

## Chapter II

### The Performance Analysis of an Application System

#### The Performance Parameter

The performance parameter is a system variable that effect the system performance. If the performance parameter is modified, the system performance will also be changed. In client-server network system, the examples of the performance parameter are average service time, communication line speed, CPU speed, error detecting ability, etc.

In application system that deals with high volumn of data and involves many officers, the performance rely on many parameter such as the responsibility of the officers, error correcting plans, system manager view, etc. There are 2 types of performance parameter, external parameter and internal parameter. (K. Kant,1992)

#### 1. External performance parameters

They are the performance parameters that are not directly concern with the physical system. The external performance parameter value can be predicted by the internal performance parameter value.

The examples of the external performance parameter are as follow.

- responsibility of the officers.
- accuracy control plans.
- skill of the user at the terminal.
- turnaround time of batch jobs.
- throughput.

## 2. Internal performance parameter

It is the system parameter that concern with a physical system, hardware, system software. The examples of the internal performance parameter are as follows.

- utilization of a device
- CPU speed
- I/O speed
- storage space
- display screen quality
- keyboard quality

Evaluators have to decide which of the performance parameters are. Thus, they can design how to evaluate the system performance and how to tune them correctly.

### The Process of Performance Evaluation

The performance evaluation consists of resource utilizations, operations and services. When performance is unsatisfied the system will be reevaluated and tuned until it is acceptable. The diagram of the process of performance evaluation is shown in figure 2.1

Computing is not a static field. New technology, an increased load, a change in users, demand for new applications or delays in new system development will make users feel frustrated. For this reason, evaluations should be scheduled at regular intervals so that systems weakness can be identified and rectified. Evaluation should be initiated when ever problem happens.

Figure 2.2 shows the examples of the three items that could be evaluated.

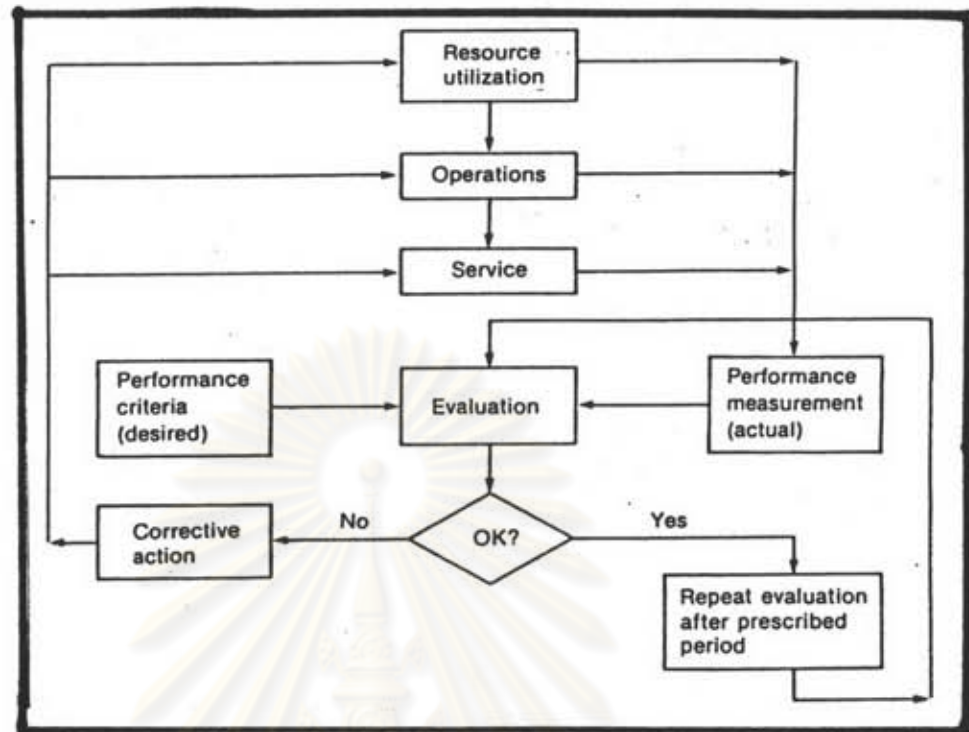


Figure 2.1 The Process of Performance Evaluation.

(Donna S. Hussian and K.M. Hussian, 1992)

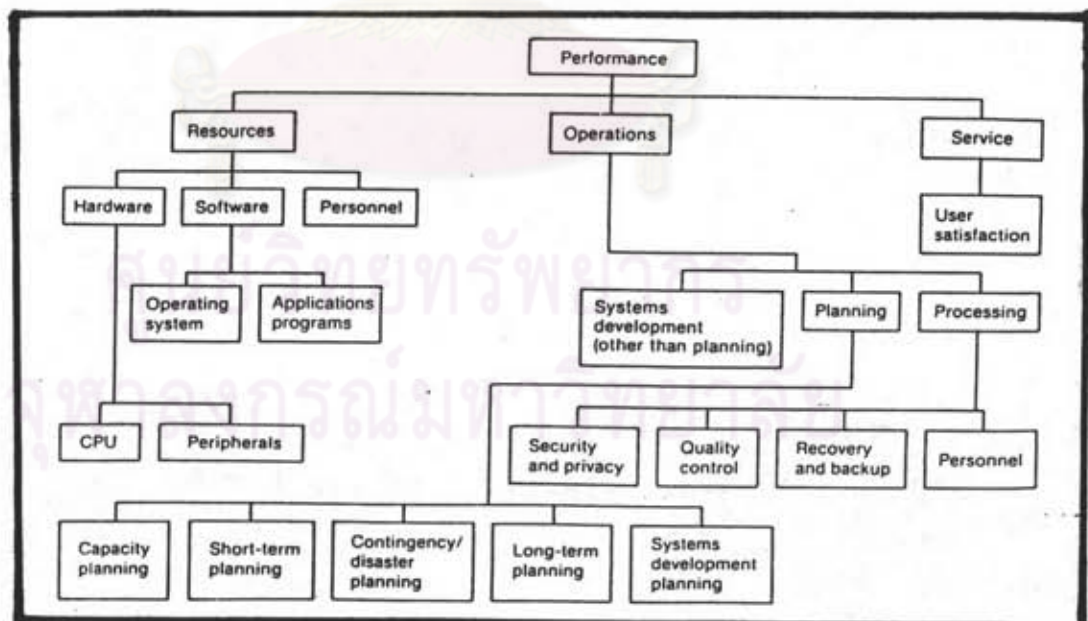


Figure 2.2 Performance Components to be Evaluated.

(Donna S. Hussian and K.M. Hussian, 1992)

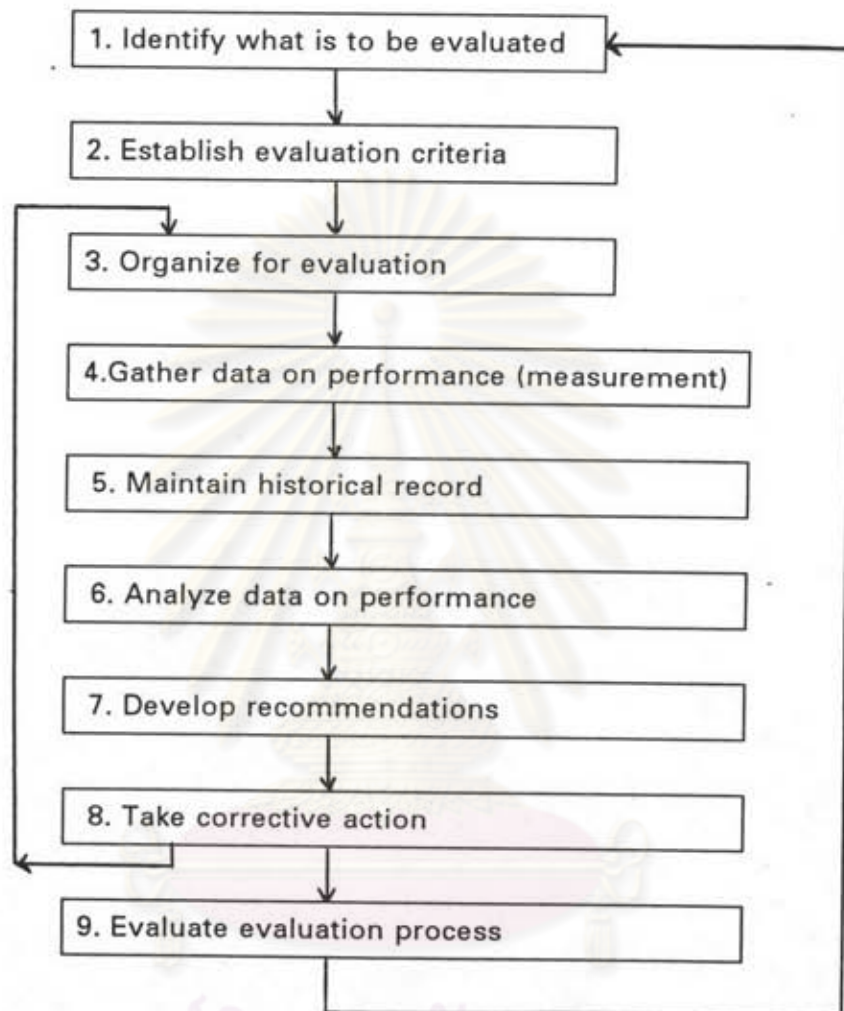


Figure 2.3 Steps in Performance Evaluation.

(Donna S. Hussian and K.M. Hussian,1992)

### Steps in Evaluation

There are nine steps in evaluation as shown in figure 2.3.

#### 1. Identify what is to be Evaluated

Four departments that can be considered to get the keys of performance are as follow :

##### 1) Financial.

The evaluator should think about management of the financial resources allocated to the computer systems function.

##### 2) Application management.

It is about controlling and report of the design, implementation, and maintenance of applications systems.

##### 3) Productivity and operations management.

It is about availability and utilization of computer.

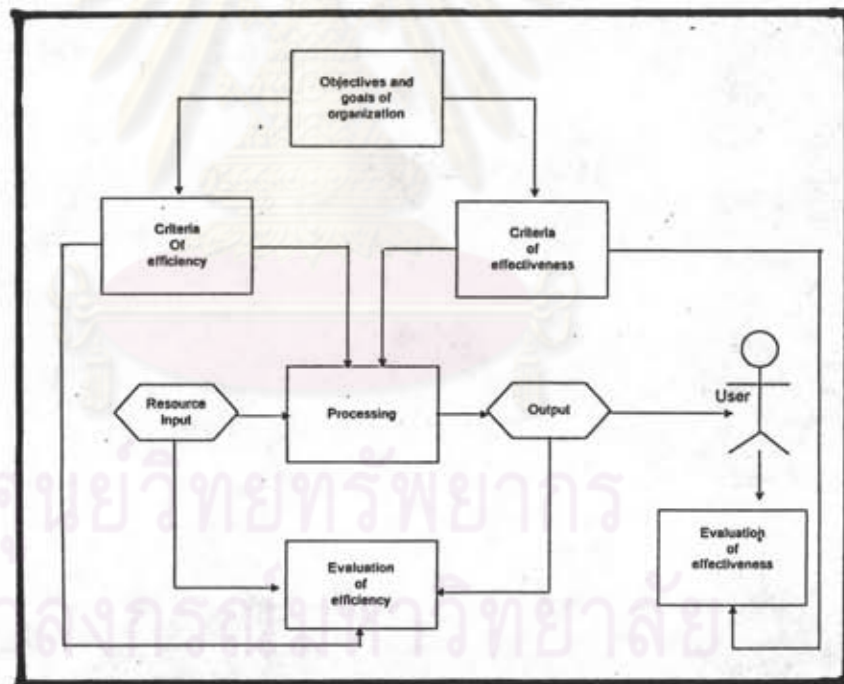
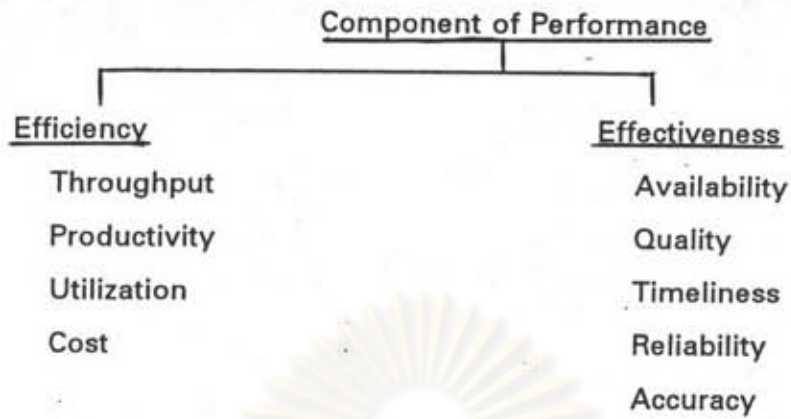
##### 4) Human resource management.

It is a productivity of personnel assigned to develop the system.

In designing what performance variables in each of four departments to be monitored and evaluated, corporate management, information users, planning groups, data administrators and other officers that participate in the system should have a voice.

#### 2. Establish Evaluation Criteria

Generally, evaluation criteria consists of two categories, efficiency and effectiveness. The system flow of efficiency and effectiveness evaluation is shown below in figure 2.4



**Figure 2.4** Efficiency and Effectiveness Evaluation.  
(Donna S. Hussian and K.M. Hussian,1992)

1) Efficiency (N) is a ratio of output(O) to input (I) as express in the formula

$$N = O/I$$

If output increases, efficiency is increased. If output decreases, efficiency is decreased. Efficiency is generally measured in term of throughput, productivity, resource utilization and costs.

- Throughput.

It means the amount of work that can be performed during a given period of time. We can measure the throughput of the central processing unit (CPU) in MIPS (Millions instructions per second) unit. CPU, throughput, however are not the exact processing constraint. Efficiency is also limited by peripheral I/O devices used in the system too.

- Productivity.

Productivity is applied to throughput performance of personel. It is the quantity of work produced by an individual in a unit of time. For example, the efficiency of data entry operators can be evaluated by comparing numbers of keystrokes per hour. Common productivity measurement are documentation pages per documenter-month, CPU hours per programmer-month.

- Utilization.

The utilization is the ratio of what is used to what is available. Unused capacity is a waste of resource. A high utilization value may indicate that bottleneck in processing will occur in the near future. The utilization can be used for capacity planning and scheduling.

- Cost.

Efficiency is increased when cost drops. One way to evaluate performance is by comparing budgeted with actual expenditures and reviewing trends in total cost of computing.

The example of cost are cost of material, cost of personel and cost of software maintenance.

2) Effectiveness evaluation is based on the objectives of the system. An effective system is one that satisfies the expectations of users. Performance is measured in terms of systems availability, information quality, timeliness, accuracy and reliability, since user satisfaction is based on these criteria.

- System availability.

Machine availability maybe measured as the percentage of time that equipment is in service.

- Quality.

Generally, quality is measured in terms of user satisfaction.

Factors that will influence this satisfaction are :

1. Ease in use of computer systems and software.
2. Security and confidentiality of data.
3. Technical support given users by computer specialists.
4. The completeness, readability and organization of documentation.
5. Ease with which systems can be maintained and upgraded.
6. Portability and reusability.

- Timeliness.

There are three measuring for timeliness :

1. Turnaround time.

It is a period of time between job submission and the return of output. This is usually a measurement for batch work and will be measured in hours or days.

2. Response time.

It is a measuring of the timeliness of interactive on-line activities. It will be measured in fractions of a second.

3. Schedule adherence.

It is the ability of a computing facility to process applications on time and to deliver new systems that are under development when promised.

Other ways to evaluate timeliness would be to study waiting time, length of queue, number of days projects are delays and backlogs.

- Accuracy.



Accuracy is the absence of error. Rate of acceptable error or error limits must be define in any systems.

### 3. Organize for Evaluation

The team that will evaluate the system performance must be set. They may work in another department. Some organization hire a consultant to evaluate the performance of their system.

For large organizations with complex information systems, an evaluation should be regularly scheduled activity. It should be conducted openly, not secretly. Employees can be helpful to evaluators in identifying and diagnosing poor performance. The cooperation is needed when corrective procedures are initiated.

### 4. Gather Data on Performance Measurement

Data on the values of variables must be collected for analysis. This can be done by the methods as follow.

#### 1) Log file.

Manual logs could be kept by officers or they could be recorded in file. By using job accounting program, the evaluator can get data for the performance measurement.

One disadvantage of using log file is time consuming. Job accounting program can replace manually collected statistics and solve time consuming problem.

#### 2) Monitors.

Figure 2.5 shows type of monitor.

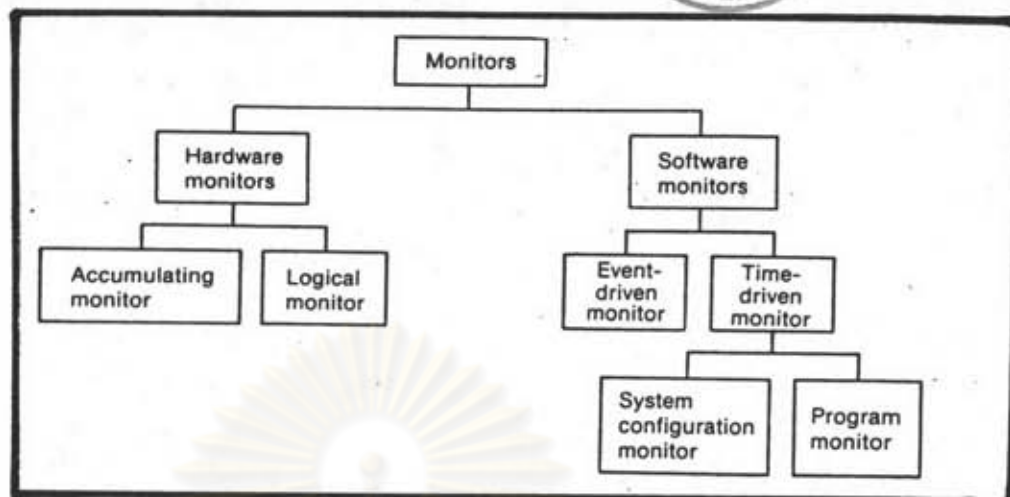


Figure 2.5 Type of Monitors. (Donna S. Hussian and K.M. Hussian,1992)

There are both hardware and software monitor :

- Hardware monitor.

It is an equipment with sensors in input and output channels. It records desired data on medias for later analysis. It can accurately report data on short-term activities and measure system overhead.

- Software monitor.

It is an application program that is part of the operating system or stored internally. There are two type of software monitor :

1. Even-driven monitor.

It interacts with the operating system interrupt handling mechanism when a specific event occurs.

2. Time-driven monitor.

It is a periodic sampling system activated at user-specified intervals.

Software monitor is easy to use, low in cost and flexible.

- User Survey.

User survey can be made by using questionares and interviews. The questionnaires must be clear. Thus they will be analyzed easily.

#### 5. Maintain Historical Record

It is useful to compare a current performance with records from the past. For this reason, historical records need to be maintained. The data should help longitudinal analysis, setting standards, identifying performance trends and calculating moving averages.

#### 6. Analyze Data on Performance

Analysis usually starts with checking at data to see if the values are reasonable. Data can be analysed to get the bottle necks of the system, utilization statistic and other information.

#### 7. Develop Recommendation

The evaluators should formulate recommendations to improve performance, supported by reviews and reports. The recommendation consists of both management view and technical view.

#### 8. Take Corrective Action

The aim of corrective action is to raise the system performance to higher standard. Recommendation for actions to correct an unacceptable situation should be come from project manager and every officers.

#### 9. Evaluate Evaluation Process

It's the final process of the performance evaluation. The evaluators should identify the problems of performance evaluation. Tools and techniques for future evaluations should be recommended.