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A REVIEW OF INFORMATION SYSTEMS PERFORMANCE EVALUATION MEASURES

AININ SULAIMAN
Faculty of Economics and Administration
Universiti Malaya

ABSTRACT

Information Systems (IS) evaluation is a problematic process, but it has to be carried out to ensure that organisations are getting value for their money on their expenditure. This paper reviews the performance measures used to evaluate the IS performance by previous researchers. A review of the literature indicated that there are more than one form measure that can be used to evaluate IS performance. Cost- benefit analysis, return on investment and users satisfaction are frequently used. Others such as IS personnel training, competitive advantage are seldom used. To facilitate the study, these performance measures were categorised into six main criteria, i.e. financial, systems development, operational, managerial, personnel and strategic performance. The review would enable future researches to evaluate IS performance using the most appropriate measures.

ABSTRAK

Proses menilai prestasi Sistem Maklumat bukanlah suatu tugas yang mudah. Walaupun ianya sukar, ia perlu dilaksanakan, terutama sekali untuk memastikan bahawa organisasi mendapat pulangan yang sewajar dengan perbelanjaan yang telah dibuat. Kertas ini telah menyorot ukuran-ukuran prestasi yang pernah digunakan oleh penyelidik-penyelidik yang lepas. Sorotan karya yang dibuat menunjukkan bahawa terdapat lebih daripada satu ukuran yang boleh digunakan untuk menilai prestasi Sistem Maklumat. Analisis kos faedah dan kepuasan pengguna adalah diantara ukuran yang seringkali diguna. Untuk memudahkan penyelidikan ukuran-ukuran prestasi ini telah diklasifikasikan kedalam enam kategori iaitu : kewangan, operasi, sistem, personel, pengurusan dan strategik. Sorotan ini akan membuka ruang bagi penyelidik-penyelidik lain dalam mengadaptasikan ukuran-ukuran yang dirasakan sesuai untuk menilai prestasi sistem maklumat.

Keywords: Information Systems, evaluation, performance, criteria, measures.

INTRODUCTION

Organisations today rely heavily on Information Systems (IS). IS are not only used to replace manual processing but more importantly they are used for strategic purpose, such as decision making and gaining competitive advantage (Laudon and Laudon, 1996). Organisations now regard IS as a capital investment not an operating expenses (Farbey, Land and Targett, 1993; Serafeimidis & Smithson, 1994). Therefore it is inevitable that comparisons between different investments be made to determine which investment is more fruitful. Moreover, to ensure that organisations are getting value for the money on their expenditure, the IS performance must be evaluated. Evaluation is also necessary to periodically measure performance, that is to compare actual performance with targeted and over time (Farbey et.al, 1994). In addition, benchmarks (economic, operational or organisational) for the targeted performance, can also be determined. In addition, IS performance must be evaluated to control quality and for auditing purposes. However, evaluating IS is a problematic process (Symons, 1990). The main problem is identifying the performance measures that one must use to evaluate the performance. Hence, there is a need to review the existing performance measures used to evaluate the IS performance. These performance measures have been categorised into six main criteria, i.e. financial, systems development, operational, managerial, personnel and strategic performance. The discussion in this paper is divided into two main sections i.e. performance criteria and performance measures.

PERFORMANCE CRITERIA

Traditionally, IS performance was measured based on three criteria, i.e. Electronic Data Processing audit, management audit and operational audit. However, this classification was dismissed because it was too quantitative as it concentrated only on quantitative aspects. The *3-pronged* approach was then introduced, whereby IS performance was evaluated under three criteria; namely *operations; system design; and user awareness* (Hurtado, 1978). This classification was also disputed by many researchers as being too general. A more precise classification was then introduced by Dickson and Wetherbe (1985), which was refined three years later (Dickson, Wells and Wilkes, 1988). They classified IS performance into *financial; organisational efficiency; managerial; and capacity performance.* Since then there have been many attempts to classify IS performance criteria to make it more comprehensive and acceptable. Scudder and Kucic (1991) for instance, added *personnel performance* to Dickson et.al, (1988) list. Bacon (1992) on the other hand, in his study of criteria that organisations used to allocate IS resources concentrated on three criteria, i.e. financial, management and development criteria. In their quest for variables that contribute to the success of IS, DeLone and McLean (1992), derived with a classification with six criteria for evaluating IS performance. This classification looks at performance from a more detailed angle, i.e. *system quality, information quality, use, user satisfaction, individual impact,* and *organisational impact.* A review of the literature showed that Saunders and Jones (1992), are responsible for one of the most comprehensive set of performance measurement classification so far. They classified IS performance measurement into 10 major criteria i.e. financial; operational efficiency; system development practice; strategic; integration of IS with other units; user/manager attitude; staff competence; integration of IS with corporate planning; personnel; and quality of information.

Although the classification among the different writers varied, they seem to be agreeable on two criteria, i.e. *financial performance and operational performance.* This is not surprising as most organisations want to ensure that money invested in the IS are money well spent and that they are getting added value for it (Price Waterhouse, 1993). All the authors agree that it is important to measure the operational

performance of IS. Based on the work of the researchers discussed above, this paper classified IS performance evaluation into six main criteria; *financial; system development; operational; managerial; personnel* and *strategic performance.*

PERFORMANCE MEASURES

Using the six criteria as a basis, the performance measures used to evaluate IS performance are elaborated (Table 1).

Financial Performance

There are several measures in which financial performance could be carried out. One of the measures most frequently used is the *cost-benefit analysis* (Clegg, Warr, Green, Monk, Kemp, Allison and Landsdale, 1988; Bacon Schumann, 1989; 1992; Ballantine, 1994; Mirtidis and Serafeimidis, 1994; among others). It compares two or more solutions to a given problem and provides a framework in which comparisons can be useful (Cetron and Bartoda, 1973). It computes a monetary value for every element that contributes to the cost and benefit of a project. It can be carried out using *Net Present Value* and *Internal Rate of Return* (Ross et. al, 1991). Although Cost benefit analysis is one of the more popular method, its usage have met with numerous criticisms (Parker , Benson and Trenor 1988, Banker, Kaufman and Morey, 1990; Powell, 1992; among others). One, it is difficult to quantify *intangible benefits* (Cashmore and Lyall, 1991), although there have been several attempts to do so. Smith (1983), developed four techniques to measure benefits whereas Matlin (1979) developed a list of the '*value and cost*' of the benefits associated with IS. Benefits have to be quantified because it is the key for getting approval and funding for any system (Mirani and Lederer, 1993). According to Walsham, Symons and Waema(1990) quantification is easy, the problem is whose perception of the value and cost is to be considered, because different people have different perceptions on the value received from a particular system. Two, cost- benefit analysis is inadequate as it considers only the benefits thus ignoring other factors (Cetron and Bartado, 1973). Three, benefits are normally quantified by the top management (Johnston and Vitale 1988), which are often biased. Four, it is only based on economic efficiency arguments, and does not considers the risks and uncertainties involved (Ewusi-Mensah, 1989).

Table 1: IS/T Performance Criteria and Measures

CRITERIA	MEASURES
Financial performance	cost-benefit analysis information economics profit contribution SESAME budget performance return on investment return on management cost of maintaining system distribution of cost by industry matching objective, projects, and technique critical success factor art criticism professional review quasi-legal (adversary)
System development performance	completion within time and budget staff turnover size of system backlog IS documentation help desk
Operational performance	quality of system quality of information system utilisation user's satisfaction
Managerial performance	senior management attitude users managers attitude
Personnel performance	technical capabilities training career satisfaction
Strategic performance	competitive advantage increase in profit and market share IS importance

Source : Researcher's compilation from literature review, 1996

Willcocks and Lester (1993b), suggested that instead of using cost-benefit analysis, evaluators should use the *information economics* approach, introduced by Parker. Parker, et. al (1988) evaluated a system through *'value linking and acceleration; value restructuring; and innovation valuation'*. It includes costs that enable benefits to be achieved in a department outside the IS department. To quote their example, *'billing application will reduce billing errors'*. This is known as *value linking*. If benefits occur at a fast pace, it is called *value acceleration*. We know that not all IS functions result in an end-product, for example the Research and Design department.

This is what the writers mean by *value restructuring*. Finally, *innovation valuations* occur when organisations are using something new, untried and unproven. This form of financial measure is becoming more popular and has been extensively reviewed elsewhere (Remenyi, Money and Twite, 1991; Wiseman 1992; Ward, Griffiths and Whitmore, 1995 among others). However, according to McBride and Fidler (1994) the information economics approach is open to misinterpretations and abuses by the stakeholders. Nevertheless, it cannot be denied that it is important to measure IS financial performance as revenues are expected to increase when IS are introduced (Hamilton and Chervavy, 1981). For example, the survey conducted on the Malaysian Local authorities, showed that there was an increase in their revenue after IS were implemented (Anonymous, 1992). The revenue is measured by assessing the local authorities' actual *profit contribution* with the implementations of IS. Ein-Dor and Segev (1981) on the other hand measured IS's contribution the organisation's profit by asking users what were the cost they incurred, and how they managed to save with IS.

Another useful way of evaluating IS financial performance is using the SESAME method which was developed by IBM (Lincoln and Shorrock, 1990). Using it, the costs and benefits of a system are compared against an equivalent manual system. It is essentially a method of establishing cost by substituting clerical operations (Willcocks, 1994). The IS financial performance can also be measured using *budget performance* approach which compares IS budget with actual expenses incurred by the organisation (Ringler, 1988). It assesses whether the organisation was able to meet the IS budget proposed. In comparison, organisations can also use *Return on Investment (ROI)*, as a means to gauge IS' performance. According to Awad (1988), Clegg et.al (1988), Angell and Smithson (1991) among others, *ROI* enables the organisation to assess whether the IS are performing as well as they should. This is because *ROI* evaluates the current value of estimated future cash flows on the assumption that future benefits are subject to some discount factors. This method is normally used by organisations with tight financial disciplines. According to Farbey et.al (1993), it is the one and only method capable of coping with the IS evaluation jungle.

Nevertheless, although *ROI* is a good form of measurement, it does not consider IS main benefits such as improved quality of service, and improved customers relations Cashmore & Lyall, (1991). Strassman (1985), and on the other hand presented a view of the role of IS with regard to performance. He looked at it from four perspectives, i.e. *individual, organisation, top executive, and society*. He used the *Return on management* metric (value-added), which incorporated the four elements. This form of measure is supported by several IS researchers (Davis and Olson 1985; Remenyi et.al, 1991, among others). There are some researchers (Remenyi et.al 1991; Saunders and Jones 1992 among others) who used *distribution of cost by industry standard* as a form of financial performance measure. This measure compares IS costs within an entire industry. However this is not a very popular form of measure because organisations are not willing to share their information with others and thus it suffers from lack of data. This form of measure however, received tremendous attention from UK's IT executives (Grindley, 1991). They indicated their wish to use this form of measure more extensively because of its practical usage. In his book entitled ***Managing IT at Board Level***, Grindley also mentioned that most of the 5000 IT executives taking part in a Price Waterhouse survey, indicated that *allocation of resources* is a big issue for them. Saunders and Jones (1992) and Scudder and Kucic (1991) used this method to evaluate IS performance of organisation in the US and Fortune 1000 company in the manufacturing and distribution businesses respectively.

This paper has also identified other modern approaches to evaluate IS financial performance. One, Butler Cox, i.e. a method which involve the matching the IS objectives, projects and techniques. Many researchers (Ward, 1990; Scott 1991; among others), have since then used this method to carry out IS

evaluation Hochstrasser (1990), for instance, evaluated the IS performance of 34 British companies. Others (Willcocks, 1992; Farbey et.al 1993) have even provided mechanisms to match evaluation methods with IS investment, thus making the method much more useful and applicable. Two, Critical Success Factor (Rockart, 1981) was used by Bergeron & Begin (1989), Parker, (1990) and Sleivin , Steiman and Boone (1992) to evaluate IS. Farbey et.al (1993), on the other hand, suggested three new measures to IS evaluation; namely Art Criticism; Professional Review and Quasi-legal (adversary) measures. From the discussion above, we can conclude that Financial performance is an important criteria as it enables one to evaluate IS performance in terms of how economical it can be.

Systems Development Performance

IS performance have also been evaluated based on the system development itself. '***An effective IS function is more effective if it promotes an organised approach to system design, development and documentation throughout the organisation***'. (Saunders and Jones 1992:74). The systems development performance can be measured in a number of ways. The most popular measure is to assess whether the system was completed within the time and budget stipulated. The Society of Information Technology Managers surveys on IT trends in the UK Local Government showed that most local authorities used *completion of project on time and within the budget* as a measure of IS performance (SOCITM, 1994).The Price Water House international IT survey (Price Waterhouse, 1993) also showed similar results. Besides time and budget, Saunders and Jones used *system backlog, staff turnover*, and *IS documentation*. *System backlog* refers to the estimates of the number of man-years backlog on system development request. The higher the number, the less efficient and effective is the system. Whereas, *staff turnover* simply refers to the turnout of IS personnel in terms of their presence and productivity.

Remenyi et.al (1991) also indicated that it was also important to evaluate IS documentation. This consists of examining both user and systems manuals and documentation, which are either written or in visual explanations form (Dickson et.al, 1988). A good documentation is indicated by factors such as ease of understanding, completeness, accuracy, availability to users and enhancement of the value of application to the user (Torkzadeh, 1988). Besides these measures, system development can be measured by assessing the responsiveness of the system to users' requests (Miller and Doyle, 1987). This can be done using *help desk* which monitors and assess the number of complaints and the response time to solve them. The amount of time needed by *help desk* to settle any problems must be minimal. The success of the system can also be observed by looking at the number of complaints received by the *help desk*. The higher the number of complaints the less effective is the help desk. In addition, if the same problems kept occurring, means that the help desk is not efficient nor effective.

The system development performance evaluation is usually measured using hardware and software monitors, benchmarking or by stimulation process (Hallam & Scriven, 1976). Evaluation based on the system development performance is usually carried out. However, a survey by Saunders and Jones (1992), showed that it is not one of the top five criteria to be measured. Thus, in their view it is not among the very top priorities that should be considered when evaluating IS performance.

Operational Performance

A review of the literature indicated that IS operational performance is one of the more popular forms of evaluation. Basically, it can be measured by assessing the quality of system; quality of information; system utilisation; and user satisfaction. Conklin, Malcom and Rickman (1982), measured the quality of system by monitoring its *response time* (turnaround time), in other words how long does it take to complete a particular function. Other researchers on the other hand, used multiple items to assess system quality.

For example, Swanson's (1974), in his work included ease of terminal use and reliability of computer system. Ease of terminal use simply means that the terminal (machines) which are used to operate the IS are easy to handle and can be used by the users without much training. Whereas a system is considered reliable when it does not breakdown constantly. It must be highlighted however, this does not include breakdowns caused by natural phenomenon such as earthquake, lightning and fire. Nonetheless, backup procedures must be adequate, example usage of a generator, when power is cut off. Others on the other hand considered backup procedures, file protection, equipment assesses control and emergency equipment and procedure as a means to measure system quality (Hellerman, 1975; Angell & Smithson, 1991; Martin & Powell, 1992; among others).
Hamilton and Chervavy (1981), included ease of use, data currency, data accuracy, and system flexibility as part of system quality measure. The quality of the system is effected by the data used. A quality system is one that uses the most current and accurate data. System flexibility as the word suggests simply means that the IS developed must be flexible to allow for enhancement and to accommodate changes requested by users. Besides the measures mentioned, Bailey and Pearson (1983), indicated that the ability of the IS to integrate with other systems was a sign that resonated the quality of the system and was therefore an important factor.

It is evident from the above paragraphs that as computers become more a part of the daily work cycle, factors such as system reliability, availability, flexibility and responsiveness became critical in ensuring that the system is a success (Srinivasan, 1985). It suffices to observe here that the quality of the IS must be *high* (zero defects). The quality of the systems can be monitored using software monitors which are designed to observe the functions of a computer system.

Besides system quality, operational performance of a system can be measured by assessing the quality of the information produced by it, namely the output (King and Epstein, 1983; Jones & McLeod, 1986; Mahmood, 1987; Saunders & Jones, 1992). Information is a key user measure of IS and success as the main reason for developing a system is to provide information for users to act upon. The information is said to be of quality if it is accurate, prompt (available when needed), reliable, complete, relevant, precise, and current (Bailey & Pearson, 1983; Miller & Doyle, 1987). Lacker and Lessig (1980), developed a questionnaire consisting of 6 items that measured the perceived importance and usefulness of the information produced by the system. These are used to assess whether the information is *relevant, informative, meaningful, important, helpful, significant, clearer, readable and unambiguous*. Besides these attributes, in order to be useful, the information must be unique, concise, clear and readable (Swanson, 1974).

The third form of operational performance measure that is always cited by researchers is the utilisation of the system (Davis and Srivivasan, 1988; Hirschheim and Smithson, 1988; Laudon and Laudon, 1996, among others). Ein-Dor et.al (1981), in their search of a dependent variable of IS success, used system utilisation as part of their research framework. Some researchers observe that utilisation of a system showed that users are confident. The more the number of users, the better the quality of the system. As Capper observes: ***'the system must be seen to be effective in the eyes of the users or it will be discarded'*** (Capper, 1988:327). However using system utilisation as a means of performance measurement is debatable. This is because first, the user involvement may increased system utilisation regardless of the quality of the system. This may be due to several factors, one, the user understands the IS functions and how it works better. Two, the user has no choice but to use the system to perform his duties, unless he resorts to do it manually. Three, some systems are designed for infrequent use, example population census (Martin and Trumbly, 1986).

Nevertheless, system utilisation, is still often used as a measure as it is a fairly approachable measure (Zmud, 1979). Walsham (1993), used it extensively to evaluate the performance of the IS that he studied. In using it as a measure researchers often concentrated on voluntary usage (Kim & Lee, 1986; Hogue, 1987) which can be measured in many ways. Ein-Dor and Jones (1985), for instance, suggested the use of *accounting modules and Kiviatt graph*. the accounting module records , the amount of resources utilised by each system. Kiviatt graph on the other hand is a method of integrating data on system's performance by a monitoring system. The objective of the graph is to enable users to disclose at a glance whether the system is utilised or not. Morris and Roth (1988), recommended hardware monitors to be used to measure the system's utilisation. System utilisation can also be determined by the number of inquiries made to the system (King and Rodriguez, 1981) and the amount of user connect time (Swanson, 1974; Ginzberg, 1981).

There has been a lot of emphasis to use *user satisfaction* as a means of performance measurement (Clegg et.al, 1988; Slevin et.al, 1991; Iivari & Ervasti, 1994; among others). User satisfaction is the extend to which users believe in the IS that they are using. Some say that user satisfaction is the surrogate measure of IS effectiveness (Awad, 1988; Baroudi & Orlikowski, 1988; Doll & Torkhzadeh, 1988; Gatian, 1994;), hence must be carried out in order to assess the systems true performance. Acknowledging the significance of user satisfaction as a measure of IS performance, researchers such as Swanson (1974), used 16-items to measure IS appreciation whereas Bailey and Pearson (1983) developed a 39-item questionnaire for measuring user satisfaction. This instrument is very comprehensive and have been adapted by many researchers (Ives et.al, 1983; Baroudi et.al, 1986; Miller and Doyle, 1987; Remenyi et.al, 1991). Remenyi for instance, used a university model to measure the effectiveness of a personal computer network used by a business school. The measure is based on the gap between what the users *believe* as important and their *perception* of what is delivered by the IS departments. The question that arises now is, *'what constitutes users satisfaction?'*. Slevin et.al, 1991, identified five elements; namely, comprehensiveness of the system; ease of use; support from IS department; quality and reliability; and timeliness. Others have indicated that user satisfaction can be seen from the level of the users' participation, their control over IS services, their understanding and confidence in the system (Miller & Doyle, 1987). Besides the four main measures discussed above, operational performance can also be measured by evaluating the operations and interaction of users and the IS personnel. It can be evaluated by assessing the ability of their communication and their attitude towards each other (Rolefson, 1978). From the discussions above, it is evident that operational performance is one of the most used performance criteria. The fourth performance criteria, Managerial performance with regard to IS evaluation is our next issue of concern.

Managerial Performance

This criterion is one of the criteria that is seldom used to assess IS performance. However, there are a few writers who argue that it is important to measure *managerial performance*. Dickson et.al (1988), for instance indicated that managerial performance must be measured because managers are responsible for the running of the organisation thus their support is needed to ensure the IS perform as it was designed to (Finlay, 1993; Laudon and Laudon, 1996). Management involvement, according to Rolefson (1978), is concerned with the degree with which the top management directs and controls the IS. Managerial performance may be measured by assessing the attitudes of senior and users managers, and their perception of the IS capabilities and problems. Top management involvement according to Miller and Doyle (1987), and Swanson (1974), is important. Usually if the top management is involved or aware of the IS functions, then the chances that the IS will perform successfully is better (Frenzel, 1996). When the involvement of the top management is minimal or none at all, situations like budget allocation being slashed may occur or other negative happenings contrary to IS (Yoon et.al, 1995). Gallenger (1974),

developed a set of questionnaires that measured managers perceptions by asking managers to *estimate the monetary value* of the reports that are produced by the IS functions and how they rated the reports.

The subsequent section discusses another performance criteria, that is, Personnel performance, which is also seldom used to evaluate IS performance. This researcher however feel that this criteria is not without any importance, as can be observed in the paragraphs below. Thus, it was included in the discussion.

Personnel Performance

Human resources i.e.. IS personnel are needed to develop,.operate and maintain IS. Since IS personnel are greatly needed for IS development, their interest must be looked after. The IS function within the organisation must exist in an environment that will encourage its personnel and users to capitalise on new technologies. Scudder and Kucic (1991), identified six measures that could be used to measure personnel performance i.e. *technical capabilities, business knowledge, training, replacement projections, career satisfaction and job satisfaction.* These issues are outlined below briefly. Personnel who are armed with *technical capabilities* are said to be more capable (Turner, 1981; Slevin et.al 1991). The more capable they are, the better the system developed, hence the better the IS performance. Like technical capabilities, *training* enables the personnel to be more equipped to handle the IS functions. Training also exposes them to new technologies which they can use in carrying out their work. As a result, a better system may be produced out of IS personnel who have adequate training (Morino 1988; Remenyi et.al, 1991). Training equips personnel with skills, knowledge and the right attitudes, all necessary for the development of a efficient and effective IS.

Career and job satisfaction are also measures of IS's performance. An effective IS organisation, would be able to secure and persevere their IS personnel. Dissatisfaction may cause two things to happen, one the personnel leave the organisation and two, they continue working, but try to sabotage the IS. When personnel leave the organisation, a replacement must be found. It will then take the new operatives a considerable amount of time to learn and operate the system. A questionnaire developed by Miller and Doyle (1987), to evaluate the effectiveness of IS, posed 6 questions regarding personnel performance. These questions cover *competence of analyst, technical competence of IS personnel, innovative, attitudes to user and IS and user-oriented analyst.*

Not many researchers carry out IS evaluation using this criteria. However, it is the view of this researcher that this is an important criteria and it is recommended that further development of IS performance measurement should take this criteria into consideration. The next criteria included in this paper is Strategic performance.

Strategic Performance

IS are a valuable tool and holds strategic importance in the organisation in which they are implemented (Scott, 1991). IS strategic performance can be measured from competitive advantage; innovation; and influence on organisational structure (decision making and communication) (Sprague and McNurlin, 1986). Competitive advantage is evaluated by assessing whether the organisation's products or services are ahead of their competitors because of aspects such as differentiation, cost leadership or market niche. Several researchers have suggested that IS success is reflected to the extend to which the systems is applied to critical or major problems (Ein-Dor and Segev, 1974; Senn and Gibson, 1981; Angel & Smithson, 1991). Critical or major problem and their solution preferably using IS can have good or harmful effects on the organisations. Strategic performance may be measured by assessing whether the

IS are a valuable tool and holds strategic importance in the organisation in which they are implemented (Scott, 1991). IS strategic performance can be measured from competitive advantage; innovation; and influence on organisational structure (decision making and communication) (Sprague and McNurlin, 1986). Competitive advantage is evaluated by assessing whether the organisation's products or services are ahead of their competitors because of aspects such as differentiation, cost leadership or market niche. Several researchers have suggested that IS success is reflected to the extend to which the systems is applied to critical or major problems (Ein-Dor and Segev, 1974; Senn and Gibson, 1981; Angel & Smithson, 1991). Critical or major problem and their solution preferably using IS can have good or harmful effects on the organisations. Strategic performance may be measured by assessing whether the

organisations profit and market share have increased due to IS functions. However, it is not easy to determine whether the increase in profit and market share is attributed to the IS or other factors such as marketing strategy. Miller and Doyle (1987), in their 38-item questionnaire listed 5 critical questions relating to strategy, i.e. relating to issues of strategic IS planning, use of steering committee, over-all cost effectiveness, database technology, business related systems priorities. Strategic performance can also be measured by putting forward to the top management as whether their organisation would be out of business if the IS do not exist (Scudder and Kucic 1991). IS strategic performance is slowly growing in importance. This is evident, from the results of the study conducted by Saunders and Jones (1992). In their study, the Chief Executive Offices ranked strategic performance as the most important performance measurement.

CONCLUSION

This review enables future evaluators of IS performance to consider the best measures for evaluating IS performance. It had identified six criteria in which IS performance can be evaluated., i.e. financial, systems development, operational, managerial, personnel and strategic performance. Financial performance, through measures such as Cost-benefit analysis and ROI are most frequently used by researchers although they have been heavily critiqued. This may be due to the fact that the financial performance illustrates the performance in monetary form, which is a big concern for all organisations. Operational performance, through users' satisfaction, on the other hand is said to be the best surrogate measure for IS effectiveness, and hence should be the determinant measure of IS performance. Many researchers have also used systems development especially, quality of system and information to measure IS performance. Although the other three criteria have not been extensively used in the past, future researchers should consider them as they are growing in importance especially strategic performance.

REFERENCES

Angell I.O., and Smithson S., (1991), **Information systems Management, Opportunity and Risks,** • UK: Macmillan.

Anonymous, (1993), *Government To Boost Development Of IT*, **New Straits Times.**

Awad E.M., (1988), **MIS: Concepts, Structure and Applications**, UK: Benjamin Cummings Publication.

Bacon J.C., (1992), *The Use Of Decision Criteria In Selecting IS/T Investments*, **MIS Quarterly**, vol 16(3):335-353.

Bailey J.E., and Pearson S.W., (May 1983), *Development Of A Tool For Measuring And Analysing Computer User Satisfaction*, **Management Science**,:530-545.

Ballantine J.A., Galliers R.D, and Stray S.J., (1994), *IS/T Investment Decisions- The Use Of Capital Investment Appraisal Techniques In Organisations*, **Proceedings of the First European Conference on IT Investment Evaluation**, UK.,:148-166.

Banker R.D., Kauffman R.J., and Morey R.C., (1990), *Measuring Gains In Operational Efficiency From IT*, **Journal of MIS**, vol 7(2), :29-54.

Baroundi J.J., and Orlikowski W.J., (1988), *A Short-form Measure of User Information Satisfaction: A Psychometric Evaluation and Notes on Use*, **Journal of Management Information Systems**, vol 4(4),:44-59.

Bergeron F., and Begin C., (1989), *The Use of Critical Success Factors in Evaluation of Information Systems: A Case Study*, **Journal of Management Information Systems**, vol 5(4),:111-124.

Capper L., (1988), *Post-Implementation Assessment Of Information Systems Application: Notes From Personal Experience*, In **Information Systems Assessment: Issues And Challenge**, (eds N.Bjorn-Anderson, G.B. Davis), Elsevier Science Publishing,:317-331.

Cashmore C., and Lyall R.(1991), **Business IS and strategies**, UK, Prentice Hall.

Cetron, and Bartoda, (1973), **Technology Assessment In A Dynamic Environment**, UK, Gordon and Breach Science Publishers.

Clegg C., Warr P., Green T., Monk A., Kemp N., Allison G., and Lansdale M., (1988), **People And Computers: How To Evaluate Your Company's New Technology**, UK, Ellis Horwood.

Conklin J.H, Malcom H.G., and Rickman J.,(1982), *On-Line Terminal Response Time*, **Information And Management**, vol 5(3),:169-173.

Davis G.B., and Olson M.H., (1985), **Management Information Systems : Conceptual Foundations, Structure and Development,** *U.S.A. :* Mc-Graw Hill.

Davis J.G., and Srivinasan A., (1988), *Incorporating User diversity into IS assessment,* In **Information Systems Assessment: Issues and Challenges,** (eds. N.Bjorn-Anderson, G.B. Davis), UK: Elsevier Science Publishing.

Delone, W.H., and MClean E.R., (March 1992), *The Information Systems Success: The Quest For The Dependent Variable,* **Information Systems Research,** vol 3(1),:60-95.

Dickson G.W., and Wetherbe J.C., (1985), *Management Assessment And Evaluation Of MIS,* In **The Management Information Systems,** McGraw Hill,:162-186.

Dickson G.W., Wells C.B., and Wilkes R.B., (1988), *Toward A Derived Set Of Measures For Assessing IS Organisations,* In: **Information Systems Assessment: Issues and Challenge,** (eds N.Bjorn-Anderson, G.B. Davis), Elsevier Science Publishing,:129-147.

Doll W.J., and Torkzadeh., (1987), *The Relationship Of MIS Steering Committee To Size Of Firm And Formalisation Of MIS Planning,* **Communications of the ACM,** vol 30(11),:972-978.

Ein-Dor P., and SEGEV E., (June 1978), *Organisational Context And The Success Of Management Information Systems,* **Management Science,**:1064-1077

Ein-Dor P., Segev E., and Steinfeld A., (Dec 1981), *Use Of MIS: An Empirical Study,* **Proceedings of the Second International Conference of Information Systems,**:215-228.

Ein-Dor P., and JONES C.R., (1985), *Computer Centre Management :A Special Topic And Practical Techniques,* in **IS Management : Analytical Tools and Techniques,** UK: Elsevier Science Publishing,:142-151.

Ewusi-Mensah K., (1989), *Evaluating Information Systems Projects: A Perspective On Cost-Benefit Analysis,* **Information Systems,** vol 14(3):205-217.

Farbey B., Land F., and Targett D., (1994), *A Taxonomy of Evaluation Methods,* **Proceedings of the First European Conference on IT Investment Evaluation,** :44-70.

Farbey B., Land F., and Targett D., (1993), **How To Assess Your IT Investment,** Butterworth-Heinemann Ltd., UK.

Farbey B., Land F., and Targett D., (1992), *Evaluating Investment In IT,* **Journal of Information Technology,** vol 7:109-122.

FrenzelL C.W., (1996), **Management of IT,** Byod and Fraser Pub. Co, US,.

Gatian A.W., (1994), *IS User Satisfaction: A Valid Measure of System Effectiveness,* **Information & Management,** vol 26(3),:119-131.

Ginzberg M.J., (1981), *Early diagnosis of MIS implementation failure : Promising results and unanswered questions*, **Management Science**, vol 27(4),:459-478.

Grindley K.(1991), **Managing IT At Board Level: The Hidden Agenda Exposed**, UK: Pitman Publishing.

Hallam and Scriven, (1976), *EDP Objectives And The Evaluation Process*, **Data Management**, vol 14(5),:40-42,50.

Hamilton S. and IVES B., (1992), *MIS Research Strategies'*, In **Information Systems Research, Issues, Methods And Practical Guidelines**, (ed. R.Galliers), UK: Blackwell Scientific Pub.,:132-143.

Hamilton S., and Chervany N.L., (Dec 1981), *Evaluating Information System Effectiveness- Part II: Comparing Evaluator Viewpoints*, **MIS Quarterly**,:79-86.

Hellerman H., and Conroy T.F (1975), **Computer system performance**, MacGraw-Hill.

Hirsxhheim R., and Smithson S. (1988)., *A Critical Analysis Of Information Systems Evaluation*, In **Information Systems Assessment: Issues and Challenges**, (eds. N.Bjorn-Anderson, G.B.Davis), Elsevier Science Publishing.

Hochstrasser B., (1990), *Evaluating IT investments: Matching Techniques to Projects*, **Journal of IT**, vol 5(4):215-221.

Hogue, J.T., (1987), *A Framework For The Examination Of Management Involvement In Decision Support Systems*, **Journal of MIS**, vol 4(1):96-110.

Hurtado C.D., (Jan 1978), *EDP Effectiveness*, **Journal of Systems Management**,:18-21.

Iivari J., and Ervastil I., (1994), *User Information Satisfaction :IS Implementability And Effectiveness*, **Information & Management**, vol 27,:205-220.

Ives B., Olson M.H., and Baroudi J.J., (1983), *The Measurement Of User Information Satisfaction*, **Communications of the ACM**, vol 26(10),:785-793.

Johnston H.R., and Vitale M.R, (June 1988), *Creating Competitive Advantage With Interorganisational Information Systems*, **MIS Quarterly**,:153-165.

Jones J.W., and MCleod R., (1986), *The Structure of Executive Information Systems*, **Decision Sciences**, vol 17(2):220-249.

Kim E., and Lee J., (1986), *An Explotary Contingency Model Of User Participation And MIS Use*, **Information & Management**, vol 11(2) 87-97.

King W.R., and Rodriguez, J.I., (Sept. 1978), *Evaluating Management Information Systems*, **MIS Quarterly**,:43-51.

Larcker D.F and Lessig V.P., (1980), *Perceived Useful Of Information*, **Decision Science, vol** 11(1),:121-134.

Laudon K.C., and Laudon J.P(1996)., **MIS:Organization and Technology,** New Jersey: Prentice Hall.

Mahmood M.A., (1987), *System Development Methods*, **MIS Quarterly,** vol 11(3):293-311.

Martin M.P., and Trumbly J.E., (Feb 1986), *Measuring Performance of Automated Systems*, **Journal of Systems Management** :7-17.

Matlin G., (Sept. 1979), *What Is The Value Of Investment In Information Systems?*, **MIS Quarterly,**:5-34.

McBride and Fidler C, (1994), *An Interpretive Approach to Justification Of Investmnet In EIS*, **Proceedings of the First European Conference on IT Investment Evaluation,**

Miller J., and Doyle B.A., (March 1987), *Measuring The Effectiveness Of Computer-Based Information Systems In Financial Services Sectors*, **MIS Quarterly,**:107-124.

Mirani R., and Lederer A.L,. (Oct. 1993), *Making Promises: The Key Benefits Of Proposed IS Systems*, **Journal of Systems Management,**:16-20.

Mirtidis D., and Serafeimidis V., (1994), *Evaluating IT Investments in Greece*, **Proceedings of the First European Conference on IT Investment Evaluation**, UK, 1994: 167-177.

Morino M.M, (1988), *Evaluating The Effectiveness Of The IS Management Support System*, **Journal of Information System Management,** vol 5(3):55-59.

Morris M.F., and Roth P.F., **Computer Performance Evaluation: Tools And Techniques For Effective Analysis,** Van Nostrand, Reinhold.

Olson M., and Ives B., (Dec 1980), *Measuring User Involvement In IS Development*, **Proceedings of the First International Conference on IS,.**

Parker M.M, Benson R.J. and Trainor H.E., (1988), **Information Economics: Linking business performance to IT**, Prentice-Hall, US,.

Powell O., (1992) *IT Evaluation: Is It Different?*, **Journal of Operational Research Society,** vol 43(1), 29-42.

Price Waterhouse, (1993), **International IT Review 1993/94,** Price Waterhouse, London,.

Remenyi, Money and Twite, A (1991)., **A Guide to Measuring and Managing IT Benefits,** Blackwell Limited.

Ringler W.S., (1988), *Planning And Evaluation Of The MIS Function At First American Bankshares*, In: **MIS: Planning, Evaluation And Implementation**, (eds. J.S. Chandler, and H.P. Holzer), U.S.A.: Basil Blackwell.

Rockart J.F., (1981), *The Changing Role Of The IS Executives: A Critical Success Factors Perspective*, **Sloan Management Review**, vol 24,:3-13.

Rolefson J.F., (Nov. 1978), *The DP Check Up*, **Journal of Systems Management**,:38-49.

Ross S., Westerfield R.W., Bradford D.J.(1991), **Fundamentals of Corporate Finance**, U.S.A.: Irwin.

Saunders C.S., and Jones J.W., (1992), *Measuring Performance of the Information Systems Function*, **Journal of Management Information Systems**, vol 8(4),:63-82.

Schumann M., (1989), *Methods Of Quantifying The Value Of Office Automation*, **Journal of Information System Management**, vol 6(4),:20-29.

Scott M. (1991), **The Corporations of the 1990's, IT and Organisational Transformation**, UK: Oxford University Press.

Scudder R.A., and Kucic A.R.,(1991), *Productivity Measures for IS*, **Information & Management**, vol 20(5), 343-354.

Senn J.A. and Gibson V.R., (1981), *Risks Of Investment In Microcomputers For Small Business Management*, **Journal Of Small Business Management**, vol 19(3),:24-32.

Serafeimidis V., and Smithson S., (1994), *Evaluation Of IS/T Investment : Understanding And Supporting*, **Proceedings of the First European Conference on IT Investment Evaluation**, 135-147.

Slevin D.P., Steiman P.A., and Boone L.W., (1991), *Case Study: Critical Success Factor Analysis For IS Performance Measurement And Enhancement*, **Information & Management**, vol 21(3),:162-171.

Smith R.D., (Sept. 1983), *Measuring The Intangible Benefits Of Computer-Based IS*, **Journal of Systems Management**,.

Socitm, (1994), **IT Trends in Local Government 1994/95**, SOCITM, UK.

Sprague R.H., and McNurlin B.C.(1986), **IS Management in Practice**, *UK:* Prentice-Hall.

Srinivasan A., (1985), *Alternative Measures For System Effectiveness*, **MIS Quarterly**, vol 9(3),:243-253.

Strassman P.A (1985), **Information Payoff**, New York: The Free Press.

Swanson E.B., (1974), *Management Information System: Appreciation and Involvement*, **Management Science**, vol 21(2), 178-187.

Symons V.(1994), *Evaluation Of IS Investments: Towards Multiple Perspectives*, In **Information Management: The Evaluation of IS Investments**, (ed. L.Willcocks), UK: Chapman and Hall. :253-268.

Symons V.J., (1990), *A Review Of IS Evaluation: Content, Context And Process*, **European Journal of IS**, vol 1(3), 205-212.

Torkzadeh G., (1988), *The Quality Of User Documentation: An Instrument Validation*, **Journal of Management Information Systems**, vol 5(2):99-108.

Turner J., (Dec. 1981), *IS And The Public Sector And Measurement In IS*, **Proceedings of the Second International Conference on IS**, US.

Walsham G. (1993), **Interpreting Information Systems in Organisations**, John Wiley and Sons, Chichester.

Walsham G., Symons V., and Waema T., *Information Systems As Social Systems: Implication For Developing Countries*, In **Information Technology In Developing Countries**, (eds S.C.Bhatnagar & Bjorn-Andersen (1990), Elsivier Science Pub, North-Holland :51-61.

Ward J., (1990), *A portfolio Approach Into Evaluating IS Investments And Setting Priorities*, **Journal of IT**, vol 5(4):222-231.

Ward J., Griffiths P., Whitmore P.(1995), **Strategic Planning for IS**, Wiley series in IS, UK.

Willcocks L., (1994), *Introduction: Of Capital Importance*, In **Information Management: The Evaluation Of IS Investments**, (ed. L.Willocks) UK: Chapman and Hall :1-27.

Willcocks L., (1992), *Evaluating IT Investments: Research Findings And Reappraisal*, **Journal of IS**, Vol 2(4):243-268.

Willcocks L., and Lester S, (1993), *Evaluating The Feasibility Of IT Investments*, **Research And Discussion Papers**, RDP93/1, Oxford, UK.

Wiseman D., (1992), *Information Economics: A Pratical Approach To Valuing Information Systems*, **Journal of IT**, vol 7,:169-176.

YoonY., Guimaraes T., and O'Neakl Q, (March 1995), *Exploring The Factors Associated With Expert System Success*, **MIS Quarterly**,:83-104.

Zmud R.W., (1979), *Individual Differences And MIS Success*, **Management Science**, vol 25(10):966-979.