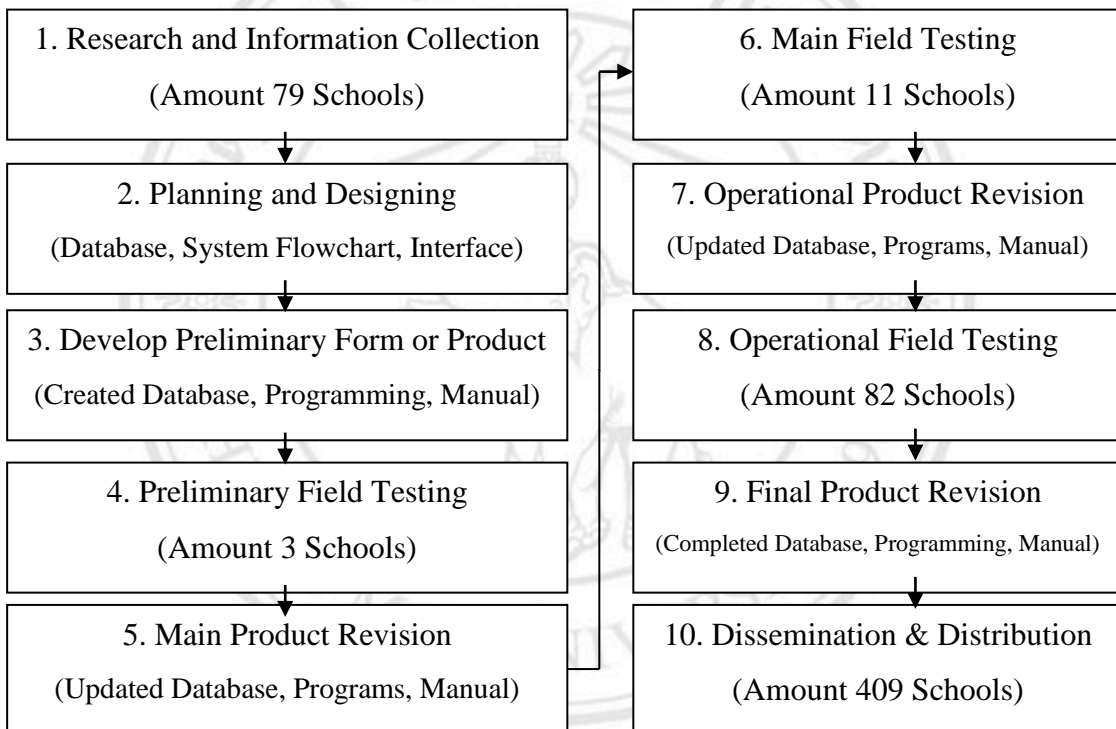# CHAPTER 3
METHODOLOGY

Research model

In this research used research and development model fellow research and development cycle of Walter R. Borg (1965), which there were the processes of research and development amount 10 steps in the following order:

1. Research and Information Collection (Amount 79 Schools)	6. Main Field Testing (Amount 11 Schools)
2. Planning and Designing (Database, System Flowchart, Interface)	7. Operational Product Revision (Updated Database, Programs, Manual)
3. Develop Preliminary Form or Product (Created Database, Programming, Manual)	8. Operational Field Testing (Amount 82 Schools)
4. Preliminary Field Testing (Amount 3 Schools)	9. Final Product Revision (Completed Database, Programming, Manual)
5. Main Product Revision (Updated Database, Programs, Manual)	10. Dissemination & Distribution (Amount 409 Schools)

Population and Sample

In this research, the population was administrator, teacher, and educational personnel in basic schools. The samples were sampling from each step of the research objectives as follows.

Step 1. A study of the problem and requirements of data and information technology for monitoring, supervision, and evaluation of learning.

The population was administrators, teachers, and educational personnel in basic schools amount 261 educational areas (Primary 183 areas, Secondary 78 areas) . The researcher used cluster random sampling 1 educational area. It was Chiang Mai Primary

Educational Area 1. Then researcher used simple random sampling from every school in Chiang Mai Primary Educational Area 1. There was 79 schools in the samples. Each school was one sample, so there was 79 persons in the samples separated by district and school size shown in Table 1.

Table 1 Number and percentage of samples used to study the problems and requirements in the development of information systems and information technology in Chiang Mai primary education area by district and school size.

District	Samples by school size Numbers (Percentage)			Total
	Small Size (1-120 Students)	Medium Size (121-600 Students)	Large Size (Over 601 Students)	
Muang Chiang Mai	5 (6.33%)	24 (30.38%)	3 (3.80%)	**32 (40.51%)**
Doi Saket	10 (12.66%)	10 (12.66%)	1 (1.26%)	**21 (26.58%)**
San Kam Paeng	8 (10.13%)	6 (7.59%)	1 (1.26%)	**15 (18.99%)**
Mae On	6 (7.59%)	5 (6.33%)	- (0.00%)	**11 (13.92%)**
Total	**29 (36.71%)**	**45 (56.96%)**	**5 (6.33%)**	**79 (100.00%)**

Table 1 shows that the samples in each district under the Office of Primary Chiang Mai Education Area 1 total 79 persons divided into 4 districts. There were Muang Chiang Mai amount 32 persons(40.51%), Doi Saket district amount 21 persons (26.58%), San Kam phaeng district amount 15 persons (18.99%), and Mae On amount 11 persons (13.92%). The samples were classified as a small school amount 29 persons (36.71%), medium school amount 45 persons (56.96%), and the large school amount 5 persons (6.33%).

The samples were classified by gender, working status, school classes, and ability of using computer shown in Table 2.

Table 2 Number and percentage of samples used to study the problems and
requirements in the development of data and information technology
in Chiang Mai primary educational area 1 classified by classified by gender,
working status, school offered class, and ability of using computer.

List	Number	Percentage
1. gender		
- Male	18	22.80
- Female	61	77.20
Total	**79**	**100.00**
2. Working Status		
- Teacher	20	25.30
- Head of academmic affair	13	16.46
- registrar	32	40.50
- Administrator	11	13.92
- Other	3	3.80
Total	**79**	**100.00**
3. School be under		
- Basic Education Commission (OBEC).	79	100.00
4. School offered class		
- Primary School Class P.1 - P.6	46	58.20
- Primary Class P.1 – High School M.3	24	30.40
- Primary Class P.1 – High School M.6	9	11.40
Total	**79**	**100.00**
5. Computer program routine use (More than 1 Reply)		
- Word Processing	77	97.50
- Spread Sheet such as Excel	71	89.90
- Presentation such as PowerPoint	63	79.70
- Database Manegement such as Access	14	17.70
- Academic Application Programs	19	24.10
- Other	1	1.30

Table 2 (Continued)

List	Number	Percentage
6. General problems in the agency. (More than 1 Reply)		
- Insufficient computer	25	31.60
- Computers are outdated	31	39.20
- Lack of application programs	48	60.80
- Using the programs and applications	33	41.80
- Lack of database mamagement	31	39.20
- Other	4	5.10
7. Numbers of computers used in schools		
- The number of 1-10	30	38.00
- The number of 11-50	41	51.90
- The number of 51-100	5	6.30
- The number of 101-500	3	3.80
Total	**79**	**100.00**
8. Amount of personnel with knowledge and ability		
to use computers in schools		
- Nobody	5	6.30
- Amount 1-3 persons	23	29.10
- Amount 4-9 persons	28	35.40
- More than 10 persons	23	29.10
Total	**79**	**100.00**

Table 2 shows that a total of samples was 79 persons, consisted of teachers, educational personnel and administrators under of the Office of the Basic Education Commission (OBEC), most of samples were female amount 61 persons(77.20%), male amount 18 persons (22.80%). Most of samples were registrar in schools amount 32 persons(40.50%), were teachers 20 persons (25.30%), were the chief of academic amount 13 persons (16.46%), and were administrators amount 11 persons (13.92%).

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Step 2 The study of knowledge to develop, data and information technology for monitoring, supervision, and evaluation of learning.

The samples in this process, on the stage of study to develop the system, there were documents, the text books, journals and other thesis amount 50 titles.

And on the stage of interviews and group focus with the experts of measurement, evaluation and information system in schools, researcher selected purposive sampling of the experience in the measurement and evaluation, and had skills about information systems management for at least five years in basic educational schools. The selected sampling from every school size. The small size, medium and large school size amount 3 schools. Each school size included 3 persons from registrar, head of measurement and evaluation, and academic administrators. Consolidation among 27 persons to interview and focus groups in outlining the principles of data and information development. List of academy a source of information in this process consisted of.

School Name	School Size	Under the office
1. The Prince Royal's College	Large size	Private school
2. Tasaban Wat Tastoy School	Large size	Municipal school
3. Anuban Chiang Mai School	Large size	Government school
4. Ban Phong Noi School	Medium size	Government school
5. Somdet Phapoodta Chinawong	Medium size	Buddhist school
6. Govit Tumrong Chiang Mai	Medium size	Private school
7. Tasaban Wat Katkaram School	Small size	Municipal school
8. Wat Pa Dad School	Small size	Government school
9. Tasaban Wat Kucome School	Small size	Municipal school

Step 3 Development of data and information technology for monitoring, supervision, and evaluation of learning.

Researcher designed the system and program development for measurement and evaluation of learning, academic affair, registration, and website to present information for monitoring and evaluation of learning. Along with a guide to using the system,

leading to a preliminary trial in school as experiments in the field testing, The samples which were a trial and improvement following 3 rounds.

Preliminary Field Testing, with a sample size of schools, there were small, medium and large school size, including 3 schools during trial data was collected from interviews in the semester 1 and the end of semester 2 until all the programs were developed to work directly with the needs of the users and working accurately. The manual was revised. Then the users replied the programs and website acceptance questionnaire.

Samples in the Preliminary Field Testing.

The schools in Preliminary Field Testing consisted of 1) The Prince Royal's College. (Large schools). 2) Anuban Chiang Mai School (middle school),   and 3) Tasaban Wat Kucome School(Small schools). The simple random sampling was applied to get data from each school consisted of teacher, head of academic affair, registrar, and school administrator amount 4 persons, including 12 samples were classified according to the following status in Table 3.

Table 3 Number and percentage of samples in a Preliminary Field Testing
and evaluation of data and information system.

List	Number	Percentage
1. Gender		
- Male	3	25.00
- Female	9	75.00
Total	**12**	**100.00**
2. Working Status		
- Teacher	3	25.00
- Head of academic Affair	3	25.00
- Registrar	3	25.00
- Measurement and Registration Personnel	3	25.00
Total	**12**	**100.00**
3. The schools in Preliminary Field Testing		
- The Prince Royal's College	4	33.33

Table 3 (Continued)

List	Number	Percentage
- Anuban Chiang Mai School	4	33.33
- Tasaban Wat Kucome School	4	33.33
Total	**12**	**100.00**

Table 3 shows that the samples in Preliminary Field Testing consisted of a small school, medium and large school size. Each of school there were 4 samples, including amount 12 persons were classified by gender as female amount 9 persons(75.00%), male amount 3 persons(25.00%), teacher amount 3 persons(25.00%), head of academic affair amount 3 persons(25.00%), registrar amount 3 persons(25.00%), and measurement and registration personnel amount 3 persons(25.00%).

Samples in the Main Field Testing.

The samples were simple random sampling from basic schools, consisted of 11 schools under the Chiang Mai municipal schools to evaluate using of data and information systems. There were 2-3 persons in each school to answer questionnaires. Number of samples 30 persons returned for the results shown in Table 4.

Table 4 Number and percentage of samples in Main Field Testing and evaluation

of the data and information technology system under the Chiang Mai municipal

List	Number	Percentage
1. Gender		
- Male	5	16.67
- Female	25	83.33
Total	**30**	**100.00**
2. Working Status		
- Teacher	1	6.67
- Head of academic Affair	3	10.00
- Registrar	8	26.67
- Measurement and Registration Personnel	13	43.33

Table 4 (Continued)

List	Number	Percentage
- Other	4	13.33
Total	**30**	**100.00**
3. The schools in Main Field Testing		
1. Tasaban School 1 (Wat Katgaram)	2 Persons	6.70
2. Tasaban School 10 (Wat Chiang Yuen)	3 Persons	10.00
3. Tasaban School 11 (Wat Muen Ngoen Kong)	3 Persons	10.00
4. Tasaban School 2 (Wat Tasatoy)	2 Persons	10.00
5. Tasaban School 3 (Wat Kucome)	3 Persons	6.70
6. Tasaban School 4 (Wat Sridonchai)	2 Persons	10.00
7. Tasaban School 5 (Wat Sri Supun)	3 Persons	6.70
8. Tasaban School 6 (Dog Ngoen)	3 Persons	10.00
9. Tasaban School 7 (Wat Pha Paeng)	3 Persons	10.00
10. Tasaban School 8 (Wat Sri Ping Muang)	3 Persons	10.00
11. Tasaban School 9 (Wat Puag Chang)	3 Persons	10.00
Total	**30** Persons	**100.00**

Table 4 shows that the Main Field Testing samples to evaluate the using of the system were 30 schools under the Chiang Mai municipal 11 schools, mostly female of 25 persons (83.33%) and the male of 5 persons (16.67%), classified as teachers 1 person (6.67%), head of academic affair 3 persons (10.00%), registrar 8 persons (26.67%), measurement and registration personnel 13 persons (43.33%) and the other for 4 persons (13.33%).

Samples in the Operational Field Testing.

The researcher randomly samples from all schools in the Chiang Mai primary education area 1, there were 82 schools after using the system, the researcher sent an evaluation of the data and information system form to answer. There were 1-2 persons in each school to answer the questionnaires. Number of samples were 93 persons returned shown as Table 5.

Table 5 Number and percentage of samples in the Operational Field Testing
and evaluation the data and information systems under the Chiang Mai
primary education area 1.

List	Number	Percentage
1. Gender		
- Male	23	24.70
- Female	70	75.30
Total	**93**	**100.00**
2. Working Status		
- Teacher	18	19.40
- Head of academic Affair	5	5.40
- Registrar	23	24.70
- Measurement and Registration Personnel	38	40.90
- Other	9	9.70
Total	**93**	**100.00**

Note List of schools in the Operational Field Testing consisted of 82 schools as follows:
Kum Tiang Anusorn, Chon Phatan Patang, Chumchon Buakok Noi, Chumchon Wat Ta
Duea, Ta Sala Thep Sadet, Ban Ko Saliam, Ban Cheng Doi (Doi Saket Suksa), Ban
Cheng Doi Suthep, Ban Cheng Chang, Ban Don Pin, Ban Talad Khee Lek, Ban Tor
Muang Lung, Ban Ta Look San Sai, Ban Bor Sang Narakorn Prasarn, Ban Bor Hin, Ban
Phong Pa Uea, Ban Pang Dang, Ban Pang Nam Too, Ban Pa Ngiw, Ban Pa Tueng Doi
Chiw, Ban Pa Pong, Ban Pa Phai, Ban Pa Mai Dang, Ban Pa Sak Ngam, Ban Pa
Sou,Ban Pa Muad, Ban Phong Koom, Ban Muang Thorn, Ban Mon, Ban Mae Chong,
Ban Mae Dog Dang, Ban Mae Poo Ka, Ban Mae Wan, Ban Mae Hoy Ngueng, Ban
Rong Khee Lek, Ban Luang Nueg, Ban Sun Kum Pang, Ban San Ton Muang Nueg, Ban
Sansai, Ban Nong Kong, Ban Huay Say, Ban On Huay, Ban Pa Khuey – Ta Rua, Phong
Num Ron Witaya, Push Ti So Pon, Mae Ta Khai, Mae Phong Samakey, Anuban Chiang
Mai, Wat Khuang Sing, Wat Chang Khian, Wat Don Jun, Wat Soy Moon, Wat Ban Noi,
Wat Ban Mon, Wat Ban Hong, Wat Pa Khoy Tai, Wat Pa Dad, Wat Pa Ton, Wat Pa
Tan, Wat Pao Sam Kha, Wat Muang Sarn, Wat Mae Pha Han, Wat Rong Wua Dang,

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Wat Rong Wua Dang, Sri Jun Witayakan, Wat Rong Or, Wat Lan Tong, Wat Wung Sing Kum, Wat Suan Dong, Wat San Khang Nueng, Wat San Paka, Wat San Ma Hog Pha, Wat Soa Hin, Wat Nong Pa Khung, Wat Huay Kaew, Wat Huay Say, Sri Na Loo, San Kum Phang Anusorn.

Table 5 shows that the sample in the Operational Field Testing and evaluate the using of the system amount 93 Persons under the Chiang Mai primary educational area 1, consisted of 82 schools were mostly females were 70 persons (75.30%), and male of 23 persons (24.70%), classified as teachers were 18 persons (19.40%), head of Academic affair amount 5 persons (5.40%), registrar amount 23 persons(24.70%), and measurement and registration personnel amount 38 persons(40.90%), and other 9 persons (9.70%).

Step 4 Studying the effects of using programs in data and information technology for the inspection supervision, monitoring and evaluation of learning.

After Operational Field Testing, researcher disseminated and extended the data and information technology system to various schools in Thailand. After using each school assessed the website to evaluate the efficiency and effectiveness of the systems. The samples to evaluate the system amount 409 schools, shown in Table 6.

Table 6 Number and percentage of the samples to evaluate the effectiveness
and efficiency of data and Information technology system.

List	Number	Percentage
1. Gender		
- Male	164	40.10
- Female	245	59.90
Total	**409**	**100.00**
2. Working Status		
- Teacher	82	20.05
- Head of academic Affair	41	10.02
- Registrar	110	26.89
- Measurement and Registration Personnel	163	39.85

Table 6 (Continued)

List	Number	Percentage
- Other	13	3.17
Total	**409**	**100.00**
3. Schools under		
- Office of the Basic Education Commission (OBEC.)	142	34.72
- Office of the Private Education Promotion (SC.)	83	20.29
- Office of National Buddhism (SP.)	29	7.09
- Department of Local School (PT.)	155	37.90
Total	**409**	**100.00**
4. Schools Start from Class to Class		
- Primary Schools P.1-6	165	40.34
- Primary Schools P.1 – High Schools M.3	124	30.32
- High Schools M.1- 6	32	7.82
- Primary Schools P.1 – High Schools M.6	88	21.52
Total	**409**	**100.00**

Table 6 shows that the samples to evaluate the efficiency and effectiveness of the data and information technology systems amount 409 persons, there were female, 245 persons (59.90%), male 164 persons (40.10%), mostly working status as measurement and registrar amount 163 persons (39.85%), registrar amount 110 persons (26.89%), schools under all department in basic education. Most schools were primary schools, start class from grade P.1- P.6 amount 165 persons (40.34%), and other, respectively.

Tools used for this research

Tools used for this research were divided into two types.

1) Tools used for developing data systems and information technology.

1.1) The Database Management System program consisted of Microsoft Access and Microsoft SQL Server for collect data and information from the system. Research used Access database for small and medium school size and SQL Server database for medium and large school size.

1.2) Computer language, There were Visual Basic Version 6 language to develop the application software such as the measurement and evaluation program, academic program, and registrar program. And the PHP language for writting the website programming to present the data and information.

2) Tools used for data collecting.

Tools used for data collection classified into the steps of the research.

Step 1 studying of the problem and requirements for data and information technology system for monitoring, supervision, and evaluation of learning.

Tool used to collect data was the questionnaire. The researcher created 4 parts, Part 1 Preliminary data of respondents, Part 2 it was the closed-end questionnaire asking about problems in data and information in schools, Part 3 it was rating scale questionnaire asking about the requirement of data and information technology in schools, and Part 4 it was the open-end questionnaire asking about the problem and requirement of data and information technology system. (Details in Appendix 4.2).

The process of creating queries, problems and requirements in data and information technology system.

1. Studying, research papers and reports on information technology problems and requirements of the hardware, software, and people ware.

2. Survey studying, using of information technology in the basic educational schools identified by hardware, software, and personnel computers.

3. Generated questions of problem and requirements identification of key-based hardware, software, and personnel computers.

4. Creating a consistency check of each question and made IOC questionnaire.

5. Sent IOC questionnaire to 7 experts (List of experts. In Appendix 2), then find value IOC in each item (IOC: Index of item objective) was shown in Table 7. (Table 7 in Appendix 4.1)

Table 7 shows that the value of the index corresponds to each question. Both the problems and requirements were high (the value of each item all over 0.86).

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6. Choosing the items that experts agree with (the IOC over 0.70) to create questionnaire in rating scale asking about problems and requirements.

7. Applied rating scale questionnaire to find the reliability. The trial samples collected data on other samples. There were samples of Chiang Mai private school amount 30 samples, using coefficient of Alpha Cronbach, found that the alpha was 0.83 indicated that the questionnaire with the high reliability. (Greater than 0.70).

8. Updating and publishing a complete questionnaire and used to collect data from the samples.

The questionnaire of problems and requirements of data and information technology system is in Appendix 4.2

Step 2 Studying of knowledge to develop, data and information technology system for the inspection supervision, monitoring and evaluation of learning.

Tools used to collect data in the process were a record of documents and texts of the information systems and interviews and focus groups with professionals in schools. The questions in the focus group of the knowledge used in the development of information systems and information technology to assist in the implementation and compliance with the requirements of the schools. Preparation of a central database of schools and studying the feasibility of the system.

Steps to create educational tools for knowledge development.

1. Studying research papers on the development of data and information technology system for the inspection supervision, monitoring and evaluation of learning in basic education.

2. Preparing for data to study the knowledge related to develop data and information technology system in basic education.

3. Provide experts in the field of measurement and evaluation in basic education schools amount 3 persons checked to determine content validity by finding the consistency index (IOC: Item Objective Congruence). (List of Experts In Appendix 2)

4. Choosing the items that experts agree with (the IOC over 0.70), then created the open-ended questionnaire.

Recorded paper to study the knowledge of development the data and information technology system shown in Appendix 4.3

Step 3 Development of data and information technology system for the inspection supervision, monitoring and evaluation of learning.

Tools used for data collection consisted of interviews using data and information technology system. The researcher developed both a formal and an informal discussion to improve the system. Creating of system acceptance test (UAT) and evaluation of the programs in measurement and evaluation program, academic program, registration program, and the website present to present data and information in schools.

The process of creating questionnaire for interviews.

1. Studying research papers to develop of data and information technology system for the inspection supervision, monitoring and evaluation of learning.

2. Development the data and information technology as it was designed to allow the user to save the data and produce information as their requirement. The knowledge gained from the previous step.

3. Generate questions about the operation of the information systems that could work as their requirements and to improve information systems. Experts amount 3 persons to check and determine the content validity by finding the consistency index (IOC: Item Objective Congruence) (name experts. In Appendix 2)

4. Choosing the items that experts agree with (the IOC over 0.70) then created open-ended interviews.

Interviews using information systems and information technology for supervision, monitoring and evaluation of learning shown in Appendix 4.4

Steps to create tool for user acceptance programs in measurement and evaluation program, academic program, and registration program.

1. Studying documents the Core Curriculum BE 2551 Basic role and scope of work for the measurement and evaluation.

2. Discussion in focus group with the measurement and evaluation of academic programs and registration to determine the requirements of each user.

3. Definition of measurement and evaluation, academic and registration.

4. Creating questions based on the indicators show the success of the measure and evaluate academic and registration.

5. Providing experts amount 3 people to find consistency index (IOC: Item Objective Congruence) (name experts. In Appendix 2). Results of index in each item in Table 8. (in Appendix 4.5)

6. Selected the items that experts agree with (the IOC over 0.70).

7. Printing the user acceptance program in check list questionnaire form.

the user acceptance program check list questionnaire in Appendix 4.5.

Steps to create tool for user acceptance website to present the data and information for monitoring, supervision, and evaluation in basic school.

1. Studying educational standards document in quality assurance education learners. In both internal and external quality assurance system for assessment and verification of academic evaluation and registration.

2. Discussion in focus groups to the active site of information system that serves as the quality assurance of education and to server the requirements.

3. Defining measurement in ensuring the quality of education the students.

4. Written questions of the standard indicators of success measure in ensuring the quality of education the students.

5. Providing the experts amount 3 persons to find the consistency index (IOC: Item Objective Congruence) (name experts. In Appendix 2). The IOC values in each item shown as Table 9. (in Appendix 4.6)

6. Choosing items that experts agree with (the IOC over 0.70).

7. Updating and publishing a complete user acceptance website questionnaire.

The user acceptance website questionnaire to present data and information is in Appendix 4.6

Step 4 Studying of using data and information technology system for the inspection supervision, monitoring and evaluation of learning.

Tools used to collect data in evaluating the effectiveness and efficiency of information systems and information technology for the inspection supervision, monitoring and evaluation of learning were evaluation questionnaire.

Process of creating efficiency and effectiveness evaluation questionnaire.

1. Study documents significant efficiency and effectiveness of data and information technology system for inspection supervision, monitoring and evaluation of learning in basic education.

2. Define indicators that show the efficiency and effectiveness of the measure and evaluation program, academic program, and registration program.

3. Creating questions of performance indicators and effectiveness of the system.

4. Provide to experts amount 7 persons (list of experts. In Appendix 2), check the accuracy of the contents in each question. Then to find the consistency index (IOC: Item Objective Congruence) results shown in Table 10. (in Appendix 4.7)

Table 10 shows that the value of the consistency index (IOC) in each question were high (the IOC all over 0.86).

5. To find the reliability of rating scale in the efficiency and effectiveness questionnaire. Research tried out with the teachers in Chiang Mai privateamount 30 persons. Using the Cronbach alpha coefficients to evaluate, there was 0.81 in Efficiency and 0.85 in effectiveness, indicating that assessment of both the high confidence. (Greater than 0.70).

6. Updated and published a complete of efficiency and effectiveness evaluation questionnaire.

Efficiency and effectiveness evaluation questionnaire is in Appendix 4.8

Data collection

Data collection used in this research fellow the steps of research procedures.

Step 1 study of the problem and requirements in data and information technology system for the monitoring, supervision, and evaluation of learning.

Data collection in this step, researcher had coordinated with supervisors in office of Chiang Mai primary area 1 for meeting with the users who were teachers, working in academic affair, and registrars in basic schools under the office, and the participants filled out the problem and requirements questionnaires.

Step 2 Studying of knowledge to develop, data and information technology system for monitoring, supervision, and evaluation of learning.

Data collection in this step, the researcher prepared questions and made appointment in interviews the teachers as their duties, measurement and evaluation, head of academic affair, registrars, and school administrators. And focus group discussion to summarize the principles to develop data and information technology system in basic education level.

Step 3 Development of data and information technology for monitoring, supervision, and evaluation of learning.

After the research led the data and information technology system to try out in the sample schools. The research was conducted to collect data using interviews, both formal and informal discussion and collect data for updating system. The information collected in this process had 3 cycles in the Preliminary Field Testing, the Main Field Testing, and the Operational Field Testing.

Step 4 Studying the effects of using programs in data and information technology for monitoring, supervision, and evaluation of learning.

Data collection in this step, research used efficiency and effectiveness evaluation questionnaire. After users used the system then they replied evaluation questionnaire through the website which the research developed.

Data analysis and statistics.

Data analysis and statistics used in this research fellow the stages of research.

Step 1 study of the problems and requirements in data and information technology system.

Analysis of data from the questionnaires.

- Quantitative data using percentage, arithmetic mean, standard deviation and scattered coefficient.

- Qualitative Data using content analysis, frequency, content classification.

Step 2 Studying of knowledge to develop, data and information technology system for the monitoring, supervision, and evaluation of learning.

Data analysis at this stage, researcher used to synthesize knowledge from theoretical principles of information technology development. The group focus from experts in measurement and evaluation work, academic work, and registration work to summarize the principles of systems development and information technology in basic education level.

Step 3 Development of data and information technology monitoring, supervision, and evaluation of learning.

Analysis problems and requirements from interviews and the need to improve information systems using content analysis. Solution improvement, needs, and suggestions were summarized in each Field Testing. And quantitative data using percentage, arithmetic mean, standard deviation and scattered coefficient.

Step 4 Studying the effects of using programs in data and information technology for monitoring, supervision, and evaluation of learning.

Analysis the efficiency and effectiveness of data and information system in the measurement and evaluation program, academic program, registration program, and the website to present data and information using arithmetic mean, standard deviation, and scattered coefficient.

Criteria for Interpretation

       1. Criteria for interpretation of arithmetic mean is absolute criteria as the guidelines of the Best (Best, 1981 : 204-208).

       Level of problems in using the data and technology information.

Arithmetic Mean	Meaning
4.51 – 5.00	Highest problem
3.51 – 4.50	High problem
2.51 – 3.50	Moderate problem
1.51 – 2.50	Low problem
1.00 – 1.50	Lowest problem

       Level of requirements in using the data and technology information.

Arithmetic Mean	Meaning
4.51 – 5.00	Highest requirement
3.51 – 4.50	High requirement
2.51 – 3.50	Moderate requirement
1.51 – 2.50	Low requirement
1.00 – 1.50	Lowest requirement

       Level of efficacy in the data and technology information system.

Arithmetic Mean	Meaning
4.51 – 5.00	Highest efficacy
3.51 – 4.50	High efficacy
2.51 – 3.50	Moderate efficacy
1.51 – 2.50	Low efficacy
1.00 – 1.50	Lowest efficacy

Level of effectiveness in the data and technology information system.

Arithmetic Mean	Meaning
4.51 – 5.00	Highest effectiveness
3.51 – 4.50	High effectiveness
2.51 – 3.50	Moderate effectiveness
1.51 – 2.50	Low effectiveness
1.00 – 1.50	Lowest effectiveness

2. Criteria for interpretation of data distribution in case rating scale 1-5 (Boontum Kitpreedaborisud, B.E.2540)

S.D.	C.V.	Meaning
< 0.5	< 10%	Low distribution
0.5 – 1.50	10% - 30%	Moderate distribution
> 1.50	> 30%	High distribution

3. Criteria for interpretation of percentage (The Ministry of Education, B.E.2553)

Percentage	Meaning
80 – 100	The highest level
70 – 79	High level
60 – 69	Moderate level
50 – 59	Low level
Less than 50	The lowest level

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