TASK DEVELOPMENT IN MAINTENANCE : A CASE STUDY OF BANGPHAE HOSPITAL

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TASK DEVELOPMENT IN MAINTENANCE : A CASE STUDY OF BANGPHAE HOSPITAL

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ABSTRACT

The objective of this research was to study the following: 1.The maintenance system of Bangphae Hospital, Rajburi Province; 2. The level of satisfaction with maintenance work and related problems / obstacles from the viewpoint of administrative staff, maintenance service users (clients) and maintenance providers; 3. The relationship between personal characteristics and maintenance operation, problems / obstacles and satisfaction. The total population studied was 119, pearson correlation was used to test the hypothesis.

The study found that, 1. The mean score of each component of the maintenance system of the hospital varied from high to low as following:The study found that, Administrators ranked satisfaction of the maintenance system, from high to low, and the client groups ranked highly the capability of technician. Their dedication of technicians and quality of work. They placed efficiency of work, follow up and case of equipment as medium. internal coordination, directing, assigning responsibility to the staff (staffing) monitoring and control, performance output, expense, organization structure, operation planning, evaluating and appropriateness of number of personal. The administrative staff had high satisfaction with the maintenance work; the problems/ obstacles were the supply of spare-parts, and preventive and corrective maintenance, which received a medium score. The client group scored satisfaction of the maintenance work from high to low as follows: capability of maintenance technician, dedicative of personal. The consonent which medium score were efficiency of maintenance work, follow up and caring of equipment by maintenance technician. The problems/ obstacles in the clients, point of view were caring of equipment by clients and follow up. The service provider group were highly satisfied with knowledgability about maintenance system, human relations and support from supervisors. Low scores of satisfaction were with equipment and appliances in performing the job, and the work-place. The main problems in the providers view was working in a limited space. Testing of the relationship between personal characteristics of both administrative staff and clients with maintenance operation, problems/obstacles and satisfaction showed no relationship by age, experience, length of service in the hospital and length of service in the present position.

The recommendations from the research were as follows. The improvement of the maintenance system should focus on external coordination between the hospital and external agencies, increased efficiency of maintenance, work registration of equipment, follow up and scheduled maintenance, using appropriate appliances. There should also be improved maintenance work plans, increased knowledge and skill to help maintenance technicians to be able to keep up with changing technology including developing a provincial maintenance network to share resources and economize government expenses in maintenance work.

KEY WORDS: MAINTENANCE / COMMUNITY HOSPITAL

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บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อศึกษา 1) ระบบงานซ่อมบำรุงของโรงพยาบาลบางแพ จังหวัดราชบุรี 2) ระดับความพึงพอใจและปัญหาอุปสรรคงานซ่อมบำรุงของโรงพยาบาลในกลุ่มผู้บริหารโรงพยาบาล กลุ่มผู้ใช้บริการ และกลุ่มผู้ให้บริการ และ 3) หาความสัมพันธ์ระหว่างลักษณะส่วนบุคคล กับ การดำเนินงานซ่อมบำรุง ปัญหาอุปสรรคและความพึงพอใจ การศึกษาใช้กลุ่มประชากร 119 คน สถิติที่ใช้ทดสอบสมมติฐานคือสหสัมพันธ์เพียร์สัน ผลการวิจัยพบว่า ระบบงานซ่อมบำรุงของโรงพยาบาลมีค่าเฉลี่ยรวมสูงจากมากไปหาน้อย ดังนี้ การประสานงานภายในโรงพยาบาล การอำนวยการ การแบ่งหน้าที่ความรับผิดชอบ การควบคุมงาน ผลการดำเนินงาน ค่าใช้จ่าย การจัดโครงสร้างงาน การวางแผนการดำเนินงาน การประเมินผลงานซ่อมบำรุงและความเหมาะสมของจำนวนผู้ปฏิบัติงาน การศึกษาระดับความพึงพอใจและปัญหาอุปสรรคของงานซ่อมบำรุง พบว่า *กลุ่มผู้บริหารโรงพยาบาล*ให้คะแนนความพึงพอใจงานซ่อมบำรุงอยู่ในช่วงระดับสูง ส่วนปัญหาอุปสรรค ได้แก่ การจัดหาอะไหล่สำรอง การซ่อมบำรุงป้องกันและแก้ไขมีค่าเฉลี่ยคะแนนอยู่ในระดับปานกลาง *กลุ่มผู้ใช้บริการ*ให้คะแนนความพึงพอใจงานซ่อมบำรุงรวมมีค่าเฉลี่ยอยู่ในช่วงระดับสูง จากมากไปน้อย ดังนี้ ความสามารถของช่างซ่อมบำรุง ความเสียสละในการปฏิบัติงาน คุณภาพงานซ่อมบำรุง ส่วนคะแนนความพึงพอใจงานซ่อมบำรุงกลุ่มระดับปานกลาง ได้แก่ ความรวดเร็วของงานซ่อมบำรุง การติดตามงาน การบำรุงรักษาอุปกรณ์ของช่าง ปัญหาอุปสรรคงานซ่อมบำรุง ได้แก่ การบำรุงรักษาอุปกรณ์ของผู้ใช้บริการ การติดตามงาน *สำหรับกลุ่มผู้ให้บริการ*ให้คะแนนความพึงพอใจงานซ่อมบำรุงอยู่ในช่วงระดับสูง ได้แก่ ความรู้ระบบงานซ่อมบำรุง มนุษยสัมพันธ์ การสนับสนุนของผู้บังคับบัญชา ส่วนคะแนนความพึงพอใจงานซ่อมบำรุงช่วงระดับต่ำ ได้แก่ ด้านเครื่องมืออุปกรณ์การทำงาน สถานที่ปฏิบัติงาน สำหรับปัญหาอุปสรรคการดำเนินงานซ่อมบำรุง ได้แก่ การทำงานในหน่วยงาน สถานที่ปฏิบัติงานซ่อมบำรุง การทดสอบความสัมพันธ์ลักษณะส่วนบุคคลของกลุ่มผู้บริหารและกลุ่มผู้ใช้บริการ ได้แก่ อายุ ประสบการณ์ การปฏิบัติงานในโรงพยาบาล และการปฏิบัติงานในตำแหน่ง พบว่า ไม่มีความสัมพันธ์กับการดำเนินงานซ่อมบำรุง ปัญหาอุปสรรค และความพึงพอใจงานซ่อมบำรุง

ข้อเสนอแนะจากการวิจัยมีดังนี้คือ ระบบงานซ่อมบำรุงของโรงพยาบาลควรมีการปรับปรุงงานด้านการประสานงานภายนอกโรงพยาบาล เพิ่มความรวดเร็วในการซ่อม มีการลงทะเบียน การติดตามงาน การบำรุงรักษาตามระยะเวลา เครื่องมืออุปกรณ์ มีแผนการบำรุงรักษาเครื่องมือ การเพิ่มความรู้ ทักษะ บุคลากรในหน่วยซ่อมบำรุงให้ทันต่อการเปลี่ยนแปลงของเทคโนโลยี ตลอดจนการพัฒนาการดำเนินงานซ่อมบำรุงของโรงพยาบาลให้เป็นเครือข่ายการบำรุงรักษาร่วมกันภายในระดับจังหวัด เพื่อเป็นการใช้ทรัพยากรร่วมกันและเกิดการประหยัดงบประมาณภาครัฐ

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CHAPTER 1
INTRODUCTION

Rationale

Medical equipment plays important role in helping doctors diagnose and treat patients successfully. The equipments need proper maintenance so that they are readily available in full function when needed. In developed countries, maintenance work for medical equipment is considered high priority. (Sukhothaithammathiraj University,2539:497)

Maintenance is the necessary work to be done to keep the equipment functionable when needed, it is one of the important part of material management for the organization. Improper maintenance of equipments causes damage to the organization because repairing cost is both very expensive and time consuming. It should be noted that the life-long maintenance cost for each equipment is higher than the purchasing price of each equipment at the beginning , thus every organization should give priority to minimizing the maintenance cost and maximizing the utilization of the equipment for the benefit of the organization (Sermsuk Cholvanich, 2529:352)

The maintenance work of each equipment differs accordingly to the ease of utilization and technology being employed in the equipment. The maintenance work can be classified into two categories; preventive and corrective.

1"**Preventive Maintenance**" is aimed at regularly checking the equipment to make sure that the equipment is in good condition and prevent damage in case of initial fault is found earlier.

2“**Corrective Maintenance**” is to bring back the function of the equipment by repairing.

There are six factors to be considered in maintenance work (Sermsuk Cholvanich 2529:393-394) which are

1. Is there adequate number of staff?
2. Do the personnel receive proper education and training about the equipment?
3. How efficient are the tools for repairing and testing the equipment?
4. Ability to judge which equipment is repairable or non-reparable.
5. Is there time constraint?
6. Is the situation appropriate to repair or purchase the new one.

Maintenance in the hospital is technical work which consists of many types of maintenance. The main function is repairing and checking all equipment and appliance used in the hospital. The work includes wood work, masonry, plumbing, electrical and medical equipment maintenance.

The maintenance department records all repairing work as input to calculate next year budget and for considering the sale of expired equipment.(Sermsuk Cholvanich 2529:358) The maintenance service as requested by many departments has to be done effectively and timely and should minimally affect the treatment of the patients.(Wisit Pichaisanit,2530:171-172)

The maintenance department of the hospital is devided into six units as follows.

1. Administration unit.
2. Logistic unit, responsible in inventory control of the spare parts and the equipment.
3. Mechanic unit, responsible in operating and maintaining all of power supply for the hospital, water-treatment system including refrigeration work.

4. Maintenance unit is responsible for other works which the mechanic unit does not cover such as maintenance of the building, housework, fire-fighting, lighting system and small power supply.
5. Transportation unit which consist of elevator services and vehicles.
6. Communication, electronic, audio-visual including medical equipment using electronic system. (Wisit Pichaisanit,2530:172)

The operation of maintenance work of the hospital consists of many steps starting from situation analysis, planning, implementing, evaluating and replanning (Somchart Toruksa,2543:64) If the mentioned steps have been done rightly, the maintenance work would be successful, however many hospitals have not followed those steps correctly thus there are still many problems such as, too many equipment could not be repaired on time, too much time required for repairing work etc. Nowaday technology has changed so fast thus many equipments become very much complicated and maintenance become a very difficult job. Many of the maintenance personnels who do not have additional training can not repair the complicated equipments, thus those equipments need to be sent to be fixed by private companies and cost more both in cash and time wasted.

Ministry of public health realized the problems of maintenance work of medical equipments and their consequence if nothing has been done (MOPH,2535:24) Thus, there was the program on development of medical engineering and maintenance in all level of hospital the improvement of maintenance system for the whole public health system.

Since there are many different kinds of equipments and each kind need different maintenance technics, thus there is the need to have different kinds of maintenance personnels such as maintenance manager, electronics, technician, technical specialist, civil engineer, electrician, mechanic, plumber, carpenter. The number and type of personnel varies accordingly with the size of the hospital.(MOPH,2531:101-164)

Community hospital is the government hospital which has the least number of maintenance personnel; 30 beds community hospital has only one technician and one plumber, 60 beds hospital has one additional carpenter, 90 beds hospital has the same number as 60 beds. Besides that there is not any apparent maintenance work in the administrative structure of the community hospital.

Bangphae hospital is 60 bed-community hospital under government service reform program. Office of Permanent Secretary MOPH and Office of (civil Commissiom) The administrative structure of the hospital consists of the following.

1. Administrative sector consists of general administration, accounting, supply and maintenance, nutrition, information and statistics and quality/standard improvement.

2. Service sector consists of.

2.1 Medical service sector consisting of emergency medicine, general medicine, dental service, Thai traditional medicine and alternative medicine service.

2.2 Technical services sector consists of rehabilitative medicine, pathology, radiology and pharmacy service.

2.3 Family medicine and community service sector of consisting of community health service.

3. Nursing service sector consisting of out- patient, in- patient and emergency service.

The reasearcher has been working in administrative section of the hospital supervising maintenance work. Many problems in maintenance operation had been taken care of but still, there are many problems to be solved. The researcher realizes the importance of maintenance work thus interested in undertaking research to find some strategies for the improvement.

Presently, there are two personnels in maintenance section taking care of medical equipment, office supplies, house work cafeteria and gardening equipment.

Repairing work is enormous, need complicated technology and time consuming. The overall maintenance work can not keep up with the growth of the hospital.

Problems analysis of the maintenance work found that there were problems both quantitative and qualitative. Such time consuming, client satisfaction was low. The main causes of problems were shortage of maintenance personnel , overload of repairing work, service providers, lack of knowledge, capability and experience, too many jobs for one personnel, unclear working system, lack of morale and incentive, lack of good human relationship. However, the clients needed to be blamed also; users of the equipments did not operate accordingly to the manuals. The administrative staffs did not have sufficient information to make decision about reparation.

There are too many different kinds of equipment causing difficulty in repairing and maintenance, the technology used was too complicated thus the equipment need to be sent to private companies for repairing wasting both the money and time. Maintenance system was not systematically set, delegation was not ambiguous. Thus the researcher decided to undertake the study to search for some strategies to improve the maintenance system of the hospital.

Research Objective

1. To study the maintenance system of Bangphae Hospital.
2. To study the level of satisfaction and problems/obstacles of maintenance work among administrative staff, clients and service providers of Bangphae Hospital.
3. To identify the relationship between personal characteristics (gender, age, length of government service, length of service in present position, education, experience and performance in service) and maintenance operation and problems/obstacles, and satisfaction.

Hypothesis of research

1. Personal characteristics has relationship with maintenance operation.
2. Personal characteristics has relationship with problems/obstacles.
3. Personal characteristics has relationship with satisfaction.
4. Maintenance operation has relationship with problems/obstacles.
5. Maintenance operation and problems/obstacles have relationship with satisfaction.

Scope of the study

The study was focused only in 60 beds Bangphae Community Hospital, Rajburi Province Ministry of Public Health.

Definition of Term

Maintenance means any work undertaken to keep the equipment in function, consisting of preventive maintenance and corrective maintenance by internal maintenance system or sent for external help.

Preventive maintenance means the routine maintenance to prevent the breaking down of the equipment including checking up of equipment after reparation.

Routine maintenance means daily, weekly/monthly checking and upkeeping of the equipment by users as well as by routine maintenance plan of maintenance unit.

Preventive repairing means the maintenance operation when found some error in the equipment though still running.

Corrective maintenance means maintenance operation for corrective measure and checking up after reparation.

Appliance means materials, equipment, land and building in the hospital assigned to be under maintenance scheme.

Community Hospital means hospital under Office of Permanent Secretary, MOPH with the beds less than150.

Satisfaction means positive attitude of related persons toward maintenance, measured by points.

Administrative staff relating to improvement of maintenance work means hospital director and section chiefs of the following:- nursing, pharmacy, dental service, family medicine and community service, administration, in-patient, obstetrics, surgery, accident and emergency, Thai traditional medicine, physiotherapy, central supply, medical record, x- rays, laboratory, nutrition, secretariat, supply, budget and accounting.

Service provider means the personnel who is responsible for hospital maintenance work or maintenance technician.

Clients means all level personnels in the hospital who are responsible with using and caring of equipments.

Problems/obstacles in maintenance operation means factors or components which hinder or obstruct the maintenance operation measured by points.

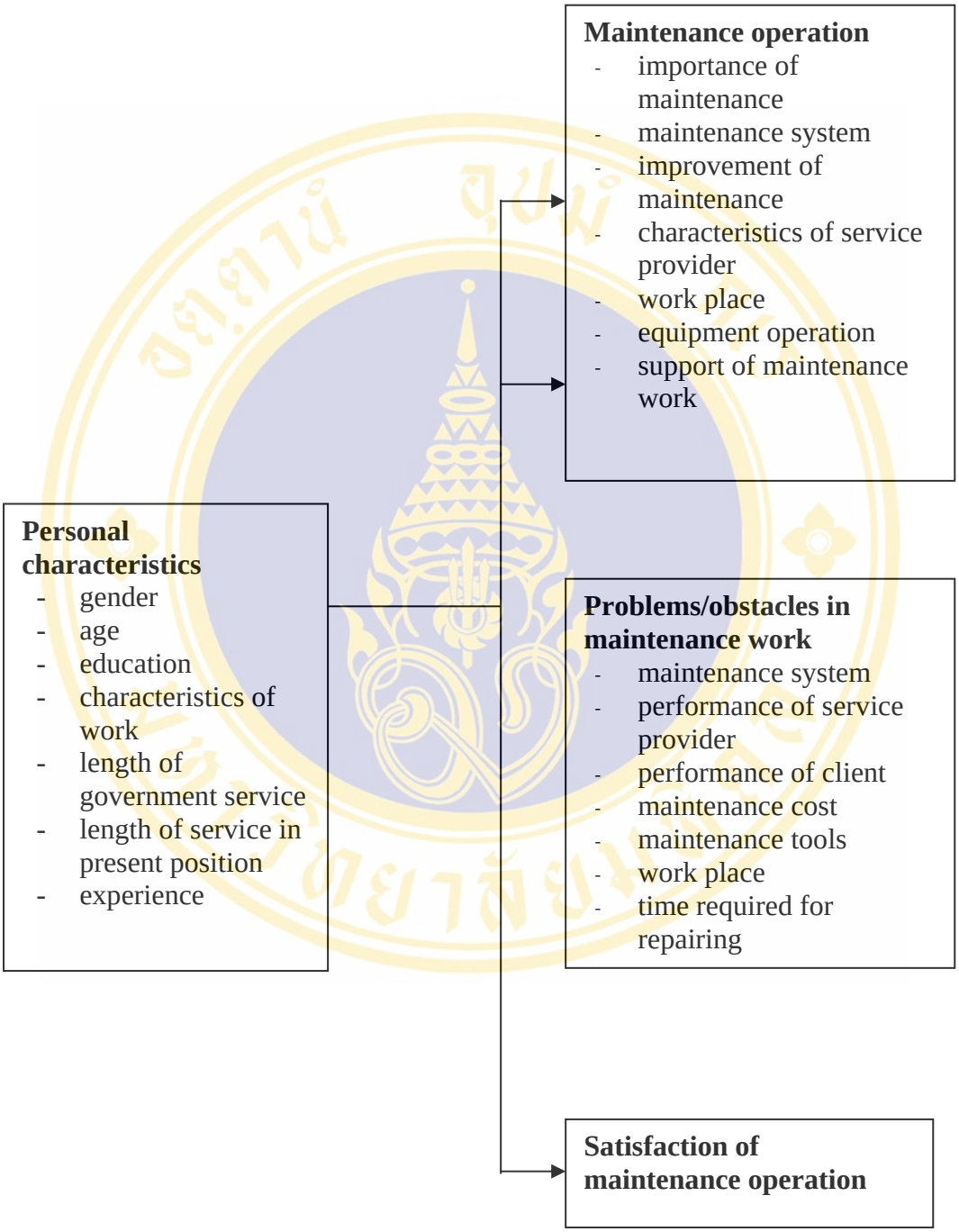

Figure 1 Conceptual Framework

CHAPTER 2
LITERATURE REVIEW AND RELATED RESEARCH

The literature and research relating to maintenance work of community hospital can be classified into three parts as follows.

Part 1 Organization theories and concepts.
Part 2 Concepts and theories relating to administrative
Part 3 Research relating to maintenance work.

Part 1 Organization theories and concepts

Main activities to be emphasized in organization development are changing of attitude; perception, behavior and expectation of personnel working in the organization. Manager who is responsible for management of change has expertise in behavioral science. He is the one who will intervene into the organization with various well-developed strategies to create positive change. He may be refered as change agent; change agent often has many bright perspectives and necessary knowledge of behavioral science. He may be external advisor, organization expert or a new manager who is assigned to be responsible for the change. Main concept of organization development is based on few assumptions; first, people want to grow and proper, second, people want to be recognized by others within the organization and third, organization climate and designed strategies can influence the behavior of individual and group. Thus cooperation between administrative staffs and people in the organization is essential for the utilization of capability and skill and elimination of some characteristics which retard the growth and development of person. (Somyos Navykarn. 2543:974)

Organization development is a process of change which has been well planned using knowledge of behavioral science as input.

There are three for major points to be reminded for organization development

1. Organization development relates directly to planning for change
2. Organization development relates to improvement of the organization.
3. Planned change is based on knowledge in behavioral science such as psychology, sociology, anthropology and related science.

Tebhanom Muangman and Sawing Suwan (2540:269-270) described the characteristics of organization development as follow.

1. Organization development is planned change, which means that it is the change that concerned person has determined to create change.
2. Organization development is comprehensive change, the change should be system change not only partial change.
3. Organization development place emphasis on work group.
4. Organization development is long-range change
5. Organization development needs the participation of change agents who are expert in organization development.
6. Organization development places emphasis upon intervention and action research

Thongchai Santiwongsa (2539:352-354) suggested steps to be taken for organization development as follows

1. Assign someone to be responsible for organization development, most organizations prefer to employ external consultant who is neutral and has no benefit in the organization. Some organization may employ internal personnel to perform this job but he must be neutral and independent as well.
2. Study and collect information about the efficiency of the organization. The methods which are popularly used are interviewing and answering questionnaires.
3. Discuss among the administrators about information collected.
4. Implement organization development scheme using different technics

such as team building, group process, leadership building, management by objective, valued added work etc.

Surachart Na Nongkhai (2543 v: 49) cited that organization development is a planned change for all level of organization consisting of major steps as follows.

1. Organization diagnosis to evaluate the organization situation.
2. Evaluation of the organization to identify point for improvement and goal for development.
3. Implement intervention to attain reach the designated goal.
4. Evaluate intervention tool and improvement of the tools.

Banyong Tochinda (2542:34) cited that management means any action to be done by people in the organization to fulfill the designated goal or objective. There are many activities that need to be done such as planning, organizing, staffing, directing, delegating, coordinating, monitoring and controlling. There are three components of efficient management:

1. Attainment of designated gold.
2. Economical in finance and other resources.
3. People in the organization have work satisfaction thus organization efficiency could be measured in many aspects such as goal attainment, economy and client satisfaction.

Part 2 Concepts and theories relating to administrative

Management principle as being proposed by Gulick and Urwick in abbreviate word of POSDCoRB refered in Saman Rangsiyogrisna and Suthee Sithisomboon (2541:3-4) could be elaborated as follow.

P (Planning) means setting up the proposed activities to be implement in the future to respond to be policy.

O (Organization) means setting up the organization structure in accord with the work model by considering both the control mechanism and authority such as “line” “staff” and auxikkary.

S (Staffing) means putting people with proper knowledge and capability to fill up the position and function. Staffing could also be as personnel administration which include many activities relating to personnel such as recruiting, positioning, assigning respondsibilities, promoting, training, rewarding and pension provision.

D (Directing) means facilitating the management work which covers monitoring and controlling, leadership, human relationship, motivation, decision making and delegating the authority.

Co (Coordinating) means activities to foster cooperation among concerned agencies and persons. Good communication can be helpful mechanism to facilitate coordination.

R (Reporting) means summarizing the past performance and informing them to concerned persons and agencies including public relation. Reporting has high relation with communication as well.

B (Budgeting) means calculating financial input and financial spending for planned activities.

Peter F.Drucker (cited by Tonglaw Dechthai,2542;246-247) principle of management by objective (MBO) for manager and employee to work together to attain the designated objective. There are sit major characteristics of MBO as follows.

1. The management and employee set up mutual understanding and agreement about main duty and responsibility together.

2. The employee set up objective both short-term and long-term with the consent of the manager and responsive to organization objective.

3. Both sides set up common agreement about criteria to measure and evaluate the performance including time-frame.

4. Both sides undertake periodically progress evaluation. The change of objective will not be made unless there is necessity and the change need to be scrutimized by appropriate process.

5. The administrator or manager must take responsibility in facilitating coordinating and supply necessary resources to be adequate for activities to attain the designated goal.

6. There are measurement of the success factors and time-frame.

MBO has both advantage and disadvantage. The advantage points are many, such as the employees have opportunity to participate in objective setting thus they are automatically motivated to take responsibility. Both sides understand eachother . The employee can take part in decision making and define their expected outcome. If some objectives are meant to improve the performance of the employee and characteristics of these objectives will be part of the excellent tool for training and development of the employee.

However, there are some disadvantage in MBO such as time consuming and diffically in the evoluation of individual employee which may cause unfair rewarding and become disincentive. (cited

Heinz Weihrich Harold Koontz (cited by Thongchai Santiwongsa,2539:34-35) suggested the concept of contingency management to help perfect the management system. They suggested that there should be systematic analysis of the factors affecting the organization both internal and external. The prominent point of this concept is that any technic or methodology to be used in managing the organization should be most appropriate and realistic for each situation. Which means that there

must be “ situational analysis” and the acceptance that there is no “one best way” in actual practice but the management must be adaptable to each situation.

The internal factors that the administrator must study and analyse are the organization objective, structure responsibility, technology and manpower. These five factors interack which each other and effect the efficiency of the organization. These internal factors could be called as the socio-technical subsystem which is consisted mainly with “ people system” and “work system”

These internal factors are continuously affected by external factors. Any change in external factors relating to technology, socio-political economic condition and culture affect the organization indirectly in certain extent. In the Same time the change of factors such as partnerships, labor, union, law and regulation customer and competitors cause direct effect to the organization.

Effective organization must be able to adapt to changing environment efficiently; timely and relevant so that the organization will be able to survive and attain the designated goal effectively.

The manager in contingency management employs two major management tools to help him in managing the organization, those are “decision making” and “communication.” These two tools help the manager to create “ coordination system” The major role of the manager are decision making and making sure that everyone in the organization understand what need to be done. He needs to analyse problem and make decision about the work facing him, he also needs to explain and communicate by all means (written and verbal ect) to create understanding about importance things among employees so that they can work harmoniously with each other. The manager also needs to get information from various report to make him well-informed and use them as input for management.

Part 3. Research relating to maintenance work.

1. Research relating to Problems of Maintenance Work

Pisnu Raksakulwanont (2526 : 35) presented the need and wants for proper maintenance work of the hospitals in the provinces at the seminar on communication and maintenance engineering and cited a case of Sanpatong Community Hospital in Chiengmai that the hospital lacked proper equipment, manpower and budget for maintenance work. He also suggested that there was urgent need to provide proper maintenance work for medical equipment, office equipment including vehicle. Medical equipment maintenance faced many problems, many of them needed to use the service of private companies because of urgent requirement, besides that some of the equipment could not be repaired by the personnel from Maintenance Division Ministry of Public Health. The hospitals lacked skilled personnel to take care of complicated machines. Many hospitals were considering about training hospital personnel to be able to perform basic maintenance work.

The result of discussion about direction for improvement of maintenance work in hospitals held by Maintenance Division, Ministry of Public health in 2526 B.E. had summarized the situation and had some recommendations as follows.

The problems of maintenance work.

- The maintenance system was inadequate in every step, diagnosing, repairing and checking.
- Lack of experienced and knowledgeable personnel.
- Inadequate repairing equipment .

The suggestion was to clearly define the authority and responsibility of the maintenance work, training of personnel and provide financial support (Maintenance Division 2526 : 72 – 73) support.

Problems of human resource development were also cited that the personnel were not efficient because the internal working system was improper, the personnel lacked experience, knowledge and working methodology; morale and career growth were inadequate. There was not sufficient understanding between administrators and the maintenance personnels , improper working environment and improper placement of personnels.

The suggestions to improve human resource were to provide training, study visit, internal system working environment improvement, including occasionally meeting between the administrators and maintenance personnels. (Maintenance Division Ministry of Public Health 2526 : 101 – 102)

Udhai Hiranto (2530 : 142 – 146) described that the bureaucratic sluggishness is caused by the system and the personnel. The personnel lacks responsibility and has no working plan, lacks monitoring and control system, failure of filing system, have self – interest, lack devote, and non – enthusiastic. Udhai Hiranto suggested scheme to improve the system to save cost and create more productively as follows

- Rid off unnecessary steps of work.
- Combine some work together to save cost.
- Reorganize the rules to make work more productive and cost less.

Supatra Bunnak (2523 : 23) suggested that the improvement of maintenance system including other system is the responsibility of the administrator to apply management technic to reach the desired goal.

Piyathida and Saksithi Tridech (2530 : 249) described the problems of maintenance in detail that there was no person being definitely assigned to take care of the machines or equipments, that those machines lacked proper maintenance and repairing cost soaring. There was lengthy permission process in asking for to have them repair thus the organization always lack the equipment.

The personnels lacked proper knowledge about operating the equipment resulting in untimely out – of – order, besides that the personnels were careless because they did not have the feeling of ownership for the equipment.

Report on the utilization of medical equipment in district hospitals and medical and health centers by sampling six 60-beds hospitals, forty six 30 – beds hospitals and ninety one 10 – beds by division of Rural Health, Ministry of Public Health in 2525 B.E. found that many of long – life medical equipments (7 years) were out of order. The reasons for untimely break-down of the machine were being over – used, low – quality equipment, personnels lacked knowledge of proper operation and repairing and neglegiance. The report recommended strategies to improve the maintenance system by.

- Training of hospital personnel about operating and basic maintenance technics.
- Set up adequate maintenance unit in the hospital.
- Improve maintenance system.
- Provide operating handbook (in Thai) to related unit.
- Set up proper life – span for each equipment to economize repairing cost.
- Prepare up – to – date inventory list of equipments and reporting system.

The study on guidelines for training of medical engineering for hospitals by Division of Provincial Hospital, MOPH in 2529 B.E. focusing upon six major equipments which were X– ray machine, respirator, oven, light – intensity meter and ultrasound machine by interviewing 130 technicians and 752 users found that 57.75% of technicians were willing to support the work of the organization and every one of them had at least one incentive. Sixty five percent of the technicians never had additional training, their capability were limited. There were many constraints among technicians as follows.

- inadequate knowledge and skill of repairing especially new equipment.
- underpaid salary
- lacked incentive and morale

- improper working environment.

There was 70% of users commented that the efficiency of medical equipment should be increased, 44.1% needed new knowledge and skill 11.4% thought that the maintenance work was below standard, 80.3% never had training how to operate the machine, 59.4% asked for training and 36.7% thought that training would help improve their performance.

The users had listed problems and constraints in their work as follows.

- Personnels lacked knowledge about the operating and caring of the equipments.
- Many users used the same machine but no one was responsible for the caring.
- Many machines were untimely out of order.
- The machines maintenance technicians of the hospitals lacked expertise, could not repair the machines on time.
- Maintenance work was not systematically arranged.
- Lack of consultants about equipment.

Maintenance Division, M O P H (2532 : 24) had calculated that there were medical equipment worthed more than 1,000 million baht in various hospitals under department of Medical maintenance in hospital of state and there was additional supply of them worth about 100 million baht every year, if the maintenance system was not well organized there would be many problems for the users and great waste of money would follow.

Rungrit Sayamanont (2517 : 116) suggested technics and methodology to improve organization management to be able to keep up with new technology and be competive with other organization. Those technics include organization chart, operation chart, output measurement, labor – saving equipment, office improvement, participative management etc.

Maintenance Division MOPH (2525 : 119 – 121) suggested the improvement of maintenance work in regional and general hospitals as follows.

1. Set up a complete maintenance unit in the hospital which is capable of repairing medical equipments and others including being responsible for maintaining work of the buildings and accessories. Cooperate with concerned agencies to provide adequate training for mechanics and electricians. Set up clear job description and number of personnel required for the job.

2. Support the training and development of maintenance personnel to increase their capability.

3. Cooperate with concerned agencies to supply essential tools for repairing the equipment and produce basic tools for internal use.

4. Cooperate with concerned agencies both implementing and academics to develop and improve technical know – how to be used in the hospital to increase efficiency

Jumpol Rakpratum (2529 : 497 – 528) former director of Maintenance Division, MOPH described problems of repairing and maintaining of medical equipment as follows.

The users were not interested in caring of the machine, most them concentrated on utilization; if problem occured let it be the business of maintenance personnels. Besides that the users did not realize their responsibility of caring for the machine because there were many users at a time, the equipments were untimely out of order. the administration process was complicated causing the slow down of purchasing and repairing. Jumpol had suggested the following corrective measures.

1. There should be maintenance handbook written in Thai, regulation controlling the maintenance should also be set up.

2. There should be operating handbook written in Thai for users, checking form before operating should also be encouraged.

Jurairatna Techapechrapaitoon (2538 : 23) cited that the limitation of maintenance planning were caused by the lack of correct information about spare parts and available equipment that need repairing in the future. Thus there was overstocking of sparepart and personnels. Ideally there should not be too many kinds of equipment and sparepart so that inventory system would be more simplified.

2. Variables using in the research

Age

Sutho Charoensuk (2515:89-90) cited that people with different age often have different knowledge and understanding about the thing related to them. Even the same person but at different age still has different opinion about the situation.

Duangduaen Pandhumnavin (2524:108) cited that age is an important factor affecting opinions of people. People with different age usually have different opinion. One needs experience and learning to perform the job.

Duangduaen Pandhumnavin and Penkhae Pajjanuk (2526:108) cited that when a person dicide to do or not to do something he needs social experience and learning to help him make decision. Thought and action of people varies accordingly to different context, thus elderly and youngster often have different ways of thought and decision making.

Tasna Boonthong (2529:190) cited that age his direct relationship with development and maturity of the person. In normal person, when he grows up has maturity and experience increase, his thought and ability to analyse situation is more complete. Thought and action vary accordingly with age.

Pechara Khunsantipongsa (2531:78-79) found that district health personnels with difterent age needs different kind of supervision. Burirachta Roddhip (2535:93) also found that clients with different age have different attitude toward the nursing service of the hospital.

Waraporn Pleepalakorn (2539:131) found the relationship between age and direction in technical management, However the study by Vasna Theelapa (2536:65) found no difference in opinion about nursing profession law among population with different age.

Pornthipya Ounkomol (2532: ก-ฆ) found that the age of the section chiefs of sanitation and diseases prevention in district hospital of the Northeast Region has some relationship with their performance in administration, technical and service.

Gender

Sucha chantraem (2525:51) cited that men and women often have different opinion and attitude toward things

Supatna Dechatiwongsa Na Ayuthya (2526 : 7-8) cited that men usually have more initiative, confidence and ability to analyse, synthesis more than women. Men also are more difficult to yield to the rules than the women.

Pornthipya Oonkomol (2523 : 74) found that gender has some relationship with the performance of the section chiefs of sanitation and diseases prevention in district hospital of the Northeast Region has some relationship with their performance in administration, technical and service.

Supawadee Kuhathong (2533:110) found that gender has some relationship with role perception of technical experts in public health.

Wanida Keeratikornsupak (2539 : 114) found that gender has some relationship with the integrated supervision process. Waraporn Pleepalakorn (2539 : 131) also found the relationship between gender and opinions about direction in technical administration. However Bureerachta Rodthipya (2539:92) found no relationship between gender and ethical behavior of the nurses.

Education

Sucha Chandraem (2525:152) cited that education is one of the factors which differentiate people in behavior, feeling, opinion, want and expectation. People with different of education also have different background expectation.

Somporn Ithidechpongsa (2530: ก) found that the directors of community hospitals who had some education or training in management perform their administrative role better than others who had no training in management. Supawadee Khuhathong (2533 : 110) also found that education has some relationship with the self perception, supervisor's supervision and colleague's perception of provincial public health Expert. However Preeyaporn Teeyakul (2540 : 89) found no relationship between education and perception of ministerial, provincial and district administrator about expected role of provincial health office.

Position

Santi Bantherngjit (2528:71-73) found that different group of public health administrators at provincial and district level had different attitudes toward administrarive activities (planning, organizing, directing, coordinating, reporting and budgeting) which was similar to the study by Pechara Khunsantipongsa (2531:88) that public health officials of different position demand different kings of supervision. Kasem Disthan (2539:209) also found that the administrator with different position had varied administrative behavior both overall aspect and individual aspect. However the study by Tabtip Titipongsapanich (2539:112) found that different

position of each individual had no influence toward the acceptance of total quality management in the organization.

Work Experience

Sermsak Wisalaporn (2522 : 131 –132) suggested that experience of any kind usually helps people to perform their functions more better, because of various and diverse experience of each day varies and helps improves the thought of people.

Pornsombat Kamtrong (2530 : 84 –92) and Uraiwan Charnyuthkarn (2535 : abstract) found that duration of work varies with needs for supervision. However Wasana Teepala (2536 : 65) found that different working experience of sample does not make their nursing law attitude different.
Tabthipya Titipongsapanich (2539 : 112) also found that working experience has no effect upon the acceptance of Total Quality Management of the study.

Satisfaction

According to dictionary of psychology, satisfaction is the initial feeling of reaching objective and growing up to be final feeling when reaching goal. (Derver, 1964 : 256) Behaviorally, satisfaction may be defined as the condition which a person feels happy or delightful when his desire or motivation has been responded. (Wolman, 1975 : 238)

Vroom (1964 : 99) defined job satisfaction as the result from which a person has participated in the work. Job satisfaction and attitude toward the job can be used interchangeably, Negative attitude can be inteprated as dissatisfied.

Gilmer (1966 : 254 – 255) defined job satisfaction as the sum of attitude of a person toward every component of the job, related to job characteristics

and working environment, such as the feeling of success in the job, being recognized and prosper in his career.

Good (1973 : 320) defined job satisfaction as level of positive feeling toward the job resulting from his interest and attitude toward the work.

Sakol Wanpong (2526 :11) defined job satisfaction as positive feeling or attitude toward the job, a feeling when physical and psychological need has been fulfilled.

Panrai Sapyaprapa (2529 : 76) defined job satisfaction as the summation of many positive attitudes which a person has toward his job and other components which relate to his work and his life.

Preeyaporn Wongsanutararojna (2535 : 143) defined job satisfaction as the enthusiasm to work, full of morale and will power all of which, affect the efficiency and effectiveness of the work and success of the organization.

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In summary, satisfaction means positive opinion or attitude of a person expressing the feeling of happiness, full of morale and will power resulting from being complimented and needs fulfilled in all aspect.

CHAPTER 3
RESEARCH METHODOLOGY

The research process is composed of 6 topics as follows:

1. Research format
2. Research area and population
3. Research tools
4. Quality of research tools
5. Data collection
6. Data processing and analysis

1. Research format

This research is a survey research. The questionnaire was constructed as a tool to collect Information from the population, the answered questionnaires was analysed by statistical method to identify relationships between many different variables.

2 Research area and population

The research area was 60 Beds Bangpae Hospital. Tambol Wangyen, Bangpae District, Rajburi. Province.

The population studied were the people who had some involvement with maintenance work of the hospital divided into 3 groups.

1. Administrative staff means: These people who are responsible with policy formulation and decision making in making in maintenance work. They were consisted of hospital director and section chiefs of nursing, pharmacy, dental services, family practioner and community, general administration,

internal patient department, obstetrics, surgery, accident and emergency, Thai Traditional medicine, physiotherapy, central supply, medical records, x – rays, laboratory, nutrition, ธุรการ, logistic and supply totaling 19 persons.

2. Service provider means : The personnels who is responsible with providing maintenance service totaling 2 persons.

3. Client means : every one at all level who operates and is responsible with various equipment and machine which are hospital employees totaling 119 persons.

3. Research Tools

The research tools were the three questionnaires being constructed for interview three groups;

1. Hospital administrative Staff
2. Service Provider
3. Clients

The questionnaire was divided into four parts as follows.

1). Questionnaires for the hospital administrative staff.

Part 1 General information about studied population consisting of personal data such as gender, age, duration of service, position, education, working experience, training, job characteristics, place of work. There are both open – ended and close – ended totalling 8 questions.

Part 2 Maintenance operation

information about maintenance work consists of requesting for service, importance of service for the organization, maintenance system, maintenance

operation, characteristics of maintenance personnel, maintenance work place, tools storage house, characteristics
of tools users, hospital support for maintenance work, satisfaction of clients. There are ten questions with 5 rating scales starting form little or inappropiate to much or appropriate

Part 3 Problems and constraints in maintenance work consists of maintenance system, performance of service providers, action of clients, repairing cost, repairing tools, work place, time required for repairing. There seven questions with five rating scales from slightly agree to much agree.

Part 4 Comments and recommendations.
There were 4 questions for suggestions and open-ended recommendations.

2). Questionnaires for service provider.

Part 1 Personal characteristics of respondents consists of gender, age, education, working status, position, duration in the present position, satisfaction for assigned job, satisfaction for past performance, work experience. There are 9 questions both open ended and close- ended.

Part 2 Maintenance operation

Information about maintenance operation such as knowledge and understanding about maintenance system, importance of maintenance work for the hospital, satisfaction for past present and performance, work improvement, intention to continue working, work colleagues, supervisors clients: satisfaction for working tools ,work place and overall maintenance system. There were 12 questions with 5 rating scale.

Part 3 Problems and constructions in maintenance work.

The problems and constrains consist of maintenance system, colleagues, clients administrative staffs of the hospitals, tools and machines, work place, time required for repairing. There eight rating scales.

Part 4 Comments and recommendations

There are five open-ended questions asking the respondents to provide suggestion about maintenance system, administrative staff, clients repairing tools, repairing place, time required for repairing.

3). Questionnaires for clients

Part 1 Person characteristics of respondents

There were 9 questions both open-ended and closed-ended asking the respondents about their age, gender, working status, job characteristics, work place, duration of government service, duration in present position, education and service requested.

Part 2 Maintenance operation

There were 2 questions with 5 rating scale asking about the level of understanding and comment about maintenance system of the hospital.

Part 3 Problems and constraints of maintenance operation.

There were 4 questions asking problems of maintenance system, service providers, maintenance place, time required for repairing.

Part 4 Comments and recommendations.

There were 5 open-ended questions asking for comments about maintenance system performance of service personnels, maintenance place, time required for repairing.

Criteria for judgement

The level of agreement is judged by the average point in different scale as follows.(Prakong Kannstutra,2525:77)

Average point	4.50 – 5.00	Highly agree
	3.50 – 4.49	Highly agree
	2.50 – 3.49	Moderately agree
	1.50 – 2.49	Slightly agree
	1.00 – 1.49	Very slightly agree

4. Quality of research tools

Quality of research tools were measured by content validity and reliability testing as follow.

1. Content validity Testing

The questionnaires had been constructed screened by research advisor and passed validity test by three experts.

2. Reliability Testing

The adjusted questionnaires had been tried out by asking 30 hospital personnels at Paktho hospitals, Rajburi to fill up the questionnaires. The data was tested for reliability using alpha coefficient by Cronbach Method using formula suggested by Boondham Kijpreda borisuthi

$$r_{tt} = \frac{k}{k-1}\left(1\frac{\sum s_2^1}{s_x^2} -\right)$$

s_x^2 = ความแปรปรวนของคะแนน

$\sum s_1^2$ = ผลรวมของค่าความแปรปรวนของคะแนนแต่ละข้อ

k = จำนวนข้อของแบบสอบถาม

The test result, reliability of maintenance work was 0.9031, reliability of problems and constraint of maintenance work was 8.8417

5. Data collection

Data was collected in two steps:

1. The research sent the letter of graduate school Mahidol University asking for cooperation from the hospital director to allow the concerned personnel to fill up questionnaires and sent back to researcher.

2. Two weeks after the letter being sent, the questionnaires were collected. The collection took one month from 27 December 2004 – 26 January 2005.

6. Data Processing

1. After questionnaires being collected the following processes were undertaken

1).Checking for completeness of information.

2).Construct manual for coding.

3).Coding the questionnaires.

4).Coding in computer and process data using package program.

2. Data analysis was undertaken as follows:

1). Descriptive statistics such as percentage, average, standard deviation were used to analyse gender, age, duration of civil service, duration of service in present position, education, experience and work place.

2) Analytic statistics was employed as follows.

- Analyse the relationship between personal characteristics and maintenance work, problems and constraints, job satisfaction, suggestion to improve maintenance work by using Pearson Product Moment Correlation.
- Compare the difference between personal characteristics of the administrative staffs with maintenance operation using Man-Whitney U test and t- test.

3. Assign statistical significance point at 0.05

In summary chapter 3 is consisted of research format, area and population to be studied, research tools, testing of research tool, data collection ,data processing and statistics employed in research. All data was coded, processed and analysed. The analysis is presented in chapter 4, discussion in chapter 5 conclusion and recommendation is in chapter 6.

CHAPTER 4
RESULTS

After sending questionnaires to three groups of study population which composed of 19 persons from administrative staff, 119 from clients using maintenance services, and 2 from maintenance technicians or service provider, the questionnaires were collected, analysed and processed. Result of the study is presented into five parts from three main groups of the population as follows:

Part 1 Personal characteristics of respondents
Part 2 Maintenance operation
Part 3 Problems/obstacles in maintenance operation
Part 4 Relationship between personal characteristics and maintenance operation including problems /obstacles
Part 5 Suggestion and recommendations

1. Hospital administration staff

Part 1: Personal characteristics of respondents

Personal characteristics of the administrative staffs could be presented as follows:

Gender: Most of the administrative staff (73.3%) were women whereas 26.3 % were men.

Age: Person who were more than 40 years old were the majority(68.4%) whilst person with the age between 30-39 years old were 21.1%, the age between 20-29 years old were 10.5%.Average age of this group was 41.6 years old.

Length of government service: People with the length of service between 21-30 years were the majority (42.1%) ,between 11-20 years were 36.8%, between 1-10 years were 15.8%, only 5.3% of the group had served in the government more than 31 years. The average length of service among this group was 17.79 years.

Length of service in present position: The number of persons who had served in the present position for 1-5 years, 6-10 years and 11-15 years were exactly the same, each group was 26.3% .The people with lengthiest service (more than 16 years) was 21.1%. Average length of service in the present position was 10.95 years.

Education: People with bachelor education were 73.7%,less than bachelor was 21.0% while with master degree was 5.3%

Experience: Most the group had opportunity to participate in study visit (68.4%) while the rest (31.6%) never had such experience.

Position: About 68.4% were unit chief 15.8% were section chief, 10.5% were sector chief and 5.3% was the hospital director.

Work place:

General administration section

Each 5.3% of the group worked at secretarial, supply and maintenance, nutrition, medical record and statistics units.

Technical service sector

Each 5.3% of the group worked at radiology and pharmacy units.

Medical service sector

Each 5.3% of the group worked at general medicine, Thai traditional medicine and alternative medicine unit while 10.5% of the group worked at dental service.

Family Medicine sector

One person (5.3%) worked at family medicine sector.

Nursing service sector

Fifteen point eight percent worked at out- patient unit, 5.3% worked at in-patient unit and 21.1% worked at emergency unit.

Table1 Percentage of hospital administrative staff classified by personal characteristics.

Personal characteristics	Number (n=19)	Percentage
Gender		
Male	5	26.7
Female	14	73.3
Age (years)		
20 – 29	2	10.5
30 – 39	4	21.1
40+	13	68.4
$\bar{X}$ = 41.16	S.D.= 6.86	Min. = 26 Max. = 54

Table1 Percentage of hospital administrative staff classified by personal characteristics. (cont.)

Personal characteristics	Number (n=19)	Percentage
Length of government service (years)		
1 – 10	3	15.8
11 – 20	7	36.8
21 – 30	8	42.1
31+	1	5.3
$\bar{X}$ = 17.79 S.D. = 7.53 Min. = 2 Max. = 34		
Length of service in present position (years)		
1 – 5	5	26.3
6 – 10	5	26.3
11 – 15	5	26.3
16+	4	21.1
$\bar{X}$ = 10.95 S.D. = 6.79 Min. = 1 Max. = 23		
Education		
Less than bachelor	4	21.0
Bachelor	14	73.7
Master	1	5.3
Experience of training / study visit		
Yes	13	68.4
No	6	31.6
Position		
Hospital director	1	5.3
Sector chief	2	10.5
Section chief	3	15.8
Unit chief	13	68.4

Table1 Percentage of hospital administrative staff classified by personal characteristics. (cont.)

Personal characteristics	Number (n=19)	Percentage
Work place		
Administration section		
Secretarial unit	1	5.3
Supply and maintenance unit	1	5.3
Nutrition unit	1	5.3
Medical record and statistics	1	5.3
Technical service sector		
Radiology unit	1	5.3
Pharmacy unit	1	5.3
Medical service sector		
General medicine unit	1	5.3
Dental service unit	2	10.5
Thai traditional medicine and alternative medicine unit	1	5.3
Family medicine sector		
Family medicine unit	1	5.3
Nursing service sector		
Out- patient unit	3	15.8
In- patient unit	1	5.3
Emergency unit	4	21.1

Part 2 Maintenance operation

2.1 Importance of maintenance work and attitude toward the maintenance system of hospital.

The administrative staff provided average value and standard deviation of the importance of the hospital maintenance system as follows.

Importance of maintenance: Administrative staff considered the importance of maintenance system at high value (4.37 out of 5.00)

Hospital maintenance system: Administrative staff provided average value toward the system as follows.

Internal coordination within in the hospital" high" (4.16), directing "high" (3.89), written job responsibility and monitoring "high" (3.84), reporting the performance and maintenance cost "high"(3.37), administrative structure of maintenance work "high"(3.68), planning of maintenance work "high"(3.58), evaluation of maintenance work and appropriate personnel "high"(3.53), external coordination outside hospital "medium"(3.47), overall opinion about maintenance system "high"(3.74),

In summary, the administrative staff gave high value toward maintenance system and had positive value toward the work in almost every aspest except external coordination which needed improvement.

Table 2 Mean and standard deviation of maintenance work and importance of maintenance system

Importance of maintenance system and comment toward present work	$\bar{X}$	**S.D.**
Importance of maintenance system	4.37	0.76
Comment toward present work		
Clear planning	3.58	0.96
Administrative structure	3.68	1.00

Table 2 Mean and standard deviation of maintenance work and importance of maintenance system (Cont.)

Importance of maintenance system and comment toward present work	$\bar{X}$	**S.D.**
Job description	3.84	0.96
Monitoring and control	3.84	0.90
Directing	3.89	0.74
Internal coordination	4.16	0.60
External coordination	3.47	0.61
Reporting	3.79	0.54
Evaluation	3.53	0.77
Maintenance cost	3.79	0.63
Personnel	3.53	0.84
Over comment toward present work	3.74	0.56

2.2 Maintenance work which needed improvement and characteristics of maintenance technician

Maintenance work which needed improvement:

The administrative staff provided average value for this topic "medium" (2.89)

Characteristics of maintenance technicians:

The administrative staff provided average value for characteristics of technician as follows:

The technician had appropriate knowledge "high" (3.68), capability in repairing work "high" (3.74), job responsibility "high" (4.05), dedicative to work

"high" (3.68), human relationship with other section member "very high" (4.58) and overall characteristics of technician "high" (3.94)

In summary the administrative staff commented that some of the maintenance work should be improved. However, for the characteristics of the technicians presently working the administrative staff provided highest value for human relationship of the technician and secondly was the responsibility. The overall comment of the technician was satisfactory as detail in Table 3.

Table 3 Mean and standard deviation of maintenance work, maintenance work which should be improved and characteristics of maintenance technician provided by administrative staff (n=19)

Maintenance work should be improved and characteristics of maintenance technicians	$\bar{X}$	**S.D.**
Maintenance work should be improved	2.89	0.94
Characteristics of maintenance technicians		
Knowledgable	3.68	0.58
Capable	3.74	0.56
Responsible	4.05	0.71
Dedicative	3.68	0.75
Good Human relation	4.58	0.61
Overall characteristics	3.94	0.47

2.3 Workplace and tools storage house

Appropriateness of workplace: Administrative staff provided" medium" value for appropriateness of workplace for maintenance operation (2.84), appropriateness of storage house for tools was given " medium" (2.68)

In summary, the administrative staff considered the appropriateness of working place and tools storage house for maintenance work as medium which means the improvement was needed to facilitate the working environment for maintenance as in table 4

Table 4 Mean and standard deviation of workplace and tool storage-house (n=19)

Workplace and tool storage-house	$\bar{X}$	**S.D**
Appropriateness of workplace	2.84	1.12
Appropriateness of tool storage-house	2.68	1.16

2.4 Maintenance operation and equipment operator

Equipment operators: The administrative staff provided average value for equipment operators as follows:

Operators were knowledgable about the equipment at "medium"(3.47), carefulness in operating "medium"(3.47), responsibility in operating "medium"(3.47) overall picture of equipment operator "medium"(3.45)

In summary, the administrative staff of the hospital had "medium" attitude for operators of equipment in knowledge, carefulness, responsibility. This could be interpreted that the improvement of "user" or "operator" side is urgent as detail in table 5.

Table 5 Mean and standard deviation in maintenance operation to equipment operator issue, administrative perspective (n=19)

Equipment users	$\bar{X}$	**S.D.**
Knowledgeble	3.47	0.70
Study operator s manual	3.47	0.70
Carefulness in operating	3.47	0.96
Responsibility in operating	3.37	0.96
Overall point of view	3.45	0.72

2.5 Support and satisfaction toward maintenance operation

Support: Mean for support and satisfaction from administrative staff was " high"(3.74) as in table 6.

Table 6 Mean and standard deviation in support and satisfaction, from administrative staff perspective (n=19)

support and satisfaction	$\bar{X}$	**S.D.**
Support	3.74	0.65
Satisfaction	3.74	0.56

Part 3 Problem and obstacles in maintenance operation.

3.1 Maintenance system

Average and standard deviation value toward problems/ obstacle of maintenance system from administrative staff point of view were "medium" (2.63) which were stocking of spare part, preventive maintenance and corrective maintenance.

Overall picture of maintenance system had problems/obstacle at medium value (2.67)

In summary the administrative staff considered that there were many problems/obstacle in maintenance system which should be minimized or corrected as in table 7.

Table 7 Mean and standard deviation problems/ obstacles of maintenance operation, maintenance system issue, administrative staff perspective

Maintenance system	$\bar{X}$	**S.D.**
Maintenance system		
Preventive maintenance	2.63	0.68
Corrective maintenance	2.63	0.83
Spare part stocking	2.74	0.73
Overall of maintenance system	2.67	0.62

3.2 Performance of maintenance technician

Administrative staff provided value of their opinion for the performance of maintenance technicians as follows: "medium" (2.63) for implementation, "medium"

(2.50) for evaluation , "medium" (2.53) for planning, "medium" (2.53) for application of evaluation value, "medium" (2.47) for external coordination, "medium" (2.32) for reporting, and "medium" (2.47) for over-all performance of maintenance technicians as in table 8.

Table 8 Mean and standard problems / obstacles of maintenance operation, performance of maintenance technician issue, administrative staff issue (n=19)

Performance of maintenance technicians	$\bar{x}$	**S.D.**
Planning	2.53	0.70
Implementing	2.63	0.83
Internal coordination	2.26	1.10
External coordination	2.47	0.84
Reporting	2.32	0.82
Evaluation	2.58	0.96
Application of evaluation result	2.53	0.91
Overall of the performance	2.47	0.62

3.3 Practice of maintenance clients

The practice of maintenance clients received the average value and S.D in administrative staff perspective as follows:

Requesting for service "medium" (2.79), "medium" (2.74) for caring of equipment and "medium" (2.70) for over-all practice.

In summary the administrative had given "medium" score for the practice of maintenance clients in every aspect which means that the practice of clients needs improvement as in table 9.

Table 9 Mean and standard problems/obstacles in maintenance operation, practice of clients issue, administrative staff perspective (n= 19)

Practice of clients	$\bar{X}$	**S.D.**
Caring of equipment	2.74	0.93
Resquesting for service	2.79	0.98
Overall practice	2.70	0.90

3.4 Cost, repairing equipment and toll, workplace and time required for maintenance operation

The administrative staff gave value for problem / obstacle in many issues relating to many factors as follows:

"low" (2.37) for maintenance cost, "medium" (2.68) for repairing equipment and tool, "medium" (2.58) for work place, "low" (2.42) for time required for repairing during office hour and "low" (2.26) for time required for repairing after office hour.

In summary the administrative staff considered that there were "medium " level of problems relating to repairing equipment and tool and work place which means that these two issues need improvement. However the problem issues in maintenance cost and time required for repairing both during office hour and after office hour were given "low" which means that there are not much problem these issues as in table 10.

Table 10 Mean and standard problem / obstacle in maintenance operation; issues of maintenance cost, repairing equipment and tool, work place, time required for repairing (n=19)

Cost, repairing equipment and tool work- place, Time required for repairing	$\bar{X}$	**S.D.**
Maintenance cost	2.37	0.96
Repairing equipment and tool	2.68	0.95
Work-place	2.58	0.84
Time required for repairing during office hour	2.42	1.12
Time required for repairing after office hour	2.26	1.05

- General administration
- Tresury and accounting
- Logistic and maintenance
- Nutrition
- Information/statistics
- Quality/Standard Improvement

- Medical service sector
- Emergency medicine
- General medicine
- Dental service
- Thai traditional medicine And alternative medicine
- Technical service sector
- rehabilitative medicine
- Pathology
- Radiology
- Pharmacy
- Family medicine and community service
- Community health service

- Out-patient
- In-patient
- Emergency

Source: Office of Permanent Secretary MOPH and Office of civil service commission

Figure 2 Organization structure of community hospital

Office of Permanent Secretary MOPH and office of civil services commission had set up organization structure and manpower requirement for community hospital. The organization is composed of three main tasks as follows:

1. Directing Task consisted of general administration, treasury and accounting, logistics and maintenance, nutrition, information and statistics and improvement of quality / standard.

2. Service Task consisted of

2.1 Medical service sector consisting of emergency medicine, general medicine, dental service, Thai Traditional medicine and alternative medicine.

2.2 Technical service sector consisting of rehabilitative medicine pathology, radiology and pharmacy.

2.3 Family medicine and community service section consisting of community health service.

3. Nursing service task consisting of out-patient, in-patient and emergency service.

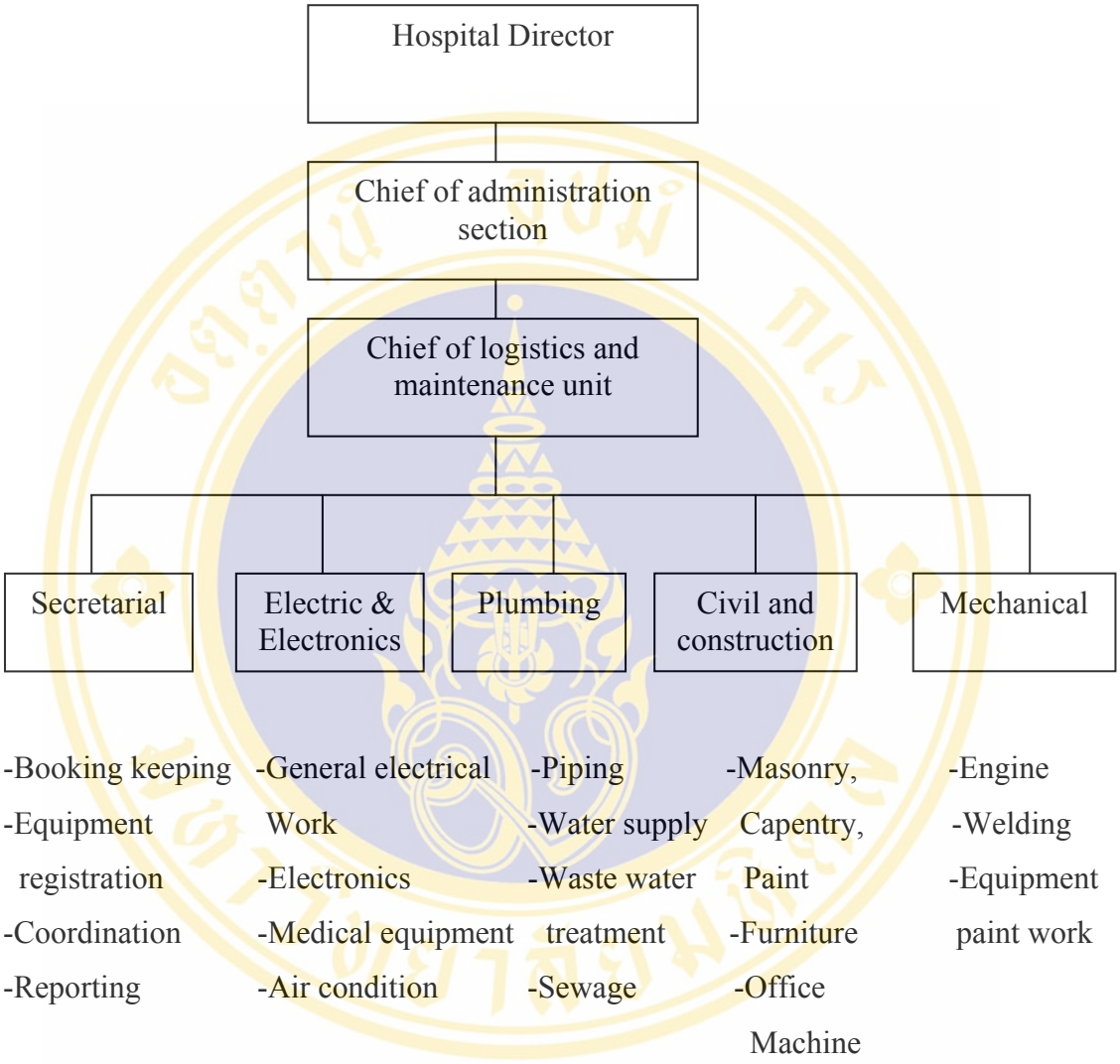

Figure 3 Organization structure of community hospital maintenance unit

The hierarchical structure of maintenance unit is consisted of hospital director, chief of logistics unit main work in maintenance operation are consisted if secretarial work, electricity and electronics, plumbing, civil and construction, mechanical work and welding.

Part 4 Relationship between personal characteristics and maintenance operation including problem / obstacle**:**

4.1 Relationship between personal characteristics and maintenance operation

Statistical analysis found positive relationship at high level with highly statistical significance (r=0.899, p< 0.001) between number of requesting for service and maintenance operation. But there were no relationship between age, experience, length of service in hospital, length of service in present position operation.

In summary it means that the more request for service the more maintenance operation will occur as in table 11.

Table11. Relationship between personal characteristics and maintenance operation, administrative staff (n=19)

personal characteristics	**maintenance operation**	
	r	**p-value**
Age	-0.159	0.514
Experience	-0.316	0.187
Length of service in hospital	0.011	0.963
Length of service in present position	-0.126	0.607
Number of requesting for service	0.899	≤0.001

4.2 Relationship between personal characteristics and problems / obstacle

Statistical analysis found no relationship between age, experience, length of service in hospital, length of service in present position of administrative staff and problems / obstacles of maintenance operation as in table 12.

Table 12 Relationship between personal characteristics and problems / obstacles of maintenance operation, administrative staff perspective.

	Problems / obstacles	
Personal characteristics	**r**	**p-value**
Age	-0.117	0.634
Experience	0.030	0.904
Length of service in hospital	0.008	0.973
Length of service in present position	0.183	0.454

4.3 Relationship between maintenance operation and problems / obstacles

Statistics analysis found negative relationship between maintenance system and problems / obstacles. (statistically significant r= 0.530, p=0.020) which means that if there is good system the problems / obstacle will be minimized. Improvement of maintenance work had positive relationship with problem / obstacles. However it was found that number of request for service, importance of maintenance characteristics of maintenance technicians, appropriateness of work-place, storage-house of repairing tools, characteristics of clients and hospital support had no relationship with problems / obstacles of maintenance as in table 13.

Table 13 Relationship between maintenance operation and problems / obstacles (n=19)

Maintenance operation	problems / obstacles	
	r	p-value
Requests for service	0.292	0.225
Importance of maintenance	-0.287	0.234
Maintenance system	-0.530	0.020
Maintenance improvement	0.715	0.001
Characteristics of maintenance technicians	-0.431	0.065
Appropiateness of work-place	-0.289	0.230
Storage-house for repairing tool	-0.319	0.183
Characteristics of clients	-0.384	0.105
Hospital support	-0.335	0.161

4.4 Comparison between personal characteristics and maintenance operation

Statistical analysis between personal characteristics of administrative staff and maintenance operation found that:

Gender: There was not any difference of operation about maintenance operation among difference gender p=0.229 denying hypothesis which means that gender difference of administrative staff had no effect upon maintenance operation.

Job characteristics:

There was not any statistically significant difference of opinion about maintenance operation among people with different job characteristics (p=0.136) denying 1st hypothesis confirming that different job characteristics did not affect the opinion about maintenance operation.

Education:

There was not any statistically significant difference of opinion about maintenance operation among people with different education (p=0.920) denying 1st hypothesis confirming that difference of education did not affect opinion about maintenance operation as detail in table 14.

Table 14 Comparison of different personal characteristics with maintenance operation

Personal characteristics	**maintenance operation**				
	N	$\bar{x}$	S.D.	U-test*	p-value
Gender				22.00	0.229
Male	5	3.72	0.95		
Female	14	4.27	0.88		
Job characteristics				22.00	0.136
Director/sector chief, section chief	6	3.66	0.88		
Unit chief	13	4.35	0.87		
Education				29.00	0.920
Diploma	4	4.15	0.95		
Bachelor/master	15	4.12	0.93		

*Mann- Whiney U test

4.5 Relationship between personal characteristics, maintenance operation and satisfaction

Statistical analysis of relationship between personal characteristics maintenance operation and satisfaction found the following result:

Personal characteristics:

There was no relationship between age, work experience, length of service in the organization, length of service in present position, job characteristics and satisfaction

Maintenance operation:

There were statistically significant positive relationship between importance of maintenance and satisfaction (r=0.629,p=0.004), maintenance system and satisfaction (r=0.531,p=0.019), maintenance technician and satisfaction (r=0.617, p=0.005) work place for maintenance and satisfaction (r=0.460, p=0.047). There was no relationship between requesting for service, storage-house for repairing tool, clients and satisfaction.

Problems / obstacles:

There was no relationship between problems / maintenance and satisfaction. In conclusion factors in administrative staff point of view which had been statistically analysed that had " no" relationship with their satisfaction of maintenance operation were personal characteristics, requesting for maintenance service, storage-house for repairing tools, clients and problems / obstacles. But factors which " had " relationship with satisfaction were importance of maintenance, maintenance system, maintenance technician and work-place for maintenance operation as detail in table 15.

Table 15 Relationship between personal characteristics, maintenance operation and satisfaction (n=19)

Personal characteristics and maintenance operation	satisfaction	
	r	p-value
Personal characteristics		
Age	-0.075	0.760
Experience	-0.294	0.222
Length of service in hospital	0.039	0.875
Length of service in present position	-0.106	0.667
Maintenance operation		
Requesting for service	0.211	0.386
Importance of maintenance	0.629	0.004
Maintenance system	0.531	0.019
Maintenance technician	0.617	0.005
Work-place for maintenance	0.460	0.047
Storage-house for repairing tool	0.292	0.225
clients	0.135	0.538
Problems / obstacles	- 0.449	0.054

4.6 Relationship between personal characteristics, maintenance operation and maintenance work which should be improved.

Statistical analysis of the relationship found the following:

Personal characteristics:

Personal characteristics (age, experience, length of service in the hospital and in present position, had no relationship with maintenance work which should be improved.

Maintenance operation:

Maintenance operation (requesting for service, importance of maintenance, maintenance system, maintenance technician, work-place for maintenance, storage-house for repairing tool and clients) had no relationship with maintenance work which should be improved.

In conclusion personal characteristics and maintenance operation had no relationship with maintenance work which should be improved in the perspective of administrative staff as detail in table 16.

Table 16 Relationship between personal characteristics, maintenance operation and maintenance work which should be improved, administrative staff perspective (n=19)

Personal characteristics, maintenance operation	**maintenance work which should be improved**	
	r	**p-value**
Personal characteristics		
Age	-0.257	0.289
Experience	-0.170	0.487
Length of service in hospital	-0.366	0.123
Length of service in present position	-0.313	0.191

Table 16 Relationship between personal characteristics, maintenance operation and maintenance work which should be improved, administrative staff perspective (n=19) (Cont.)

Personal characteristics, maintenance operation	maintenance work which should be improved	
	r	p-value
Maintenance operation		
Requesting for service	0.105	0.670
Improve of maintenance	-0.021	0.934
Maintenance system	-0.179	0.464
Maintenance technician	-0.265	0.272
Work-place for maintenance work	-0.070	0.777
Storage-house for repairing tools	-0.135	0.582
Clients	-0.254	0.294

Part 5 Suggestion and recommendation

The administrative staff had many recommendations relating to maintenance work which could classified into four groups as follows:

Maintenance system:

The requesting for service should be divided into two categories as regular request and emergency request. For regular service the client should send the written request to administrative section then the request will be forwarded to logistic unit and the maintenance technician in emergency case the verbal request should be directed to logistics unit to notify the technician and the written request will be follows as in regular case.

There should be priority setting for maintenance by setting criteria for importance and emergency. The maintenance record to all equipment should be

properly kept, allowance time for each repairment should be known, in the case of using external repairment the client should be notified and monitoring system should be set up. The maintenance technician should have appropriate knowledge of the work.

Performance of maintenance technicians:

There should be definitive plan of action, system for routine maintenance of equipment should be established, the maintenance technician and equipment operators should collaboratively work together to occasionally develop knowledge about maintenance and the system of equipments.

2.Clients Group

Part1. Personal Characteristics of respondents

Work-place for maintenance work:

Presently work- place is too small and inconvenient to provide service. Recording system of equipment has not been set up, the equipments were scattering placed, thus the 5 principles of office management should be encouraged.

Gender: Most of clients were female (79.8%) while the rest were male. (20.2%)

Employment status: Most of clients were government official (63.9) while the rest employee (36.1)

Position: Most of the clients implementing personel (79%) while the rest were supeursors16%

Work-place:

Most of the clients worked in nursing sector (51.3%),18.5% worked in administrative section, 10.9% at technical service sector and family medicine sector. While 9.2% worked in medical service sector.

Age: Most of the clients were 30-39 years of age (40.7%), 29.6% were 40 years old and over, 24.4% were 20-29 years while average age was 35.18 years.

Length of service in the hospital:

Majority of the clients 41.2% had been working in the hospital for 6-10 years ,32.8% for more than 10 years and 26.1% for 1-5 years . Average length of serving in the hospital was 9.3 years.

Length of service in present position:

Thirty nine point five percent of clients had been working in the pre sent position for 6-10 years; 38.7% for 1-7 years and 21.8% for more than 10 years. Average length of service in present position was 7.75 years.

Education:

Fifty three point eight percent of clients had bachelor education,18.5% had secondary education,9.2% had diploma 7.6% had finished 9^{th} grade and master education.

Frequency of requesting for service:

Thirty eight point one percent of clients had made 1-5 requests for service,30.5% nerver made any request, 19.55 made 6-10 request, 11.9% made more than 11 request. Average number of request was 6.17 as detail in table 17.

Table 17 Personal characteristics of clients classified by percentage.

Personal characteristics	Number	Percentage
Gender		
male	24	20.2
female	95	79.8
Employment		
Government office	6	63.9
Government employee	43	36.1
position		
Hospital director	1	0.8
Sector chief	2	1.7
Section chief	3	2.5
Unit chief	19	16.0
Implementer	94	79.0
Work-place		
Administrative section	22	18.5
Technical service sector	13	10.9
Medical se	11	9.2
Family medicine sector	13	10.9
Nursing service sector	61	51.3
Age		
20 – 29 years	9	24.4
30 – 39 years	58	48.7
<40 years	32	29.6

$\bar{X}$ = 35.18 S.D. = 6.52 MIN.= 21 MAX. = 54

Table 17 Personal characteristics of clients classified by percentage.(cont.)

Personal characteristics	Number	Percentage
Length of service in the hospital		
1-5 years	31	26.1
6-10 years	49	41.2
<10 years	39	32.8
$\bar{X}$ = 9.35 S.D. = 5.52 MIN.= 1 MAX. = 21		
Length of service in present position		
1-5 years	46	38.7
6-10 years	47	39.5
<10 years	26	21.8
$\bar{X}$ = 7.75 S.D. = 5.09 MIN.= 1 MAX. = 23		
Education		
Primary	9	7.6
Early secondary	9	7.6
Secondary	22	18.5
Diploma	11	9.2
Bachelor	64	53.8
Master	4	3.4
Frequency of request for service		
Never	36	30.5
1 – 5 times	45	38.1
6 – 10 times	23	19.5
<11 times	11	11.9
$\bar{X}$ = 6.17 S.D.= 9.84 MIN. = 0 MAX. = 51		

Part 2 Maintenance Operation

Mean and standard deviation from the opinion of clients relating to maintenance operation were as follows:

The clients had "medium" value for their knowledge about maintenance system (2.97).Their opinion about the maintenance officials and their work were as follows:

The capability of maintenance technician was high (3.74), sacrifice for the work was high (3.61), promptness of service was medium (3.45), follow up for service was medium (3.30) caring of the equipment by technicians was medium (3.23).

Overall picture**:** about maintenance operation was high (3.43)

In conclusion since the study found that the clients had "medium" knowledge about maintenance operation three is the need to improve the knowledge and understanding among clients.

The clients opinion about maintenance operation is shown in table 18.

Table 18 Mean and standard deviation about maintenance operation, perspective of Clients

Maintenance operation	$\bar{X}$	**S.D.**
Knowledge about maintenance system	2.97	1.08
Opinion about maintenance operation		
Caring of equipment by technician	3.23	0.86
Promptness	3.45	0.76
Follow up of the work	3.30	0.77
Sacrificing for the work	3.72	0.74

Table 18 Mean and standard deviation about maintenance operation, perspective of Clients (Cont.)

Maintenance operation	$\bar{X}$	**S.D.**
Capability of technician	3.74	0.65
Quality of the work	3.61	0.63
Over-all opinion about operation	3.51	0.53
Over-all of the maintenance operation	3.43	0.51

Part 3 Problems / obstacles in maintenance operation

3.1 Problems / obstacles in maintenance operation system.

Average value and S.D. about problems / obstacles about the system were as follows:

"Medium" for routine maintenance by clients (3.09), "medium" for follow up of work (3.00)," low" for maintenance by requesting for service (2.82)

Overall picture of problems / obstacles was "medium" (2.69)

In conclusion, the overall problems / obstacles, obstacles of maintenance system was "medium" especially the routine maintenance by clients and the follow-up of the work thus it is necessary to improve the routine maintenance of the client and the follow-up work.

However the problems about the maintenance by technicians and requesting for service were "low" as in table 19.

Table 19 Mean and standard deviation problems / obstacles about maintenance operation, perspective of clients (n=119)

Maintenance	$\bar{X}$	**S.D.**
Routine maintenance by clients	3.09	1.12
Maintenance by technicians	2.91	0.92
Requesting for service	2.82	1.02
Follow-up of work	3.00	0.93
Over-all of maintenance system	2.96	0.82

3.2 Problems / obstacles of maintenance operation relating to technicians work-place, time service to available, in working hour and after working hour, perspective of clients.

The mean and standard 3d about problems / obstacles relating to maintenance operation were as follows:

"Medium" for technician (2.86)

"Medium" for work-place (2.80)

"Medium" for time service available during working hour (2.97)

"Medium" for time service available after working hour (2.66)

"Medium" for time required for maintenance service (2.81)

In conclusion, problems / obstacles relating to maintenance operation in the perspective of clients were "medium" as in table 20

Table 20 Mean and S.D. problems / obstacles of maintenance operation relating to maintenance technicians, work-place, time service available, perspective of clients (n=119)

Problems / obstacles of maintenance operation	$\bar{X}$	**S.D.**
Maintenance technician	2.86	1.11
Work-place	2.80	0.96
Time service available		
During working-hour	2.97	1.10
After working-hour	2.66	1.33
Over-all time required for maintenance	2.81	0.94

Overall problems / obstacles of maintenance operation was "medium" (2.88)

Table 21 Mean and standard diviation for over-all problems / obstacles of maintenance operation, perspective of clients.(n=119)

Problems / obstacles of maintenance	$\bar{X}$	**S.D.**
Maintenance system		
Maintenance by clients	3.09	1.12
Maintenance by technicians	2.91	0.92
Requesting for services	2.82	1.02
Follow-up of work	3.00	0.93
Overall of maintenance system	2.96	0.82
Technicians	2.86	1.11
Work-place	2.80	0.96

Table 21 Mean and standard diviation for over-all problems / obstacles of maintenance operation, perspective of clients.(n=119) (Cont.)

Problems / obstacles of maintenance	$\bar{X}$	**S.D.**
Time, service available		
During working hour	2.97	1.10
After working hour	2.66	1.33
Overall time required for maintenance	2.81	0.94
Overall problems and obstacles	2.88	0.77

Part 4 Relationship between personal characteristics and maintenance operation and problems / obstacles

4.1Relationship between person characteristics and maintenance operation

Statistical analysis found no relationship between personal characteristics(age, length of service in the hospital, in present position, frequency of request for service) with maintenance operation as in table 22.

Table 22 Relationship between person characteristics and maintenance operation, (n=119)

Person characteristics	**Maintenance operation**	
	r	**p-value**
Age	0.174	0.059
Length of service in hospital (years)	0.050	0.591
Length of service in present position (year	0.104	0.261
Frequency of request for service(time)	-0.011	0.908

4.2 Relationship between personal characteristics and problems / obstacles.(n=119)

Statistical analysis between personal characteristics and problems / obstacles found that:

Length of service in the hospital had statistically significant negative relationship with problems / obstacles (r=-0.193, p=0.035)

However age, length of service in present position and frequency of request for service had no relationship with maintenance operation with statistically significant value <0.05

In conclusion length of service in the hospital had relationship with problems / obstacles as in table 23.

Table 23 Relationship between personal characteristics and problems / obstacles (n=119)

Personal characteristics	**problems / obstacles**	
	r	**p-value**
Age	-0.006	0.477
Length of service in hospital (years)	-0.193	0.035
Length of service in present position (years)	-0.111	0.231
Frequency of request for service (times)	-0.051	0.580

4.3 Comparison of different personal characteristics and maintenance operation

Different personal characteristics of clients did not make any difference about their opinion toward maintenance operation as confirmed by t- test (p=0.359, 0.070, 0.080 and 0.570 consecutively) as in table 24.

Table 24 Comparison of different personal characteristics and maintenance operation, clients

Personal characteristics	**Maintenance operation**			**t -test**	**df**	**p-value**
	n	$\bar{x}$	**S.D.**			
Gender						
Male	24	3.52	0.52	0.92	117	0.359
Female	95	3.41	0.52			
Employment status						
Government official	76	3.42	0.53	-0.33	117	0.74
Government employee	43	3.45	0.49			
position						
Administrative	25	3.59	0.62	1.73	117	0.08
Implementors	94	3.40	0.48			
Education						
Below bachelor	51	3.46	0.49	0.57	117	0.57
Bachelor and higher	68	3.40	0.54			

4.4 Relationship between personal characteristics and maintenance operation and satisfaction

Personal characteristics:

The study found no relationship between personal characteristics (age, length of service in hospital, length of service in present position, education, frequency of request of request for service, and satisfaction.

Maintenance operation:

The study found positive relationship between knowledge about maintenance system and satisfaction with statistically significant (r= - 0.262,p=0.004)

In summary conclusion three was no relationship between personal characteristics satisfaction but there was positive relationship between maintenance operation and satisfaction as in table 25.

Table 25 Relationship between personal characteristics, maintenance operation and satisfaction clients.

Personal characteristics and maintenance operation	**Satisfaction**	
	r	**p-value**
Personal characteristics		
Age	0.111	0.230
Length of service in hospital (years)	0.020	0.831
Length of service in present position (years)	0.095	0.305
Frequency of requesting for service (times)	-0.075	0.421
Maintenance operation		
Knowledge about maintenance system	0.262	0.004

4.5 Relationship between maintenance operation and problems / obstacles

Statistical analysis found positive relationship between knowledge of maintenance work and problems / obstacles (r=0.208,p=0.012), between routine maintenance by users and problems / obstacles (r=0.326, p=<0.001). However the promptness of service, follow up of the work, dedicative to work, capability of technician and quality of service had no relationship with problems / obstacles as shown in table 26.

Table 26 Relationship between maintenance operation and problems / obstacles clients (n=119)

Maintenance operation	**problems / obstacles**	
	r	**p-value**
Knowledge of maintenance	0.208	0.012
Opinion about maintenance operation		
Caring of equipment by technicians	0.326	<..0.001
Promptness of service	0.062	0.251
Follow up of the work	0.040	0.332
Sacrificing for work	-0.081	0.190
Capability of technicians	0.070	0.224
Quality of maintenance work	0.070	0.219

Part 5 Suggestions and recommendations

1. Maintenance system

1.1 Maintenance system by users

The users should have daily checking of equipments, formulate primary maintenance plan for weekly and monthly check. Every user should receive training and adequate information about the equipment so that everyone could operate the machine (with confidence).

User's manual should be established, the users should be able to describe the irregular symptom of the equipment as precisely as possible so that the maintenance could be done correctly.

1.2 Maintenance system by maintenance unit.

In urgency the technician should respond at once upon being notified by phone, the written request will follows. There should be priority in providing maintenance service stocks of spare-part should be reading available. Time frame for each repairment should be set and notification to user should be made in case the repairing work was not completed. The maintenance plan for equipment of the whole hospital should be set up and follows:

2. Performance of technician.

Technicians should be able to always keep up with new knowledge because there is continuing development of equipment. It would be better to be able to do repairing work by hospital technician because it was safer both in time and expenses.

3. Work-place for maintenance.

The maintenance shop was too small the equipments were not kept in order the place was not clean. The practice of 5-ways to improve office should be implemented.

4. Time, service available.

4.1 During working hour.

In urgency, the technician should respond as soon as being notified.

4.2 After working hour

There should be “ on call“ system and special payment should be available for technician who work after working hour.

3. Maintenance technicians

Part 1 Personal characteristics of respondents

There were two maintenance technicians both of them were demporary employees of the hospital. The first one was a 4o years old man with secondary education. He used to be technician assistant for 10 years and had expenience of working in the factory before joining the hospital. The second man was 35 years old with diploma in electrical engineering, he had experience of being assistant for 5 years. Both of them used to be the technician in Department of labor Bangkok, they were very satisfied with assigned work.

Part 2 maintenance operation

Maintenance technician’s opinion about the operation which were knowledge, importance and improvement of maintenance work were “high”

Dedication to work, human relation, acceptance of other’s opinion and unity also received “high” score.

Support from supervisor, clarity in direction, advice, decision, supervision, coordination, promptness in solving problem, acceptance of other’s opinion also received “high” score

However the maintenance operation by users, human relation, responsibility in talking care of equipment, cooperation in solving problem and satisfaction for the service received “medium” score from maintenance technicians perspective.

The maintenance technician gave “low” score for repairing tool and maintenance work-place.

Part 3 Problems / obstacles in maintenance operation

The maintenance technicians provide “medium” score for problems / obstacles about preventive and corrective maintenance, spare-part stocking, clients, administrative staff, supportive equipment work-place and time service available.

Part 4 Suggestion and recommendation

There should be daily, weekly and monthly maintenance plan, pre-operative checking should be employed. Training about operating and maintaining of specially care equipment should be done.

4.1 Maintenance system under the maintenance unit

There should be priority setting for maintenance work. The technicians should receive continuous training to be able to take care of many types of equipment. The time-frame for each maintenance work should be notified to the client and informed them if time-frame could not be fulfilled.

4.2 Performance of maintenance technician

The technicians should be equipped with electronic page so that they could be reached all the time.

4.3 Work-place

There should be improvement for work-place to be cleaner and more orderly to facilitate the working environment

4.4 Time service available

During working hour the maintenance could be requested without much difficulty however during after working hour there should be “on call” system and special subsidy should be paid as incentive for technicians.

CHAPTER 5
DISCUSSION

Data analysis and conclusion on task development in maintenance work (a case study of Bangphae Hospital) had been presented in chapter 4. The discussion about the result of research was presented concerning with three groups of respondents, the administrative staff, clients (equipment operator) and service providers (maintenance technician)

Administrative staff

1. Relationship between personal characteristics and maintenance operation.
2. Relationship between personal characteristics and problems / obstacles.
3. Relationship between maintenance operation and problems / obstacles.
4. Comparison of different personal characteristics and maintenance operation among the administrative group.
5. Relationship between personal characteristics, maintenance operation and satisfaction.
6. Relationship between personal characteristics, maintenance operation and improvement of maintenance service.

Clients Group

7. Relationship between personal characteristics and maintenance operation.
8. Relationship between personal characteristics and problems / obstacles.
9. Comparison between personal characteristics and maintenance operation.
10. Relationship between personal characteristics, maintenance operation and satisfaction.
11. Relationship between maintenance operation and problems/ obstacles.

Service Provider Group (maintenance technicians)

12. Personal characteristics, maintenance operation, problems / obstacles comments and recommendation.

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Administrative Staff

1. Relationship between personal characteristics and maintenance operation:

The study about the relationship between personal characteristic and maintenance operation as in 1st hypothesis found that age, experience length of service both in hospital and in present position had no statistically significant relationship with maintenance work operation.The only factor which had significant relationship at ≤ 0.05 was the number of request for maintenance service.

The discussion is as follow:

Age:

The study found that opinion about maintenance operation of administrative staff with different age was not statistically significant different, Supawadee Khuhathong (2533:109) found also that age had no relationship with the role perception of public health experts as perceived by themselves, their supervisors and colleagues. Chuenchom Charoenyuth (2522:65) also found that age had no relationship with utilization of medical service of respondents. In contrary, Burirachta Rodthipya (2535:93) found that difference of age of hospital client had relationship with their opinion toward the behavior of service nurses.

Experience:

The study found that having experience of study visit group and non-having group had their opinion (about maintenance operation) non-different. Pechara Khunsantipongsa (2531:88) found that working experience of public health officials made no difference about their demand for management supervision. Wasna Theelapa (2536:65) found that the person with different kind of working experience had no

difference in their opinion about nurse professional law. However Sermsak Wisalaporn (2522:131-132) found that any experience of people often helped people to perform their work better because those increased experience helped sharpen their ideas and thought.

Length of service in the hospital:

The study found that length of service in the hospital had no relationship with the opinion about maintenance operation, which was similar to Supavan Suwansithis (2539:53) finding that length of service had no relationship with the performance of public health nurse. However the study by Pornsombat Kamtrong (2530:84-92) and Uraiwan Charnyuthkarn (2535:abstract) found that length of service had relationship with the demand for supervision.The highest length of service in the hospital of administrative staff was 31 years (5.3%), 42.1% had 21- 30 years, 36.8% had 11-20 years and 15.8% had 1-10 years of service . The length of service in the hospital had no relationship with their opinion about maintenance operation thus rejected the hypothesis.

Length of service in present position:

The study found that length of service in present position had no relationship with maintenance operation, similar to the finding by Preeyaporn Tiayakul (2540:91) that length of service of public health administrators at the ministerial, provincial and district level had no relationship with their expected role of the provincial health office.However Santi Bantherngjit (2528:71-73) found that public health administrators at provincial and district level of different positions had different attitudes toward administration.

Number of request for maintenance service:

The study found that number of request for service had statistically significant relationship with maintenance operation at ≤ 0.05 while other variables such as age, education, gender, experience, length of service both in hospital and in present position had no relationship with maintenance operation. However the study by Supawadee

Khuhathong(2533:10) found some relationship between personal characteristics and maintenance operation. The researcher would like to make a note that the reason why personal characteristics had no relationship with maintenance operation in the case of Bangphae Hospital may be the sample size was not large enough and it was the study in only one hospital. There were many other studies that found the relationship between personal characteristics and maintenance operation including other services.

2. Relationship between personal characteristics and problems / obstacles:

The study found no relationship between personal characteristic of administrative staff and problems/ obstacles as in second hypothesis.

The discussion was as follows:

Age:

The study found that age had no relationship with problems/obstacles in maintenance work.There were 68.4% of administrative staff who older than 40 years, 21.1% were the age of 30-39 years, 10.5% were the age20-29 years.The average age of the staff was 41.16 years. The administrative staff gave high opinion in the importance of maintenance work, thus there was the finding that the age of respondent had no relationship with problems/ obstacles in maintenance work. which was similar with the work of Chuenchom Charoenyuth (2522:65) which found that age had no relationship with the request for curative service of the patients.

Experience:

The study found that study visit experience had no relationship with problems/ obstacles in maintenance with was similar to Pechara Khunsantipong (2531:abstract) that experience of management training had no relationship with demand for supervision of public health workers in the North-East Thailand. However the study by office of Permanent Secretary of state MOPH (2529:101-102) found that the reason for inefficiency of maintenance technicians was the lack of experience and knowledge about the work.

Length of service in the hospital:

The study found that length of service in the hospital had no relationship with problems/ obstacles in maintenance operation denying the hypothesis. The administrative staff who had 21-30 years of service were 42.1% of the group while 36.8% had 11-20 years of service; average length of service of the administrative staff was 17.79 years.Supawan Suwansithi (2539:53) found also that length of service had no relationship with the performance public health nurses, however Pornsombat Kamtrong (2530:84-92) found the relationship between length of service with the demand for supervision.

Length of service in present position:

The study found no relationship between the length of service in present position and problems/ obstacles. Each twenty six point three percent of administrative staff had served in the present position between 1-5 years, 6-10 years and 11-15 years and 21% had served for more than 16 years.

3. Relationship between maintenance operation and problems/ obstacles:

The study found two components of maintenance operation which were characteristics of maintenance system and the improvement of maintenance work that had statistically significant relationship with problems/ obstacles at ≤ 0.05, but the other components (requesting for maintenance, importance of maintenance work, characteristics of maintenance technician, appropiatness of maintenance working place, storage-house for equipment, characteristics of clients, hospital support and satisfaction for maintenance operation) had no relationship with problems/ obstacles.

Characteristics of maintenance system had relationship with problems/ obstacles and could be explained in detail as follows:

The characteristics of maintenance system of the hospital(which were composed of written operation plan, organization, structure, job responsibility, personel management, monitoring and control, directing coordinating, reporting, expense in maintenance operation and appropriate number of maintenance technician) had relationship with problems / obstacles in operating the maintenance system. The finding was in accordance with Rungrit Sayamanonda(2517:116) who cited that management improvement could begin with improvement of organization structure, working process, monitoring and control, measurement of success including human resource development. Jumpol Rakpratum(2529:497-528) also suggested that the components of the process to increase efficiency of the maintenance system were setting up clear purpose, appropriate organization structure, working process, clear delegation of authority and setting up appropriate job responsibility includig controlling and evaluating.

Improvemrnt of the maintenance system had statistically significant relationship with problems/ obstacles at ≤0.05 the administrative staffs score for improvement of maintenance system was moderate (2.89) .Focusing detail about the opinion of administrative staff toward each component of the existing maintenance system were as follows:

-**Preventive** and corrective maintenance including spare parts supply were moderate (2.67)

-**Planning**, implementing, coordinating reporting and evaluating by the maintenance technician were low (2.47)

-**Caring** of equipment and requesting for service by client was moderate (2.70)

-**Maintenance expense** , maintenance equipment, work-place, time notified for service (both during and after service hour were moderate (2.37, 2.68, 2.58, 2.42 and 2.26 consecutively)

The result of the study showed that the maintenance system need to be improved in every aspect to increase efficiency and minimize obstacles. The improvement scheme should include more systematic ways of working to save cost and increase productivity, resource and procedure pooling (if possible) reregulate if some regulation is obsolete. Supatra Boonnak (2533:23) cited that to improve the maintenance system there should be standard working procedure which is simple to follow.

The administrators should play the major role in planning and implementing the improvement scheme.

4. Comparison of personal characteristics and maintenance operation among the administrative group

Gender:

There was no significant difference between male and female administrators about their opinion toward maintenance operation(p=0.229) rejecting the hypothesis.Bureerachta Rodtipya(2535:92) found also that gender difference did not affect the attitude of nurses. In contrary, Supawadee Khuhathong(2533;110) found that gender difference affected the role perception of public health expert as self- perceived, supervisor-perceived and colleagues-perceived.

Position:

There was not significant difference of opinion toward maintenance operation among administrative staff of different position (p=0.136), rejecting the hypothesis. Tabtipya Titipongpanich(2539:112) similary found that position did not affect perception of ministerial, provincial and district public health administrators.

However Pechara Khunsantipongsa(2531:88) found that position did affect demand for supervision of public health personel, Waraporn Pleeplakorn(2539:ก-ข) also found that position had relationship with direction in academic development.

Education:

There was no statistically significant of difference opinions toward maintenance staff with different education background (p=0.92) rejecting the hypothesis. Similarly Wasana Teepala (2536:131) found no difference of opinion about nursing professional law among respondents of different educational background. Poranant Pungcham (2539:93) also found no difference of role performance of prison nurses with different education background. However Supawadee Khuhathong (2533:110) found the relationship between education background and self-perception of the role of public health expert, Similary, Waraporn Pleepalakorn (2539:131) also found the relationship between education background and comment on academic management.

5. Relationship between personal characteristics, maintenance operation and satisfaction

The study found no relationship between personal characteristics of administrative staff (age, experience, length of service both in the hospital and in present position) and satisfaction with maintenance operation.

The study also found no significant relationship between maintenance operation (requesting for service, storage-house and clients) with satisfaction

But the study found significant relationship between importance of maintenance work, maintenance system, maintenance technician including work-place and satisfaction at ≤ 0.05.

The importance of maintenance work:

The administrative staff gave high value for the importance of maintenance work (mean=4.37) and related to the satisfaction. Thus it showed that the administrative staff

considered that good quality maintenance work could prepare the equipment for readiness which would be useful for the hospital and quality hospital care.

Maintenance system of the hospital was composed of planning, organizing, staffing, monitoring and control, directing, coordinating, reporting, evaluating, costing and personnels. The overall opinion of the administrative staff toward the system was quite high(mean=4.74) and related to satisfaction. Internal coordination received the point of 4.16

Characteristics of maintenance Technicians

The characteristics was composed of knowledge and understanding, responsibility in maintenance work, dedicativeness and human relation. The administrative staff placed high value for this category(mean=3.94), Orathai Ruayajin (2524:27-30) found that the people chose the service at health center because they were satisfied with knowledge and capability of the personnel. In this case the human relationship of maintenance technician had received high score from the administrative staff(mean=4.58)

Appropiateness of work-place for maintenance:

The appropiateness of work-place was scored at medium value (mean=2.84) reflecting that the work-place was still inappropriate and needed improvement. Supachai Khunaratpruek and Duangsamorn Boonpadung (2532:54) found that the clients of general hospitals of Ministry of Public Health had opinion that the work-place of the hospital was not clean and inappropriate for providing service.

6. Relationship between personal characteristics, maintenance operation and improvement of maintenance service

The study found no statistically significant relationship between personal characteristics (age, experience, length of service both in hospital and in present position) and improvement of maintenance service.

The study found no statistically significant relationship between maintenance operation (requesting for service, importance of the maintenance work, system, maintenance technician, work-place, storage house for equipment and clients) and improvement of maintenance work.

Clients Group

7. Relationship between personal characteristics and maintenance operation:

The study found no statistically significant relationship between personal characteristics of clients(age, length of service both in the hospital and in present position and number of request for maintenance service) and maintenance operation as detailed in the following,

Age:

The study found no difference of opinion about maintenance operation among client of different age group. Wasna Teepala (2536:65) found also that the respondents of different age did not have difference in opinion about law on nurse profession.

However Pechara Khunsantiponsa (2531:78-79) found difference of demand for supervision among district health personnel of different age, Waraporn Pleeplakorn(2539:131) found the difference of opinion about academic development direction among respondents of different age.

Length of service in the hospital:

The study found no relationship between length of service in the hospital of the clients and maintenance operation.

Length of service in present position:

The study found no relationship between length of service in present position and maintenance operation.

8. Relationship between personal characteristics and problems/ obstacles

The study found no statistically significant relationship between personal characteristics(age, length of service in present position, number of request for maintenance service) and problems/ obstacles. But length of service in the hospital was found to have statistically significant relationship at ≤0. 50 with problems / obstacles as detailed in the following.

Age:

Forty eight point seven percent of clients were in the age of 30-39 years, 29.6% were older than 40 years old and 24.4% were in the age of 20-29 years. The average age of the client or equipment operator was 35.18 years old.

Length of service in present position:

The study found no relationship between length of service in present position and problems / obstacles. This could be explained, the length of service in present position of clients could be divided into three group 1-5 years, 6-10 years and 11-15 years and number of person in each group was 26.3% of total group, Thus there was no difference in length of service in present position and caused no difference in problems/ obstacles of maintenance operation. Besides that the number of request for maintenance service was not large, for example the highest number of request was 1-5 times and was 38.1% of the group, Thus the problems/ obstacle in maintenance was not felt.

Length of service in the hospital:

The study found " the relationship"between length of service in the hospital of clients with problems/ obstacles in maintenance. Forty two point one percent of clients had 21-30years of service and36.8% had 11-20 years the average length of service was 17.79 years. Pornsombat Kamtrong (2530:84-92) found the relationship between length of service and demand for supervision, however Supawan Suwansithi (2539:53) found no relationship between length of service and the performance of public health nurse.

9. Comparison between personal characteristics and maintenance operation

In comparing personal characteristics(gender, type of employment, position and education) with maintenance operation as in the hypothesis, the study found the following.

Gender:

Gender difference did not make the opinion about maintenance operation different(p=0.359) Buiratchta Rodtipya (2535:92) found that gender difference did not affect the attitude of respondents toward ethical behaviour of nurse. However Porntipya Oonkomol(2533:74) found that gender had relationship with role performance of chiefs of sanitation and diseases prevention of district hospitals in North Easten Thailand. Ingamporn Tongdee(2542:92) also found the relationship between gender and administrative role performance of the chiefs of general administration section.

Type of employment:

The clients who were government officers and government employees had no difference in their opinion about maintenance operation (p=0.740)

Position:

The clients who were in administrative group and non-administrative group had no difference in their opinion about maintenance operation(p=0.080) Tabtipya Titipongpanich(2539:112) found also that position had no relationship with acceptance of total quality management.

Education:

The clients who had different background (less than bachelor, bachelor and master) had no difference in their opinion about maintenance operation (p=0.570) Preeyaporn Tiayakul(2540:89) also found no relationship between education and expected role of provincial public health office as perceived by ministerial, provincial

and district health administrators. However Utoomporn Singutsaha 2530:ก-ข) found that the administrative nurses(who were section chiefs in provincial health office) who had bachelor education could perform the function of planning and technical support better than the nurses who had less education. Isres Dhamwithyakul (2534:ก) also found that the higtest education background of modern drug manufactures had relationship with factory management.

10. Relationship between personal characteristics, maintenance operation and satisfaction.

The study found no relationship between personal characteristics of clients (length of service both in hospital and in present position, number of request for service) and satisfaction

But the study found statistically significant relationship between knowledge and understanding of client about maintenance system and satisfaction at ≤0. 50 as in Table 25 and some explanation could be made as follow.

Age:

The study found that age did not have relationship with maintenance operation, this might be because most of the clients (68.4%) were in the age of over 40 years and average age of the client was 41.16 years that made the age had no relationship with problems/obstacles. Chuenchom jaroenyuth(2522) also found no relationship between age and utilization of health services of respondents. However Saisampan Rabkwan (2529:102) found that the older the clients the more the utilization of higher service than health center were made.

Length of service in hospital and in present position:

The study found no relationship between length of service of the clients both in the hospital and in present position with the satisfaction for maintenance operation

(caring of equipment), efficiency, follow up, dedicativeness, capability of maintenance technician and quality of maintenance work). The average score for maintenance operation from the client was high.

Knowledge and understanding of maintenance system:

The study found the relationship between knowledge and understanding of client about maintenance system with satisfaction. Average knowledge and understanding of client about maintenance operation was medium.

11. Relationship between maintenance operation and problems/obstacles

The study found "the statistically significant relationship" between maintenance operation(knowledge and understanding about maintenance operation of client and caring of equipment by maintenance technician) with problems/ obstacles at ≤0. 50.

But the efficiency of maintenance (promptness) ,capability of technician and quality of the work did not have statistically significant relationship with problems/ obstacles which could be explained as follows.

Knowledge and understanding of clients about maintenance work:

The clients provided medium score for their knowledge and understanding about maintenance operation and provided also medium score for problems/ obstacles. Thus there is the urgent need to do every mean to help the clients to have more knowledge and understanding about maintenance system so that the problems/ obstacle could be reduced.

General comment about maintenance operation:

The clients provided medium score for the caring of equipments by maintenance technician thus reflecting the caring system(which includes regular check,

preventive caring ect.) was under performance,irregularly done and became problems/ obstacles in maintenance system.

Service Provider Group (Maintenance Technician)

The providers who were the maintenance technicians of the hospital provided high scores for their knowledge about maintenance operation, result of the work and improvement of the maintenance system. The scores for willingness to work, human relationship, accepting opinions of each other and unity were high. The scores for being supportive of the supervisor, clarity in directing, advice provision, decision making, caring of the supervisee, coordination, efficiency in problem solving, all of the these received high value.

The scores about clients from providers perspective were medium and low. Those perspective included caring of the equipment, human relationship, cooperativeness in problem solving and satisfaction for maintenance work. When focused carefully in detail it was found that human relationship between provider and client received "medium" score and responsibility in caring of equipment including cooperativeness in solving problems were "low"

Thus it is urgently necessary that human relation between provider and clients needs to be improved and creation of better knowledge and understanding about maintenance operation among the clients needs to be implemented.

The provider provided "low" score for equipment and tool used for performing maintenance work which stimulates the hospital to solve this problem so that the maintenance capability could be increased.

The work-place for maintenance work received "low" score. Presently the work-place is too small, there is not enough space for keeping tool and equipment in neatly order, the place for registration of equipment is also limited. The urgent need to improve work-place for maintenance is encouraged.

Problems and obstacles in maintenance operation:

The problems/ obstacles in maintenance operation which are composed of preventive maintenance, corrective maintenance and stocking of spare-parts received medium score which means the system could be operated without much difficulty.

Comment and Recommentation:

The maintenance technicians (provider) suggested that the maintenance work-place should be provided more space for convenience of working. Both the clients and providers agreed.

CHAPTER 6
CONCLUSION AND RECOMMENTDATIONS

Maintenance operation is the activity to be performed to keep the equipment and appliance in the ready state to function properly and to repair the broken one to be in functional state. The researcher had undertaken the study "Task Development In Maintenance: A Case Study of Bangphae Hospital" The purpose of the research was to study the maintenance system of the hospital, the level of satisfaction for maintenance service including problems/ obstacles of maintenance system among administrative group, clients group and service provider group. The relationship between personal characteristics and maintenance operation, problems/ obstacles and satisfaction. The research is a survey research, the population to be studies was the people who had activities related to maintenance work of Bangphae Hospital which is a 60 beds community hospital in Rajburi Province. The studies population was divided in to three groups; administrative group(19) clients or equipment operators (119) and service provider or maintenance technician(2). The independent variables were personal characteristics(gender, age, education, position, length of service in the hospital, length of service in present position and training experience. The dependent variables were maintenance operation, problems/ obstacles and satisfaction with maintenance service. Structured questionnaires were designed and checked for validity by three experts. The pretest of questionnaires were undertaken with 30 respondents at Paktho Hospital Rajburi, the validty test was analysed using alpha coefficient of Cronbach Method.The validity of questionnaires for maintenance operation was 0.9031 while validity for problems/obstacles was 0.8417. The questionnaires were distributed during 27 December 2004 to 26 January 2005. The statistics used were Pearson Product Moment Correlation, and Mann-Whitney U test and t- test.

The research result were as follows.

Administrative Group

Personal characteristics:

Most of the administrative staff were female (73.3%) with the age of over 40 years. Most of these people had bachelor education (73.3%) ,length of service in present position was 19.95 years, 68.4% had experience of some training and study visit

Maintenance system:

The administrative staff provided high score for overall picture of maintenance system especially about the coordination function. The maintenance system was composed of planning, organizing, staffing, directing, monitoring and control, coordination, reporting, evaluation, costing and personnel management.

Problems/obstacles:

The administrative staff provided medium score for problems/obstacles in maintenance operation which was composed with preventive and corrective maintenance including spare-parts supply.

Comparative Analysis Of The Difference And The Relationship

Administrative Group

Comparative Analysis Of The Difference:

The analysis of personal characteristics; gender, position and education of administrative staff found that different personal characteristics of the above did not statistically significant affect the maintenance operation.

Analysis Of The Relationship:

1. Relative analysis between personal characteristics(age, experience, length of service in hospital, length of service in present position) of the administrative staff found no statistically significant relationship with at ≤ 0.05 thus rejected 1st hypothesis the maintenance.

2. Relative analysis between personal characteristics(age, experience length of service in hospital and in present position) of the administrative staff with problems/ obstacles found no statistically significant relationship at ≤ 0.05 thus rejected 2th hypothesis.

3. Relative analysis between maintenance operation(requesting for service, importance of maintenance, characteristics of maintenance technician, appropriateness of work-place, storage-house for equipment, characteristics of clients, support from hospital and satisfaction of administrative staff toward maintenance operation) and problems/ obstacles found no statistically significant relationship at ≤ 0.05 thus rejected 3rd hypothesis. However, only characteristics of maintenance system and improvement of maintenance operation were found statistically significant related with problems/ obstacles at ≤ 0.05 and with maintenance work which should be improve at ≤ 0.05 thus accepted 3rd hypothesis.

4. Relative analysis between personal characteristics(age, experience, length of service in hospital, length of service in present position) found no statistically significant relationship with satisfaction of administrative staff at ≤ 0.05 thus rejected 4th hypothesis.

5. Relative analysis between maintenance operation(request for service, storage-house for equipment, client) among administrative staff found no statistically significant relationship at ≤ 0.05 thus rejected 5th hypothesis.

Client Group

6. Relative analysis between personal characteristics (age, length of service in hospital, length of service in present position, number of request for service) and satisfaction found no statistically significant relationship at ≤ 0.05 thus rejected 5th hypothesis.

Recommendation For Application Of The Research Result:

1. There should be more preventive maintenance to increase efficiency of maintenance system.

2. There should be continuous caring of the equipment in the organization.

3. The equipment should be utilized with highest efficiency.

4. The improvement of maintenance work should prioritize in providing appropriate space for performing maintenance work, set up appropriate room for equipment.

5. There should be some training or education about basic caring of equipment to prevent untimely damage. There should be daily plan for maintenance check by client and monthly maintenance check by hospital maintenance.

6. Set up after-working hour service so that maintenance technician could be reached all the time. Special reward should be provided for such service.

7. Provide apportunity for maintenance technician to keep up with modern technology which are always changing.

8. Set up more convenient and efficient maintenance system to serve the client.

Recommendation For Further Research:

1. The maintenance system of the hospitals with different size should be differentiated accordingly with the context.

2. Devopment of provincial maintenance system to share resource and economize the expense.

3. Factors and methodology to improve the efficiency of maintenance system.

4. The policy of Ministry of Public Health supports the improvement of knowledge of maintenance technician and manpower supply for maintenance system but in actual practice those policy seem to be far-reaching while the maintenance expense is spirally increasing.

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อุไรวรรณ ชาญยุทธการ.(2535).ความต้องการการนิเทศการพยาบาลของพยาบาลหน่วยอภิบาลโรคหัวใจ โรงพยาบาลของรัฐ กรุงเทพมหานคร.วิทยานิพนธ์ปริญญาครุศาสตร์มหาบัณฑิต สาขาบริหารการพยาบาล.บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย.

APPENDIX

RESEARCH INSTRUMENT EXPERTS

Examining the research instrument and suggestions for improvement by:

1.Mrs.Somsri Wongsawirati	M.Sc.(Public Health) Administratrive office 8 The 17th Supreme Patriarch Hospital Suphanburi Province
2.Mr.Kometh Nakwankit	M.Sc.(Public Health) Office of Quality Devlopment Ministry of Public Health
3.Mr.Surapanth Chailawratna	Electrical Engineer 8 Engineering Standard Section Division of Public Health

Questionnaires.Set 1

For Administrative Staff

1.This questionnaire is composed of 4 parts.

Part 1.Personal characteristics of respondents

Part 2.Maintenance operation

Part 3.Problems/ obstacles of maintenance operation

Part4.Suggestion and recommendation

2.Instruction

This set of questionnaires is part of the study for completion of Master of Sciene (Public Health) Major in Hospital Administration Faculty of Public Health, Mahidol University. The result of the study will be applied for the benefit of your organization and for improving the efficiency of maintenance unit.

Please provide answers that truly represent your opinion. Every answer will be kept confidential and will not affect the evaluation of your performance.

Please return the answered questionnaires to administrative section within date……..month…….2547 B.E.

Your kindness in answering the questionnaires is greatly acknowledge

Mr.Chan Eiumsuksri

Master of Science Student
Major in Hospital Administrative
Faculty of Public Health
Mahidol University

Title Task Development In Maintenance, Bangphae Hospital (for administrative staff)

Date……/……/ ……..

Part 1. Personal characteristics of respondent.

Instruction Please mark / in ( ) or fill in the blank.

1.Gender

( ) male ( ) female

2.Age…….years

3.Length of government service (calculated since date recruited) ……..years

4.Length of service in present position……years

5.Highest education level

( ) Diploma field

( ) Sub bachelor

( ) Bachelor field

( )Master field

( )Other field

6.Experience of training, study visit about management

( )Yes ( )No

7.Your present position

( )Hospital director ( )Sector chief

( )Section chief ( )Unit chief

( )Other (specify)

8.Your present work place sector / section

8.1Administrative section in “unit”

( )administration ( )secretarial

( )treasury and accounting ( )supply and maintenance

( )nutrition ( )medical record and statistics

( )quality/ standard ( )other(specify)

8.2Technical service sector in “unit”

( )rehabilitative medicine ( )pathology

( )radiology ( )pharmacy

8.3Medical service sector in “unit”

( )emergency medicine ( )general medicine

( )dental service ( )Thai traditional medicine and alternative medicine

8.4Family medicine sector in “unit”

( )community health ( )family medicine

8.5 Nursing service sector in “unit”

( )out-patient ( )in-patient

( )emergency medicine ( )other(specify)

Part2 Maintenance operation

Instruction The following are questions asking for your opinion about hospital maintenance operation.Please circle ◯ around the number which reflects your opinion from highly agree (5) to slightly agree (1) as follows

Question	**Your opinion**				
1.For the past one year you have used the service ofMaintenance unit…….times					
	high				**low**
2.Maintenance work is important to your Organization high	5	4	3	2	1
3.Hospital maintenance system has following Characteristics	5	4	3	2	1
	Appropriate			**Non-appropriate**	
3.1There is definite and written Maintenance operation plan	5	4	3	2	1
3.2Organization structure of maintenance work	5	4	3	2	1
3.3Written job responsibility of maintenance work	5	4	3	2	1
3.4Personel administration of maintenance work	5	4	3	2	1
3.5Monitoring and control	5	4	3	2	1
3.6Directing	5	4	3	2	1

3.7Intrenal coordination between maintenance unit with other unit in the hospital	5	4	3	2	1
3.8External coordination between maintenance unit with other unit outside the hospital	5	4	3	2	1
3.9Reporting of maintenance operation	5	4	3	2	1
3.10Evaluation of maintenance operation	5	4	3	2	1
3.11Cost of maintenance	5	4	3	2	1
3.12Suffiecient number of personnel	5	4	3	2	1
	High				**low**
4.Present maintenance should be improve	5	4	3	2	1
5.The maintenance technicians who provide the service	5	4	3	2	1
5.1Knowledgable	5	4	3	2	1
5.2Capable	5	4	3	2	1
5.3Responsible	5	4	3	2	1
5.4Dedicative	5	4	3	2	1
5.5Good human relationship	5	4	3	2	1

	Appropriate			**Non-appropriate**	
6.Workplace is appropriate	5	4	3	2	1
7.Storage house for equipment and tool is appropriate	5	4	3	2	1
	High				**low**
8.Operators of equipments have Characteristics					
8.1Knowledgable about equipment	5	4	3	2	1
8.2Study operating manual	5	4	3	2	1
8.3Careful in operating	5	4	3	2	1
8.4Responsible in operating	5	4	3	2	1
9.You support maintenance operation	5	4	3	2	1
10.Your satisfaction for maintenance operation	5	4	3	2	1

Part 3 Prolems/ obstacles in maintenance operation.

Instruction Please circle ◯ around number which reflects your opinion about prolems/ obstacles in maintenance operation as follows.

Question	**Level of prolems/ obstacles**				
	High				**low**
1.Maintenance system					
1.1Regular preventive maintenance	5	4	3	2	1
1.2Corrective maintenance	5	4	3	2	1
1.3Sparepart stocking	5	4	3	2	1
2.Performance of maintenance technicians					
2.1Planning	5	4	3	2	1
2.2Implementing	5	4	3	2	1
2.3Internal coordination	5	4	3	2	1
2.4External coordination	5	4	3	2	1
2.5Reporting	5	4	3	2	1
2.6Evaluation	5	4	3	2	1
2.7Utilizing of evaluation result	5	4	3	2	1
3.Performance of clients					
3.1Maintenance of equipment	5	4	3	2	1

3.2Requesting for maintenance service	5	4	3	2	1
4.Maintenance cost	5	4	3	2	1
5.Facilities and tools in maintenance	5	4	3	2	1
6.Workplace in maintenance operation	5	4	3	2	1
7.Time service available					
7.1Office hour	5	4	3	2	1
7.2After office hour	5	4	3	2	1

Part 4 Suggestion and recommendation.

Instruction Please express your opinion and recommendation about the improvement of maintenance operation in the following topics.

1.Maintenance system

……

……

2.Performance of maintenance technicials.

……

……..

3.Workplace for maintenance operation

……

……

4.Time requesting for maintenance

4.1During official hour.

……

……

4.2After official hour and holiday

……

……

5.Other(specify)

……

……

Questionnaires Set 2

(For maintenance technician)

1. This questionnaire is composed of 4 parts.

Part 1. Personal characteristics of respondents

Part 2.Maintenance operation

Part 3.Problems/ obstacles of maintenance opertion

Part4.Suggestion and recommendation

2. Instruction

This set of questionnaires is part of the study for completion of Master of Sciene (Public Health) Major in Hospital Administration Faculty of Public Health, Mahidol University. The result of the study will be applied for the benefit of your organization and for improving the efficiency of maintenance unit.

Please provide answers that truly represent your opinion. Every answer will be kept confidential and will not affect the evaluation of your performance.

Please return the answered questionnaires to administrative section within date……..month…….2547 B.E.

Your kindness in answering the questionnaires is greatly acknowledge

Mr.Chan Eiumsuksri
Master of Science Student
Major in Hospital Administrative
Faculty of Public Health
Mahidol University

Questionnaires Set 2

Title Task Development In Maintenance, Bangphae Hospital (for maintenance technician)

Date……./ ……./ ……

Part 1 Personal characteristics of respondent

Instruction Please work / in ( ) or fill in the blank form.

1.Gender

( ) male ( )female

2.Present age……..years

3.Education

( )grade 4,6 ( )grade 9

( )grade 12 ( )diploma branch……

( )other (specify)

4.Employment status

( )government official ( )permanent

( )temporary employee ( )other (specify)

5.Present position

( )technician ( )electrician

( )plumber ( )carpenter

( )mender ( ) other (specify)

6.length of service in present position…….years

7.Your satisfaction in your assignment

( )most ( )much

( )some-what much ( )some-what little

( )little ( )least

8.Your proudness for your past performance

( )most ( )much

( )some-what much ( )some-what little

( )little ( )least

9.Do you have experience of study visit / training in maintenance work?

( )no ( )yes(specify)

Part 2 maintenance operation

Instruction The following are questions asking for your opinion about maintenance operation of the hospital. Please ◯ around number which truly represents your opinion from 5 to 1

Question	**Level of opinion**				
	High				**low**
1.Your have knowledge and Understanding about maintenance system	5	4	3	2	1
2.Your work is important to the hospital.	5	4	3	2	1
3.Your satisfaction for your present work.	5	4	3	2	1

4.Your proudness for your performance	5	4	3	2	1
5.The maintenance system can be improved.	5	4	3	2	1
6.Your willingness to continue your work.	5	4	3	2	1
7.Your colleague in maintenance.					
7.1sacrifying for work	5	4	3	2	1
7.2dedicative to work	5	4	3	2	1
7.3friendly to colleague	5	4	3	2	1
7.4accept other s opinion	5	4	3	2	1
7.5there is unity in the maintenance unit	5	4	3	2	1
8.Your supervisor has following characteristics					
8.1supportive to your work	5	4	3	2	1
8.2clear direction	5	4	3	2	1
8.3regularly	5	4	3	2	1
8.4right decision	5	4	3	2	1
8.5friendly to supervise	5	4	3	2	1
8.6well coordinate with others	5	4	3	2	1

8.7quick in problem solving	5	4	3	2	1
8.8accept other s opinion	5	4	3	2	1
9.Your clients who use your maintenance service have following characteristics					
9.1friendly	5	4	3	2	1
9.2responsible in operating the equipment	5	4	3	2	1
9.3cooperative in problem-solving	5	4	3	2	1
9.4satisfies with the of maintenance unit	5	4	3	2	1
10.Your satisfaction in repairing equipment and tools					
10.1repairing equipment and tool	5	4	3	2	1
10.2stocking of spare-parts	5	4	3	2	1
11.Your satisfaction in your work-place	5	4	3	2	1
12.Your overall satisfaction toward Maintenance system	5	4	3	2	1

Part 3 Problems/ obstacles in maintenance operation

Instruction Please ◯around the number which represent your true opinionabout problems / obstacles about maintenance operation as follows.

Questions	**Level of problems/ obstacles**				
	High				**low**
1.Operation system					
1.1preventive maintenance	5	4	3	2	1
1.2corrective maintenance	5	4	3	2	1
1.3spare-part stocking	5	4	3	2	1
2.Colleagues in maintenance unit	5	4	3	2	1
3.Clients who use maintenance service	5	4	3	2	1
4.Administrative staff	5	4	3	2	1
5.Repairing equipment and tool	5	4	3	2	1
6.Work-place	5	4	3	2	1
7.Time for maintenance					
7.1office hour	5	4	3	2	1
7.2affter office hour	5	4	3	2	1

Part 4 Suggestion and recommendation

Instruction Please provide your suggestion and recommendation about improvement of hospital maintenance operation in the following topics

1.Maintenance system

……

……..

2.Personnels(administrative staff, client)

2.1Administrative

.....

.....

2.2Clients

.....

.....

3.Repairing equipment and tool

.....

.....

4.Work-place

.....

.....

5.Time requesting for maintenance

5.1 office hour

.....

.....

5.2after office hour and holiday

……

……..

6.Other

.....

.....

Questionnaires Set 3

For clients

1.This questionnaire is composed of 4 parts.

Part 1.Personal characteristics of respondents

Part 2.Maintenance operation

Part 3.Problems/ obstacles of maintenance operation

Part4.Suggestion and recommendation

2.Instruction

This set of questionnaires is part of the study for completion of Master of Sciene (Public Health) Major in Hospital Administration Faculty of Public Health, Mahidol University. The result of the study will be applied for the benefit of your organization and for improving the efficiency of maintenance unit.

Please provide answers that truly represent your opinion. Every answer will be kept confidential and will not affect the evaluation of your performance.

Please return the answered questionnaires to administrative section within date……..month…….2547 B.E.

Your kindness in answering the questionnaires is greatly acknowledge

Mr.Chan Eiumsuksri
Master of Science Student
Major in Hospital Administrative
Faculty of Public Health
Mahidol University

Questionnaires.Set 3

Title Task Development In Maintenance, Bangphae Hospital (for clients)

Date……/……/ ……..

Part 1. Personal characteristics of respondent.

Instruction Please mark / in ( ) or fill in the blank.

1.Gender

( ) male ( ) female

2.Employment status

( )government official ( )permanent

( )temporary employee ( )other (specify)

3.Your present position

( )Hospital director ( )Sector chief

( )Section chief ( )Unit chief

( )other (specify)

4..Your present work place sector / section

4.1Administrative section in “unit”

( )administration ( )secretarial

( )treasury and accounting ( )supply and maintenance

( )nutrition ( )medical record and statistics

( )quality/ standard ( )other(specify)

4.2Technical service sector in “unit”

( )rehabilitative medicine ( )pathology

( )radiology ( )pharmacy

4.3Medical service sector in “unit”

( )emergency medicine ( )general medicine

( )dental service ( )Thai traditional medicine and alternative medicine

4.4Family medicine sector in “unit”

( )community health ( )family medicine

4.5 Nursing service sector in “unit”

( )out-patient ( )in-patient

( )emergency medicine ( )other(specify)

5.Your age ……years

6.length of service in this hospital……years

7.Length of service in present position……..years

8.Education

( )grade 4,6 ( )grade 9

( )grade 12 ( )diploma branch……

( )other (specify)

9.For the past one year you have used maintenance service…….times.

Part 2 maintenance operation

Instruction The following are questions asking for your opinion about hospital maintenance operation.Please circle ◯ around the number which reflects your opinion from highly agree (5) to slightly agree (1) as follows

Questions	**Level of your opinion**				
	High				**low**
1.Your knowledge understanding about Maintenance system	5	4	3	2	1
2.Your opinion about maintenance Operation					
2.1carry of equipment by maintenance technicians	5	4	3	2	1
2.2promptness to provide service after notification	5	4	3	2	1
2.3following up to maintenance service	5	4	3	2	1
2.4maintenance technician s dedication To work	5	4	3	2	1
2.5capability of maintenance technician	5	4	3	2	1
2.6quality of maintenance service	5	4	3	2	1

Part 3Problem/ obstacle in maintenance operation

Instruction Please circle ◯ around number which reflects your opinion about prolems/ obstacles in maintenance operation as follows.

Question	**Level of prolems/ obstacles**				
	High				**low**
1.Maintenance system					
1.1routine maintenance by operator	5	4	3	2	1
1.2routine maintenance by maintenance Unit	5	4	3	2	1
1.3requesting for maintenance	5	4	3	2	1
1.4follow up the maintenance	5	4	3	2	1
2.Maintenance technician	5	4	3	2	1
3.Work-place	5	4	3	2	1
4.Time requesting for maintenance					
4.1offive hour maintenance	5	4	3	2	1
4.2after office hour maintenance	5	4	3	2	1

Part 4 Suggestion and recommendation.

Instruction Please express your opinion and recommendation about the improvement of maintenance operation in the following copies.

1.Maintenance system

……

……

2.Performance of maintenance technicials.

……

……..

3.Workplace for maintenance operation

……

…….

4.Time requesting for maintenance

4.1During official hour.

……

……

4.2After official hour and holiday

……

……

5.Other(specify)

……

…….

No. 106/2004

Documentary Proof of Ethical Clearance
The Committee on Human Rights Related to Human Experimentation
Mahidol University, Bangkok

.....

Title of Project: **The Development of Maintenance Task at Bangphae Hospital in Rajchaburi Province**

Principal Investigator: **Mr. Chan Eiumsuksri**

Name of Institution: **Faculty of Public Health**

Approved by the Committee on Human Rights Related to Human Experimentation

Signature of Chairman: _____
(Professor Dr. Srisin Khusmith)

Signature of Head of Institute: _____
(Professor Dr. Pornchai Matangkasombut)

Date of Approval: 16 SEP 2004

BIOGRAPHY

NAME	Mr.Chan Eiumsuksri
DATE OF BIRTH	July 6, 1956
PLACE OF BIRTH	Rajburi Thailand
INSTITUTION ATTENDED	B.Sc. (Public Health), 1986 Sukhlothaidhmathirat University Mahidol University, 2001-2005 Master of science (Public Health) Major in Hospital Administration
POSITION AND OFFICE	1987-Present, Bangphae Hospital Rajburi Province Position:Administrative Office 7