, Phranakhon Si Ayutthaya Rajabhat University, 2013.

[2] Office of the National Economics and Social Development Council, "*National Security Strengthening for Sustainable Development*," The Twelfth National Economic and Social Development Plan (2017-2021), Office of the National Economics and Social Development Council, Bangkok, 2017.

[3] T. Baworn, "*4.0 School Management–Driving Force for Education Reform*," [Online]. Available: http://www.drborworn.com/articledetail.asp?id=20137. [Accessed: Nov. 20, 2019].

[4] N. Aree, et al., "Adjustment under Globalization," *Songkhla Rajabhat University Journal*, vol. 7, no. 1, pp. 1-12, 2014.

[5] R. Somchai, "*Education Assessment and Measurement*," Lecturing Notes, 475788 Physical Therapy, pp. 137-138, 2011.

[6] Higher Education Commission, "*Policy of Elevation of English Standards in Higher Education Institutes*," Announcement of Higher Education Commission, Bangkok, 2016.

[7] Office of the National Economics and Social Development Council, "*National Security Strengthening for Sustainable Development*," The Eleventh National Economic and Social Development Plan (2011-2016), Office of the National Economics and Social Development Council, Bangkok, 2011.

[8] W. Chanchakorn, "*Educational Measurement and Evaluation*," Teaching Materials, Faculty of Education, Pibulsongkram Rajabhat University, Phitsanulok,2011.

[9] T. Sumit, "*Developing a Test Bank for English Learning Subjects for Students Grade 4*," Master's Thesis in Educational Research and Evaluation Major, Kanchanaburi Rajabhat University, Kanchanaburi, 2015.

[10] R. Kawinthorn, "*Development of Online Test Bank System*," Research Report Demonstration School, Mahasarakham University (Secondary Department), 2016.

[11] I. Opas, Management Information System: MIS, *Se-Education Public*, Bangkok, Thailand, 2017.

[12] T. Bhuvaneswari and S. Prabaharan, "A survey on software development life cycle models," *International Journal of Computer Science and Mobile Computing*, vol. 2, no. 5, pp. 262-267, 2013.

[13] F. Sirnual, *System analysis and design*, Chiang Rai Rajabhat University, Chiang Rai, 2014.

[14] T. Rodmunkong and P. Wannapiroon, "The Design of Cloud Computing Management Information System Accordance with Thai Qualifications Framework for Higher Education," *International Journal of e-Education, e-Business, e-Management and e-Learning*, vol. 3, no. 3, pp. 214-218, 2013.

[15] A. Chaiya, "*Development of test bank and online examination system Maha Sarakham Primary Educational Service Area Office 3*," Research Report, Maha Sarakham Education Area 3, Office of the Basic Education Commission, Ministry of Education, 2018.

[16] M. Predrag and T. Pere, "A Comparative Overview of the Evolution of Software Development Models," *Journal of Industrial Engineering and Management*, vol. 1, pp. 163-172, 2010.

[17] Joint Committee on Standards for Education Evaluation, "*Program Evaluation Standards Statements*," [Online]. Available: http://www.jcsee.org. [Accessed: Feb. 2, 2020].

[18] W. Kanchana, "*The Research for Educational Development*," Institute for Educational Executive Development, Office of the Permanent Secretary, Ministry of Education, Bangkok, 2005.

[19] Ch. Sureewan, S. Panuwat, and Ch. Pimchaya, "Designing and developing a system for trading and collecting points for computer equipment on the internet in structural way," *Journal of Science and Technology*, Southeast Bangkok College, vol. 2, no. 2, pp. 40-52, 2015.

[20] D. Pawanrut et al., "Study to improve storage of equipment technology and time to work: a case study of Ananda Mahidol hospital," *Journal of Research and Academics*, vol. 4, no. 1, pp. 149-156, 2020.

[21] P. Thanchuda, et al., "Efficiency Improvement in Manufacturing Process by Industrial Engineering Tools: Case Study - Bicycle Assembly Factory," *Industrial Engineering Network Academic Conference 2014, Samut Prakan,* 30-31 October, pp.1-8,2014.

[22] P. Chaiyaphon, "*Work order system*," M.S. thesis, Network Engineering, Faculty of Science and Information Technology, Mahanakorn University of Technology, Bangkok, 2017.

[23] W. Sairung, "*Analysis and Design of Electronic Payment System in Fisheries Single Window*," Information and Communication Technology Center, Department of Fisheries, Bangkok, 2018.

[24] P. Khemmanit, "*Information Technology Competency and Management Information Systems of Administrator Under Jurisdiction of Nakhonpathom Primary Educational Service Area Office*," M.Ed. thesis, Silpakorn University, Bangkok, 2011.

[25] J. Wannaporn, "Efficiency of Recording Studio Rental Systems and Internet Music Equipment by Using the Concept of Electronic Service Quality," *Journal of Science and Technology*, Southeast Bangkok University, vol. 1, no. 1, pp. 15-25, 2021.