

Work study : A basic method for redesigning nursing practice system*

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Although work study has originated in engineering field, currently, it has been increasingly popular in other fields as well, such as agriculture, hotel, retail trade, hospital, etc. It is a systematic technique with several benefits for investigating human work, and thus leading to further improving work productivity. Work study consists of three techniques: method study or motion study, work measurement, and job evaluation. Motion and time study is one integrated technique of work study which includes seven procedures in examining work procedures, developing better ones and setting them as a standard for practice. This method can be adopted in the nursing practice areas of both in nursing service and nursing education. This article will demonstrate this technique through a case study wherein motion and time study is applied in nursing activities.

Keywords : *Work study, Redesigning, Nursing practice.*

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แม้ว่าการศึกษางานจะมีจุดกำเนิดมาจากการงานด้านวิศวกรรมศาสตร์ แต่ในปัจจุบันเทคนิคนี้กำลังเป็นที่รู้จักอย่างกว้างขวางมากขึ้นในงานด้านอื่นๆ เช่น อุตสาหกรรมการเกษตร โรงแรม ร้านค้า ขยายปลีก และโรงพยาบาล เป็นต้น การศึกษางานเป็นเทคนิคที่มีระบบและมีประโยชน์หลายประการ โดยการสำรวจงานของผู้ปฏิบัติงานและนำไปสู่การปรับปรุงผลผลิตงาน การศึกษางานประกอบด้วย 3 เทคนิค คือ การศึกษาวิธีการทำงาน (Method study or motion study) การวัดงาน (Work measurement) และการประเมินงาน (Job evaluation) การศึกษาการเคลื่อนที่และเวลา (Motion and time study) เป็นเทคนิคงานหนึ่งของการศึกษางานที่ประกอบด้วยขั้นตอนทั้งหมด 7 ขั้นตอนเพื่อตรวจสอบงาน พัฒนางานและกำหนดเป็นมาตรฐานการปฏิบัติงาน เทคนิคนี้สามารถนำมาประยุกต์ใช้ในงานพยาบาลทั้งในการบริการและการศึกษาการพยาบาล ในบทความนี้จะเสนอกรณีศึกษาของการประยุกต์ใช้การศึกษาเคลื่อนที่และเวลาในงานพยาบาล

คำสำคัญ : การศึกษางาน, การออกแบบใหม่, การพยาบาล

In this millennium, Thailand has the situation similar to many other countries in which vast changes have been drastically emerging in all aspects of life and society as a whole. Some of the examples are huge progresses of information technology and sciences around the world, the increasing scarcity of natural resources, the rapid growth of aging population, and a lot of entailing social and economic problems, and many others. These changes lead to the adaptation of people's behaviors, the various reformations and the redesigning of workplaces; the society is increasingly concerned more about the quality of life; and also the new laws congruent with the present circumstances have been enacted. The health care service has become one of the most crucial concerns in Thai society ever since the issue of the new constitution which stipulates more attention to human rights and the participation of Thai citizens in the state administration. This implies that both health care managers and providers should offer more productive and quality healthcare service in order to meet their needs and expectations.

In the nursing view point, how to meet the patient needs in order to achieve their high satisfaction is a troublesome and complicating burden for nurses. The main reason is that while they have to improve their practices in providing more efficient nursing care, most of them do not have sufficient experience in enhancing the quality of work and are still struggling with their many daily routine tasks. Work study is an effective investigation means to identify unproductive nursing activities and leading to work redesign for better result. Although this concept is borrowed from the industrial engineering, it does contribute lots of advantages for the users. This article aims to illustrate

the concept of work study, its history, benefits, types, and its application in nursing practices. And as a result, nursing managers and nurses will be able to apply this fundamental method of quality improvement to their work effectively, and the outcome will be more a success instead of a failure.

The general concept of work study

The general concept will provide the definitions in work study and its history, benefits, types and procedures, and the relationship among three types of work study.

Definition of work study

Work study is a term used to refer inclusively to all the techniques of method study and work measurement which are employed to ensure the best possible use of human and material resources in performing a specific activity or job.⁽¹⁾ Larkin stated that work study is a management service based on method study and work measurement, which are used in the examination of human work in all its contexts, and which lead to the systematic investigation of all the resources and factors affecting the efficiency and economy of the situation being reviewed, in order to effect improvement.⁽²⁾ Morris cited that work study is the systematic approach comprising three basic techniques: method study, work measurement, and job evaluation.⁽³⁾

In conclusion, work study can be defined as a systematic technique for examining human work which leads to further improvement by investigating both resources and factors regarding the efficiency and economy of the context studied. Thus, work study is especially concerned with productivity, since it is

used to monitor human work systematically and this will increase the amount produced from a given quantity of resources with little or without further capital investment.

History of work study

Work study was originally developed in engineering. The pioneer of the analytical study of work was Charles Babbage who published a book called *The Economy of Machinery Manufactures* in 1832. It became very popular both in Britain and abroad. He wrote about the use of standard forms for studying work and recording facts about it, and commented on the use of the stopwatch for timing operators at work. But it had not been used until the turn of the century when Frederick Winslow Taylor began using the work study in the machine shop of Midvale Steel Company in 1881. He studied the endurance of workers and measured physical work in terms of horsepower. Furthermore, the other study was his well-known experiment with shovels used for shoveling coke, sand and limestone by carrying it out using stopwatch to find out how long the work would and should take.^(3,4) The other study is of Frank B. Gilbreths and his wife who have introduced "Motion Study" which studies human beings at work in a specified period of time. Afterwards, several techniques of the work study have been developed respectively up to the present time. Nowadays, work study has been applied extensively, outside engineering fields, such as agriculture, retail trade, hospitals, hotels, and so on in order to improve productivity and achieving goal with more efficient process.⁽⁴⁾

The value of work study

The International Labor Office used to claim that there was nothing new about the investigation and improvement of operations in the workshop or workplace; good managers had been investigating and improving ever since human effort had been organized in a large scale, and that must have been long before the Pyramids were built in Egypt.⁽¹⁾ In fact, productivity can almost always be greatly increased by heavy capital investment in the forms of new and improved plant, equipment, and places. The research and development necessary to develop a new process, a new equipment, or a new technology of higher performance are usually expensive and time-consuming. On the other hand, work study has been widely used to increase productivity through carrying out its systematic procedures; in fact, an ordinary man can achieve results as good as or sometimes better than a less systematic genius. How much can we expect to gain through the use of the management techniques? The comparison made in general terms can be a guide in the table 1.

The work study has at least 4 benefits as follows⁽¹⁾: (1) it is a method of raising the production efficiency or productivity of the operating unit or work place by reducing unnecessary work content and ineffective time, and then reorganizing the work; it is a method involving little or no capital expenditure on equipment or materials; (2) it is a systematic approach so that no factor affecting the efficiency of an operation is overlooked; (3) it is the most effective tool of investigation and improvement in any activities and operations for managers in making decisions so that they will gain better work flow, lower cost, but

Table 1. The comparison between work study and other means to improve productivity*

Approach	Type of improvement	Means	Cost	How quickly can results be achieved	Extent of improvement in productivity	The role of work study
Capital investment	1. Development of new basic processes or fundamental improvement of existing ones	<ul style="list-style-type: none"> - Basic research - Applied research - Pilot equipment 	High	Generally years	No obvious limit	<ul style="list-style-type: none"> - Method study to improve ease of operation and maintenance at design stage
	2. Install more modern or higher-capacity equipment	<ul style="list-style-type: none"> - Purchase - Process research 	High	Immediately after installation	No obvious limit	<ul style="list-style-type: none"> - Method study to improve ease of operation when modernizing
Better management	3. Reduce the work content of the product	<ul style="list-style-type: none"> - Product research - Product development - Quality management - Method study 	Not high compared with 1 and 2	Generally months	Limited	<ul style="list-style-type: none"> - Method study to improve design for ease of production
	4. Reduce the work content of the process	<ul style="list-style-type: none"> - Process research - Pilot equipment - Process planning - Method study - Operator training 	Low	Immediate	Limited	<ul style="list-style-type: none"> - Method study to reduce wasted effort and time in operating the process by eliminating unnecessary movement
	5. Reduce the ineffective time of operative and plant or work	<ul style="list-style-type: none"> - Work measurement - Marketing policy - Standardization - Product development - Product planning and control - Improved working conditions - Operator training - Incentive schemes 	Low	May start slowly but effect growth quickly	Limited	<ul style="list-style-type: none"> - Work measurement to investigate existing practice, locate ineffective time and set standards of performance as a basis for: - Planning and control-Utilization of equipment - Labor cost control - Incentive schemes

* Modified from International Labor Office, 1964: 38-9

with higher outcomes and less human power; and (4) it can be exploited in every situation, with regards to its application, not only in manufacturing sectors, but also in other ones, such as business workplaces, hospitals, offices, hotel services, restaurants, and stores.

Types and procedures of work study techniques

Work study comprises three techniques according to the nature and the purpose of the studied work. Three techniques are Method Study or Motion Study, Work Measurement, and Job Evaluation.

Method Study or Motion Study

Method study or motion study is a systematic study of work system to find out how work should be done^(3,4) or it is a systematic recording, analysis and critical examination of existing and proposed ways of doing work, and also it is a systematic way for the development and application of easier and more effective methods⁽¹⁾. The techniques of method study are many, like process charting, path of movement, film analysis and others.⁽²⁾ The basic procedure can be described as follows:^(3,5) (1) defining the problem, (2) ascertaining all facts relevant to the problem, and recording them if the problem is too complex to handle, (3) examining the facts critically to find what causes the facts, (4) developing a new method, applying certain rules based on the critical examination, (5) implementing according to the decision and (6) maintaining the method.

Work Measurement

Work Measurement is also a systematic study of work system involving finding out for how long

and how hard people have to do a job.⁽³⁾ In other words, it is the application of techniques designed to establish the work content of a specified task by determining the time required for carrying it out at a predefined standard of performance by a qualified worker;⁽¹⁾ or it is the application of techniques designed to establish the time for a qualified worker to carry out a specified job at a predefined level of performance.⁽²⁾ The work measurement is one of the best ways in determining the actual manufacturing costs, improving planning, and determining machinery and labor requirements.⁽⁶⁾

There are several techniques for work measurement : time study, activity sampling or work sampling, synthesis, and analytical estimating.⁽³⁾ However, each approach has its strengths and weaknesses.⁽⁶⁾ The techniques mentioned in the following will be only the popular ones like time study and activity sampling, for more clarification.

A. Time study is a work measurement technique for recording the times and the rates of working for the elements of a specified job carried out under specified condition, and then for analyzing the data so as to obtain the time necessary for carrying out a specified job at a predefined level of performance. There are 8 steps in time study procedure:⁽³⁾ (1) selecting the job to be studied, (2) recording and analyzing the operations into elements, and checking for standard conditions, (3) rating the performance and record the time for each element, (4) extending the times and ratings, (5) selecting a basic time for each element, (6) determining the element frequency, (7) assessing and allowing for physical fatigue, and (8) calculating the value and issuing it.

Table 2. Case study : Results of motion and time study of nursing activities before developing a new nursing practice system.

Order	Activity	Mean of nursing activities each shift (min)			Mean of total (min)	%
		morning	evening	night		
Direct care						
1	Patient round	37.00	34.33	91.67	163.00	5.45
2	Patient round with physicians	46.33	11.33	00.00	57.66	1.93
3	Drug administration directly to patients	73.67	75.67	30.33	179.67	6.01
4	Feeding patients	9.00	28.00	-	37.00	1.24
5	Nasogastric tube feeding	39.67	11.33	11.66	62.66	2.10
6	Care for intravascular fluid transfusion and blood transfusion	22.33	49.00	28.66	99.99	3.34
7	Wound dressing	22.33	32.50	-	54.83	1.83
8	Suction	21.33	45.67	36.67	103.67	3.47
9	Vital signs recording	31.33	54.67	92.00	178.00	5.95
10	Voiding and bowel movement care	11.33	30.67	18.50	60.50	2.02
11	Admission and discharge	22.00	6.33	-	28.33	0.95
12	Preparation for special physical examinations such as x-ray, ultrasound, etc.	11.00	5.00	1.00	16.00	0.57
13	Post operation care	8.50	22.00	3.00	33.50	1.12
14	Specimen collection	6.00	16.50	-	22.50	0.75
15	Guidance and health education	34.00	14.33	5.00	53.33	1.78
16	Position change for patients	5.00	3.50	25.00	33.50	1.12
17	Environment care such as adjusting light within patients' rooms, changing the strained bed sheet, etc.	-	7.00	-	7.00	0.23
18	Personal hygiene care	18.50	8.00	5.00	31.50	1.05
19	Discharge planning	-	44.00	40.00	84.00	2.81
20	Miscellaneous such as: respirator care, cold compress, etc.	12.00	5.00	1.00	18.00	0.60

Table 2. Case study : Results of motion and time study of nursing activities (cont.)

Order	Activity	Mean of nursing activities			Mean of total (min)	%
		each shift (min)	morning	evening		
Indirect care and unit-related activity						
1	Check medical instruments	10.00	20.00	4.00	34	1.14
2	Change of shift report	46.00	45.67	36.67	128.34	4.29
3	Hand washing	7.00	4.00	4.00	15.00	0.50
4	Order transcription	122.67	7.33	-	130.00	4.35
5	Drug preparation such as checking patients' name with charts, signing nurses' name after drug administrating, etc.	70.67	34.33	60.00	165.00	5.52
6	Nursing recording such as Nurse's note , Discharge summary, Vital signs sheet	205.33	160.67	99.00	460.00	15.39
7	Cooperation					
	7.1 telephone communication such as reporting laboratory result, calling physicians, coordinating other health care members, etc.	20.00	29.00	3.50	52.50	1.76
	7.2 personal communication such as consulting with head nurses, reporting directly to other nurses, etc.	24.33	23.67	31.00	79.00	2.64
8	pre-conference	14.00	35.50	12.00	61.50	2.06
9	Assignment recording	-	7.50	9.00	16.50	0.55
10	Drug and medical supply through computer	5.00	16.50	9.00	26.00	1.02
11	Medical supply and ward inspection for readiness	16.00	7.00	4.50	27.50	0.92
12	Medical instrument and ward cleaning	13.50	8.67	14.50	36.67	1.23
13	Chart rounds	-	24.33	31.67	56.00	1.87

Table 2. Case study : Results of motion and time study of nursing activities (cont.)

Order	Activity	Mean of nursing activities each shift (min)			Mean of total (min)	%
		morning	evening	nigh		
Personal activity						
1	1. meals	167.67	72.66	23.00	263.33	8.81
2	2. drinking	5.00	7.00	-	12.00	0.40
3	3. going to toilet	7.50	7.33	14.00	28.83	0.96
4	4. others such as visiting friends, reading books, talking, etc.	8.00	45.00	14.00	67.00	2.24
Total in minutes		1,168.99	1,061.00	759.33	2,989.32	
Total in percent (%)		39.11	35.49	25.40	100	

Table 3. Comparison of time allocation for the selected five nursing activities between Test 1 and Test 2.

Nursing activities	Test 1			Test 2		
	Mins/day	Number of events	Mins/event	Mins/day	Number of events	Mins/event
1. Nursing documentation	1,253	68	18.4	1,681	145	11.6
2. Medication administration directly to patient	539	78	6.9	806	148	5.5
3. Drug preparation	495	110	4.5	253	65	3.9
4. Medical orders transcription	390	34	13.8	523	68	7.7
5. Patient chart review	168	6	28.0	260	18	14.4

B. Activity sampling or work sampling or activity analysis is the process of making sufficient random observations of an operator's activities in order to determine the relative amount of time the operator spends on the various activities associated with the job. Thus, it is most important that the work sampling be conducted when working conditions are truly representative of the normal working conditions of a given job. The data are collected within intervals of time, such as to sample twice an hour or at randomly selected time intervals depending on the studied condition; one other example of sampling would be that 800 observations are required for 20 working days which is established as an observation time period and so 40 observations are to be recorded each day; then a random number table may be used to set up the random times for each observation.^(7,8)

According to the facts mentioned above, work sampling consists of intermittent, random, instantaneous observations of work activities of multiple workers by independent observers who record the various activities on data collection forms. However, conducting work sampling does not include only such a collection procedure but also the other ones as the following:⁽⁷⁾ (1).establishing the purpose of the study, (2) identifying the subjects, (3) identifying the measurement of the output, (4) establishing a time period of study, (5) defining the activities that are performed by the people under study, (6) determining the number of observations which is dependent on the percentage of time determined to spent on the major work element, (7) scheduling the observations, (8) informing the personnel, (9) recording the raw data, and (10) summarizing the data.

However, method study and work measurement procedures can be integrated into seven basic steps in performing a complete work study. Three of them are common to both method study (M.S.) and work measurement (W.M.), two are method-study steps, and the other two steps are of work measurement. Therefore, the procedures are:⁽¹⁾

1) Selecting the job or work to be studied (M.S. & W.M.).

2) Recording all relevant facts about the present method by direct observation (M.S. & W.M.).

3) Examining those facts critically and in ordered sequence, using the techniques best suited to the purpose (M.S. & W.M.).

4) Developing the most practical, economic and effective method, having due regard to all circumstances (M.S.).

5) Defining the new method so that it can always be identified (M.S.).

6) Installing that method as standard practice (W.M.).

7) Maintaining that standard practice by regular routine check or proper control procedure (W.M.).

At the present time, there is a trend of making work method design or method study synonymous with motion study, and work measurement synonymous with time study. Thus, the motion and time study and method study and work measurement will be used interchangeably respectively.⁽⁴⁾

With regard to the motion and time study, this term refers to a broad branch of knowledge dealing with the systematic determination of preferable work methods, with the determination of the time required

for the use of humans and/or machines to perform the work by the stipulated method, and with the development of materials required to make practical use of these data. The motion and time study can be usefully adopted in solving basic problems, increasing productivity, effectiveness, and efficiency, and also in other managerial uses. It may be applied in heavy or light factories, offices, staff, farm work, housework, hospital works, hotel works, or any other human activities.^(9,10)

Job Evaluation

Job evaluation is the method of finding out how much work is worth when it is done at its lowest acceptable standard of quantity and quality, in terms of the mental and physical demands of the work.⁽³⁾ In addition, it is a systematic appraisal of the work of a particular job related to all other jobs in the agency or it is a prerequisite for fair salary structure and effective career ladders.

Job evaluation includes job analysis and job description. Job analysis is the first step in job evaluation and requires investigating each job regarding the duties and responsibilities associated with the job, and the skills and personal attributes required in doing the job. With regards to the definition of job description, it is a written record of the principal duties and the scope of responsibility for a particular job, together with the requirement of the employee's characteristics. For instance, the job description for a professional nurse includes performing a physical assessment and obtaining a health history for each patient on admission, establishing nursing diagnoses and a care plan, providing nursing care to patients consistent with the care plan, and so forth.⁽¹¹⁾

The relationship between work study techniques

Each of the techniques provides its answers to different kinds of management problems. The data obtained from each technique will be used in their work steps depending on the purpose of the users. Sometimes the method study should be carried out before work measurement. However, some occasions the need to know how long the work is investigated by work measurement is more important than the need for good methods from method study; for some situations the need to know data from both techniques. In some conditions, the manager needs to know the job evaluation through method study or work measurement to employ the qualified personnel (Figure 1).

How to apply work study to nursing performance

Improvement in determination of nursing activity times can only occur if the nurse has a basic understanding of work study concept and its techniques, and uses it in nursing works to eliminate waste and complexity⁽¹²⁾ before managing and organizing them to become more productive than the traditional one.

Nursing service

Nursing practice on clinic

The objective is the efficient utilization of nursing personnel and resources to achieve the highest possible level of organizational goal that is to save life, enhance healthy state, prevent complications, and respond to patient's needs both physically and psychosocially. Nurses are able to adopt work study method to improve their inefficient works, such as medication administration, order

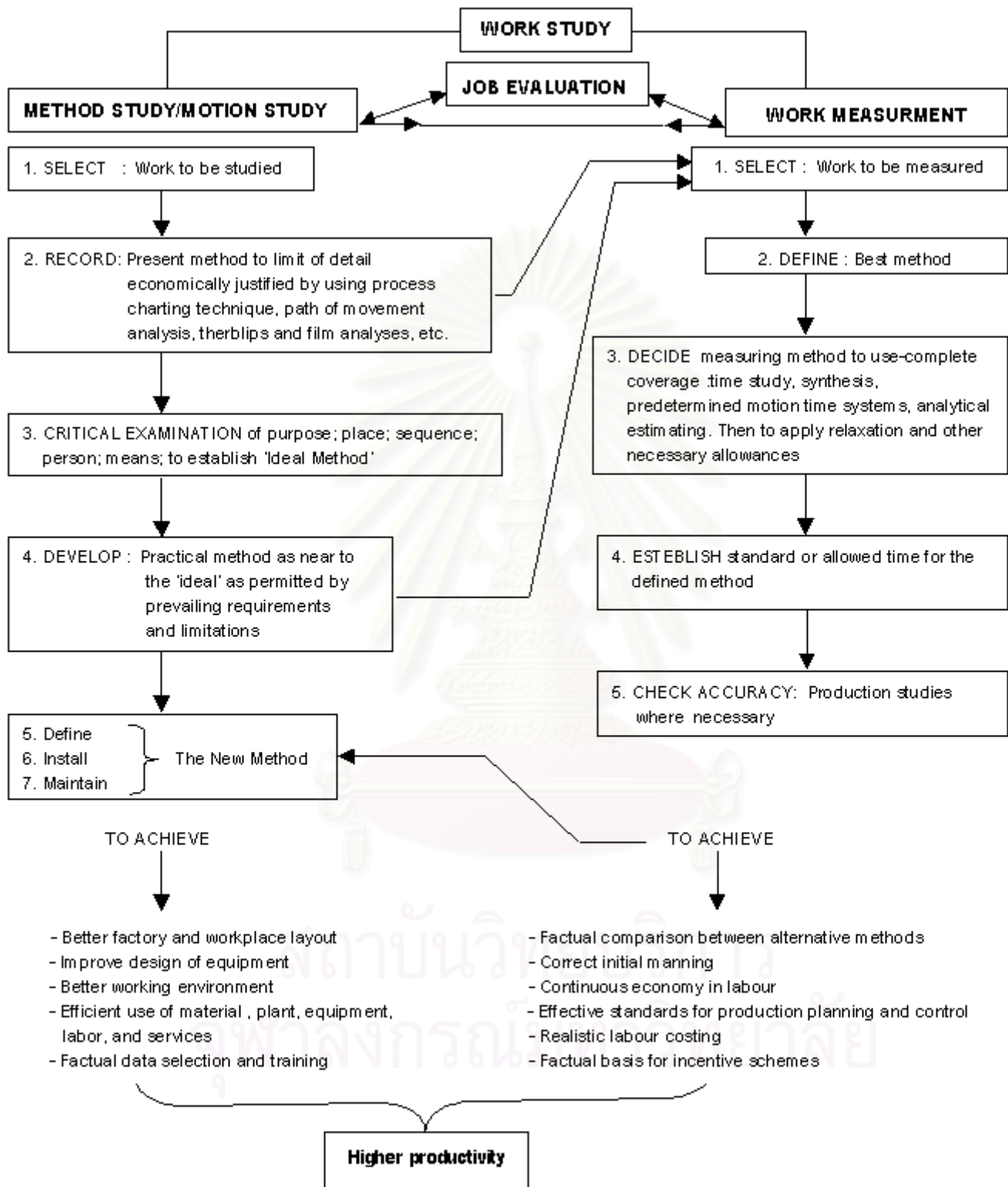


Figure 1. The relationship between work study techniques* (Modified from Larkin, 1969, p.20; International Labor Office, 1964, p. 42)

transcription, direct nursing activities for patients (e.g. admission process, NG tube feeding, discharge planning procedure, and so on), nursing round, or change of shift report. One typical example is that the motion and time study of Kupperschmidt found that a new intravenous additive or ADD-Vantage additive system was more efficient than a volumetric IV additive system.⁽¹³⁾

Nursing management

Work study is one of the most penetrating tools of investigation for productivity improvement which will spread throughout the health organization.⁽¹⁾ In other words, it affects all parts of the organization, not only nursing department, but also the other ones as well. Some examples of nursing operations where a nursing manager can apply work study are ward design, nursing staffing, nursing personnel development, and nursing standards. However, work study is not a substitute for good management, it is one of the management tools for the managers that is used for producing the desired results. The knowledge and attitude towards work study that a nursing manager has is essential in launching a successful work study. Nursing managers who are knowledgeable and experienced in nursing works will gain lots of advantages from utilizing work study; while those who are not familiar with or have bad attitude towards work study will not obtain much benefit from it. The findings of Mangum and Cutler confirm the advantages of the motion and time study that it results in a decrease in turnover times while an increase in team efficiency⁽¹⁴⁾

Nursing education

The work study should be introduced and

applied to at least related subject areas such as nursing management, total quality management, and nursing quality assurance. This application extends obviously to quality improvement concept for nursing students, hence can be adopted to their own other study programs, especially in clinical setting or management perspective, for better productivity of their works.

The advantages and disadvantages of utilizing work study in nursing performance

The advantages

1. It provides more accurate result than self-reporting or observation with non-structured form. Thus, it is a reliable tool for any users, especially for the nursing managers.
2. It is a method of increasing the nursing productivity through reducing unnecessary work content and ineffective time, and reorganizing work to become more efficient and effective.
3. It helps save cost – it's beneficial in reducing cost due to its systematic approach in identifying the factors affecting the efficiency of an operation, together with increasing the amount produced from a certain quantity of resources with a small scale or without further capital investment.
4. It can be exploited in every nursing operation : in nursing practice, nursing management, and nursing education. Furthermore, it is applied to numerous different activities such as direct care activities, indirect care activities, supervisory activities, nursing meeting, and writing up nursing students' nursing care plan for assigned patients before actually providing care.

The disadvantages

There are some difficulties in conducting work study, like method study and work measurement to quantify nursing time and measure nursing practice:⁽¹⁵⁾

1. The work study is developed from industrial engineering which deals with technical tasks which do not consist of the assessment, evaluation, and psychosocial aspects of the nurse-patient contact or human interaction. Thus, a nursing activity wherein a patient requires technical tasks could very likely be rated in a higher category than ones that require psychosocial or teaching activities.

2. It is difficult to distinguish between the start and completion of a nursing activity, because nursing tasks involve both technical tasks together with professional judgments; and often, nurses have to conduct some other activities as well at the same time. For example, while giving a patient a bath, and the nurse interacts with the patient; while checking Foley catheter the nurse also talks to and asks the patient about his/her condition.

3. The procedure is often not completed from the start to the end without any interruption, such as physician round, other nursing personal interactions, or others, like visitors asking for information.

Case study : Applying motion and time study to nursing activities in a Private Hospital of Thailand

This is a part of a dissertation named “Facilitating change: The development of an effective nursing documentation of a medical-surgical ward in Thailand,” which aims at examining the nature of nursing activities in a medical-surgical ward, and reducing time consumption in unnecessary tasks. The results there from will be the supportive data for decision making in redesigning new nursing tasks which are more appropriate for the daily activities. The motion and time study is used for this study through following the procedure similar to the basic procedure of the International Labor Office as mentioned above.

Step	Procedure of time and motion study from theory	Procedure of time and motion study from the study
1	Selecting the job or work to be studied.	All nursing activities are selected for investigation. The purposes of the study are to abolish ineffective tasks and to reorganize those which bring about more efficient and more effective outcomes.
2	Recording all relevant facts about the present method by direct observation	The observation form is established for recording directly observed nursing activities. The activities are categorized into 3 types. ⁽¹⁶⁾ 1).Direct care. All nursing care activities performing in the presence of the patient and his/her family. 2).Indirect care and unit-related activity: All nursing activities that are done away from the patient but on the patient's behalf, and those related to general maintenance of the unit.

Step	Procedure of time and motion study from theory	Procedure of time and motion study from the study
3	Examining those facts critically and in ordered sequence, using the techniques best suited to the purpose.	3). Personal activity. All activities that are done to meet the personal needs of the nursing staff. Three days of a week are randomly selected through observing the actual activities within 24 hours, and to report the result with the mean and percent according to each category of activity(Table 2). These facts are discussed in the meeting to find out what are the causes and which activities should be refined to achieve the purposes.
4	Developing the most practical, economic and effective method, having due regard to all circumstances	First five important tasks which have been selected to be developed include nursing documentation, medication administration direct to patients, drug preparation, and medical order transcription (Table 3).
5	Defining the new method so that it can always be identified.	To define the new method by eradicating ineffective parts of the activity, such as to use medication chart, instead of drug card, which will spend less time for drug order transcription, and with less repetitious and excessive drug administration procedures (checking up the cards, filling the cards in the card box timely, putting the card back into the box, etc.)
6	Installing that method as the standard practice.	To write up the guideline of new drug administration and order transcription, and to train registered nurses to conduct according to the guideline.
7	Maintaining that standard practice by regular routine check or proper control procedure.	To monitor those performances through direct observation and to report the better outcomes in the meeting(Table 3). Afterwards, it is approved in the meeting to carry on these procedures as the model.

Conclusion

The knowledge of work study is not new for either nursing managers or clinic nurses, but its application probably seems unfamiliar to them. The work sampling study in nursing tasks, which is the most popular work study for nursing operations, was found occasionally in the research works as well as in

some studies in Thailand. However, work sampling has some limitations that there are not quantifiable measurements and there is not any detailed analysis like time study. Thus, the motion and time study is another effective investigation of work study, which is beneficial to nursing productivity improvement. The collected detail will be useful for productivity analysis

in order to lessen work which is not cost-beneficial by decreasing non-productive or excessive work, getting rid of less efficient standard procedures, and setting better standard of nursing practice. Thus nursing service will enjoy higher productivity and standardization, while minimizing labor power loss and time loss, and concurrently maintaining the quality of care.

References

1. International Labor Office. Introduction to Work Study. Revised Edition. 2nd revised ed. Switzerland: Impression Couleurs Weber; 1964: 35 - 43
2. Larkin JA. Work Study Theory and Practice. New York: McGraw-Hill; 1969: 19 - 21
3. Morris JW. Principles of Work Study. Heinemann: Institute of Supervisory Management, 1969: 1 - 14
4. Barnes RM. Motion and Time Study Design and Measurement of Work. 7th ed. New York: John Wiley & Sons, 1980: 6 - 17
5. International Labor Office. Introduction to Work Study. 2nd revised ed. Second Edition. Switzerland: Impression Couleurs Weber, 1970: 76 - 7
6. Gowan CB. Which work measurement tool? Manufacturing Engineering March. 1999 Mar; 122(3): 18 - 9
7. AFT LS. Productivity Measurement and Improvement. Reston: Reston Publishing Company, 1983: 270-82
8. Sullivan EJ, Decker PJ. Effective Leadership and Management. 4th ed. Menlo Park: Addison-Wesley Longman, 1997: 288 - 9
9. Mundel ME, Danner DL. Motion and Time study Improving Productivity. 7th ed. Englewood Cliffs: A Paramount Communications Company, 1994: 1 - 3
10. Mundel ME. Motion and time study Principles and Practices. 4th ed. New Jersey: Prentice-Hall, 1970: 1 - 26
11. Gillies DA. Nursing Management A Systems Approach. 3rd ed. Philadelphia: W.B. Saunders Company, 1994: 148 - 56
12. Burrill CW, Ledolter J. Achieving Quality through Continual Improvement. New York: John Wiley & Sons, 1999: 478
13. Kupperschmidt BR. Commentary on the Cost-Effectiveness of Two Intravenous Additive Systems. Aone's Leadership Perspectives 1994 Nov-Dec; 2(6): 17
14. Mangum SS, Cutler K. Increased Efficiency through OR Redesign and Process: Simplification. AORN J 2002 Dec; 76(6): 1041 - 6
15. Simms LM, Price SA, Ervin NE. The Professional Practice of Nursing Administration. New York: Delmar Publishers, 1994: 288 - 9
16. Linden L, English K. Adjusting the Cost-Quality Equation: Utilizing Work Sampling and Time Study Data to Redesign Clinical Practice. J Nurs Care Qual 1994 Apr; 8(4): 34 - 42