

**EVALUATION OF PERFORMANCE OF COMPUTER-BASED INFORMATION  
SYSTEMS: A SURVEY OF ITS PRACTICE IN KENYA**

**BY**

**AKELO, ERNEST OCHIENG**

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**DECLARATION**

This management project is my original work and has not been presented for a degree in any other University.

Signed:  Date: 10/5/93

Akelo, E. Ochieng

This management project has been submitted for examination with my approval as University Supervisor.

Signed:  Date: 17/5/93

Omosa, Florence (Miss)  
Lecturer,  
Department of Management Science.

**DEDICATION**

TO

**MY PARENTS**

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## ABSTRACT

This study examines the practice of evaluation of computer-based information systems (CBIS) in Kenya. Computer-based information system is a relatively new technology.

A great deal has, for some time now, been said about the importance of CBIS in the overall performance of the organization. But while the importance of the CBIS has captured much attention culminating into the rush for its adoption by organizations, relatively little is known about what organizations do about the management of these systems, especially the control aspect of it when this is the core of the success of any system.

A field study was conducted resulting in 32 respondents from a variety of organizations based in Nairobi. The respondents were systems analysts, data processing managers and any other person in the organization who may have had the desired information (as may have been advised). The following were the major issues examined: whether the organization had a system for continuous evaluation of information systems, the methods used for evaluation, the factors considered when evaluating, the existence of a written policy on evaluation, and for organizations that do not evaluate, reasons as to why it is not done.

The findings reveal that most organizations do not have a written policy on performance evaluation and also that most organizations do not evaluate their IS after it has been installed and is in operation. Lack of company policy on evaluation,

unavailability of clear-cut evaluation methods, and costs of carrying out the exercise were the main reasons given for lack of evaluation.

Further it was found that the few organizations that evaluate mostly use auditing and financial control as methods of evaluation. The factors that are widely considered when evaluating are the hardware performance and software performance. The human factor was found to be the least considered factor in IS evaluation.



# CHAPTER ONE

## INTRODUCTION

### 1.1 Background to the Study

Many managers have concluded that if you cannot measure something, you cannot manage it (Silver, 1989, p.342). This is true in many areas of human endeavour and is particularly important now for information systems' performance since information system has assumed major corporate asset (Hoplin and Suresh, 1989, p.27). The information systems function now enjoys high visibility in most organizations since (Hoffman, 1989, p.25): its budget is significant and competes with others for resources; its functions are integrated into most operational activities; it interacts with high level of management; and it affects the bottom line.

Companies spend thousands of dollars to design and implement systems and procedures (Coates, 1988). They then spend thousands more to train employees to understand and follow them. Once this is done, managers assume everything is working well and no further intervention on their part is required. Coates (1988) warns that this is wrong and should not be the case.

He argues that it is critical that managers establish control techniques to make sure the systems and procedures are operating as designed. He further warns that "before you commit your time, money, and future on whatever program happens to be in vogue today, consider a simpler approach. Consider an approach over which you have the knowledge and experience needed for successful implementation."

Awad (1988, p.522) suggests that after the system is completely converted and

the operation is "up and running", the effect of the new system on the organization should be carefully evaluated. He also concurs with Murdick and Claggett's observation that "after the management information system (hereafter, MIS) has been operating smoothly for a short period of time, an evaluation of each step in the design and of the final system performance should be made (Murdick and Claggett, 1988).

The system's impact must be analyzed in terms of its effect on people, procedures and the overall performance of the business. More specifically, the main areas of concern should be the quality of information and decision making, attitudes of end-users and costs of information processing.

Although the information systems' literature appears to be in widespread agreement regarding the need to evaluate the product and the process of systems development, the means for undertaking such an evaluation is far from clear (Hirschheim and Smithson, 1990). Numerous suggestions have been offered about what should be done, and there have been various attempts to define how it should be done (Hoffman, 1989; Taylor and Dean, 1966; Murdick and Claggett, 1988).

Unfortunately, much of what has been done under the umbrella of information systems evaluation has been ill-conceived (Hirschheim and Smithson, 1990). The social dimension of evaluation has largely been ignored in the drive to provide a rigorous interpretation and means for evaluation.

Couger (1990) observed that in the past, a number of potentially high-benefit systems were given low priority for computerization because of the difficulty in quantifying the benefits of these systems which were classified as intangible. He gives,

as the best illustration, the general category of computer-based management information systems. Due to the difficulty in quantifying the benefits, improved quality or timeliness of information, those systems were rarely computerized. However, the situation doesn't seem to have improved much. Brancheau and Wetherbe (1988) say that "...measurement continues to be a critical problem as organizations invest more and more in information systems."

Computer-based information systems are now widely applied in business. That is to say, they are business systems. However, business systems are dynamic because changes with time in such systems are inevitable. For a dynamic system, it is necessary to review either periodically or continuously the nature of the output to adjust the system for changes in its own operation or changes in the environment (Murdick and Claggett, 1988). In a business system we need to observe whether the output of products is profitable and acceptable to the customer; otherwise the system will come to a standstill. But care must be taken because it is possible for a system to be malfunctioning even though employees and others praise it (Silver, 1989 ).

## **1.2 Statement of the problem**

Information systems which were once perceived by senior management as having solely a support role, are now being used strategically to gain competitive advantage (McFarlan, 1973). As organizations in Kenya take to increased usage of computer-based information systems, a relatively new technology, the question that arises is whether these organizations are fully prepared to meet the challenges involved in managing these systems, especially the control aspect of it.

Stivers and Beard argue: "Although the appropriateness of the control process

may seem intuitively obvious, many data processing managers have the incorrect perception that normal management policies do not apply to data processing" (Stivers and Beard, 1987, p.35). The basic control process, wherever it is found and whatever is being controlled involves: establishing standards, measuring performance against these standards and taking corrective action (Koontz and Weihrich, 1988: 490). This study hopes to find out whether the control process in IS is practiced in Kenya.

Measurement of information systems' performance has long been a problem and still continues to be. Whereas several attempts have been made by researchers to measure the performance of information systems, little is known about what the organizations themselves do about it. Although suggestions have been made regarding the methods to use and factors to consider when evaluating performance of information systems, no study appears to have been done in Kenya to determine whether those suggestions are really put into practice by the organizations. It is hoped that this study will find out the same.

Coates (1989) asserts that companies spend a lot of money to design and implement systems, spend some more to train employees to understand and follow them and that once this is done, managers assume that everything is working well and that no further intervention on their part is required. That means, they ignore evaluation. Does this apply to firms in Kenya that have computerized their information systems? It is the hope of this researcher that this study will also address this issue.

### **1.3 The objectives of the study**

The objectives of this study will be to find out whether and how firms in Kenya evaluate the performance of their computer-based information systems and hence the importance they attach to evaluation.

For firms that evaluate their information systems, the study helps to find out which evaluation techniques are commonly used and the factors considered when evaluating the systems. For firms found not to have formal evaluation systems, the reasons as to why they do not evaluate will be sought.

### **1.4 Importance of the study**

#### **(1) Academics**

Researchers and academics should benefit from this study. More insight can be gained into the practice of evaluating the performance of information systems. As a result, further research can be carried out in this area.

#### **(2) Systems analysts**

It is expected that this study will improve the systems analysts' evaluation knowledge by revealing the factors that should be considered when performing evaluation. Further, other evaluation methods that they might not have been aware of may be revealed.

#### **(3) Vendors of computer hardware and software**

It is very important for the vendors to know the basis on which their products

are evaluated. This will enable them to improve on their products on those aspects that are considered when carrying out evaluation. This may improve the demand for their products.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1. Systems evaluation

Systems evaluation is the systematic assessment of system performance to determine whether goals have been reached (Silver, 1989). It is a vital and important part of both the implementation and post implementation phases of the information system. Its purpose is to measure the performance and output of a system and compare it to the goals established in the planning phase for feedback and control purposes.

Evaluation in general is endemic to man's existence. Whether conscious or not, man evaluates the products and processes of his labour (Hirschheim and Smithson, 1987). Evaluation is taken as a matter of course in the attempt to gauge how something will meet a particular expectation, objective or need.

Evaluation is apparently an important and intrinsic property of the process of understanding. It is only natural, therefore, that man has sought mechanisms to help in the process of evaluation. Various tools, methods, and techniques have been developed to aid this process. Criteria such as bouquet and clarity are used to judge the quality of wine; hardware monitors are used in computers to assess their efficiency; econometric models are used to evaluate the state of a nation's economy; and formal methods are used to evaluate the correctness of a computer program (Hirschheim and Smithson, 1987).

As was noted by Mason and Swanson (1981), underlying these tools and methods is a more basic concept - that of measurement. Measurement is the link between evaluation and tools. In order for something to be evaluated, it has to initially be measured, which is normally undertaken through the application of tools and techniques. One cannot tell whether he has improved something if he has not measured its performance! Without measurement tools and benchmarks, the actual performance, improvements, and benefits of a new system can only be guessed at or hypothesized.

Coupled with this is the fact that whatever is to be measured must first be decided on. As Strassman (1985) notes: "You cannot measure what is not defined". This means that clear policies and strategies on evaluation must be laid down. In their article, Hirschheim and Smithson (1987) contend that in the drive for better tool creation (to improve the process of evaluation), man has concentrated on the 'means' to the detriment of the 'ends'. That is, the function and substance of evaluation has been given too little attention, while the mechanisms for carrying out evaluation have been given too much attention. This has led to confusion and a basic misinterpretation of one of the ultimate goals of evaluation - that of understanding.

## **2.2 Evaluation techniques**

Controlling the IS is that feedback activity which includes regulation and pilotage of the system. Controlling essentially consists of comparing actual performances with set standards, or objectives, and of taking the corrective actions required.



Evaluation methods can be dichotomized into objective and subjective techniques (Zakierski, as cited by Powell, 1992, p.30). Objective measures, which are generally older, seek to quantify system inputs and outputs in order to attach values to the items. That is, they endeavour to categorize the costs associated with a system or proposed system. These costs may relate to the functions of the system, to those involved in the system or to the life-cycle of the system. It is hoped that by careful cost categorization all sources of cost can be identified, and hopefully quantified in a reasonable robust manner. A similar set of activities is advocated for the attribution of values to benefits.

Subjective methods acknowledge the frailty of the values so computed - from the objective methods - and rely instead on the attitudes and opinions of users and system builders. According to Powell, subjective methodologies first arose in the late 1970s. These methodologies were often propounded as team building ones. The idea was to get the computer system out of the data processing domain and into that of the manager or user, hence giving the user a sense of participation, ownership and commitment. In some sense most of the subjective methods are merely spurious pseudo-quantitative ones. They still try to quantify in order to differentiate between systems, but the quantification is of feelings, attitudes and perception.

Evaluation of Information Systems' performance may be classified into four broad types (Dumas, 1980): (i) the hardware/software performance evaluation (ii) auditing (iii) financial control and (iv) application evaluation.

### 2.2.1. Hardware/software performance evaluation

This class of evaluation methods includes performance monitoring, or computer system performance measurement (CSPM). The purpose of CSPM is to determine whether things are done correctly in the computer system. It is not concerned with the relevance and effectiveness of application, but with the efficiency of the computer system itself. Possible outcomes of CSPM are twofold: Firstly, CSPM may lead to an improvement - a "tuning" - of the present systems by minor adaptation such as:

- Change in data storage organization (e.g. virtual memory, files structure)
- Change in physical storage units (disks, tapes)
- Change in channels (addition, deletion, speed modification)
- Dropping facilities not efficiently used (on-line devices, software modules)
- Modification of main memory capacity
- Addition of new software modules
- Balancing the work load between several computers

Secondly, CSPM indicates to management what the present excess in capacity may be thus enabling them to realistically plan the future development of the system with respect to both the normal increase of work load due to business activity, and the new application envisioned.

There are two main approaches under which hardware/software performance evaluation can be done. One approach involves the use of system logs, audit trails, console reports and visual observation of computer operations. The other approach is by automatic censoring devices such as hardware or software monitors.

## **(i) Systems logs and visual observations**

Most operating systems provide some kind of record of what happens in the central unit and main peripheral as time passes by. An analysis of systems logs may reveal problems with variation in running times, re-runs, CPU (central processor unit) waiting for control responses or excessive machine failures. Direct observation of the computer room may also indicate much about work organization and scheduling e.g., printing paper; excessive requirement from the operator at console; complicated re-start procedures, and the like. Direct observation is important because it is not worth to look for micro second in the CPU if minutes are lost in the room. Other hints can be acquired from the observation of the console, the disk units and their arm moves, the mainstream light, or the tape drives.

The observation and use of systems logs are the cheapest ways to evaluate computer system operations. They are also easy to understand for the operating team. However, they are difficult to apply in large systems, ineffective for multiple computer installations and are judgemental in part in the observation phase. Furthermore they give limits, but no indication of 'causes'.

## **(ii) Hardware/software monitors**

Hardware monitors are sensing devices that measure the activity for specific subparts of the computer ( e.g., CPU, peripherals, channels, etc). They do not require space in memory and are unobtrusive in the computer. Data collected by the monitor is stored in machine - readable form and exploited periodically by special programs. Yet mere hardware monitors' utilization does not easily give information of specific program efficiency as soon as multiprogramming is being used.

On the other hand software monitors are programs that are stored in the memory and require execution time. They are thus obtrusive in the computer, stopping and slowing down normal execution in order to record data about the very execution. They generally perform on a sampling basis of the activities of the components of a computer system.

Hardware/software monitors have been developed mainly because computer operations have grown too intricate for an observer to understand the whole process inside the "computer black box" (e.g. multiprogramming, on-hire systems, virtual storage, data base management). They are costly to develop and operate - the trend seems to favour the use of packages. The need for adapting packages to a specific installation implies that evaluators have some preconceived idea or model of how resources are utilized. On the basis of this model data can be meaningfully collected and analyzed through the utilization of monitors.

Monitors provide a view of cause - effect relationship inside the computer system. They enable recommendation to be made for specific improvements and also to test the effectiveness of the system. In addition, they are applicable for larger systems and exist in package form (for software monitors).

Monitors are nevertheless costly and limited to large systems only because of the package requirements (in the case of software monitors). They need highly specialized personnel because of the necessity to adapt packages and to prepare the performance review. Software monitors also interfere with normal operations of the computer system.

## 2.2.2 Auditing

Another dimension of evaluating computer-based information system is auditing. Tailor and Dean (1966) performed a study that revealed that there is significant correlation between poor auditing practice and less-than optimum computer systems performance. This finding strongly lends support to the fact that auditing can be a very useful technique in the evaluation of computer systems' performance.

Auditing practices vary from rather informal reports, to management on an annual basis, to regular quarterly or semiannual audits documenting return on investment, cost reduction, and operating improvement.

Hoffman (1989, p.25) proposed (and introduced) a new concept: Management Audit of Information Systems. He defined audit as an "official" examination or review implying reference to some standard such as Generally Accepted Practice (GAP) as is used by accountants. However he used the term review instead of audit since there are no proposed or official standards in information processing.

He noted that conclusions reached in a review tend to be subjective and reflect the emphasis of the reviewer. But he argued that the proposed audit methodology would serve as a step toward development of standards of Generally Accepted Practice which could then be adopted and promulgated by an appropriate professional organization. A management Audit of information systems could then be conducted by qualified individuals to determine the extent of compliance with generally accepted practice.

The proposed standard audit procedure consist of six major tasks. These are:

user and management survey whose purpose is to survey key users and management to determine their perception of information systems services; appraisal of information systems organization, management, staff, and budget the purpose for which is to appraise the organization, management, and staff of information systems; technical audit of information systems; audit of personal and departmental computers whose purpose is to audit the information systems role in administration and support of personal and departmental computers; audit of capacity and utilization; and audit report.

Dumas (1980, p.99) defines auditing as the activity of ensuring corporate management of the computer-based information system (CBIS) achieves a high degree of integrity with respect to its stated objectives. Auditing attempts to measure the effectiveness of CBIS.

Wasserman, as reported by Dumas (1980, p.100), states that auditing is concerned mainly with two main aspects of computer operations: whether the actual data resources and procedures are reflecting the real status of the organization, and primarily its financial status (systems integrity); and whether data resources and users are dependable, safeguarded against disruptions and breaching attempts (systems dependability). Dumas identifies four methods under auditing viz: observation and inquiry; auditing around the computer; auditing through the computer and; auditing systems dependability.

### **(i) Observation and inquiry**

In view of the fact that computer audit is a means for assessing computer effectiveness, the technique rests extensively on interviews and opinion research. Systematization of observation and inquiries is achieved by the use of checklists.

The overall appraisal leads the auditor to check the installation against a small number of criteria that are relevant for corporate management. Among the possible criteria are: the accuracy and completeness of data, particularly the financial data; the meeting of deadlines; the rapidity of adaptation to users' requests; the formulation of mid- and long-term goals for the computer department; the budget performance and cost-control; or the reliability of the system.

### **(ii) Auditing around the computer**

This deals with checking computer programs and procedures. It is performed without examining the computer "black box". The justification of this is that if the input data is correct, then the output documents (e.g., files and print-outs) must also be correct. The work of the auditor here is to create and submit a test deck, and to perform manually all calculations so that he can compare computer and manual outputs.

### **(iii) Auditing through the computer**

Under this, the routine auditor's job is performed by the computer itself - otherwise it is not different from the preceding method. It is the 'audit software' which generates the test deck and flagged data, carries out simulated calculations, and output desired data at selected moments in the process. The audit software may be

based on packages and supplemented by custom made programs to suit different applications or tests.

#### **(iv) Auditing systems dependability**

Dumas notes, however that the existence of procedures is not sufficient. There must be a way of ascertaining that they are enforceable and effective. To this end, a simulation approach is proposed where simulation of breaching attempts, and disaster conditions as is the case with fire or other emergency situations, is performed.

### **2.2.3 Financial control**

The financial control of computer operations has been defined as the backbone for corporate management appraisal of information systems (Nolan, 1972, as cited by Dumas, 1988, p. 103)

Under the financial control, we have the policy for charging data processing expenses to other departments. There has been a lot of debate going on over this policy. However, the two extreme alternative policies are: the computer and information systems department is regarded as a cost center whose charges are passed on to operating department as corporate overhead and; expenses of the computer and information systems department are fully charged to the "customers" departments. In between the two extremes, users are partially charged.

The two policies (charging out versus overhead) offer a means for assessing efficiency and effectiveness of the service provided by the information systems



department in general, and the information systems in particular. This is because the charging-out policy helps in creating a market economy inside the firm.

Nolan, as reported by Dumas (1988, p. 104), comments that:

"the full charge-out system employs the pricing mechanisms to fully decentralize to the ultimate user of the computer resources the effectiveness decision as to what system ought to be developed, and the efficiency controls over the use of computer resources. The essential assumption is that users will appropriately make the trade-offs of computing with other alternatives..... The underlying assumptions of the full charge-out system are virtually the same as those for "economic man".

#### **(i) Non charge-out method**

The non charge-out method has the following advantages:

It is cheaper to carry out since there is no need of complicated price calculations and billing software. The EDP department, which solely can control its costs, is responsible for them. As a result the EDP department tends to be more honest with its costs and at the same time, EDP expenses fall directly under the eyes of corporate management (viz. controller). Finally, it insulates Information System development from firm's activity fluctuations.

However, it has the following disadvantages: It does not commit users to their responsibility in data use; it makes the task of project selection on some "cost effectiveness" basis difficult; and finally, it makes it difficult to assess priorities when hardware is overloaded (peak period).

#### **(ii) Full charge-out method**

This method has the following advantages: it requires more meaningful analyses and commitment on the part of users; it is expected to suscite more "rational"

behaviour in users' allocation of resources among projects; it permits to compare firms' EDP efficiency with out-house services; it facilitates the selection of development projects and; the by-product data are available for selecting computer configuration.

On the other hand, the full charge-out method is costly and complicated to implement and to understand. Also, it is a positive feedback control system and has been reproached as having "stagflationary" influence at the macro level. Also, in practice, rates are dependent on activity levels hence users cannot budget meaningfully their computer expenses. Rates also fluctuate because of machine operating system allocations, a process beyond the control of users. Further, rates are dependent on machine used. Change in configuration requires new pricing schemes with sudden variations which is out of the control of users. Lastly, system department budget is exposed to the firm's profit conjectural variations whereas the long lead time for hardware and software development require some budgetary stability.

### **(iii) Partial charge-out method**

Users may be partially charged for their utilization of data processing facilities. Partial charge-out means that a trade-off is made between the costly, complicated and difficult to understand methods of full charge-out and the non committing methods of non charge-out.

## **2.2.4 Applications evaluation**

"The appraisal of performance (effectiveness and efficiency) of a computer application is much less established in a methodology" (Dumas, 1980, p. 105). The trend now is towards enlarging the scope of the auditors' job so that their duties may go beyond the mere computer performance evaluation.

Under the applications evaluations, there are three basic methods that can be identified in present day practices. These methods are however used concurrently. They represent respectively a decreasing degree of formalization, and are suited to an increasing degree of decision unstructuredness. The methods are based on:

- A) a comparison with a list of quantitative objectives (not only economic)
- B) a measure of user's satisfaction, and
- C) an appraisal of the situation in comparable organizations.

### **A. Quantitative criteria of computer application performance**

When evaluating the computer application performance using the quantitative criteria, the factors that are considered include: the meeting of deadlines and budget forecastings; cost control achievements; number of personnel trained both inside and outside the computer department; number of transactions handled by the system; accuracy of results from the user's standpoint; number of re - runs; appraisal of EDP personnel by their superiors; and the like. These criteria are often placed in a historical perspective showing trends. For instance, year to year comparisons may be done to see if the performance is improving (upward trend) or deteriorating (downward trend):

The main advantage of the quantitative criteria is that it is objective with respect to the list used. The method is also well understood by top management and the cost is reasonable.

The following are the disadvantages of this method. Firstly, the list of criteria is subjective and difficult to establish. Secondly, there is the risk of biased behaviour in order to maximize performance with respect to the list. Thirdly, systems managers may aim at scoring well on most visible items of the list (e.g., budget variance). And lastly, there is the risk of technical camouflage.

## **B. Measure of user's satisfaction**

A very important measure of effectiveness of a system is its usability, which is its worth, as perceived by its principal users. The measure of user's satisfaction may occur:

- (i) within the framework of computer costs control, and
- (ii) through specific surveys of phycho-social types.

### **(i) Measure through financial control**

Such measure indirectly occurs either in steering committees for budget allocation when non charge-out method is applied, or by "consumers' fidelity" when full charge-out method is employed. However, such measures are questionable on at least two grounds. Firstly, consumer departments do not actually behave as 'economic men'. Secondly they do not have any control on the EDP department's pricing methods, and the competition with out-house services is not real.

Cost control as a surrogate of user's satisfaction has the following advantages: the evaluation is consistent with a free market philosophy of business (full charge-out); it is well understood if the pricing algorithm is simple enough; it provides for continuity in performance evaluation and; cost may stay reasonable in partial charge-out.

However, it has the following limitations: steering committees may be a parody (non charge-out) for budget allocation, where unrelated issues are biasing the negotiation process; charge-out may prove dysfunctional and real preference may not be expressed and; user's expenses for computer service are hardly controlled by themselves.

#### **(ii) Measure through phycho-social inquiry**

There are not many instances of systematic use of phycho-social techniques for evaluating computer application performance (Seward et al., as cited by Dumas, 1980, p.107). However, it should be noted: that informal phycho-social inquiry is performed by top managers when they play their role of integrating other managers' judgements about data processing effectiveness and; that auditors rely for a part upon user's judgements in order to describe the utilization of the computer system they have to evaluate.

Under phycho-social inquiry, attempts are made to develop a more formal, systematic and scientific methodology for gathering users' opinions. The rationale for such methods is that users' opinions are a valid surrogate for measuring application effectiveness (Gallagher, Walther, and Seward, as cited by Dumas, 1980).

People are the final evaluators of information systems. The morale of employees using or affected by a system is a good measure of the success of the project. If the improvements achieved are offset by indicators of poor morale, such as grievances or high absenteeism, then the system is not achieving its objectives. Therefore, users should be polled periodically because problems may emerge, or the circumstances that originally made the system useful may be replaced by other circumstances. Sooner or later, all systems must change in response to changes in their environment.

There are two issues involved in the utilization of psycho-social techniques. They are methodological and practical. From the methodological standpoint psycho-social inquiry is far from being established. Biased questionnaires are frequent, sample size and representativeness are difficult to determine. It is even questionable whether "scientific" knowledge is attainable in the field of psycho-sociology.

Even if a method were agreed upon, the practical difficulties (e.g. cost of such methods, lack of skilled personnel in the audit of EDP environments) to implement it - with respect to the information systems' personnel - are paramount.

The advantages of users' surveys include: MIS goals are expected to be uncovered by inquiring users, instead of being assessed on a speculative and normative basis by, e.g. systems designers; Criteria and measurement of system effectiveness are similarly transferred to the users.

On the other hand, its limitations are: The method raises basic questions such as: who are the users? (e.g. corporate management or the personnel), and how to inquire them more practically?; It needs skilled personnel that is customarily found

neither in audit nor in EDP environments; It is costly and time consuming (for interviewees); it is difficult to conduct on a periodic, systematic basis and; there is risk of bias due to the behavioural impact of the method, besides the classical biases due to sample size and representativeness.

### **C. Appraisal by Comparison**

The expression "appraisal by comparison" designates a class of evaluation methods that is generally poorly recognized, although quite common. When the evaluator does not know the goals sought by the system, nor the means to achieve them - when the goals are at least suspected - he turns to compare the performance observed in his organization with performance observed in more or less similar organizations. Professional publications, meetings and seminars are the channels for appraisal by comparison. They permit communication of information in written and by hearsay.

### **2.3 Performance Criteria**

For a meaningful evaluation of the information system performance, there has to be a performance criteria. From the foregoing evaluation techniques, a number of performance criteria can be seen. These must however be established during the system design phase.

Before a system is evaluated, it should perform through several complete cycles. Silver (1989, p.342) suggests that: if a cycle is repeated several times in a day, evaluation should be done after a few days; for a monthly cycle system, several months should elapse; and for systems working on an annual basis, two to three years

should elapse before assessment can be made.

Some performance criteria that can be used to assess the performance of computer - based information systems are given below (Silver,1989).

### **2.3.1. Time Element**

Under this, the time units required for a particular action to be performed is measured. Essentially, what is being determined is the speed at which the system works. The most important things to look at are:

- (i) The time that elapses before a system responds to a demand placed upon it. This is known as response time.
- (ii) The period during which a system carries out a demand placed upon it, that is, the length of time required before results are returned. This is known as turnaround time. A slow turnaround means a comparatively long period of time is required for processing, and a fast turnaround means a short period is needed.

### **2.3.2. Cost Element**

The cost of operating a system is a quantitative measure of performance, sometimes the only measure applied. Things like profit, return on investment, or errors in manufacture and shipping are measured in monetary terms. A good system requires less money to service a given demand than a poor system. Costs are used to determine whether various parts of the system are performing up to financial expectations.



### **2.3.3. Hardware Performance**

Computer systems usually represent a major portion of the costs involved in a business system and therefore their operation is vital to overall performance. The elements in the computer system that must be evaluated and compared against initial expectations include processing time, reliability of equipment, maintenance costs, speed of input/output devices, and performance of secondary storage equipment.

A common means of quantifying computer performance is the number of instructions that can be processed in one second. The system should also be evaluated in terms of the training required by operators and users. The following questions should be asked and answers found: Are the training programs adequate and relevant? Do operators have sufficient knowledge to run the machines with little or no difficulty? Do users receive sufficient instructions to enable them to process data or to perform other tasks on the computers? Total operating costs for the computer system must be evaluated in light of estimated costs and any differences investigated.

### **2.3.4. Software Performance**

Software performance must be evaluated for both user-written and purchased program packages. Key factors to assess are speed of processing, quality and quantity of output, accuracy, reliability, and amount of maintenance and updating necessary to keep the software current.

### **2.3.5. Productivity**

This is a measure of system performance that states the relationship or ratio between input and output. The productivity of an entire system or its parts can be

measured to gain insight into system performance. Productivity is found by dividing output produced by the system by the input costs. Relatively low input costs and a high output volume produce a high productivity factor. When the output volume is low and input costs are high, low productivity results.

#### **2.3.6. Accuracy**

This is a measure of the freedom from errors, or conformity to truth, achieved by a system. Obviously a high degree of accuracy is a desirable goal, since a low accuracy rate may diminish the utility of an entire system. Accuracy is usually related to productivity. The error rate tends to rise along with the output volume. As speed goes up, accuracy goes down.

There are many ways in which accuracy rate can be determined. Firstly, the output of processing from one system can be compared to the output from another or to results already known. Secondly, one can look at the number of errors that occur during a given period, such as the number of misfiled orders or mistransmitted data. This is a measure of system performance. The magnitude of the errors should also be assessed.

#### **2.3.7. Information Security**

Good information security means that records are kept safe, confidential, and under system control at all times. There should be no leakage of vital or proprietary data to outsiders or to those who have no need for the information.

### 2.3.8. Morale

This is reflected in the satisfaction and acceptance that employees feel toward their jobs. The higher the morale, the greater the expected work performance level. Morale is difficult to measure directly because it involves many psychological considerations. However, it can be assessed by looking at the absentee rate or employee turnover.

### 2.3.9. User and customer reactions

User and customer reactions offer another means of measuring information systems performance. Poor performance of the system can be reflected in the number of complaints from customers concerning the output of the system. A large number of complaints, *ceteris paribus*, could mean that the output of the system has many errors or the results are not got at the required time. Few complaints, on the other hand, might suggest that the system is operating as was designed. Similarly, request from other departments for additional information or different kinds of report would indicate awareness of the ability of the new system to manipulate or process data.

## 2.4 Problems of Information Systems Performance Measurement

Measurement of information systems' performance has long been a problem for executives (Brancheau and Wetherbe, 1988). Powell (1992, p.29) concurs: 'Evaluating or justifying information technology investment is problematic'. This indicates that there are a lot of difficulties involved in IS performance evaluation.

Brancheau and Wetherbe argue that while measurement of performance is crucial for sound management, few concrete measures exist for assessing the health of the

IS organization. Further, they say that while costs are relatively straightforward to establish, benefits continue to be difficult to quantify. Underlying the problem is the IS profession's inability to establish and quantify the value of information, which is largely intangible.

The other problems they give are:

(i) A large number of unresolved issues involved, such as task allocation and personnel. For example, it is hard to know who is responsible for a thorough and comprehensive definition of information or data processing requirements. Other questions are: Where should one draw the line between the MIS department's education of users regarding the potential of new technology and its overselling of technology? Who should bear the responsibility for lack of top management involvement with MIS departments and for the resulting consequences?

(ii) Measuring MIS department performance involves measuring performance in several major areas of activity: systems development, data resource management, operations, technical support, control of utilization of different resources, security, quality of information, and user computing support. To complicate matters further, performance in each of these areas must be measured in the context of the organization's past, presently available resources, company earnings and political realities.

(iii) Activities ( variables ) in these different areas are interrelated in complex ways. For example, if in an organization with high performance in the traditional system development area, the MIS department enjoys strong top management support, it may be deliberately suppressing personal computing. How should one

assess overall MIS department?

The literature on measurement of performance of IS reveals some conflicting issues. Some authors argue that IS performance evaluation uses an objective measurement criteria. For example, Hirschheim and Smithson (1987) note that virtually all of it is based on an objective - rational grounding. On the other hand, Hoffman (1979) feels that information systems' performance measurement is subjective. He says that since there are no information systems standards to measure against, the conclusions reached in the usual review are subjective and tend to reflect the emphasis and/or the experience of the reviewer. It is difficult for management to determine if a situation has improved if subsequent reviews are carried by different reviewers.

Literature on information systems' performance measurement also reveals that user-satisfaction is one of the factors commonly used to evaluate the performance of information systems. However, a study by Hoffman (1979) revealed that one of the factors used in measuring user satisfaction is information systems' performance. One is therefore left wondering even more on how to go about measuring the performance of IS.

## CHAPTER THREE

### RESEARCH METHODOLOGY

An exploratory research of the cross-sectional type was selected. This is because the author is not aware of any related studies undertaken in Kenya and hence the need of a survey-kind of study.

#### 3.1 Population

The population of interest consisted of all private firms based in Nairobi that have an information systems department which has existed for at least three years. Since it is a requirement that a system should perform through several complete cycles before being fully evaluated (Silver, 1989), three years was considered to be long enough for most systems to have undergone through a good number of cycles.

Nairobi was selected for the study because about 87% of the firms that use computer systems are located here while those that are outside Nairobi are mainly branches of the head-offices located in Nairobi (Anila, 1990).

A single, complete listing of all firms in Kenya that possess computer systems is difficult to find since nobody has come up with a formal list of the same. Therefore, the major computer vendors, software houses and institutes associated with computing within Nairobi were visited, and the lists of their clients and customers obtained.

### 3.2 Sampling method

A sample size of 35 firms was selected for the study. This sample size is considered convenient for data analysis purposes. Any sample size of  $n > 30$  (or  $n = 30$ ) is considered large enough for data analysis purposes (Boyd et al, 1988). Therefore with a sample size of 35, good results are expected. Simple random sampling method was used to select the sample elements.

### 3.3 Data collection method

The source of data was primary. The information sought in the study was collected using a non-disguised questionnaire with some structured, closed-ended questions and some open ended questions. The structured questions were geared to generate quantitative data for statistical analysis, while the open ended questions were aimed at providing data for qualitative analyses. The drop - and - pick method was employed.

The questionnaire was divided into three sections. Section one contained general questions and attempted to obtain the background information of the organization in question. Section two asked questions relating to performance measurement issues, that is, the questions sought information on what the firms do as far as evaluation of information systems is concerned. Lastly, section three addressed itself to those firms that do not perform a continuous review of their systems.

The questionnaire was directed to systems analysts, data processing managers, or any person within the organization who had the desired information as may have been advised.

### 3.4 Data Analysis

Since this is an exploratory study, summary statistics were deemed adequate. Therefore percentages (or proportions), and tables (cross and univariate tabulations) were used and analyses done on the summarised data.



## CHAPTER FOUR

### DATA ANALYSIS AND FINDINGS

The following analysis was based on 32 responses from organizations within Nairobi. This was a 91.4% response rate made from those who were issued with the questionnaires. This was considered a good response to allow the completion of the study.

Under this section, the data from the successfully completed questionnaires is summarized and presented in form of tables and percentages. The section is divided into three major parts. Part one deals with the background information on the computerization of the organizations that were surveyed. The second and third parts deal with evaluation issues. Part three specifically summarizes the responses from organizations that do not evaluate.

**4.1 A SUMMARY OF CHARACTERISTICS OF THE ORGANIZATIONS THAT WERE SURVEYED**

Table 4.1

	Frequency	(%)
<b>OWNERSHIP</b>		
Locally owned	18	(56.3%)
Foreign owned	0	(0.0%)
Joint venture	14	(43.7%)
<b>TOTAL</b>	<b>32</b>	
<b>TYPE OF ORGANIZATION</b>		
Service oriented	17	(53.1%)
Product oriented	1	(3.1%)
Both service and product oriented	14	(43.8%)
<b>TOTAL</b>	<b>32</b>	
<b>WHEN COMPUTER FACILITIES WERE ACQUIRED</b>		
Less than or equal to 5 years ago	10	(31.1%)
More than 5 but less than or equal to 10 years ago	9	(28.1%)
More than 10 Years ago	13	(40.6%)
<b>TOTAL</b>	<b>32</b>	
<b>INVESTMENT IN COMPUTER SYSTEM</b>		
Less than or equal to Ksh. 1 million	11	(34.4%)
Less than or equal to 5 million but more than Ksh.1million	10	(31.2%)
Over Ksh. 5 million	11	(34.4%)
<b>TOTAL</b>	<b>32</b>	
<b>TYPE OF COMPUTER USED</b>		
Mainframe	2	(6.3%)
Minicomputers	16	(50.0%)
Microcomputers	25	(78.1%)
<b>PROCESSING METHODS</b>		
Batch	8	(25.0%)
On-line	6	(18.8%)
Combined batch and on-line	18	(56.2%)
<b>TOTAL</b>	<b>32</b>	
<b>LEVEL OF MANAGEMENT THAT USE COMPUTER-BASED INFORMATION SYSTEM</b>		
Top management	17	(53.1%)
Middle management	23	(71.9%)
Lower management	24	(75.0%)

The following observations were made from the table above (table 4.1):

56.3% of the organizations surveyed were locally owned, 43.7% were joint ventures - while non were foreign owned. 53.1% of the organizations were service

oriented while 43.8% were both service and product oriented. Only 3.1% of the organizations were product oriented. It can be seen that computer systems are widely used in the service oriented organizations than in the product oriented ones. This could be because service oriented firms have realized the competitive advantage of computer systems in the provision of quality service to their customers. This is in agreement with Learmonth and Ives' observation that 'creative deployment of information system technologies can lead to new ways to differentiate products and services through customer service, while simultaneously strengthening customer ties (Learmonth and Ives, 1987, p.7).

40.6% of the organizations indicated that they acquired their computer facilities more than 10 years ago. 31.1% and 28.1% reported that they acquired their computer facilities less than (or equal to) 5 years ago and more than 5 but less than or equal to 10 years ago, respectively.

65.6% of the organizations surveyed reported an investment of Kshs. 1 million and over in their computer systems. Over three-quarters of the organizations surveyed (78.1%) reported that they use microcomputers. 50.0% of the respondents reported that they use minicomputers while only 6.3% reported that they use mainframe computers. Mainframe computers are rapidly being replaced by microcomputers which are relatively less costly and convenient to use. This view is strengthened further by the fact that 75% use on-line processing method - a common feature with the microcomputers.

The table indicates that in a majority (75%) of the organizations, it is the lower management that use computer-based information system. This is followed by

middle management (71.9% respondents). This implies that top management still relies a great deal on the lower and middle management for information for decision making.

The behaviour exhibited can be explained further through cross-tabulations as in tables 4.2 and 4.3 below.

Table 4.2  
CROSS-TABULATION OF TYPE OF ORGANIZATION WITH INVESTMENT (I) IN SYSTEM

	I<=Ksh.1m		I>=1, but <Ksh. 5m		I>=Ksh.5m	
	NO.	(%)	NO.	(%)	NO.	(%)
Local	10	(90.9%)	3	(30.0%)	5	(45.5%)
Foreign	0	(0%)	0	(0%)	0	(0%)
Joint venture	1	(9.1%)	7	(70.0%)	6	(54.5%)
TOTAL	11		10		11	

The table above (Table 4.2) shows that most organizations that had invested less than Ksh. 1 million in their systems were locally owned. Only 9.1% of them were joint venture organizations. Of the organizations that invested more than Kshs. 5 million, 54.5% were joint venture organizations. This is because foreign investors have always had the capacity to raise capital for investment than the local investors, implying that the foreign holdings in joint ventures must be availing the funds.

Table 4.3

	LOCAL		JOINT VENTURE		TOTAL	
	NO.	(%)	NO.	(%)	NO.	(%)
<b>PROCESSING METHOD</b>						
- Batch	5	(62.5%)	3	(37.5%)	8	(100%)
- On-line	4	(66.7%)	2	(33.3%)	6	(100%)
- Combined	9	(50.0%)	9	(50.0%)	18	(100%)
<b>TYPE OF ORGANIZATION</b>						
- Service oriented	6	(35.3%)	11	(64.7%)	17	(100%)
- Product oriented	1	(100.0%)	0	(0.0%)	1	(100%)
- Both service and product oriented	11	(78.6%)	3	(21.4%)	12	(100%)

The table above (Table 4.3) indicates that 62.5% of the local organizations use batch method of processing data. Only 37.5% of the joint venture organizations use batch method. It further reveals that 66.7% of the local organizations use on-line method and that 33.3% of the joint venture organizations use on-line method. The table also reveals that of the service oriented organizations surveyed, 64.7% were joint venture organizations.

## 4.2 Evaluation Issues

Table 4.4 gives a summary of the response to questions relating to performance measurement.

Table 4.4

	Frequency	(%)
<b>AUDIT BY INDEPENDENT PARTY</b>		
Yes	8	(25%)
No	24	(75%)
<b>TOTAL</b>	<b>32</b>	
<b>WRITTEN POLICY</b>		
Yes	8	(25%)
No	24	(75%)
<b>TOTAL</b>	<b>32</b>	

Table 4.4 Continues

EXISTENCE OF A CONTINUOUS EVALUATION SYSTEM	Frequency	(%)
Yes	8	(25%)
No	24	(75%)
<b>TOTAL</b>	<b>32</b>	
<b>EVALUATION OBJECTIVES</b>		
To fulfill the company policy	5	(62.5%)
To measure the service levels	8	(100.0%)
To improve the overall performance	7	(87.5%)
To measure the response time	4	(50.0%)
<b>METHODS USED FOR EVALUATION</b>		
User - Satisfaction	5	(62.5%)
Audit	6	(75%)
Financial control	6	(75%)
Use of software monitors	1	(12.5%)
<b>THE METHOD USED: Whether subjective, objective, or both.</b>		
Subjective	1	(12.5%)
Objective	2	(25%)
Both	5	(62.5%)
<b>TOTAL</b>	<b>8</b>	
<b>EVALUATION EFFORT: Whether formal, informal, or both.</b>		
Formal	4	(50%)
Informal	0	(0%)
Both	4	(50%)
<b>TOTAL</b>	<b>8</b>	
<b>HOW OFTEN EVALUATION IS DONE</b>		
Monthly	1	(12.5%)
Quarterly	3	(37.5%)
Semi-annually	1	(12.5%)
Annually	3	(37.5%)
<b>TOTAL</b>	<b>8</b>	
<b>WHO SHOULD EVALUATE INFORMATION SYSTEM PERFORMANCE</b>		
Data processing manager	4	(50%)
MIS manager	3	(37.5%)
Technicians	3	(37.5%)
Top management	3	(37.5%)
An independent person	4	(50.0%)
<b>WHO DOES THE EVALUATION</b>		
Systems analyst	2	(25%)
Internal auditor	5	(62.5%)
An independent party	3	(37.5%)
Information systems manager	3	(37.5%)
Computer manager	3	(37.5%)

Table 4.4 Continues...

FACTORS CONSIDERED WHEN EVALUATING	Frequency	(%)
Hardware performance	7	(87.5%)
Software performance	7	(87.5%)
Productivity	2	(25.0%)
Accuracy	6	(75.0%)
Information security	4	(50.0%)
User and customer reactions	4	(50.0%)
Effect on IS personnel	1	(12.5%)

The table shows that 75% of the organizations reported that they did not have a written policy on evaluation. Lack of an organization policy on evaluation indicates that evaluation is not recognized as very important by most organizations. This is contrary to some studies done (Awad:1988, Murdick et al., 1988). It should be noted that policies define an area within which a decision is to be made and ensure that the decision will be consistent with, and contribute to, an objective (Koontz and Weihrich, 1988, p. 64). It is a means of encouraging discretion and initiative, but within limits. Lack of policy therefore, indicates lack of top management's interest in, and support for, evaluation.

It is also revealed that 75% of the organizations surveyed do not have an independent party conducting audit for their information systems. If an accurate assessment of IS performance is to be done, then an independent party is the best person to perform the evaluation.

The table also reveals that a majority of the organizations (75%) do not have a continuous evaluation system. Only 25% indicated that they evaluate their computer systems on a continuous basis. This shows that evaluation of CBIS is still not viewed as mandatory by most organizations, and thus the systems development cycle is not fully implemented by these firms (Kendal and Kendal, 1988).

62.5% of the organizations that evaluate reported that some of the methods they use are subjective while others are objective. The table also indicates an equal proportion (of 50%) of firms who reported that they use formal methods for evaluation and those that reported that they use both formal and informal methods. However, no organization admitted using informal evaluation method only. The organizations that evaluate try to make it formal so that it can be successfully carried out.

The findings show that the measurement of service levels is a factor that is considered by all organizations that evaluate. This means that organizations show concern on the type of services provided by their information system. 87.5% of the organizations indicated that they evaluate so as to improve the overall performance. This is in agreement with Beard and Stivers (1987) who say that management must plan, measure actual performance, compare actual performance against planned, investigate variances, and take corrective action.

Auditing and financial control are shown to be the most widely used methods for evaluation (by 75% of the firms studied). This is not surprising because IS were first incepted and dominated by accounting departments (Awad, 1988). This is supported by scholars like Powell (1992, p. 30) who contends that the current evaluation techniques are an outgrowth of the traditional cost-benefit methodologies or are the application of standard accounting techniques -which fits what auditing is. Further, Powell talks of a documented move towards a charging system for computer use being employed by organizations which, in essence, is what financial control is all about. The use of auditing as an evaluation technique was further emphasized by the



fact that 62.5% of the persons who responded to the survey that they evaluate reported that it is the internal auditors that evaluate their IS.

The table indicates that 37.5% evaluate their IS on a quarterly basis, 37.5% annually, 12.5% monthly, and 12.5% semi-annually. It can be said that most organizations evaluate quarterly and annually so as to report on the performance at the same time they make their quarterly and annual reports and/or returns. This is because most companies especially big ones make quarterly returns and all companies are required to make annual reports.

On the issue as to who should evaluate, 50% of the respondents believed that evaluation should be done by a data processing manager. This is in agreement with Gore and Stubbes' observation that: 'The system should normally be turned over to the data processing department for routine operation'(Gore and Stubbe, 1984, p.232). It then follows that the data processing managers are better placed to measure the IS performance on operation issues. However, for total evaluation efforts to succeed without any bias at all, an independent party is necessary, and may be this is why 50% of the respondents reported that it should be done by an independent party.

The most important factors considered when evaluating a system are hardware, and software performance. They were both cited by 87.5% of the organizations. Another important factor is the accuracy of information which was cited by 75% of the organizations. However, the least considered factor is the effect of IS on information systems personnel. This was exemplified by the responses received when the respondents were asked to list four factors that they considered crucial in IS's success (see Table 4.5 below).

Table 4.5

	Number of citations
Quality of output of the system	18
Accuracy of data	18
The reliability of the system	17
Response of the system	12
Completeness of data	11
Meeting of deadlines	6
Data storage costs	5
Users' satisfaction	5
Maintenance cost	4
Customer complaints	3
Rapidity of adaptation to users' requests	2
Adaptation of users to the systems	2
The number of errors that occur during a given period	1

This means that the human factor in the IS performance has been greatly ignored, and yet theories on human resource management reveal that people are an important factor in system performance (Hicks H.G. and C.R. Gullet, 1981). Further, it can be seen from the table above that quality of output of the system and accuracy of data are the most crucial factors for organizations. Another important factor is the reliability of the system. It is very unfortunate that most organizations do not regard users and customers as crucial.

But how do these evaluation findings relate to organizational ownership? (See Table 4.6 below).

Table 4.6

	LOCAL		JOINT VENTURE		TOTAL	
	NO.	(%)	NO.	(%)	NO.	(%)
<b>EXISTENCE OF AN EVALUATION SYSTEM</b>						
- Yes	3	(37.5%)	5	(62.5%)	8	(100%)
- No	15	(62.5%)	9	(37.5%)	24	(100%)
<b>AUDIT BY AN INDEPENDENT PARTY</b>						
- Yes	2	(25.0%)	6	(75.0%)	8	(100%)
- No	16	(66.7%)	8	(33.3%)	24	(100%)
<b>WRITTEN POLICY ON EVALUATION</b>						
- Yes	2	(25.0%)	6	(75.0%)	8	(100%)
- No	16	(66.7%)	8	(33.3%)	24	(100%)

62.5% of the organizations that evaluate are joint venture organizations and 37.5% of them are locally owned. Of the organizations that use independent party to audit their IS, 75% of them were joint venture organizations while 25% were locally owned. Further, it is revealed that of the organizations that had a written policy on evaluation, 75% were joint ventures whereas 25% were locally owned. Therefore it can be said that joint venture organizations are committed to ensuring that their systems function as was designed than locally owned organizations.

### 4.3 Organizations that do not evaluate

This sub-section summarizes the responses from the organizations that reported that they did not have a continuous evaluation system.

Table 4.7

	Frequency	(%)
<b>WHY EVALUATION IS NOT DONE</b>		
It is costly	9	(36.0%)
There are no clear - cut evaluation methods	18	(87.2%)
It is not important	3	(12.0%)
It is not clear what to measure	9	(36.0%)
There are no objective measuring tools	11	(44.0%)
There is no company policy on that	16	(64.0%)
It is not my responsibility	2	(8.0%)
<b>PLAN FOR METHOD OF EVALUATION FOR THE FUTURE</b>		
Yes	6	(25%)
No	18	(75%)
<b>TOTAL</b>	<b>24</b>	
<b>THE LIKELY OBJECTIVES</b>		
To measure the service levels	3	(50.0%)
To measure the response time	4	(66.7%)
To fulfill the company policy	2	(33.3%)

The table above reveals that of the organizations that do not evaluate, 87.2% reported that they do not evaluate due to lack of clear-cut evaluation methods. 64%

of them said that there is no company policy on that (i.e., on IS performance evaluation). Although difficulties involved in evaluation of IS performance are at the forefront in hindering the evaluation efforts, it is now hard to ignore lack of commitment by those involved, especially the top management, as is manifested in the lack of policy on evaluation.

A majority of the respondents (75%) reported that they were not planning to install a system of evaluation for the future. This means that most organizations do not seem to realize the importance of measuring the performance of their information systems and yet Awad (1988), Murdick et al. (1988) contend that evaluation should be mandatory.

Of the organizations that reported planning for a future evaluation system, 66.7% indicated measurement of the response time as the likely reason while 50% indicated that they were planning for an evaluation system for the purpose of measuring the service levels.

## **CHAPTER FIVE**

### **SUMMARY AND CONCLUSIONS**

The main objective of this study was to find out the practice of evaluation of computer-based information systems' performance in Kenya. That is, the study was to establish whether or not firms in Kenya that utilize computer-based information systems evaluate their performance with respect to both efficiency and effectiveness.

It can also be said that the study was aimed at determining the management considerations of the Information System since evaluation of performance falls directly under the management task of control.

The study was to come up with the methods that are widely used to perform evaluation and the aspects that are considered when evaluating. Further, the study was to find out the reasons that make firms not to evaluate (for firms that do not evaluate).

#### **5.1 Conclusions**

A number of conclusions can be drawn from the research findings of Chapter Four.

Most of the respondents/organizations (75%) reported that they did not have an existing system of computer performance evaluation. This indicates that many organizations assume that the system is performing well after it has been installed and that there is no need for evaluation.

Again, a majority of the organizations (75%) reported that they did not have a policy on computer-based information system performance evaluation. This further confirms that evaluation is not considered to be crucial for the performance of IS by most organizations.

From the organizations that stated that they had computer performance evaluation system, the following were the objectives that were cited (in order of decreasing frequencies):

Objective	Number of citations
To measure the service levels	8
To improve the overall performance	7
To fulfill the company policy	5
To measure the response time	4

Clearly, measuring the service levels and improving the overall performance are the main objectives for undertaking evaluation as can be seen from the table above.

The widely used methods are auditing and financial control. Both were cited by 75% of the organizations. User-satisfaction is also used to some extent.

Those who reported that they did not have an evaluation system installed and planned to do so in the near future gave the following as the likely objectives: to measure the response time; to measure the service levels; and to fulfill the company policy.

While most organizations that have a continuous evaluation system agree that evaluation should be done by an independent party, most of the organizations do not use independent parties to evaluate their IS. In fact, only 37.5% of the organizations reported the use of an independent party to evaluate their systems.

50% of the respondents believed that evaluation should be done by a data processing manager. This is in line with Gore and Stubbe's (1984, p. 232) observation that, "the system should normally be turned to the data processing department for routine operations". If this be the case, then data processing managers are the best people to assess the performance of information systems.

The study revealed that joint venture organizations have invested more in computer systems and generally engage in evaluation activities than the local organizations.

Further, the study revealed that the human factor in the IS performance has been greatly ignored. Most organizations concentrate too much on the hardware and software without looking at the human side, which is very important if the IS is to perform as required.

## **5.2 Limitations of the study**

The results of the study offer very useful insights into the area of performance evaluation as it relates to IS. However, they should be interpreted bearing the following limitations in mind.

(i) The reader is cautioned about drawing conclusions about what seems to be glaring differences in the proportions as there was no statistical significance test done on the differences.

(ii) Ideally, personal interviews would have been most appropriate for good information on the issues raised in the questionnaire. However, there was lack of sufficient time for that (personal interview) in view of the duration for the project.

(iii) The best results should have been obtained had a larger sample consisting of organizations from all parts of Kenya been used. Thus it is possible that the results reveal more of what is going on in Nairobi than in Kenya as a whole.

### **5.3 Recommendations**

It is true that firms in Kenya are now investing heavily on computer-based information systems. For information systems to be effective, the control aspect which is still lacking widely should be taken seriously.

Organizations should outline a clear policy for IS performance measurement since a good number of organizations indicated that they do not evaluate on the ground that there was no company policy on that. Further, the firms should have objectives that will act as a yardstick by which to measure the proposed systems. It should be noted that performance evaluation requires the statement of predetermined standards.

Managers or persons who are directly responsible for performance evaluation should stress the need and importance of the exercise.

### **5.4 Suggestions for further studies**

From the findings and limitations of this study, the following areas need further studies. A study could be carried out to determine the management considerations of computer-based information systems in Kenya. This is more so as the present study addressed only one aspect of management - the control aspect.

A replicative study could be done after some time to determine whether the situation has improved or not as far as evaluation is concerned.



Further, a study could be carried out to investigate how the currently available evaluation techniques are employed and, if possible, how they can be amended to overcome the difficulties that are involved in computer-based information system evaluation.

Generally, a study that will cover any area in MIS would be recommended as this is an area that has almost not been touched in Kenya.

## APPENDIX I

Department of  
Management Science  
University of Nairobi  
P.O. Box 30197  
Nairobi

Dear Sir/Madam,

I am a postgraduate student in the Faculty of Commerce, University of Nairobi. In partial fulfillment of the requirements of the Degree of Masters of Business and Administration I am collecting data to assist me into writing a Management Project entitled "Evaluation of Performance of Computer-Based Information Systems: A Survey of its Practice in Kenya".

Please assist me by completing the attached questionnaire to the best of your knowledge. The information requested is needed purely for academic purposes and will be treated with strict confidence. Any additional information you might feel is necessary is most welcome, and can be written on the back of the questionnaire. Your co-operation will be greatly appreciated.

Yours Sincerely,

Akelo E. O.  
M.B.A. II STUDENT

Academic Supervisor  
Omosa Florence, Lecturer,  
Department Of Management Science University Of Nairobi.

## APPENDIX II

### QUESTIONNAIRE

Please answer the following questions by placing a tick in the spaces ( ) provided and/or giving details as may be necessary.

#### SECTION A: GENERAL

1. When was your Organization Established?  
Year .....
2. (a) Approximately, how many people are employed in your organization? .....  
(b) How many of these employees are in the information systems and/or computer department? .....
3. (a) How would you classify your organization with regard to ownership?  
Locally owned ( )  
Foreign owned ( )  
Joint venture ( )  
  
(b) For the classification selected above, what is the proportion of ownership?  
(i) Local .....  
(ii) Foreign .....
4. How many branches does your organization have in Kenya? .....  
Overseas ? .....
5. Your organization is  
Service oriented ( )  
Product oriented ( )  
Both service and product oriented ( )
6. When did your organization acquire computer facilities ?  
Less than 5 years ago ( )  
Less than 10 but more than 5 years ago ( )  
More than 10 years ago ( )
7. (a) How many of your Kenyan-based branches are computerized?.....  
  
(b) How many of your overseas-based branches are computerized? .....
8. Approximately how much have you invested in your computer system ?  
Less than Ksh.1 million ( )  
More than Ksh. 1 million but less than 5 million ( )  
Over Ksh. 5 million ( )
9. What type of computer do you have?  
(i) Mainframe ( )  
(ii) Minicomputers ( )  
(iii) Microcomputers ( )  
(iv) Combination - state which.....  
.....

SECTION B

1. Which of the following management levels in your organization use computer-based information systems ?
- Top Management ( )
  - Middle Management ( )
  - Lower Management ( )

2. Which of the following processing methods (approaches) does your information systems utilizes? (operates on?)
- Batch method ( )
  - On-line method ( )
  - Combined batch and In-line method ( )

- 3 (a) Listed below are statements dealing with various issues in the evaluation of computer-based information systems performance. Please tick in the appropriate box ( ) to specify the extent to which each statement is assessed periodically after the system has been installed and is in operation.

	To a great extent 4	To a moderate extent 3	To a small extent 2	To no extent 1
(1) Accuracy of data	( )	( )	( )	( )
(2) Completeness of data	( )	( )	( )	( )
(3) Meetings of deadlines	( )	( )	( )	( )
(4) Rapidity of adaption to users' requests	( )	( )	( )	( )
(5) The budget performance and cost control	( )	( )	( )	( )
(6) The reliability of the system	( )	( )	( )	( )
(7) Adaptation of users to the system	( )	( )	( )	( )
(8) Response time of the system	( )	( )	( )	( )
(9) Maintenance costs of the system	( )	( )	( )	( )
(10) Data storage costs	( )	( )	( )	( )
(11) Costs of training personnel to operate the system	( )	( )	( )	( )
(12) Power requirements of the system	( )	( )	( )	( )
(13) Customer complaints	( )	( )	( )	( )
(14) Employee turnover	( )	( )	( )	( )
(15) Quality of output of the system	( )	( )	( )	( )
(16) The number of errors that occur during a given period	( )	( )	( )	( )
(17) Absentee rate of IS personnel	( )	( )	( )	( )

(b) Please tick in the appropriate box ( ) to specify the extent to which the following is done in your organization after the system has been installed and is in operation.

(18) Expenses of the information systems department are fully charged to the customers department	( )	( )	( )	( )
(19) Results of the system is compared with a list of quantitative objectives	( )	( )	( )	( )
(20) User's satisfaction with the information system is measured	( )	( )	( )	( )

(21) An appraisal of the situation/results with those of comparable organizations. ( ) ( ) ( ) ( )

(c) Of the factors given in (a), state four considered crucial to your organization. ....

4. Does an independent party periodically conduct a surprise audit of computer systems to make sure they serve their intended purpose? Yes ( ) No ( )

5. Does your organization have a written policy on evaluation (assessment) of computer/information system's performance? Yes ( ) No ( )

6. Is there a continuous evaluation (assessment) of your MIS/ computer system performance? ( If no, please go to SECTION C ) Yes ( ) No ( )

7. If yes, please explain the objectives of the evaluation system. RANK (i) To fulfill the company policy ( ) ..... (ii) To measure the service levels ( ) ..... (iii) To improve the overall performance ( ) ..... (iv) To measure the response time ( ) ..... (v) Others, (specify) ..... .....

8. Rank the objectives given above in order of importance. (ie. 1 for the most important, 2 for the second most important, etc.). Use space for ranks provided in Q.7

9. Which of the following methods do you use for evaluation? (You may tick more than one box) User-satisfaction ( ) Audit ( ) Financial control ( )

Others, (specify) .....

10.(a) What would you say about the methods you use for evaluation? They are subjective ( ) They are objective ( ) They are both subjective and objective ( )

11. How would you classify your evaluation effort ? Formal ( ) Informal ( ) Both formal and informal ( )

12.(a) How frequently is the review of information system performance done in your organization? Monthly ( ) Quarterly ( ) Semi-annually ( ) Annually ( ) Any other (specify) .....

- (b) Who does the evaluation? ( You may tick more than one )
- Systems analyst ( )
  - Internal auditor ( )
  - An independent third party ( )
  - Information systems manager ( )
  - Other(s) ( Specify ) .....

13. Who, in your opinion, is best suited to evaluate the performance of computer-based information system? (You may tick more than one)

- Data processing manager ( )
- MIS/ information systems manager ( )
- Technicians ( )
- Top management ( )
- An independent person ( )
- Any other (specify) .....

14. (a) Which of the following do you consider every time you evaluate?

- Hardware performance ( )
- Software performance ( )
- Productivity (ratio between input and output) ( )
- Accuracy ( )
- Information security ( )
- User and customer reactions ( )
- Effect on information personnel ( )
- Others, (specify).....

(b) Would you please rank the above in order of importance. (ie. 1 for the most important, 2 for the second most important, and so on)

- Hardware performance .....
- Software performance .....
- Productivity (ratio between input and output) .....
- Accuracy .....
- Information security .....
- User and customer reactions .....
- Effect on information system personnel .....
- Others, (specify).....

SECTION C

1 (a) Indicate what best describes why you or your organization do/does not have an evaluation system. You may tick more than one.

- |  | RANK  |
|--|-------|
| It is costly ( )                             | ..... |
| There is no clear-cut evaluation methods ( ) | ..... |
| It is not important ( )                      | ..... |
| It is not clear what to measure ( )          | ..... |
| There are no objective measuring tools ( )   | ..... |
| There is no company policy on that ( )       | ..... |
| Others ( Specify ) .....                     | ..... |
| .....  | ..... |
| .....  | ..... |

(b) Rank the above in order of their contribution. Place the ranks in the rank column in (a)

3. Are you or your organization planning for a method of evaluation for the future? Yes ( ) No ( )

4. If yes, what are your likely objectives?

- To measure the service levels ( )
- To measure the response time ( )
- To fulfill the company policy ( )
- Others (specify) .....
- .....
- .....

T H A N K   Y O U .

## BIBLIOGRAPHY

- Boyd et al., Marketing Research: Text and Cases, 6th Ed., Homewood, Illinois, Richard D. Irwin, Inc., 1988
- Coates E.J., "Letting Auditors wear the White Hats," Industrial Management, Sept/Oct., 1988
- Dumas P.J., "Management Consideration of the Information System," in Computers: Applications in Industry and Management, North Holland Publishing Co., 1980.
- Gore M.R. and J.W. Stubbe, Computers and Information Systems, New York, McGraw-Hill, Inc., 1984, pp. 232-234
- Hirschheim, R. and Smithson, S. "Information Systems Evaluation: Myth and Reality". In Information analysis: selected readings. Galliers, R., Singapore, Addison - Wesley Publishing Co., Inc., 1987
- Hoffman A.J., "Management Audit of Information Systems," Data Base, Vol.20, No.2, Summer, 1989, pp. 25-26
- Hoplin H.P. and Suresh B.A. "Measurements of Computer System/Information System Performance," Data Base, Vol.20, No.2, Summer, 1989, pp. 27-30
- Igbaria M., "End-User Computing Effectiveness: Structural Equation Model," Omega, Vol.18, No.6, 1990, pp. 637-652
- Learmonth G.P. and B. Ives, "Information System Technology can Improve Customer Service", Database, Winter, 1987, pp.6-10
- Lederer, A.L. and V.L. Spencer, "The Effective Information Center: Targeting the Individual User for Success", Journal of Systems Management, January, 1988, PP. 22-26
- Liang, T., "Local Area Networks: Implementation Considerations", Journal of Systems Management, January, 1988, PP.6-12
- Little D. and R.C. Sweeting, "The management of new technology based businesses: The Existentialist Firm", Omega, Vol.18, NO.3, 1990, pp. 231-240
- McFarlan F.W., "Management Audit of the EDP department," Havard Business Review, May-June, 1972
- Murdick R.G. and J.R. Claggett, Information Systems for Modern Management, 3rd Ed., Englewood Cliffs, Prentice-Hall International, Inc., 1988
- Powell P., "Information Technology Evaluation", Journal of Operational Research Society, Vol.43, NO.1, January, 1992, pp.29-49



Raghunathan B. and T.S. Raghunathan, "Information Systems Planning Effectiveness: An Empirical Analysis," Omega, Vol.19, No.2/3, 1991, pp. 125-133

Schmaltz, D.A., "Simply Seeking Software", Journal of Systems Management, August, 1990, pp. 7-9

Silver G.A., Systems Analysis and Design, New York, Addison-Wesley Publishing Co., Inc., 1989, pp. 341-349

Stivers B.P. and L.H. Beard, "Information Systems: Getting Back to Basics", Journal of Systems Management, March, 1987, pp.35-41

Thierauf, J.R., A Manager's Complete Guide to Effective Information Systems. London, Collier Macmillan Publishers, 1983

Watts K.M. and J.C. Higgings, "The Use of Advanced Management Techniques in Research and Development", Omega, Vol.15, NO.1, 1987, pp. 21-29

Weinberg G.M. and D.P. Geller, Computer Information Systems, Boston, Little, Brown and Company, 1985