CHAPTER 4

Results of Data Analysis

Researcher presents results of data analysis follows research objectives.

4.1 Results of studying problems and requirements in data and information technology.

4.2 Results of studying knowledge related to data and information technology.

4.3 Results of data and information technology systems development.

4.4 Results of the effects of the data and technology information system development for monitoring, supervision, and evaluation in basic educational level.

4.1 Results of study the problems and requirements in data and information technology.

Researcher used cluster random sampling one of educational area, sampling was in Chiang Mai primary Area 1, then simple random sampling every schools in educational area 1 amount 79 schools, each school had 1 sample total 79 samples to study the problems and requirements of data and information technology system.

Results of studying problems in data and information technology from the samples amount 79 persons shown in Table 11.

Table 11 Arithmetic mean, standard deviation, and scattered coefficient in the problems of data and technology information.

List	$\overline{\text{x}}$	S.D.	C.V.	Meaning
1. Problems of the hardware and networking				
1.1 Performance of computers out of dated.	3.33	0.83	24.86	Moderate
1.2 Number of computers is not enough to meet demand.	3.25	0.97	29.72	Moderate
1.3 The budget shortfall to supply computers.	3.32	1.08	32.58	Moderate

Table 11 (Continued)

List	$\overline{\mathrm{x}}$	S.D.	C.V.	Meaning
1.4 The inappropriateness of the ratio of students per computer in computer classroom.	3.16	0.97	30.54	Moderate
1.5 No computer network or network instability.	3.49	1.02	29.30	Moderate
1.6 No information centers (Data Center).	3.43	0.92	26.69	Moderate
1.7 Shortages projector to use in teaching and learning.	3.59	0.93	25.79	High
1.8 Shortage of digital equipment to assist in the production of electronic media.	3.25	1.04	32.08	Moderate
1.9 Internet services are inadequate and do not cover all the space available.	3.44	0.98	28.57	Moderate
1.10 Speed Internet connections in schools, is not fast enough.	3.56	1.12	31.43	High
Total Average in hardware and network	**3.38**	**0.68**	**20.09**	**Moderate**
2. Problems of the software.				
2.1 The lack / shortage the office programs on a computer.	3.52	0.89	25.28	High
2.2 The lack / shortage computer programs for teachers to measure and evaluate learning results.	3.67	1.00	27.14	High
2.3 The lack / shortage academic programs for academic affair personnel in management.	3.62	0.92	25.53	High
2.4 The lack / shortage programs for registrar to manage and report student documents.	3.67	0.97	26.43	High
2.5 The lack / shortage programs for teachers to manage teaching and learning.	3.61	0.93	25.66	High

Table 11 (Continued)

List	$\overline{\text{X}}$	S.D.	C.V.	Meaning
2.6 The lack / shortage website for school to promote and public relations.	3.51	1.07	30.59	High
2.7 The lack / shortage website to provide data and information of schools.	3.56	1.06	29.78	High
2.8 No program or software that responds to the needs of users.	3.77	0.77	20.34	High
2.9 The absence or lack of proper manuals in many programs.	3.65	0.89	24.47	High
2.10 The difficulty and complexity of using programs.	3.54	1.00	28.14	High
Total Average in software	**3.61**	**0.76**	**21.08**	**High**
3. Problems of people ware				
3.1 Most of the teachers don't have the basic knowledge and skills in computer.	3.46	0.83	23.99	Moderate
3.2 No technicians help maintain computer in schools.	3.63	1.28	35.31	High
3.3 Most people lack the knowledge to use the computer programs.	3.63	1.09	29.95	High
3.4 Management lacks of vision, knowledge, and information technology.	3.41	0.87	25.55	Moderate
3.5 Teachers could not use program to measure and evaluate the student learning results.	3.25	0.95	29.31	Moderate
3.6 Heads of academic affair could not use program to help their jobs.	3.22	0.78	24.23	Moderate
3.7 The registrar could not use computer to help educational document and transcript.	3.65	1.09	29.80	High
3.8 Programmers develop programs do not meet the needs of the user.	3.47	0.88	25.22	Moderate

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Table 11 (Continued)

List	$\overline{x}$	S.D.	C.V.	Meaning
3.9 Lack of coordination between users and computer program developers.	3.63	1.00	27.59	High
3.10 Lack of knowledge and training to use computer programs or software.	3.54	0.90	25.48	High
Total Average in people ware	**3.49**	**0.71**	**20.28**	**Moderate**
Total Average in all items	**3.49**	**0.64**	**18.35**	**Moderate**

From Table 11 showed that the average of the overall problems was moderate ($\overline{x}$ = 3.49), the overall hardware problem was moderate ($\overline{x}$ = 3.38), the overall software problems was high level ($\overline{x}$ = 3.61), and the overall people ware problems was moderate ($\overline{x}$ =3.49). Each problem had moderate scattered coefficients (C.V. values ranged from 20% to 30%).

The details of each problem were as follows.

Computer hardware and networking problems.

Problems of hardware and computer networks in schools found that the overall problem was moderate. ($\overline{x}$ = 3.38).

There were 2 items of hardware problems in high level amount 20.00% of all items, including a shortage of projectors for using in teaching (No 1.7, $\overline{x}$ =3.59) and the speed of internet connection in schools was not fast enough. (No 1.10, $\overline{x}$ = 3.56).

There were 8 of hardware problems in moderate level amount 80.00 % of all items, including No computer network or network instability (No 1.5, $\overline{x}$ = 3.49), providing internet services was inadequate and did not cover all the space available (No 1.9, $\overline{x}$ = 3.44) and no information center or data center (No 1.6, $\overline{x}$ = 3.43), the performance of computers were out of dated (No 1.1 $\overline{x}$ = 3.33), the budget shortfall in the supply of computer (No 1.3 $\overline{x}$ = 3.32), number of computers, there were not enough for using (No 1.2 $\overline{x}$ = 3.25), the lack of digital devices to aid in the production of electronic media (No 1.8, $\overline{x}$ = 3.25), and the inappropriateness of the ratio of students per computer (No 1.4 $\overline{x}$ = 3.16), respectively.

Computer software problems.

Software problems found that overall problems was high level. ($\bar{x}$ = 3.61).

There were 10 items of software problems in high level amount 100.00 % of all items. Software problems sorted in descending order as follows: the problem no program or software that responds to application requirements (No 2.8, $\bar{x}$ = 3.77), the lack or shortage computer program for teachers to measure and evaluate the studying results (No 2.2, $\bar{x}$ = 3.67), the lack or shortage of applications, enrollment in school (No 2.4, $\bar{x}$ = 3.67), the lack or shortage of suitable user programs (No 2.9, $\bar{x}$ = 3.65), the lack or shortage of academic programs in management (No 2.3, $\bar{x}$ = 3.62), the lack or shortage of the program for teacher helping to teach (No 2.5, $\bar{x}$ = 3.61), the lack or shortage of website to provide information of schools (No 2.7, $\bar{x}$ = 3.56), the difficulty and complexity of programs using (No 2.10, $\bar{x}$ = 3.54), and no or shortages of the office program in computer (No 2.1, $\bar{x}$ = 3.52), and the absence or shortage of website to promote and public relations (No 2.6, $\bar{x}$ = 3.51), respectively.

People ware or computer users problems.

People ware problems found overall problems was moderate ($\bar{x}$ =3.49).

There were 5 items of people ware problems in high level amount 50.00% of all items, the descending order as follows. The registrar could not use computer to report or transcript (No 3.7, $\bar{x}$ = 3.65), No worker or staff to maintain computer (No 3.2, $\bar{x}$ =3.63), most personnel lack the knowledge to use the program (No 3.3, $\bar{x}$ =3.63), lack of coordination between users and developer (No 3.9, $\bar{x}$ =3.63), and lack of knowledge to use the program helping the job (No 3.10, $\bar{x}$ =3.54),respectively.

There were 5 items of people ware problems in moderate level amount 50.00% of all items, the descending order as follows. Programmers developed programs and did not meet the requirements of the user (No 3.8, $\bar{x}$ = 3.47), teachers did not have the basic knowledge and skills of computer (No 3.1, $\bar{x}$ = 3.46), lacked of knowledge in data and information technology (No 3.4, $\bar{x}$ = 3.41), teachers could not use program to measure and evaluate student learning results (No 3.5, $\bar{x}$ = 3.25), and the management could not help academic administrations (No 3.6, $\bar{x}$ = 3.22), respectively.

The study of the requirements in data and information technology.

   The studying from the samples amount 94 persons , The results of studying requirements for data and information technology system shown in Table 12.

Table 12 Arithmetic mean, standard deviation, and scattered coefficient in the
    requirements of data and technology information for monitoring
    supervision, monitoring and evaluation of learning in basic schools

List	$\overline{\text{x}}$	S.D.	C.V.	Meaning
1. Requirements of hardware, networks.				
1.1 Providing modern computers with high performance to schools.	4.25	0.87	20.44	High
1.2 Increasing the number of computers to meet the demand.	3.97	1.00	25.15	High
1.3 Increasing the budget for computer and accessories.	4.09	1.02	24.83	High
1.4 Improving classroom computer proportion is 1 person per machine.	3.91	1.00	25.63	High
1.5 The preparation of computer network and stable.	4.27	0.90	21.14	High
1.6 The establishment of data and information centers (Data Center).	4.15	0.98	23.49	High
1.7 Supply Projector (Projector) for use in the teaching and learning.	4.19	0.89	21.30	High
1.8 Supplying additional digital equipment to assist in teaching media production.	3.68	1.12	30.29	High
1.9 To provide a stable internet service and covers an area of active	4.05	0.93	23.02	High
1.10 Increased speed Internet in schools as needs.	4.34	0.97	22.40	High
Total Average in hardware and network	**4.13**	**0.81**	**19.68**	**High**

Table 12 (Continued)

List	$\overline{\text{X}}$	S.D.	C.V.	Meaning
2. Requirements of software.				
2.1 Providing the office programs on computer.	4.30	0.76	17.59	High
2.2 Development the program to assists in the measurement and evaluation.	4.42	0.78	17.61	High
2.3 Development academic programs in management.	4.39	0.79	18.01	High
2.4 Development the program to help registrar.	4.51	0.77	16.99	High
2.5 Providing program helps teachers to manage teaching and learning.	4.37	0.72	16.47	High
2.6 Development program for Public Relations website.	4.06	0.98	24.08	High
2.7 Development website to provide information of schools	4.18	0.94	22.60	High
2.8 Supplying other programs that respond to the needs of users.	4.41	0.69	15.64	High
2.9 Providing and preparation of manuals for users.	4.43	0.67	15.20	High
2.10 Supply or edit programs to use not complicated.	4.34	0.73	16.86	High
Total Average in software	**4.34**	**0.66**	**15.21**	**High**
3. Requirements of people ware.				
3.1 Development teachers or personnel to have the basic knowledge and skills.	4.23	0.88	20.73	High
3.2 Providing for a computer technician in school.	4.44	0.84	18.98	High
3.3 Training teachers and staff to have the knowledge, the ability to use applications.	4.38	0.76	17.27	High

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Table 12 (Continued)

List	$\overline{\text{X}}$	S.D.	C.V.	Meaning
3.4 Development administrators to have the vision, and knowledge of information technology.	4.06	0.81	19.84	High
3.5 Development teachers can use computer program to measure and evaluate learning results.	4.03	0.85	21.04	High
3.6 Developed administrators can use software for academic administration.	4.15	0.83	20.07	High
3.7 Development, the registrar can use computer to help in document and transcript.	4.24	0.84	19.70	High
3.8 Development software programming to meet the demand.	4.27	0.81	19.03	High
3.9 Coordination between user and the application developer to solve problems.	4.23	0.83	19.66	High
3.10 Training and workshops to users in all programs as needs and ongoing.	4.28	0.86	20.13	High
Total Average in people ware	**4.23**	**0.69**	**16.37**	**High**
Total Average All Items	**4.22**	**0.64**	**15.16**	**High**

Table 12 showed that the overall arithmetic mean of requirements in all items for data and information technology, was high ($\overline{\text{X}}$ = 4.22) and scattered coefficient of data was low to moderate level (C.V. values ranged from 15.20% to 30.29%).

Each requirement item the detailed as follows:

Requirements of hardware and computer networks.

Requirements of hardware and computer networks in all items was high level ($\overline{\text{X}}$ = 4.22).

Hardware requirements were high in 10 items amount 100.00% of all items. The descending order as following, increased speed Internet in schools as needs (No 1.10,

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$\overline{X}$ = 4.34), Providing the computer network and made it stable (No 1.5, $\overline{X}$ = 4.27), providing the modern computers with high performance in schools (No 1.1, $\overline{X}$ = 4.25), supplying projectors for using in the teaching and learning process (No 1.7, $\overline{X}$ = 4.19), the establishment of Data and Information center (No 1.6, $\overline{X}$ = 4.15), to increase the budget for supplying computer and equipment (No 1.3, $\overline{X}$ = 4.09), to provide a stable internet service and cover the active area (No 1.9, $\overline{X}$ = 4.05), to increase the number of computers to meet the requirements (No 1.2, $\overline{X}$ = 3.97), improve classroom computer proportion was 1 person per machine (No 1.4, $\overline{X}$ = 3.91). and the providing digital media to assist in teaching and production (No 1.8, $\overline{X}$ = 3.68), respectively.

Requirements of software or a computer program.

Requirements of software or a computer program in all items was high level ($\overline{X}$ =4.34).

Software requirements were high in 10 items amount 100.00% of all items. The descending order as following, development registration program (No 2.4, $\overline{X}$ = 4.51), preparation the program needs to the users (No 2.9, $\overline{X}$ = 4.43), development program assisted in the measurement and evaluation (No 2.2, $\overline{X}$ = 4.42), providing the other applications that user needed (No 2.8, $\overline{X}$ = 4.41), development academic programs in management (No 2.3, $\overline{X}$ = 4.39), providing programs helped teaching (No 2.5, $\overline{X}$ = 4.37), sourcing or editing program to use not complicated (No 2.10, $\overline{X}$ = 4.34), providing programs in office computers (No 2.1, $\overline{X}$ = 4.30), development the website to provide information of the schools (No 2.7, $\overline{X}$ = 4.18), and development school public relations website (No 2.6, $\overline{X}$ = 4.06), respectively.

Requirements of People ware or computer users.

Requirements of people ware or computer users in all items was high level ($\overline{X}$ = 4. 23).

People ware requirements were high in 10 items amount 100.00% of all items. The descending order as following, to arrange for a computer technician in school (No

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3.2, $\overline{X}$ = 4.44), training teachers and staff have the knowledge, the ability to use the programs (No 3.3, $\overline{X}$ = 4.38), training and workshop to users in required programs and ongoing (No 3.10, $\overline{X}$ = 4.28), development programming to meet the user's needs (No 3.8, $\overline{X}$ = 4.27), developed the registrar can use computer to help making documents and transcripts (No 3.7, $\overline{X}$ = 4.24), development teachers and educational personnel to have basic knowledge and ability in computer (No 3.1, $\overline{X}$ = 4.23), coordination between the program user and the application developer to solve problems together (No 3.9, $\overline{X}$ = 4.23), developed administrators could use the programs to help academic administration (No 3.6 , $\overline{X}$ = 4.15), executive development to provide the vision, knowledge of information technology (No 3.4, $\overline{X}$ = 4.06) and the development teachers could use program to measure and evaluate the student learning results (No 3.5, $\overline{X}$ = 4.03), respectively.

Gathers the results of the requirements for the data and information technology system in schools classify by academic works shown in Table 13.

Table 13 Number and percentage of opinions on the problems and requirements classify by the measurement and evaluation work, academic affair work, and the registration work.

List	Number	Percentage
The measurement and evaluation work.		
- Program should develop follows curriculum B.E.2551.	50	63.29
- Program should work with Excel for transfer data.	45	56.96
- Program requires assessment in 4 parts as Curriculum B.E.2551 consisted of subject evaluation, the ability to think , the character , and the activity development.	33	41.77
- Development programs must be able to report the development of learners and can be used to print reports instead of writing by hand.	24	30.38

Table 13 (Continued)

List	Number	Percentage
- Programs should be designed to use data with other applications, to reduce redundant work.	10	12.66
- Student academic measurement must be able to pass on to other program such as the academic and registrar program.	6	7.59
The academic work.		
- Program should be designed to help academic affair work such as providing the timetable and student enrollment.	36	45.57
- The academic program should help the school to notify the parents like to know such as all points during the semester	28	35.44
and final score.	12	15.19
- academic program should the reporting of student achievement, both individual courses and classes.		
The registrar work.		
- The program should help registrar in documents, and evidence of study (PP.) the same as the format of Educational Ministry.	25	31.65
- Registrar should entry data or update data in every document and evident paper.	12	15.19
- Program should be designed to transfer data to other applications. Without redundant data.	5	6.33
Other comment.		
- The system should be designed to assist the student affair work, consisting of all the student records accumulated.	23	29.11

List	Number	Percentage
- The software should help to screening student on the desired conditions, such as those with low achievement, students with behavioral problems, nutritional conditions report.	16	20.25
- The program should provide the student evaluation form (SDQ) and evaluation of emotional intelligence (EQ) due to the handmade process is quite complex so the system to help the processing.	10	12.66

Table 13 shown that the requirements of the data and information technology system classified by jobs in schools as follows.

The Measurement and evaluation work requirements were: the program should develop follows curriculum B.E.2551, program should work with Excel for transfer data, the program requires assessment in 4 parts as Curriculum B.E.2551 consisted of subject evaluation, the ability to think , the character , and the results of activity development, development programs must be able to report the development of learners and can be used to print reports instead of writing by hand, programs should be designed to use data with other applications, to reduce redundant work, academic measurement must be able to pass on to other program such as the academic and registration program.

The academic work requirements were: program should be designed to help academic affair work such as providing the timetable and student enrollment, the academic program should help the school to notify the parents like to know such as all points during the semester and final report, academic program should the reporting of student achievement, both individual courses and classes.

The registrar work requirements were: The program should help registrar in documents, and evidence of study (PP.) the same as the format of Educational Ministry, registrar should entry data or update data in every document and evident paper, program should be designed to transfer data to other applications without redundant data.

Other comment were : The system should be designed to assist the student affair work, consisting of all the student records accumulated, the software should help to screening student on the desired conditions, such as those with low achievement, students with behavioral problems, nutritional conditions report and The program should provide the student evaluation form (SDQ) and evaluation of emotional intelligence (EQ) due to the handmade process is quite complex so the system to help the processing.

4.2 The study of knowledge related to develop of data and information system.

Researcher synthesis the development of data and information technology systems from many books and texts, interviews and group discussions between experts who had experience and knowledge in academic works and data information in each school. The sample was in every school size: small, medium and large school size, each size researcher select 3 schools all amount 27 persons of samples. The principles were found to develop data and information technology system for the inspection supervision, monitoring and evaluation of learning in basic education as follows:

1) Creating central database of schools (Data Center).

Schools need to have a central database of schools (Data Center) that holds all the information of education. Consistent with the research of Nidthaya Patsornsiri , and Kanya Poolotakanon (B.E. 2548) noted that the introduction of computers to assist in the development of information systems. It can store data in the large volume, provides analysis, and processed quickly. It can reduce the amount of paperwork, cut people down when compared to the handmade. Especially in the field of measurement and evaluation of learning, students will be evaluated in every subjects, desired characteristics, ability to read, think critically and write. As well as the development of learners through student activities to comply with the Basic Education Core Curriculum B.E. 2551, so in the development of the system. Every school must design and prepare central database of schools for collection all the data and information of schools.

In addition, schools should provide one computer to be the server for collecting of data and information, and to be the center of users to share resources each other. It effects users to work and share resources together (Share Data).

2) Tasks of teachers to measure and evaluate the learning results.

Principles of measurement and assessment of learning results in curriculum B.E.2551. Teachers are required to collect the achievement of learners to improve learners. Moreover, in the curriculum set to be evaluated according to the standard metrics. So should design and develop systems to measure and evaluate follows the principle. Consistent with the principles of information systems development said transaction processing systems to provide for the daily operational to increase efficient and effective (The office of Ratchathani primary education area 4, search on Jan. 7, 2555.,from http://202.143.156.4/edplaza/), it can be used to produce information as their needs. The teachers are involved in the import data to measure and evaluate the students individually. And the basic core curriculum B.E.2551, teachers have obligation to measure and evaluate the learning of students in four areas of measurement and evaluation courses. Assessment the learning results, desired characteristics, the ability to think critically and write, and student activity development. Teachers are high workload, thus schools should provide programs to help reduce the workload. Especially in the report of the student development (PP.5), the book reports to develop the learner (PP.6) should be used the computer programs instead of using by hand.

3) Tasks of academic affair.

Because each semester school has to arrange the subjects to the teacher for teaching by using timetable or schedule enrollment. Therefore, to create a system to measure and evaluate the need for academic action in the matter. In addition, schools must also serve on the audit supervision, monitoring and evaluation of learning. This is consistent with the principles of quality assurance mechanisms aimed at providing education part of internal quality assurance system to provide feedback to develop and evaluate the implementation of quality assurance system. (Ministry of Education, "Quality assurance of education is basic education", Journal 13, No. 1, January-March, pp. 30-35).

4) Tasks of registrars

Registration of schools serving students in recording information. Since the enrollment and details. Documents and evidence to be used in the study. In principle, measurement and evaluation of the program in curriculum B.E.2551 (Ministry of

Education, 2553), therefore, requires data and information of all learners. Both the history Information from the measurement and evaluation of teachers and reports of academic achievement. In addition, the development will need to be flexible sych as the program can import data from external in the future, if there is a change of curriculum, the system should still valid.

5) Quality assurance in education.

Education law requires that all schools in the country must have quality assurance. The record of quality assurance within a year for internal assurance and external quality assurance within every five years. The quality assurance process are the process of the inspection supervision, monitoring and evaluation of learning. In ensuring the quality of education requires a study of data and information. The assessor will need to gather information and evidence to confirm the reality of developing quality educational institutions as reported in the self-assessment report and evidence that reflects the reality that is not in the self-assessment report. (Office for National Education Standards and Quality Assessment, 2555), so the system should design and develop to help assess learners metric standards, reduce the load on the system of redundant data and information derived from operating normally which reflects the authentic assessment. Also, be prepared to present information of students to parents and the community has been aware of the operation of the schools.
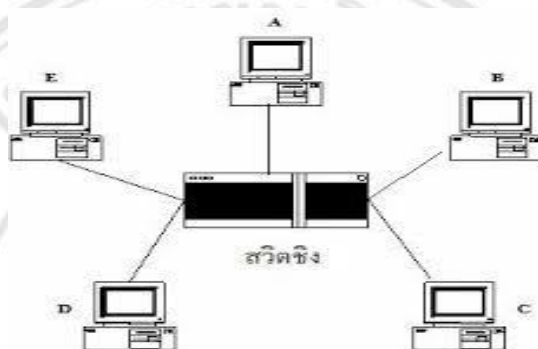
6) Creating computer network in schools.

Since each academic agencies of schools need to work together, exchange information with each other. Thus, schools should design a computer network in the schools. Currently, computer networking costs are not high. Schools only supply switching HUB and connect each computer to the device. Then set the IP address to each of the computers in the same group. It makes individual computers can communicate, exchange information with each other. Database management system needs to have the information shared by the control center. Controlled using a central database. Database system can support the work of different people. (Ministry of Education, 2549).

If any school with the availability of computer networks can supply a server and configure a static IP (Fixed IP Address) to the host machine. Install the Database

Management program, set the client computer to assign a static IP or IP automatically but in the same group of server. It can cause the client to send data to a server and if there is a program developed for computer network. It can cause central database of schools produce information perfectly.

The computer network diagram to provide a central database and a data center in schools shown in Figure 6.

Figure 6 The computer network diagram in schools

4.3 Results of development for data and information technology system.

The researcher has developed the data and information system fellow the steps of the research and development of Walter R. Borg (Walter R. Borg, 1965), which has 10 steps in the following order.

1) Research and Information Collection.

A study of the problems and requirements of data and information technology system and the knowledge in the development of data and information technology system. The findings were as follows:

(1) The development of data and information technology system. The computer system needed to be implemented in three aspects: hardware was supplying computers available. The software was providing or developing programs to assist for data storage. Processing data and produce information as educational needs. And the people ware consisted of teachers and personnel with knowledge of computer who have ability to use data and information technology system.

(2) The problems in development of data and information technology system.

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Most schools did not have software or computer program to assist in the production and storage data and produce information as their needs. Currently computer programs were not available as they should.

(3) The requirements for data and information technology system of each school to develop computer program to help the teacher work, academic work, and the registrar work.

(4) The data and Information technology system should be designed to assist in the performance of teachers, management , and registration depended on school size. In the small size and medium school size (students less than 500 students) should use the stand alone system, the large school size (students over 500 persons) should use the network system.

2) Planning.

2.1) Database Design.

Studying of knowledge to develop the data and information technology system, the study found that each school require a central database for collecting various data and information, especially data and information of the students individually. Therefore, researchers have designed a database to collect such data and information the important tables consisted of :

(1) Table named TBStudent using for collecting the students individually data as shown in Table 14.

Table 14 Table for collecting students individually data named TBStudent,
Field name, Meaning of field, and the maximum characters in the field.

Field name	Meaning of the field	Maximum
IDStudent	Student identification number	Numeric,<999999999
IDCitizen	Student ID Card	Character 13
PreName	Title name	Character 50
NameFirst	Name	Character 50
NameLast	Surname	Character 50
NickName	Nickname	Character 50

Table 14 (Continued)

Field name	Meaning of the field	Maximum
Sex	Gender (1=male, 2=female)	Numeric 1 or 2
BloodGroup	Blood (A , B , AB , O)	Character 50
PLevel	Class Level (0=kindergarten, 1= primary P.1-3, 2=primary P. 4-6, 3=high school M.1-3, 4=high school M.4-6)	Numeric 1
PClass	Class (K.1 , K.2 , P.1, ... , P.6 , M.1 ...... , M.6)	Character 3
PRoom	Room (1 , 2 , ... , 20)	Numeric 2
PClassNo	No. in classroom (1 , 2 , ..m...... , 250)	Numeric 2
DMYBirth	Birthday (format dd/mm/yyyy)	Character 10
Nationality	Nationality	Character 50
Religion	Religion	Character 50
DMYStart	School applied date (format dd/mm/yyyy)	Character 10
BSchool	Old school name	Character 50
BProvince	Old province name	Character 50
BClass	Class finished from old school	Character 50
PPlan	Study plan (1=General plan, or M.4-6 science, 2=Art math, 3=art French, 4=Art German, 5=Chinese 6=Art Japanese, 7=Art music, 9=etc. Art)	Character 2
Status	Student Status (1=preset student, 0=resign)	Numeric 1
FIDCitizen	Father ID Card No.	Character 13
FPrename	Father title name	Character 50
FnameFirst	Father name	Character 50
FNameLast	Father surname	Character 50
MIDCitizen	Mother ID Card No.	Character 13
MPrename	Mother title name	Character 50

Table 14 (Continued)

Field name	Meaning of the field	Maximum
MNameFirst	Mother name	Character 50
MNameLast and etc.	Mother surname	Character 50

(2) Table named TTeacher using for collecting the teachers or educational personnel in school individually data as shown in Table 15.

Table 15 Table for collecting teachers individually data named TTeacher, Field name, Meaning of field, and the maximum characters in the field.

Field name	Meaning of the field	Maximum
IDTeacher	Teacher identification number	Character 20
IDCitizen	Teacher ID Card	Character 13
PreName	Title name	Character 50
NameFirst	Name	Character 50
NameLast	Surname	Character 50
sex	Gender (1=male, 2=female)	Number 1
DateBirth	Birthday (format dd/mm/yyyy)	Character 10
TeacherLevel	Class Level (0=kindergarten, 1= primary P.1-3, 2=primary P. 4-6, 3=high school M.1-3, 4=high school M.4-6, 5= support personnel)	Number 1
SubPlevel	Class teaching(11=P.1, 12=P.2, 13=P.3, 21=P.4, 22=P.5, 23=P.6, 31=M.1, 32=M.2, 33=M.3, 41=M.4, 42=M.5, 43=M.6, 51=No class)	Number 2
PGroup	Group learning (1=Thai, 2=Mathematic,…, 8= Foreign language)	Number 1
DutyStart	Job when start working	Character 10
TPosition	Current Position	Character 50
EduWut	Educational background	Character 50

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Table 15 (Continued)

Field name	Meaning of the field	Maximum
Major	Major	Character 50
Minor	Minor	Character 50
Address	Address	Character 250
Road	Road	Character 50
MOO	Village No.	Character 2
Tumbon	Tumbol	Character 50
Amphur	District	Character 50
Province	Province	Character 50
ZipCode	Postal code	Character 5
Tel	Telephone number	Character 50
Email	Email address	Character 50
TeacherStatus	Teacher status (1=Teacher, 2=Registrar, 4=Administrator, 5=System Administrator)	Number 1
Status and etc.	Status (1=Present teacher, 2=Retire , 0=Resign)	Number 1

(3) Table named TSubject using for collecting the subjects or the courses data that learning and teaching in school as shown in Table 16.

Table 16 Table for collecting the subjects or the courses data in school named TSubject, Field name, Meaning of field, and the maximum characters in the field.

Field name	Meaning of the field	Maximum
PSubjectCode	Course code in Thai	Character 50
PSubjectName	Course name in Thai	Character 50
ESubjectCode	Course code in English	Character 50
ESubjectName	Course name in English	Character 50
PSubType	Type of course (1=Core, 2= supplement)	Number 1
PSubjectCredit	Credit (40 Hours = 1 Credit)	Number 2

Table 16 (Continued)

Field name	Meaning of the field	Maximum
PLevel	Class Level (0=kindergarten, 1= primary P.1-3, 2=primary P. 4-6, 3=high school M.1-3, 4=high school M.4-6)	Number 1
PPlan	Study plan (1=General plan, or M.4-6 science, 2=Art math, 3=art French, 4=Art German, 5=Chinese 6=Art Japanese, 7=Art music, 9=etc. Art)	Number 2
PSubInClass	The course in class (P.1, ..., M.6 , if any class fill in -)	Number 3
PSubInTerm	The course in semester (1, 2, or 0 if any)	Number 1
GroupSara	Group learning (1=Thai, 2=Mathematic,…, 8= Foreign language)	Number 1
PSubjectGroup	Sub group learning (Foreign language 81=English, 82=French, 83=German, 84=Chinese, 85=Japanese)	Number 2
PSubjectNo_	Subject or Course running number	Number 3
nHourPerWeek	Number of hours or number of period in one week.	Number 2
nPeriodPerCourse	Number of hours or number of period in all course	Number 3
Status And etc.	Subject or Course Status (1=Open,0=Close)	Number 1

(4) Table named TScore using for collecting the scores or grades in each course as shown in Table 17.

Table 17 Table for collecting the scores or grades in each course named TScore, Field name, Meaning of field, and the maximum characters in the field.

Field name	Meaning of the field	Maximum
IDYearData	Code of LevelYearSemesterClassRoom	Character 11
PSubjectCode	Subject Code or Course ID	Character 50
IDStudent	Student identification number	Number 10
PClassNo	No. in classroom (1 , 2 , …, or 1=not used)	Number 2
PPlanNo	Study plan (P.1-M.3=1)	Number 2
P100	Total Score (From 0 to 100)	Number 3
PGrade	Grade (0 , 1 , 1.5 ,2 ,2.5, 3 ,3.5 , 4 , T , U)	Character 3
Sex	Student Gender (1=Male, 2=Female)	Number 1
IDTeacher And etc.	Teacher identification number (0=Any)	Character 20

Types and relationships between tables vital information used in the system are as follows. (All tables of the database are in the instalation system CD/DVD).
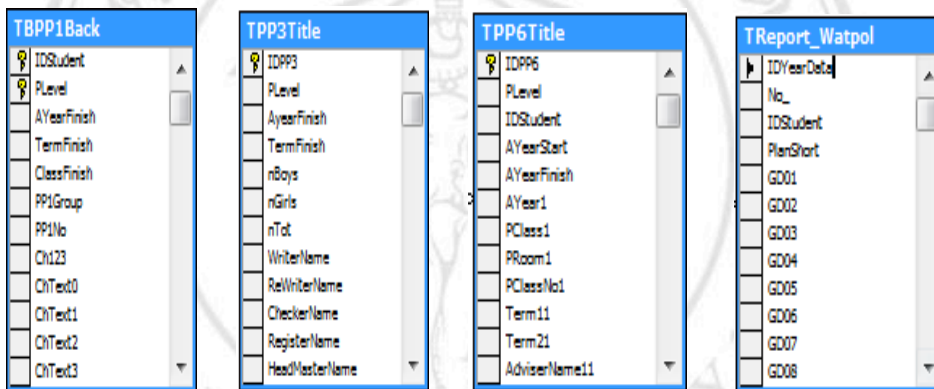
1) The initial data collection in schools. (Type of relationship is One to One).

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2) Table storage the student assessment. (Type of relationship is One to Many).
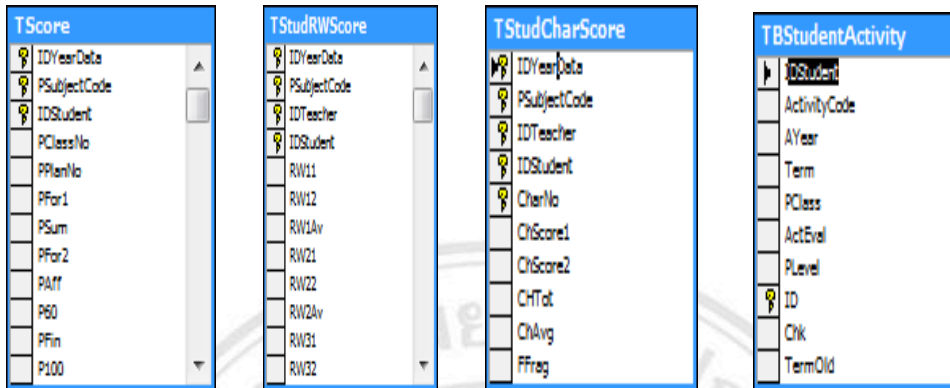
3) Table of data storage to the report. (Type of relationship is One to Many).

Figure 7 Table relationships between each tables in database systems.

Table stores all the details and relationship tables in an installation CD, and database of appendix 6.

2.2) The work flow of each work are.

(1) The registrar acts recording school data, all courses in school, receiving or sending information to the government as required.

(2) Academic affair assign subjects to teachers (Connected to teachers and classes), and enrollment (Connects student data to teachers and classes) in each semester. (high Schools) or the academic year. (Primary schools)

(3) The teacher records the scores or grades into the measurement and evaluation program (PP.5), the class teacher must prepare more student data in the student development book (PP.6), and all data of learners in a record collection (PP.8).

(4) The registrar updates the student data and reports cumulative academic record as needs (PP.1), graduate certificate (PP.2), report of graduating students in each class level (PP.3), or print any certificate of student (PP.7).

At the end of the year, registrar should make a copy of the original database for the old students request their certificates on the new folder of the programs, and the current folder of the programs, the registrar should move student class to new class in the next academic year.

Work flow of the data and information technology system are as follows.
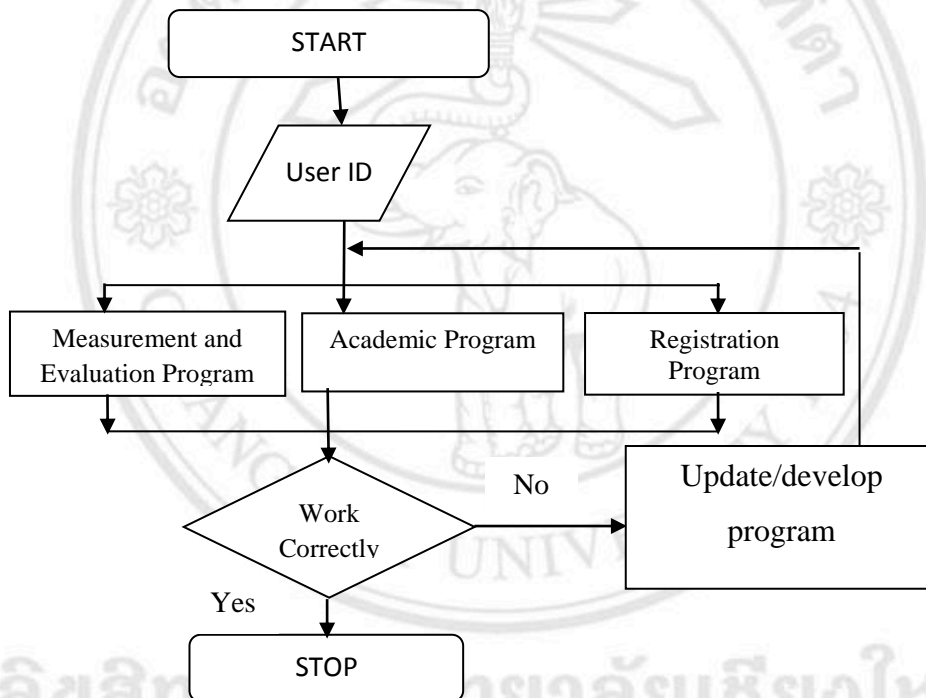
Figure 8 System work flow of the data and information technology system.

2.3) The user Interface.

Researcher designs the main menu of the system as follows.

(1) The main menu of the system.
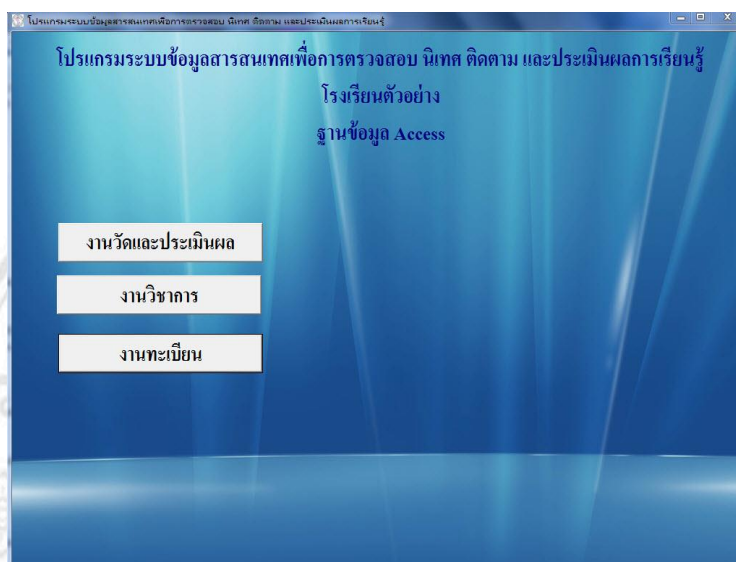
Figure 9 The main menu of the system.

(2) The main menu of the measurement and evaluation program.

Figure 10 The main menu of the measurement and evaluation program.

(3) The main menu of the academic program.

Figure 11 The main menu of the academic program.

(4) The main menu of the registration program.

Figure 12 The main menu of the registration program.

Detailed screenshots of the entire program seeing from the program. After installation the program can be retrieved from the screen of the program on each item.

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3) The Develop Preliminary Form or Product.

Researcher prepares the database as designed and programming each work by using Visual Basic 6, then trial program and the preparation of a manual information system for supervision, monitoring and evaluation of the learning. Detailed in Appendix.

4) Preliminary Field Testing.

Researcher using Preliminary Field Testing with the every school size. The small size was Wat Ku Come school, the medium size was Anuban Chiang Mai school and the large size was The Prince Royal's College. The research was conducted to collect data from the user program consists of teachers (using the measurement and evaluation program), academic affairs (using the academic program), and registrar (using the registrar program), and school administrators. The contributors of up to 4 people total study sample of 12 persons.

Researcher developed program to improve the user needs. In a preliminary Field Testing until all of the schools were evaluated through the adoption system (Percent accepted higher than 80%). , then the researcher used the acceptance program questionnaire to evaluate the programs. The results showed in Table 18.

Table 18 Number and percentage of acceptance in the measurement and evaluation
program, academic program, and registration program
in Preliminary Field Testing.

List	Number	Percentage
1. The measurement and evaluation program. 1.1 The program can be saved and printed course results.	12	100.00
1.2 Program helps process and grading for the student.	12	100.00
1.3 The program can record and report the ability to read, write, and think.	11	91.67
1.4 The program can record and report the desired characteristics.	10	83.33
1.5 Program helps to evaluate the activity development.	12	100.00

Table 18 (Continued)

List	Number	Percentage
2. The academic program.		
2.1 Program can assign subject to the teachers and enroll them.	12	100.00
2.2 Program can assign student activity to the teachers and enroll them.	12	100.00
2.3 Program helps to report the results of the midterm and final exams.	12	100.00
2.4 Program can report the achievement the course.	11	91.67
2.5 Program can report the achievement of classroom.	10	83.33
3. The registration program.		
3.1 The program can record the history student.	12	100.00
3.2 The program can report the students' grading report (PP.1).	12	100.00
3.3 The program can print a certificate of students (PP.2).	12	100.00
3.4 Program can report the completion of the class level (PP.3).	12	100.00
3.5 The program helps to find Improve the learning outcomes of students.	11	91.67

Table 18 shows that the results of school's Preliminary Field Testing. All users admitted to the program, the researchers developed. Work exactly as intended by the educational requirements and in accordance with the measurement and evaluation of the basic core curriculum B.E. 2551 (percentage of the agreed needs, almost all equal to 100.00).

Gathers the results of the samples in Preliminary Field Testing with 12 persons appear in Table 19.

Table 19 Number and percentage of acceptance website offers information
for monitoring, supervision and evaluation for learning in basic education
in Preliminary Field Testing.

List	Number	Percentage
1. Information presented preliminary study.		
1.1 Location of the school	12	100.00
1.2 Amount of the class students	12	100.00

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Table 19 (Continued)

List	Number	Percentage
1.3 Amount of the teachers	11	91.67
1.4 number of classrooms	11	91.67
1.5 The ratio of students per class	10	83.33
1.6 The ratio of students per teacher	10	83.33
2. Presentation for quality assurance.		
2.1 Students have moral, ethical and desirable.		
2.1.1 Presentations assessing discipline.	10	83.33
2.1.2 Presentations assessing honesty.	10	83.33
2.1.3 Presentations royal to Thailand.	10	83.33
2.2 Ability to think, analyze, synthesize.		
2.2.1 Presentations of the ability to think.	12	100.00
2.3 Learners with the knowledge and skills required by the curriculum.		
2.3.1 Presentations to assess student achievement average.	11	91.67
2.3.2 Summarizing the national test.	10	83.33
2.4 Learners with the skills to work.		
2.4.1 Assessment diligent in work.	10	83.33
2.5 Learners with physical and mental health, health habits for good.		
2.5.1 Presentations to evaluate weight, height, and nutritional status.	12	100.00
3. Presenting information to the report.		
3.1 Report on the development of the learners (PP.6).	12	100.00
3.2 Achievement report of achievement by class	12	100.00
3.3 Achievement report of student achievement by group learning	12	100.00
Total	12	100.00

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Table 19 shows in Preliminary Field Testing websites that offer information systems for supervision, monitoring and evaluation, learning the 3 schools agree that the website which researcher developed work exactly as intended by the educational requirements and in accordance with the measurement and evaluation work of the basic core curriculum B.E. 2551 (percentage of the agreed needs almost all equal to 100.00).

From the interview with the program, the research developed in Preliminary Field Testing 12 persons were shown in Table 20.

Table 20 Number and percentage of opinions on the revision and development.
in Preliminary Field Testing.

List	Number	Percentage
1. The measurement and evaluation program.		
- Updating program accordance with the 2551 curriculum evaluation.	10	83.33
- Updated developed students consistent with the teacher work book score.	5	41.67
- Adding the points from Excel are saved through program evaluation.	4	33.33
2. The academic program.		
- Assigning subjects to teachers. Enable information from the timetable instead.	5	41.67
- Enrollment is set to 2 types of registration compulsory and elective courses.	3	25.00
3. The registration program.		
- The report documents the study accordance with the educational department.	12	100.00
- Student completing some items are also not accurate.	10	83.33
- The program provides students data to Excel because the recording program take a lot of time.	4	33.33

Table 20 (Continued)

List	Number	Percentage
4. The website to present data and information. - Adjusted the learning outcomes present on the website.	3	25.00
Total average	**12**	**100.00**

5) Main Product Revision.

The researcher improve programs as the user needs according to the program's suggested in Preliminary Field Testing.

6) Main Field Testing.

Researcher has developed applications using the samples from Chiang Mai municipal schools amount 11 schools, samples amount 30 persons in Table 21.

Table 21 Arithmetic mean, standard deviation, and scattered coefficient

using programs results in the Main Field Testing.

List	$\overline{X}$	S.D.	C.V.	Meaning
1. Measurement and evaluation program.				
1.1 The program can be saved and printed course results.	4.17	0.79	19.00	High
1.2 Program helps process and grading for the student.	4.23	0.77	18.28	High
1.3 The program can record and report the ability to read, write, and think.	4.17	0.70	16.77	High
1.4 The program can record and report the desired characteristics.	4.27	0.69	16.21	High
1.5 Program helps to evaluate the activity development.	4.37	0.72	16.45	High
Total average in measurement and evaluation program	**4.24**	**0.68**	**16.03**	**High**

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Table 21 (Continued)

List	$\overline{x}$	S.D.	C.V.	Meaning
2. Academic program.				
2.1 Program can assign subject to the teachers and enroll them.	4.17	0.70	16.77	High
2.2 Program can assign student activity to the teachers and enroll them.	4.23	0.77	18.28	High
2.3 Program helps to report the results of the midterm and final exams.	4.23	0.77	18.28	High
2.4 Program can report the course achievement.	4.27	0.74	17.34	High
2.5 Program can report the achievement of classroom.	4.23	0.77	18.28	High
Total average in academic program	**4.23**	**0.71**	**16.84**	**High**
3. Registration program.				
3.1 The program can record the history student.	4.33	0.80	18.51	High
3.2 The program can report the students' grading report (PP.1).	4.50	0.68	15.16	High
3.3 The program can print a certificate of students (PP.2).	4.33	0.76	17.49	High
3.4 Program can report the completion of the class level (PP.3).	4.33	0.84	19.48	High
3.5 The program helps to find Improve the learning outcomes of students.	4.20	0.76	18.12	High
Total average in registration program	**4.34**	**0.65**	**15.07**	**High**
Total average in every programs	**4.27**	**0.63**	**14.78**	**High**

Table 21 found that schools using the program information system for monitoring , supervision, and evaluation in the Main Field Testing that the programs

could work was in all high level ($\overline{X}$ = 4.27) and the scattered coefficient of the data was a low level (C.V. values less than 20%).

Performance of measurement and evaluation program, it work as needs. The total average mean was high ($\overline{X}$ = 4.24). The average means were descending order from high to low as follows, this application helped to evaluate the activity of learner development (No 1.5, $\overline{X}$ = 4.37), program could record and report the desired characteristics (No 1.4, $\overline{X}$ = 4.27), program could process and calculate student grade (No 1.2, $\overline{X}$ = 4.23), the program could save and print course achievement (No 1.1, $\overline{X}$ = 4.17), the program could record and report of students in reading, thinking, and writing abilities (No 1.3, $\overline{X}$ = 4.17), respectively.

All items of academic program worked as the user's needs. The total average mean was high ($\overline{X}$ = 4.23). Each item mean was descending order from high to low as follows, program could report the achievement course (No 2.4, $\overline{X}$ = 4.27), program could organize courses and enrolls in each seminar (No 2.2, $\overline{X}$ = 4.23), program helped reports in midterm and final exams (No 2.3, $\overline{X}$ = 4.23), program could report the classroom achievements (No 2.5, $\overline{X}$ = 4.23), and the program could assign the courses to the teachers and enrollment (No 2.1, $\overline{X}$ = 4.17), respectively.

Registration program for all items worked as the user's needs, the total average mean was high ($\overline{X}$ = 4.34). Each item means were descending order from high to low as the following, the program could record and accumulate the students' grades (PP.1) (No 4.50, $\overline{X}$ = 3.2), the program could record the student's history (No 3.1, $\overline{X}$ = 4.33), program could print the diplomas of students (PP.2) (No 3.3, $\overline{X}$ = 4.33), the program could report the completion of students in every class level (PP.3) (No 3.4, $\overline{X}$ = 4.33), and program could help in the searching and to improve the learning outcomes of students (No 3.5, $\overline{X}$ = 4.20), respectively.

From the interview of users who used the in the Main Field Testing amount of samples 30 persons were shown in Table 22.

Table 22 Number and percentage of comments on the revision and development

        the measurement and evaluation program, academic program, and registration

        program in the Main Field Testing.

List	Number	Percentage
1. The measurement and evaluation program. - Adding program ability to measure and evaluate the standards indicators.	7	23.33
2. The academic program. - updating the report to display the grades in all courses and GPA	5	16.67
- Adding the program to summarize the results of the study all subjects.	4	13.33
3. The registration program. - Updating program to display the grading reports accordance with the ministry of education in the new forms.	9	30.00

       7) Operational Product Revision.

          Researcher has improved the program classified by the user's work and the responsibilities of each work and improve various errors and reports to meet the needs of users.

       8) Operational Field Testing.

          Operational Field Testing in using the developed programs. The samples were the schools under the office of Chiang Mai primary educational area 1, amount 82 schools, samples were amount 94 persons, then the users evaluated using the program. The results were shown on Table 23.

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Table 23 The mean, standard deviation, and scattered coefficient to evaluate
the programs in the Operational Field Testing.

List	$\overline{\text{x}}$	S.D.	C.V.	Meaning
1. Measurement and evaluation program.				
1.1 The program can be saved and printed course results.	4.30	0.73	17.07	High
1.2 Program helps process and grading for the student.	4.37	0.69	15.76	High
1.3 The program can record and report the ability to read, write, and think.	4.33	0.66	15.34	High
1.4 The program can record and report the desired characteristics.	4.38	0.67	15.41	High
1.5 Program helps to evaluate the activity development.	4.46	0.64	14.23	High
Total average in measurement program	**4.37**	**0.63**	**14.47**	**High**
2. Academic program.				
2.1 Program can assign subject to the teachers and enroll them.	4.28	0.74	17.35	High
2.2 Program can assign student activity to the teachers and enroll them.	4.28	0.76	17.69	High
2.3 Program helps to report the results of the midterm and final exams.	4.31	0.74	17.09	High
2.4 Program can report the achievement the course.	4.33	0.73	16.78	High
2.5 Program can report the achievement of classroom.	4.32	0.74	17.11	High
Total average in academic program	**4.31**	**0.71**	**16.43**	**High**

Table 23 (Continued)

List	$\overline{\text{X}}$	S.D.	C.V.	Meaning
3. Registration program.				
3.1 The program can record student history.	4.41	0.70	15.77	High
3.2 The program can report the students' grading report (PP.1).	4.49	0.64	14.16	High
3.3 The program can print a certificate of students (PP.2).	4.45	0.67	15.00	High
3.4 Program can report the completion of the class level (PP.3).	4.48	0.68	15.29	High
3.5 The program helps to find Improve the learning outcomes of students.	4.35	0.69	15.75	High
Total average in registration program	4.44	0.61	**13.75**	**High**
Total average in every programs	**4.37**	**0.60**	**13.81**	**High**

Table 23 shown the results found that the users evaluated programs in the Operational Field Testing that all the programs worked as the user's needs, the total mean was high ($\overline{\text{X}}$ = 4.37), and the scattered coefficient was low (C.V. less than 20%).

Performance of the measurement and evaluation program worked as the user's needs. The total arithmetic mean was high ($\overline{\text{X}}$ = 4.37). Each item mean was descending below, the program helped to evaluate the student activity development (No 1.5, $\overline{\text{X}}$ = 4.46), program could record and report the desired characteristics (No 1.4, $\overline{\text{X}}$ = 4.38), program could process the reading, thinking, and writing of students (No 1.2, $\overline{\text{X}}$ = 4.37), program could record and report the ability to think (No 1.3, $\overline{\text{X}}$ = 4.33), and program could record and report course evaluation (No 1.1, $\overline{\text{X}}$ = 4.30), respectively.

All items in academic program, worked as the user's needs, the total average mean was high ($\overline{\text{X}}$ = 4.31), the items mean were sorted descending below, program could report the student's achievement courses (No 2.4, $\overline{\text{X}}$ = 4.33), program could report the classroom achievements (No 2.5, $\overline{\text{X}}$ = 4.32), program helps reports of midterm and final exams (No 2.3, $\overline{\text{X}}$ = 4.31), program could assign the course to the

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teachers and enroll up (No 2.1, $\overline{X}$ = 4.28), and program could assign and evaluate the student activities (No 2.2, $\overline{X}$ = 4.28), respectively.

All items of registration program worked as the user's needs. The total mean was high ($\overline{X}$ = 4.44), the items mean were sorted descending as below, the program could record and report student grading in all curriculum (PP.1) (No 4.49, $\overline{X}$ = 3.2), the program could report the completion of students in class level (PP.3) (No 3.4, $\overline{X}$ = 4.48), program could report the diploma of students on the standard form (PP.2) (No 4.45, $\overline{X}$ = 3.3), the program could record the student's history (No 3.1 , $\overline{X}$ = 4.41), and program could help to search and improve the learning outcomes of students (No 3.5, $\overline{X}$ = 4.35), respectively.

From the collection of feedback for improving programs in the Operational Field Testing, the samples amount 94 persons, the results were appear in Table 24.

Table 24 Number and percentage of comments on the revision and development.
the programs in the Operational Field Testing.

List	Number	Percentage
The measurement and evaluation program.		
- Updating the report on the development of individual learners (PP.6), according to the school needs.	15	15.96
- addition to import scores from examination checker	6	6.38
The academic program.		
- Updating reports on midterm and Final as needs.	10	10.64
- Separate achievement reported by courses and classes.	4	4.26
The registration program.		
- Adding the national scores (O-NET) to the program	13	13.83
- Update program to import the national score to system (O-NET) with Excel file.	8	8.51

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Table 24 (Continued)

List	Number	Percentage
Website to present data and information of the school.		
- update program to report the development of the learner (PP.6) to cover all sides.	12	12.77
- update program can save data from the Internet network	5	5.32
Total Average	**94**	**100.00**

9) Final Product Revision.

The results of the field testing, researcher have improved and development as follows:

9.1) Updating the system to select database appropriate with the school size. The small school size and medium school size, students were not more than 500 persons, the schools should use ACCESS database and operated independently (Stand Alone) because it was easy to use the system and not require networking. But the large school size or medium school size that had the network should use the SQL Server database and the users should have some knowledge of database administration.

9.2), Updating the programs and website to present data and information of the schools to connect the database as the database type used in schools.

9.3), Updating the complete user's manual as attached in Appendix 5.

10) Dissemination and distribution.

When the system for inspection supervision, monitoring and evaluation of learning in basic education level, have been developed that could be used in every schools, researcher had dissemination and distribution to the basic schools amount 409 schools across the country. Then the schools evaluated the effectiveness and efficiency of data and information technology system through the website which the researcher have developed.

Conclusion the steps to develop the data and information technology system
following the research and development cycle (R & D cycle).

      The process of developing data and information technology system, the results were shown in Table 25.

Table 25 Summarizes the process of developing data and information technology system for monitoring, supervision, and evaluation in basic educational level following the research and development cycle (R & D cycle).

R & D Step	Samples	Tools / Development	Reports / Results
1. Research and Information Collection	Sample schools amount 79 schools under Chiang Mai primary educational area 1	The problems and requirements of data and information system questionnaire	The results in Table 9 - 11
2. Planning and Designing	-	- Database Designing - System Flowchart - User Interface	- Data Structures Table 12 - 15 - System flowchart, User interface Image 9 - 12
3. Develop Preliminary Form or Product	-	- Database Management Program - Computer language - Preliminary manual	- Database - Application Programs - Preliminary manual
4. Preliminary Field Testing	Sample of different school size amount 3 schools	- Interviews the users - program acceptance questionnaire (UAT)	- The results in Table 16 - 17

Table 25 (Continued)

R & D Step	Samples	Tools / Development	Reports / Results
5. Main Product Revision	-	- Updated database - Update programs - Updated manual	- Updated the programs, database, manual in the first round.
6. Main Field Testing	Sample schools under Chiang Mai Municipal schools amount 11 Schools	- Program Evaluation Questionnaire - Interviews of program users	The results in Table 19 - 20
7. Operational Product Revision	-	- Updated database - Update programs - Updated manual	- Updated the application programs, database, and manual in the second round.
8. Operational Field Testing	Sample schools amount 82 schools under Chiang Mai primary educational area 1	- Program Evaluation Questionnaire - Interviews of program users	The results in Table 21 - 22
9. Final Product Revision	-	- Updated database - Update programs - Updated manual (Completed Database, Programming, Manual)	- Updated the application programs, database, and manual in the third round.

Table 25 (Continued)

R & D Step	Samples	Tools / Development	Reports / Results
10. Dissemination & Distribution (Amount 409 Schools)	Sample schools in Thailand amount 409 schools	- The efficacy and effectiveness evaluation questionnaire	The results in Table 24 - 25

Summary of development for the data and information technology system.

The development of the data and information technology system make the system consisting of

1) Database for use to storage data and information by the database contains tables include such as table name TBstudent collected students data, table name TTeacher collected teacher and personnel data, table name TSubject collected courses data, and table name TScore collected assessment scores and learners data. The database were divided into two systems: Access database for the stand alone system to operate independently for medium and small schools, and SQL Server databases for work in computer networking support for large data in medium, large and extra large schools.

2) The application programs for recording data, processing data, and produce information needs of the user and the program consists of measurement and evaluation program, academic program, and registration program.

3) Information for monitoring, supervision, and evaluation of the learning in basic education level. Information obtained the system in each program as follows:

3.1) The information from the measurement and evaluation program.

3.1.1) Results of the evaluation of learning in each course.

3.1.2) The desired characteristics of the students.

3.1.3) The ability of reading, thinking and writing of students.

3.1.4) Learning report and course description.

3.1.5) The standard indicators of learning courses.

3.1.6) Assessment report and the results of student learning courses.

3.1.7) Time attendance of student course report.

3.1.8) reports the summary of each course.

3.1.9) Assessment report of student activity development.

3.1.10) The lists of students in each class and enrollment in courses.

3.2) Information from the academic program.

3.2.1) Anecdotal reports of teachers and administrators.

3.2.2) Teaching and learning schedule in each classroom.

3.2.3) Teacher activity enroll and evaluation in each activity.

3.2.4) Calendar of the activities in the school.

3.2.5) Attendance reports of each classroom.

3.2.6) The report of the desired characteristics in each classroom.

3.2.7) The report of the reading, thinking and writing ability.

3.2.8) Reporting mid-term, final in all subjects of each classroom.

3.2.9) Reporting final test in all subjects of each the classroom.

3.2.10) Reporting of the achievement individually, courses, and classes.

3.3) Information from the registration program.

3.3.1) Statistics of students in each classroom.

3.3.2) The accumulated grades of student record (PP.1).

3.3.3) The certificate of graduation (PP.2).

3.3.4) Graduation of students in each educational level (PP.3).

3.3.5) Report of character developments of each student (PP. 4).

3.3.6) Report on the development of Students in each course (PP.5).

3.3.7) Reports the quality of the learners (PP.6).

3.3.8) Transcripts certification and other educational certification (PP.7).

3.3.9) Reports of student record collection (PP.8).

3.3.10) Report on the development of the students individually(PP.9).

3.4) Website to preset the data and information of the school contained.

3.4.1) School data.

3.4.2) Student information.

3.4.3) Personnel Information.

3.4.4) Number of students per teacher, number of students per class.

3.4.5) Statistics of number of students, teachers and classrooms.

3.4.6) Results of learning in each subject and class.

3.4.7) Average grade point average and percentile (GPA/PR).

3.4.8) Report on the development of the students individually.

3.4.9) Student achievement in each course.

3.4.10) Results of desired characteristics, Reading, thinking and writing

4.4 Results of the effects in data and information system for monitoring, supervision, and evaluation in schools.

1) The results of the coefficient evaluation in data and information system for supervision, monitoring and evaluation in basic schools.

Researcher extended the results of data and information technology system to basic education in Thailand amount 409 schools, then the users evaluated the efficacy and the effectiveness of the system, the results appear in Table 26.

Table 26 The mean, standard deviation and the scattered coefficient
of the efficacy evaluation in data and information technology system
for supervision, monitoring and evaluation of learning in basic schools.

List	$\bar{x}$	S.D.	C.V.	Meaning
1.1 System developed helped facilitate the operation of schools.	4.97	0.26	5.23	Highest
1.2 System developed helps user to work faster, save time and reduce redundant work.	4.96	0.25	5.02	Highest
1.3 System developed running accuracy is acceptable to the user.	3.93	0.25	6.43	High
1.4 The developed system is easy to use with a manual assembly applications and step in operation.	4.87	0.34	7.02	Highest

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Table 26 (Continued)

List	$\overline{\text{X}}$	S.D.	C.V.	Meaning
1.5 Measurement and evaluation program is easy to use, convenient, fast and works properly.	4.93	0.31	6.36	Highest
1.6 Academic program is easy to use, convenient, fast and works properly.	4.98	0.13	2.61	Highest
1.7 Registration program is easy to use , fast and works properly.	4.98	0.13	2.61	Highest
1.8 Website data and information system is easy to use, fast and works properly.	3.90	0.30	7.62	High
1.9 The developed system is well worth the effort versus working by hand, usually.	4.94	0.27	5.46	Highest
1.10 user satisfaction with information systems and information technology system.	4.95	0.22	4.47	Highest
Total Average	**4.75**	**0.10**	**2.15**	**High**est

Table 26 shows that the total average of the efficacy evaluation in data and information technology system was high ($\overline{\text{X}} = 4.75$) and the scattered coefficient was low (C.V. less than 20%)

The average of the efficacy evaluation were the highest levels, there were 8 items of 10 items, or 80 percent of the average sort descending from high to Low in the following order, academic program is easy to use, convenient, fast and works properly (No 1.6, $\overline{\text{X}} = 4.98$), registration program was easy to use, fast and works properly (No 1.7, $\overline{\text{X}} = 4.98$), the system help facilitate performance in school (No 1.1, $\overline{\text{X}} = 4.97$), the system developed helped user to work faster, save time and reduce work duplication (No 1.2, $\overline{\text{X}} = 4.96$), satisfaction with data and information technology system (No 1.10, $\overline{\text{X}} = 4.95$), the system is well worth the effort versus working by hand (No 1.9, $\overline{\text{X}} =$ 4.94) , measurement and evaluation program is easy to use, fast and works correctly (No 1.5, $\overline{\text{X}} = 4.93$), easy to use with a manual assembly operating procedures (No 1.4, $\overline{\text{X}} =$ 4.87).

The average of the efficacy evaluation were high, there were 2 items of 10 items, or 20 percent of the average sort descending from high to Low in the following order, system developed running accuracy is acceptable to users (No 1.3, $\overline{X}$ = 3.93) and the website data and information system is easy to use, fast and works properly (No 1.8, $\overline{X}$ = 3.90).

2) The results of the effectiveness evaluation in data and information technology system for supervision, monitoring and evaluation.

Researcher has evaluated the effectiveness of data and information technology system through the website, the results in Table 27.

Table 27 The mean, standard deviation, scattered coefficient of the effectiveness in data and information technology system.

List	$\overline{X}$	S.D.	C.V.	Meaning
2.1 System developed processes are in line with the core basic curriculum B.E.2551	4.83	0.42	8.66	Highest
2.2 The measurement and evaluation program works directly with the operations and needs of teachers.	4.87	0.34	6.96	Highest
2.3 Academic Program works meets the academic needs of basic education.	4.93	0.31	6.28	Highest
2.4 Registration program works meets the requirements of registration in schools.	4.92	0.32	6.48	Highest
2.5 The measurement and evaluation program, academic program, and registration program can work accordingly and allows teachers academic and registration to work together.	3.88	0.32	8.38	High
2.6 Website services information and provides educational information is current.	3.89	0.37	9.50	High

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Table 27 (Continued)

List	$\overline{\text{X}}$	S.D.	C.V.	Meaning
2.7 System developed allows you to check the accuracy of the data and information.	3.87	0.39	10.05	High
2.8 System developed assist in the supervision, monitoring and evaluation of learning.	4.97	0.18	3.67	Highest
2.9 System developed processing is required to comply with the requirements of the curriculum.	4.91	0.28	5.70	Highest
2.10 The developed system can produce reports, documents transcript (PP.1-3) have met with the Ministry of Education.	4.98	0.13	2.61	Highest
Total average	4.60	0.11	**2.29**	**High**est

Table 27 shows that the total average of effectiveness data and information technology for supervision, monitoring and evaluation of learning was highest ($\overline{\text{X}}$ =4.60) and the scattered coefficient was low (C.V. values less than 20%).

Effectiveness of the system were highest, there were 7 items of 10 items or 70 percent. The average mean sorting descending from high to low in the following order. The developed system can produce reports, documents transcript (PP.1-3) have met with the Ministry of Education (No 2.10, $\overline{\text{X}} = 4.98$), the system assist in the supervision, monitoring and evaluation of learning (No 2.8, $\overline{\text{X}} = 4.97$), academic programs work meets the academic needs of basic education (No 2.3, $\overline{\text{X}} = 4.93$), registration program work meets the requirements of registration in schools (No 2.4, $\overline{\text{X}} = 4.92$), system developed processing is required to comply with the requirements of the core basic curriculum (No 2.9, $\overline{\text{X}} = 4.91$), program measurement and evaluation work directly with the operations and needs of teachers (No 2.2, $\overline{\text{X}} = 4.87$), and the system processing are in line with the core basic curriculum B.E.2551 (No 2.1, $\overline{\text{X}} = 4.83$).

Effectiveness of the system were high, there were 3 items of 10 items or 30 percent. The average mean sorting descending from high to low in the following order. Web data and information systems help provide data and information of the current study (No 2.6, $\overline{X}$ = 3.89), the measurement and evaluation program, academic program, work accordingly as teachers, academic, and registration requirements (No 2.5, $\overline{X}$ = 3.88), and the developed system allows you to check the validity of such data and information (No 2.7, $\overline{X}$ = 3.87).

     3) The results of using the data and information technology system for monitoring, supervision, and evaluation in basic schools.

     Using the system, users need to entry data through computer program developed by the researcher and program would process data and produce information used for monitoring, supervision, and evaluation of learning. summarized as follows:

     3.1) The measurement and evaluation work, users were the teachers to entry data through the measurement and evaluation program. Table 28 shown the process.

Table 28 Data, processing and information for monitoring, supervision, and evaluation of learning in the measurement and evaluation work.

Data	Processing	Information
1. Score data	Sum, the results of the study, calculated average.	Report of grades frequency, average score in each course.
2. Desired characteristics data	Calculated results of desired characteristics	Report of desired characteristics evaluation.
3. Ability to read, think, and write of student data.	The assessment of reading, thinking and writing in all subjects assessed.	Report of the ability to read, think critically and write.
4. The activity development data	Classified the enrollment, in activity evaluation.	Report of the development activities.
5. The course and activity attendance	Calculate amount of course attendance periods	Report the percentage of total courses or activities attendance.

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Table 28 (Continued)

Data	Processing	Information
6. Evaluated data of each indicators	Storage data, calculate summation of indicators	Assessing students in each indicators and evaluation report.
And others.	…	…

Table 28 shown that teachers record score and evaluation data of students into the system, then program will process and produce information in measurement and evaluation work.

3.2) The academic affair work, users were the academic or head of academic affair to entry data through the academic affair program. Table 29 shown the processed.

Table 29 Data, processing and information for monitoring, supervision, and evaluation of learning in academic affair work.

Data	Processing	Information
1. Teacher and personnel data	Classify data, grouping work and history	Anecdotal reports of teachers and personnel by the working group.
2. Assigning subjects to teachers in each classroom.	Students enrollment of each subjects to teachers.	Teaching schedule individually and schedule of each classroom.
3. Score data in each subject	Summary of scores all subjects in each semester.	Reports of mid-term and final in each semester.
4. Grades in each subject	Summary of GPA all subjects in each semester.	Reports of GPA in each semester.
5. Score, Grades in all courses data	Calculate total scores and GPA in all subjects.	Students achievement list by the courses and classes.
6. Class Teacher, advisor data	Determining teacher In each classroom	The teachers monitor and assess the desired characteristics.
And others.	…	…

Table 29 shown that the academic personnel record data about teaching schedule and students enrollment into the system for teachers to use the measurement and evaluation program, then program will process and produce information in academic work.

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3.3) The registration work, users were the registration personnel or registrar to entry data through the registration program. Table 30 shown the processed.

Table 30 Data, processing and information for monitoring, supervision, and evaluation of learning in registration work.

Data	Processing	Information
1. Achievement in all subjects / activity	To calculate the average grade point(GPA) in each group and all subject.	Records show the achievement of students in each curriculum (PP.1).
2. Student list who pass on curriculum	Formatted print data into a form the department.	The diploma of class level (PP. 2).
3. List of student graduates.	The conclusion of the course graduates.	Report graduates each level of education (PP. 3).
4. Academic performance, behavior and more.	Selected from the conditions for issuing such certificates.	Certificate of Education in various fields (Pp. 7).
5 students data in all aspects.	Summary information about health and other.	Report the cumulative record (PP. 8).
6. Student's history family data.	Storage student's data and searching system.	Monitoring student, father, mother, and parent.
7. National test data (O-NET,NT).	Storage achievement, Calculate school average.	Study certification, Report GPA from school GPA and O-NET.
8. Re-grade, and updating data.	Changing and updating evaluation data.	Monitoring, supervision, and evaluation individually, all subjects.
And others.	…	…

Table 30 shown that the registrar records students data and manages student classroom, the academic personnel records about teaching schedule and students enrollment into the system for teachers to use the measurement and evaluation, then program will process and produce information in registration work.