Supporting Investment Evaluation and Project Management: Toward A Framework of IT/IS Costs

M.T. Hides[1], Z. Irani[1] and P.E.D. Love[2]

[1]Department of Information Systems and Computing, Brunel University, Uxbridge, UB8 3PH, United Kingdom
E-mail: mick.hides@bigfoot.com and zahir.Irani@brunel.ac.uk

[2]School of Architecture and Building, Deakin University, Geelong, Victoria, 3217 Australia
E-mail: pedlove@deakin.edu.au

ABSTRACT: *Information Systems (IS) are widely acknowledged as one of the major enablers of business change. However, despite enormous capital IS investments, organizations have not always been able to enjoy commensurate financial returns. Much of the reason for this is that there are considerable costs associated with the adoption of IT/IS, with many of these cost factors being indirect and intangible, and difficult to identify at the project description and justification stage. This paper describes the first phase of a UK-government funded research project that will extend the myopia of traditional direct financial cost analysis through identifying indirect cost factors, together with their respective natures. The need to identify the true level of such costs during the evaluation process is presented, which in doing so, will support an improvement in decision-making and hence, organisational learning will be demonstrated.*

Keywords: Information systems, costs, evaluation, decision making, management.

INTRODUCTION

The need to identify and manage the portfolio of costs associated with deploying Information Technology (IT) and Information Systems (IS) is motivated in-part by industries increasing expenditure on IT/IS to deliver strategic competitive advantage. Furthermore, as the implications of such investments are *now* realised as being far reaching, and having a whole host of socio-technical implications, with IT/IS cost identification and management being high on the agenda of investment decision makers.

Developments in intra-organisational systems [eg. intranets] and the new era of strategic inter-organisational IT/IS deployments [eg. enterprise resource planning] that support increases in supply chain efficiencies are regarded as changing the traditional portfolio of direct financially tangible IT/IS costs. Instead, there are now regarded as being a whole host of *indirect* costs that are *not* only difficult to identify but, occur during different stages of the IT/IS life-cycle, and are in many cases intangible, indirect and hidden. This has clear implications on the investment evaluation process, as traditional approaches to IT/IS appraisal are unable to accommodate the changing cost portfolios associated with deploying IT/IS. However, before investment decision makers are presented with such difficulty, there is much need to increase the awareness of indirect IT/IS costs to project managers thus, allowing for their consideration and management, timing and magnitude assessment on budget. This is increasingly necessary as capital budgeting is often geared around those costs that are easy to identify and financially quantify, which limits cost management to visible direct costs. The inability of managers to identify the true costs of IT/IS is considered attributable to a lack of knowledge and understanding of IT/IS costs and product life cycles, and as a result, is calling for new approaches to life-cycle evaluation. Consequently, research that supports managers in cost identification and management will be of value to organisations.

This paper describes the first phase of a UK-government funded research project that will extend the myopia of traditional *direct* financial cost analysis through identifying *indirect* cost factors, together with their respective natures. This will contribute towards a framework that will integrate taxonomies of costs and performance measures/metrics, which will support management during the planning and investment decision making process of IT/IS projects. In addition this will enable benchmark metrics for the costs of post-implementation evaluation to be determined, which in turn will facilitate organisational learning.

The implications of the research will contribute towards the literature through increasing the awareness of IT/IS cost portfolios, and therefore support the efficient utilisation and effective deployment of IT/IS resources.

In addition, a case will be presented to propose the development of an evaluation life-cycle model that support the evaluation of IT/IS during its own life-cycle, and also identifies costs at specific phases.

COSTS: UN-AVOIDABLE EVIL

The necessity for organisations to be more effective has led to a greater reliance on IT/IS to support a host of strategic, tactical and operational processes. The introduction of new technology is one, which few organisations are able to avoid throughout their life (Dasgupta *et al*., 1999; Lock, 2000). Anandarajan and Wen (1999) report the view amongst chief executive officers that their companies do not sufficiently exploit the IT investment even though the investment can account for up to a half of companies' total business expenditure. The time-cost-quality triumvirate has been the success criteria for project managers for the last fifty years. Cost and time are considered to be estimates *"calculated at a time when least is known about the project"* (Atkinson, 1999). The need, therefore, to better identify the cost element of the iron triangle is crucial especially if companies are to achieve better value from any IT/IS investment. Irani *et al*. (1998) reported two main categories of costs, mainly direct and indirect; further expanding the latter to differentiate between indirect human and organisational costs. Table 1 summarising this distinction IT/IS cost categories.

Cost type	Definition	Examples of costs in IT/IS project
Direct	"Factors easily attributed to the implementation and operation of IT"	Air conditioning facilities, File server, Terminal, Printers, Software, Installation engineers and Vendor software familiarisation courses.
Indirect human	Time spent by people integrating new systems into current work practices.	Devising, approving and amending IT and manufacturing strategies, exploring the potential of the system, being trained and training others.
Indirect organisational	Transformation from one system to another	Losses in organisational productivity, strains on organisational resource and organisational restructuring.

Table 1. IT/IS cost categories (developed from Irani *et al*., 1998)

Shin (1999) extends the above taxonomy by proposing co-ordination costs, and as a result, widens the scope, from purely integration into an organisation's operations, to consider alignment between separate organisations. The notion of exceptions as a cost is proposed by Saastamoinen (1995) and establishes, through survey, an average cost for an exception. Activity-based costing is proposed as a method for attributing costs (Cooper and Kaplan, 1988) and giving executives reliable cost information, which can be used to consider strategic options.

DECISION MAKING

The view that decisions are made in the best interest of the organisation is dismissed by several complementary theories (Karake 1995; Gurbaxani and Whang, 1991) a comparison of which can be seen in Table 2.

Theory	Definition	Example of cost
Agency	A firm is a "nexus of contracts among self-interested individuals[2]". OR "Managers and shareholders desire to maximise their own interests[1]"	"Costs incurred as a result of discrepancies between the objectives of the principal and those of the [employees][2]"
Upper echelon	"Characteristics of top-level management teams are determinants of strategic choices[1]"	*Age* - older managers more risk-averse *Organisational tenure* - willingness to maintain the status quo *Experience* *Power*
Transaction	"External co-ordination costs[2]"	"Costs of writing a contract and enforcing it"

Table 2. Comparison of Decision Making Theories (after [1]Karake 1995, [2]Gurbaxani and Whang 1991)

The decision to invest in IT/IS considers the benefits of the investment, but "it is the intangible and intermediate benefits….which complicate the justification process for IT investments" (Shin, 1999). Southern and Murray (1994) reporting on investment in a manufacturing environment conclude, "cultural company involvement in decision-making must be supported by good data systems and good information presentation". This is reinforced in a different environment by Hayes and McGee (1998) who suggest that understanding the organisational model of an institution and managing the decision making are more important than the "management of technical questions".

This focus on short-term, non-strategic tangible benefits is one which Sharif and Irani (1999) suggest misses the "larger picture". The dissonant nature of many cost studies has prompted many academic institutions to embark on the COSTS project (Leach and Smalle, 1998). This research judged the technology support services against a number of criteria, namely: economies of scale, outsourcing, 'you get what you pay for' and complexity. These views are strengthened by Williams (1997) who suggests that an organisation should look both at its culture and financial position before deciding whether to invest in IT/IS. Bucki and Pesqueux (2000) continue by stating that as companies are becoming dependent on data processing systems we need to appreciate complex systems in such a way as to include culture, creativity, well being and real time.

EVALUATION PROCESS

The most widely used method of evaluation for IT/IS has been payback, cost-benefit analysis and return on investment (Ballantine and Stray, 1999), however an understanding of what is being measured and the value that this has to the organisation must be established (Cronk and Fitzgerald, 1999). In a public sector environment Garbett and Baldwin (1999) discuss quantifying the added value of the information provided by an IT/IS solution. In a survey Ballantine and Stray (1999) found that evaluation of IT/IS was far more narrowly focussed than other capital expenditure projects. Serafeimidis and Smithson (1999) conclude that many evaluation methodologies have weaknesses related to the

> "....limited importance paid to understanding the overall context, their inability to deal effectively with new elements of content, the restrictive systems development life cycle used as the time frame and finally, the need for contingency models to deal with uncertainty and the constant contextual changes"
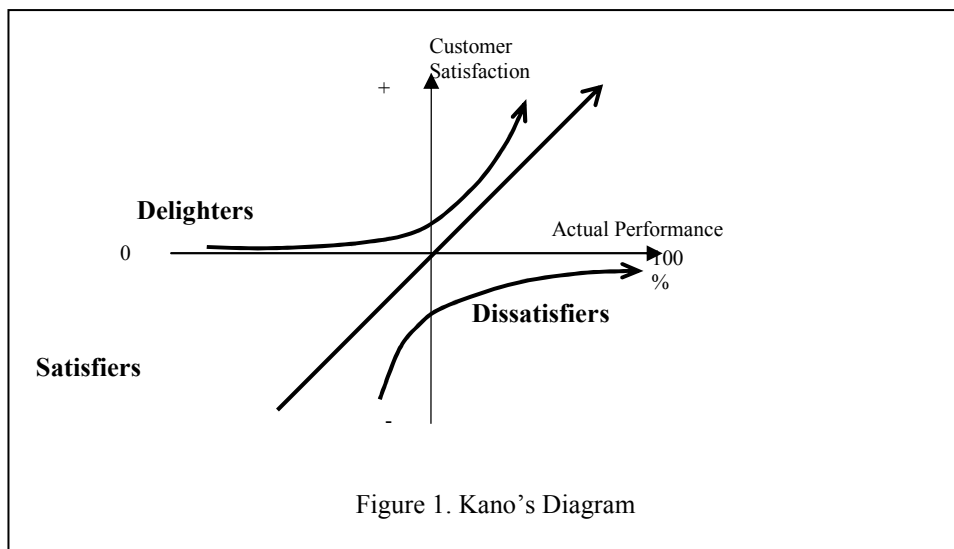

Figure 1. Kano's Diagram

Lubbe and Remenyi (1999) state that organisations use a variety of criteria to evaluate IT but suggest that successful IT considers the stakeholder outcomes (i.e. benefits). The expressed and unexpressed needs of the customers' project definition or *satisfiers* and *dissatisfiers* in terms of Kano's diagram can be seen in Figure 1 (Cohen, 1995).

A method of "continuous participative evaluation" involving all the stakeholders is proposed by Remenyi and Sherwood-Smith (1999) as a means to ensuring that IT/IS investment prepares for a changing world rather than just the short-term deliverable's of a project

DISCUSSION AND CONCLUDING COMMENTS

Investment evaluation will always remain a difficult process, simply because there are a wide range of interacting socio-technical variables that need considering. As a result, any robust model will need to address such factors (Irani *et al.,* 2000), with IT/IS costs being at the genesis of such a model. In doing so, providing an important control mechanism to monitor resources. In identifying a more realistic portfolio of costs, managers will be better equipped to monitor costs during the life-cycle of the investment.

The increase in power of personal computers has reinforced the reliance on Information Technology and Information systems and with this has come pressure to sufficiently exploit the investment. An understanding of the true costs of investing in IT/IS is vital to enable the benefits to be judged fairly. The traditional method of evaluating a project, using the iron triangle, has been shown to be inaccurate by concentrating purely on the visible *direct* costs of IT/IS.

Expanding the view to include the indirect costs associated with individuals and the organisation gives a true and broader understanding of the costs. The investment cost it has been shown to be relegated when decision-making theories are considered. Agency, upper echelon and transaction theories all bias decision–making whilst at the same time adding to by the implementation of IT/IS. Karake (1995) specifically talks about managerial abuse of power in IT/IS investment. The process of decision-making is seen to add cost with the collection of appropriate data and inclusion of so many stakeholders. This (presumably) is one of the reasons that companies have not included such information but as the research has shown it is the value (i.e. benefits) not the cost which should take precedent in the decision-making process.

Traditional methods of evaluation including payback, cost-benefit analysis and return on investment are even more narrowly applied for IT/IS. Rather than evaluating the cost of IT/IS several authors (Cronk and Fitzgerald 1999; Remenyi and Sherwood-Smith, 1999; Lubbe and Remenyi, 1999) suggest examining the value to the organisation and the stakeholders. Further to this Remenyi and Sherwood-Smith (1999) suggest that evaluation should move from a method of project closure to a process for project improvement. Organisations that are in dissonance with the stakeholders will not be in a position to promote organisational learning. Similarly companies that have a blame culture will concentrate on the cost, ignoring the benefits, and further forcing a concentration on the direct costs. Evaluation can take into account a wider remit and Serafeimidis and Smithson (1999) found evidence of organisational learning. Gurbaxani and Whang (1991) who identified a link between IT/Is and organisational learning reinforce this point.

The next stage of the project is to create a detailed taxonomy of the costs that can then be used as a framework during interviews with organisations. Part of the research will concentrate on identifying organisations that have a significant IT/IS investment strategy although care will be taken to ensure that a wide variety of industry and public sector s are included. Finally, when considering organisational learning and its role during investment decision making, a case has been proposed to comprehensively identify the true of cost of IT/IS to improve the decision-making and hence, undertake evaluation, which promotes improvement and hence organisational learning, has been shown.

REFERENCES

Anandarajan, A. and Wen, H.J., (1999), Evaluation of Information Technology Investment, *Management Decision,* **37**(4), pp. 329-337

Atkinson, R., (1999), Project Management: Cost, Time and Quality, two best guesses and a phenomenon, its time to accept other success criteria, *International Journal of Project Management,* **17**(6), pp.337-342.

Ballantine, J.A. and Stray, S., (1999), Information Systems and other Capital Investments: Evaluation Practices Compared, *Logistics Information Management,* **12**(1/2), pp.

Bucki, J. and Pesqueux, Y., (2000), Automation seen as Delegation, *Kybernetes,* **29**(1), pp.

Cohen, L., (1995), *Quality Function Deployment: How to make QFD work for you,* Addison-Wesley Publishing Company, Mass., pp.36-41.

Cooper, R. and Kaplan, R.S., (1988), Measure Costs Right: Make the Right Decisions, *Harvard Business Review,* September-October, pp.96-103.

Cronk, M.C. and Fitzgerald, E.P., (1999), Understanding "IS Business Value": Derivation of Dimensions, *Logistics Information Management,* **12**(1/2), pp.

Dasgupta, S., Sarkis, J. and Talluri, S., (1999), Influence of Information Technology on Firm Productivity, *Logistics Information Management,* **12**(1/2), pp.120-129

Garbett, C. and Baldwin, F., (1999), Achieving Best Value from Information Systems: a Case Study of Information Systems Analysis for a Local Authority Property Department, *Facilities,* **17**(7/8), pp.

Gurbaxani, V. and Whang, S., (1991), The Impact of Information Systems on Organisations and Markets, *Communications of the ACM,* **34**(1), pp.59-73.

Karake, Z.A., (1995), Information Technology Performance: Agency and Upper echelon Theories, *Management Decision,* **33**(9), pp.

Khang, D.B. and Myint, Y.M., Time, Cost, Quality Trade-off in Project Management: a Case Study, *International Journal of Project Management,* **17**(4), pp.249-256.

Leach, K and Smallen, D., (1998), What do Information Technology Support Services Really Cost, *Cause/Effect,* **21**(2), pp.38-45.

Lock, D., (2000), *Project Management,* 7th ed., Gower, Aldershot.

Lubbe, S. and Remenyi, D., (1999), Management of Information Technology Evaluation – the Development of a Managerial Thesis, *Logistics Information Management,* **12**(1/2), pp.

Remenyi D. and Sherwood-Smith, M., (1999), Maximise Information Systems Value by Continuous Participative Evaluation, *Logistics Information Management,* **12**(1/2), pp.

Saastamoinen, H., (1995), Case Studies on Exceptions, *Information Technology and People,* **8**(4), pp.48-78.

Serafeimidis, V. and Smithson, S., (1999), Rethinking the Approaches to Information Systems Investment Evaluation, *Logistics Information Management,* **12**(1/2), pp.

Sharif, A.M. and Irani, Z., (1999), research Note: Theoretical Optimisation of IT/IS Investments, *Logistics Information Management,* **12**(1/2), pp.

Shin, N., (1999), Does Information Technology Improve Co-ordination? An Empirical Analysis, *Logistics Information Management,* **12**(1/2), pp.

Southern, G. and Murray, A.U., (1994), Quality Information Management The Way to a Better Company Culture, *Information Management and Computer Security,* **2**(2), pp.

Williams, L.T., (1997), Planning and Managing the Information System – A Manager's Guide, *Industrial Management and Data Systems,* **97**(5), pp.