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# It Doesn't Add Up: Why Financial Evaluation Methods are Inadequate in Appraising IS Investments

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## It Doesn't Add Up: Why Financial Evaluation Methods are Inadequate in Appraising IS Investments

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### Abstract

*Corporate investment in Information Systems (IS) is growing at an ever increasing rate and is being touted as a solution to business issues and as a source of prosperity. Growth in IS and the opportunity this offers has increased the number and range of ideas for new IS investments to be presented to organisations. With such a vast array of options available, organisations are looking for better ways to justify these investments and one way in which this has been done is to employ evaluation methods which have traditionally been used to appraise capital financial investments. However, there are drawbacks of doing so. This study aims to explore the merits and deficiencies in applying evaluation methods from the accounting, finance and economics disciplines to IS investments. A deeper look in to the structure and intended use of each method will be coupled with a review of empirical studies in the area to shed some light on these methods in practice.*

### Keywords

IS Evaluation Methods, Pre-Implementation Evaluation, IS Evaluation

### Introduction

The significance and growth of Information System and Technology (IS) investments both in dollar terms and as a percentage of total corporate expenditure (Powell 1992, Sheppard 1990) have put pressure on management to adequately justify these investments (Dos Santos 1991, Lin & Pervan 2001a, & Silk 1990). Managers are not only concerned about the substantial amount of spending on IS (Bannister & Remenyi 2004), but also about cost cutting arising from increased competition and globalisation (Ballantine, Galliers & Stray 1996, Serafeimidis & Smithson 1999). Some, like Baraua, Kriebel & Mukhopadhyay (1995), have argued that the purpose of this pressure is to drive management to make more informed decisions. Whatever the purpose, these decisions have not proven to be particularly easy to make given that the adoption of IS is considered to be one of the most expensive, complex, and time-consuming tasks that an organisation can undertake, highlighting the importance of, and need for, the IS evaluation act itself before the investment takes place (Cronholm & Goldkuhl 2003, Patel & Irani 1999, Lin & Pervan 2001a).

Over time management have been in search for an acceptable way to solve the issues surrounding the evaluation of their IS investments (Al-Yaseen & Eldabi 2004). In practice managers frequently use simple evaluation methods (Willcocks & Lester 1994) like Cost Benefit Analysis (CBA), Net Present Value (NPV), Return on Investment (ROI), Payback Period, Discounted Cash Flow Analysis (DCF) and other methods borrowed predominately from the finance discipline which can offer financial based approximations of reality (Bannister & Remenyi 2000). Clemons & Gu (2003) are of the view that management require a means to evaluate investments that may enable the rapid development of future IS assets. According to Lin & Pervan (2001b) the evaluation of these investments is becoming an important activity because of the increasing levels of IS and their significance within organisations. This view is also echoed by Murphy & Simon (2002) who argue that growing IS expenditure and the sheer importance of IS in organisations have made the justification of these projects all the more critical. In justifying these investments organisations have turned to financial evaluation methods like CBA, NPV, ROI, Payback, DCF and others which are well established in the accounting, finance and economics disciplines for appraising financial capital investments. However, some studies have found that these methods are ineffective when applied to IS investments, because they are simply not designed for the intricacies of IS investments, which have large qualitative and intangible components.

The debate over tangibles and intangibles is not new, it is also not just an IS debate, in fact historically the distinction between the two is a product of the differences between tangible 'goods' and intangible 'services' – which (services) being transitory meant that they "...could not be counted as assets, but goods could" (Murphy & Simon 2002, pg. 5). The other complication is that the integration of IS into business processes, technology and communications infrastructure is making it harder to isolate the costs and benefits of IS. This paper will study some of these findings while taking a deeper look at several financial evaluation methods to understand their nature, structure, merits and deficiencies when applied in the IS investment context.

A purely quantitative method of evaluating IS investment would not be sufficient or suitable (Patel & Irani 1999). This is interesting given a recent Australian study by Lin & Pervan (2001a) found that Australian surveyed organisations focussed predominantly on 'quantitative' IS investment evaluation measures. Bacon (1992) who surveyed 80 organisations in the US, Australia, NZ and Britain also found that 75% of the 80 surveyed organisations use financial methods. However quite contradictory results have been found several years later by Ballantine & Stray (1998) who identified that these methods on average were only in use by 47% of the organisations in their study. The Serafeimidis et al. (1999) study found, in two cases that these organisations were only prepared to consider financial criteria for their IS evaluations. This is in line with the Willcocks (1992) study that found financial criteria are primarily used during evaluation.

To begin, some clarity needs to be given to the concepts within and around the term of 'evaluation'. This is imperative because financial evaluation methods generally do not fit the definition of what IS evaluation should entail. Evaluation as a general concept is defined as being "...a wider consideration of investments at different times" (Ballantine & Stray 1998, pg. 4). A more comprehensive definition is proposed by Lin & Pervan (2001b) in that evaluation is a process that "...suggest[s] appropriate planning and treatment by providing feedback information and contributing to organisational planning" (pg. 3). In the context of IS investments evaluation is taken to be the assessment of the economic and non-economic worth of an IS within the context of its use. Smithson & Hirschheim (1999) define evaluation in this context to mean "...the assessment or appraisal of the value, worth or usefulness of an Information System" (pg. 160), a view that Remenyi (1997) also supports. It is seen in terms of the process or set of activities relating to the measurement and assessment (Remenyi 1997), at different or continuous points in time (Farbey, Land & Targett 1999) aiming to "...establish the value of, or the contribution made by a particular situation" (Remenyi 1997, pg. 46). Fasheng & Teck (2000) assert that IS evaluation "...directly supports management decision making" (pg. 502). Another view considers the 'impacts' in that IS evaluation is performed "...for searching and for making explicitly, quantitatively or qualitatively all the impacts of an IT project and the program and strategy of which it is a part" (Farbey, Land & Targett 1999, pg. 190). Part of the reason why there is such a variety of perspectives on IS evaluation is because the literature is comprised of research that is either focussed on pre-implementation (known as *ex-ante*) or post-implementation (known as *ex-post*) evaluation of IS. It is therefore imperative to understand the difference between the two before reviewing the evaluation methods themselves.

This paper draws on the literature to provide a conceptual analysis of several financial evaluation methods and discuss relative strengths and weaknesses of these evaluation methods for IS investments. Practitioners will benefit by being able to better understand what these methods are and perhaps consider their suitability for use in evaluating IS investments.

## IS Evaluation

The IS evaluation literature is split into two distinct areas, *ex-ante* evaluation and *ex-post* evaluation. The focus of *ex-ante* evaluation is on the pre-implementation evaluation of what, how and why organisations should invest in IS (Al-Yaseen & Eldabi 2004). It is also defined by Williams & Williams (2004) as being 'predictive evaluation', perhaps because of the speculative nature of the evaluation in predicting the impact of an IS in a certain situation in future (Remenyi & Sherwood-Smith 1999). Murphy & Simon (2001) are of the view that the *ex-ante* evaluation focuses on the justification of IS investments before being initiated. The information needed to perform this evaluation are estimates of future worth, and are a function of the evaluator's judgement (Remenyi & Sherwood-Smith 1999). This differs from *ex-post* evaluation which aims to evaluate IS projects after the implementation has occurred to assess whether the perceived value was in fact achieved or whether the system is doing the job it was designed for. With corporate expenditure rising amidst a climate of cost cutting, management are being encouraged to justify their investments. This paper seeks to contribute towards understanding the financial methods of justifying IS projects, and so the focus will be on *ex-ante* IS evaluation.

A plethora of evaluation methods have surfaced since the 1980's (Bannister & Remenyi 2000, Berghout & Reekema 1994, Katz 1993, Cronhold & Goldkuhl 2003). IS evaluation is both subjective and contextual and perhaps this is why there has not been one approach that fits all circumstances (Mirani & Lederer 1998). In fact there is no evaluation approach which can be used in all situations to evaluate the benefits of IS (Khalifa 2001). The whole area of IS evaluation is both conceptually and operationally difficult to approach as well as being complex and elusive (Blacker and Brown 1988, Hirschheim & Smithson 1988). Financial evaluation methods

have not been able to adequately justify IS investments, as they only address the financial aspects of IS investments.

One of the more pressing problems discussed in the literature and evident in practice is that the existing evaluation methods tend to have a narrow view and focus. A major deficiency points to the fact that most methods only look at single issues from a single angle (Lubbe & Remenyi 1999). These rather weak evaluation methods called financial methods have been widely criticised as inadequate when applied to IS investments. These evaluation methods are taken from the Accounting (Patel & Irani 1999), Finance (Williams & Williams 2004) and Economics (Cronholm & Goldkuhl 2003) disciplines.

## **A Selection of Financial Evaluation Methods in IS**

It is evident that IS have become more complex (Smithson & Hirschheim 1998), perhaps because of the explosion in number of IS assets in organisations, their scope and functionality have increased as well (Smithson & Hirschheim 1998). Not only is IS becoming more integrated into the information and communications infrastructure of the organisation (Smithson & Hirschheim 1998), but many IS assets have evolved over time to become integral elements of a product or service (Smithson & Hirschheim 1998), making it even harder to isolate the impacts of IS alone, and making evaluations of those systems in isolation a difficult endeavour indeed (Smithson & Hirschheim 1998). This level of integration has created an expectation that IS applications can be used to support tasks that are more complex and sophisticated than ever before (Smithson & Hirschheim 1998, pg. 4). Murphy & Simon (2001) argue that the change in Information Systems from Transaction Processing Systems (TPS) to Management Information Systems (MIS) and Decision Support Systems (DSS) has affected the way these systems are evaluated in that with the former the "...returns are relatively easy to quantify" (pg. 1) compared with the later types which are more difficult to justify in isolation from other aspects of the business. The review of several financial evaluation methods will be made in light of the fact that IS is constantly changing and being more integrated with other organisational assets.

For this paper, five financially based evaluation methods will be reviewed. They have been selected because all have an origin in the finance discipline and are traditionally used to appraise/value capital investment projects. These methods are generally recognised and applied in the IS practice. While others certainly do exist, they cannot all be included in this limited paper. The chosen methods represent the main financial evaluation methods, and each will be introduced and analysed below.

### **Return on Investment (ROI)**

The Return on Investment or ROI method is a way of evaluating "...the current value of estimated future cash flows on the assumption that future benefits are subject to some discount factor" (Farbey, Land & Targett 1999, pg. 114). This method is used predominately by organisations that have tight financial discipline. Management usually set a 'hurdle' rate, for example 12%, where projects are accepted if they are anticipated to yield a return on investment greater than the hurdle rate. This single unit of measurement comes with a major strength in that the organisation is able to cross compare the returns on various projects within the organisation in this case IS projects with other projects not driven by technology (Farbey, Land & Targett 1999). One of the other strengths of this method is that it is based on sound financial principles and the value proposition is easily understood and defined. Not only can management easily set the hurdle rate but organisations can cross compare the returns on various projects within the organisation. This clearly is an advantage and is perhaps one reason why the method is widely used in practice. In fact according to the Ballantine & Stray (1998) study 52% of the respondents generally used this method for their IS investments.

However, there are also some negative points with this method, one of which is that projects where cash benefits are difficult to assess are withheld. The method rests on the assumption that future benefits are subject to some discount factor, which is invariably difficult to set. These weaknesses mean that that "...some good investment possibilities are withheld because the benefits are difficult to assess in cash flow terms" (Farbey, Land & Targett 1992, pg. 114). IS projects may not generate cash flows because they may be developed to enhance 'capability', improve process or support the launch of a product or service. Ultimately the impact to cash flows is indirect and difficult to identify. This makes it quite hard to utilise ROI for IS projects without including a set of assumptions about the financial value or return of non-financial attributes which run the risk of being unreasonable or unrealistic.

### **Cost Benefit Analysis (CBA)**

The Cost Benefit Analysis (CBA) method is one where "...the future stream of economic benefits and costs is estimated and the value of each project option is calculated" (Murphy & Simon 2001, pg. 3). It is described in more detail by Farbey, Land & Targett (1999) who state that the CBA method "...attempts to find (or compute) a money value for each element contributing to the cost and benefit of a development project. The approach

originated as an attempt to deal with the problem that some elements regarded as benefits or costs have no obvious market value or price whilst other elements incur costs or achieve benefits which are 'external' to the company making the investment" (pg. 114).

The strength of the method comes from its ability to factor future economic benefits and costs of a project. It is a well-researched, established method for appraising a variety of different projects in industry. The results from the CBA method are easy to interpret which is perhaps why it is widely used in practice. In fact the Ballantine & Stray (1998) study found that 72% of the respondents used this method in their most recent IS project and 76% generally conducted a CBA generally for their IS projects. While Murphy & Simon (2001) find evidence that the CBA method is applied in large IS projects, quite contradictory results are found in Marshal & McKay's (2002) study which suggests that there is minimal support for the CBA method in evaluating E-Commerce projects within small to medium enterprises. It appeared that the method was not particularly effective when applied in this context.

There are several weaknesses of the CBA method, one of which is that accounting requires a sound infrastructure to be in place, something not all organisations have with respect to IS investments. Given that financial accounting can not extend beyond simple monetary terms, the result is that many important issues of value are omitted. The method suffers from not being able to cope with uncertainty (Keeny & Raiffa 1976), and is also expensive to prepare (Schell 1986).

The other notable weakness of the method is in its 'computation' of each project item that contributes to costs and benefits. The practice of quantifying costs and benefits in monetary terms is a weakness because like ROI it would simply ignore or place an estimated monetary value on the non-monetary value of IS projects. As a result some worthwhile projects may be discarded in place of others that can be justified in monetary terms however unrealistic the assumptions may be.

Schell (1986) is of the opinion that "Most cost/benefit analyses categorise each cost and each benefit as tangible or intangible, direct or indirect, recurring or nonrecurring, personnel or hardware" (pg. 83). However there is a drive to quantify in dollar terms the intangible benefits because they need to be compared ultimately to the cost of the project. This is because the bottom line measurement is in dollar terms and so justification of projects is on a financial basis. Although this may sound relatively straight forward, more often than not this is a very difficult task and so people may choose to simply estimate (often inaccurately) the numbers, given that IS investments in and of themselves may not generate hard cash benefits. This raises data quality issues of the value proposition resulting from the application of the CBA method in IS investment.

Smithson & Hirschheim (1998) point out that there has been a growing concern over the years that narrow cost benefit analyses are too limited and there is a need to develop a more comprehensive and holistic view of the impact a new IS has in the organisation. Part of this limitation according to Farbey, Land & Targett (1999) "...is the artificial nature of some of the surrogate measures" (pg. 114). They go on to argue that the values selected by the CBA are not accepted by decision makers who often overturn recommendations made by this method in practical cases. Van Wegen & De Hoog (1996) sum up the weakness of the CBA method by saying that it assumes that "...the value of the impacts can be predicted and measured in dollars. The complexity and uncertainty of IS impacts in more radical and strategic investments in IT have given rise to a variety of other approaches" (pg. 249).

The CBA method is known and widely used in practice, and despite a number of strengths there are a plethora of weaknesses that clearly need to be considered when adopting this method for IS investment evaluation. The ultimate downfall of this method like many other financial methods is the insistence on quantifying benefits and costs in dollar terms.

### **Net Present Value (NPV)**

NPV is a method of calculating the expected net monetary gain or loss from a project by discounting all expected future cash inflows and outflows to the present point of time. The NPV is calculated as the present value of a project's cash inflows minus the present value of the project's cash outflows. There the NPV of a project indicates the expected impact of the project on the value of the firm.

There are several strengths of this method, the first being that there is a clear view of what value constitutes for users of this method. Only projects with a positive NPV should be considered and projects with a negative NPV should be discarded. This makes the investment decision much easier if financial considerations are an important aspect of the project selection process. Even though it may be an established and well known method according to the Ballantine & Stray (1998) study - 66% of the respondents indicated that they did not use this method for their recent IS project while 63% did not generally for their IS investments. This is interesting, given that the method is robust and generally used to appraise financial capital investments.

The NPV method was originally developed for financial capital investments where investments are measured in monetary terms like ROI and other financial methods, and it is similarly difficult to incorporate intangibles into the equation. According to Dos Santos (1991) the major weakness with this method when applied to evaluate IS investments, is that it does not "...consider the options that are available to management in dealing with these projects. While the financial NPV approach can be modified using decision tree analysis to take into account management options, its use requires an enumeration of all possible future outcomes and their impact. Operationally, this can be an extremely difficult problem"(pg. 87). Another weakness is the use of a discount factor which is criticised by Murphy & Simon (2001) and Dos Santos (1991) who state that a serious problem arises from the use of the NPV because the "...determination of an appropriate discount rate for those projects. Since the discount rate used can have a significant impact on project value, determining the true value of the project is extremely difficult" (pg. 87). The NPV method is a quantitative method and is not able to include qualitative criteria in its computations (Agarwal, Tanniru & Darcruz 1992). Murphy & Simon (2001) have a similar position when they argue that "...mathematical equations like NPV cannot quantify intangible benefits such as better information access, improved workflow and increased customer satisfaction" (Murphy & Simon 2001, pg. 6). Dos Santos (1991) discusses another major problem arising in estimating the real benefits of first-phase projects or investments. He goes on to state that the NPV method fails to consider the flexibility the organisation poses in managing the implementation of new IS technologies.

The NPV method possesses rigour in its computational logic and definitely has its place in appraising financial capital investments. However the difficulty in setting the discount rate even for those projects that generate cash flows does not make it an entirely suitable method for IS investments. In addition, like the earlier methods discussed it ignores the qualitative impacts of IS projects and focuses the value to be expressed as future cash flows.

### **Discounted Cash Flow Analysis (DCF)**

The DCF method is used to analyse the future projected cash flows of an investment. The future cash flows are discounted (by a weighted average cost of capital or WACC) to convert them into present value. The objective of using the DCF method is therefore to value in present terms all future project cash flows of an investment.

The strength of the method is its ability to value cash inflows, however there is a need to greater understand how this plays out for IS investments particularly because they may not generate direct cash flows. Clemons & Weber (1990) argue that the evaluation of strategic IT initiatives "...is fraught with complexity that is not well handled by DCF analysis" (pg. 12). In addition to this point Dos Santos (1991) makes the point that the DCF method is criticised for its inability to adequately value strategic investments.

Wilner, Kock & Klammer (1992) surveyed 100 US organisations and found that DCF evaluation methods were mainly used to evaluate high technology investments. However a number of non-quantitative factors were included in the process of IS evaluation. Tam (1992) on the other hand surveyed 134 senior IS US executives and found that capital budgeting techniques are used in IS development but ultimately have little impact on the evaluation.

Overall, the DCF method offers the ability to determine the present worth of all future cash flows of an investment however offers little in the way of measuring the value of strategic projects. IS can be seen as offering intangible value because they 'enable' an improvement in the way the business functions. The immediate impact might be on internal capabilities which in use may or may not lead to a cash inflow. However attempting to quantify this without a series of assumptions is dangerous.

### **Payback Period**

Payback period is the amount of time it will take to recoup, in the form of net cash inflows, the net dollars invested in a project. In other words, payback analysis determines how much time will lapse before accrued benefits overtake accrued and continuing costs. Murphy & Simon (2001) state that the payback period is simply "...the earliest period in which the project's cost is recovered" (pg. 4). The obvious benefit here is that it is an established method and it is relatively easy to understand the results. It is widely used in practice according to the Ballantine & Stray (1998) study, which found that 60% of the respondents used this method in the most recent IS project and 70% indicated that they use this method generally for IS projects. Another benefit is that a project rule could be set up where by projects are accepted if its payback period is less than a specified cut off point.

In terms of the weaknesses the method assumes that the project with the easiest payback period is the optimum choice. However as Murphy & Simon (2001) argue "...this may not be reasonable logic if a competing project has large anticipated benefits further in the future." (pg. 4). The payback period is a method which seeks to answer the fundamental question – 'how long will it take before the project pays itself off?', the result is easy to understand and ideal for financial capital investments. The focus on 'paying back' again like the other methods

reviewed in this paper indicates that there is an emphasis on monetary gain. However, an IS project may not exist to generate cash flows but rather produce qualitative outcomes. For example an organisation may be willing to make an investment in an IS project that enriches or improves the customer experience while shopping at a store. Organisations in this case may find it difficult to apply the Payback period method to justify this investment because clearly the justification in this case hinges more on the evidence provided that the IS project will achieve these outcomes within the constraints of time, budget and resources.

One weakness is the notion that the benefits associated with IS projects need to pay back the cost of the investment, excluding the idea that IS projects may generate intangible benefits, which cannot be quantified in dollar or cost saving terms, but are still present and important. These intangibles need to be captured to understand the true extent of the impact the project might have within the organisation.

A simple example could highlight a major weakness in this method. Consider the case of two projects, one with a payback period of 3 years and a relatively significant positive NPV and the other with the same payback period of 3 years with a significantly less NPV. By employing the payback period both projects will be treated equally because they have the same payback point. This is because the method does not consider the cash flows arising past the payback point.

The table below (see Table 1) seeks to summarise the major strengths and weaknesses found in each of the financial evaluation methods reviewed above:

Table 1: Strengths and Weaknesses of five Financial Evaluation Methods in IS Investments

|            | Description                               | ROI | CBA | NPV | DCF | Payback Period |
|------------|---|-----|-----|-----|-----|----------------|
| Strengths  | Results relatively easy to understand     | *   | *   | *   | *   | *              |
|            | Strong emphasis on monetary gains         |     |     |     | *   | *              |
|            | Clear 'value' proposition                 | *   |     | *   |     | *              |
|            | Able to cross compare various projects    | *   |     |     |     |                |
| Weaknesses | Difficult to include intangible benefits  | *   | *   | *   | *   | *              |
|            | Inability to handle strategic IS projects |     | *   | *   | *   |                |
|            | Difficult to calculate discount rate      |     |     | *   | *   |                |
|            | Does not deal well with uncertainty       |     | *   |     |     | *              |

Overall it is evident in the discussion above that financial evaluation methods offer some advantages for IS investments that are expected to produce cash flow or some other tangible benefits. However they do little justice to the IS investments designed to support a business initiative or produce an intangible outcome, but have relevance and important use to the business. This is because the value of IS is predominately in the flow and use of 'information' and while this is intangible, it still affects tangible things like people and products as well as non-tangible things like processes and services. By emphasising the notion of quantifying everything in monetary terms, financial evaluation methods ignore the qualitative and intangible aspects of IS investments. Accordingly they encourage the practice of quantifying the unquantifiable and so the result is an unrealistic evaluation based potentially on erroneous assumptions. Their limitations have made these methods rather difficult to apply in the context of IS yet they still remain widely used in practice as found in the Ballantine & Stray (1998) study. Part of the underlying problem is that these methods originated in the accounting, finance and economics disciplines where a predominant focus is on quantitative analysis rather than on a holistic one based on a combination of both quantitative and qualitative measures.

## A Discussion of Financial Evaluation Methods for IS Investments

Financial methods are wrong or right, they are just not designed for the intricacies of IS and therefore lack the capacity to adequately evaluate these investments. As a result they are described as 'inappropriate' by Hochstrasser (1990), as well as Lay (1985). Financial techniques are designed to assess the financial impact of investments (Irani & Ghoneim 2002). Part of the problem why organisations may still be using these methods is that IS based investments have traditionally been evaluated as capital projects (Ward 1990). The introduction of IS into an organisation is becoming increasingly difficult to justify in advance based on accounting terms (Smithson & Hirschheim 1998). Perhaps because the accounting based methods themselves are conservative in that they mistrust the best and expect the worst (Ward 1990). A more common sense reason is that the 'counting' element of Accounting implies that items are quantified in numeric terms. This would be difficult for IS investments without making somewhat 'wild' assumptions.

In relation to IS investments, the financial methods lack precision in defining the results which management expect (Irani & Ghoneim 2002). Dos Santos (1991) argues that they do not deal with 'real' value, while a

number of other authors point to limitations in coverage and scope (Irani et al. 2005, Patel & Irani 1999, Smithson & Hirschheim 1998). To add to this Brynjolsson & Hitt (2003) argue that a deficiency of these evaluation methods is that they underestimate the realistic output of IS investments, and as Irani & Ghoneim (2005) claim, are unable to capture wider organisational costs.

Fasheng & Teck (2000) are of the view that these financial methods omit the human side of evaluation by ignoring human factors such as issues of decision making and management judgement. The methods are unable to cope with the change in the role IT plays in an organisation (Serafeimidis & Smithson 1999). One deficiency is that these evaluation methods are often facilitated by the finance department, a potentially dangerous proposition seeing that the finance department often demands monetary, cash based justifications and measures of benefits, and does not necessarily have IS knowledge (Irani & Ghoneim 2002). However the conundrum management face is that they may be forced to play the game by the rules and expectations placed on them by the finance department or those sponsoring the project. This may be for fear they will lose out on funding to other projects which required financial justification.

Financial evaluation methods are designed for situations where investments are viewed to operate statistically (Patel & Irani 1999), and are based on quantitative measures (Williams & Williams 2004), like cash or cost benefit based terms (Irani & Ghoneim 2005). The fact that they are unable to incorporate qualitative criteria (Agarwal, Tanniru & Dacruz 1992) means that they fail to accommodate intangible benefits (Irani & Ghoneim 2002, Lubbe & Rememnyi 1999, Patel & Irani 1999).

Farbey, Land & Targett (1999) studied ten IT projects in the UK and found that very few evaluation techniques were used to justify investments. Agarwal, Tanniru & Dacruz. (1992) state that financial evaluation methods that have attempted to overcome some of their limitations by reducing qualitative criteria to numerical quantities make it difficult to interpret the overall results. Irani (1999) on the other hand found in one case study that because benefits were intangible and non-financial, the organisation was unable to utilise financial appraisal methods. The lack of management awareness of, and experience in, non-financial evaluation methods meant that the intangible benefits were simply ignored even though they were significant to the organisation. The study went on to identify a more pressing problem which is seen all too often in that increased pressure on management to produce hard financial savings made it difficult to produce reliable results.

Viewing an IS investment in financial terms is only looking at the situation from one angle, and in fact strong financial outcomes may not mean that the expectations of stakeholders are satisfied (Irani & Ghoneim 2005). Thus financial evaluation methods are not able to assess the full extent of the impact and value that an IS investment yields to an organisation. For example, the Irani & Love (2001) study identified in the case they examined, financial evaluation methods were inappropriate when trying to factor the impacts of the IS investment. The Patel & Irani (1999) study found that because of the changing face of IS in keeping up with business and technological change, financial evaluation methods have become unsuitable for use in evaluating IS investments. As they are designed with a sense that investments are represented statistically, these methods may lack the capacity to represent a true reflection of IS value beyond just statistical representations.

It has been noted extensively in the literature that as IS becomes more integrated in the infrastructure technology of an organisation the harder it becomes to assess the returns on individual investments or assets (Murphy & Simon 2001). Especially given that many benefits of IS projects probably are 'soft' and intangible in nature (Agarwal, Tanniru & Dacruz 1992). Another issue management are faced with is the pressure put on them by the CIO to "...derive an IT project's return before the project is undertaken" (Murphy & Simon 2001, pg. 1). In response to this pressure, tangible and intangible measures are used to "...determine a system's contribution to an organisation's bottom line" (Murphy & Simon 2001, pg. 1). This is all the more difficult where the group or organisation is using a cost benefit form of evaluation (Murphy & Simon 2001). The difficulties in "identifying and measuring" potential costs and benefits of IS investments are discussed by Serafeimidis et al. (1999), in addition to Murphy & Simon (2002), Powell (1990), and Ward (1990) who states that "It is simply not possible to express all the benefits of systems in quantitative terms and it serves no useful purpose to develop spurious calculations to quantify the unquantifiable" (pg. 224). Irani & Ghoneim (2002) argue that financial evaluation methods are simply unable to handle strategic benefits and indirect costs. Perhaps the best summary and articulation of the above discussion comes from Bajaj & Bradely (2005) who state that these evaluation methods usually provide a single, one dimensional view of the expected impacts of IS.

## Conclusions and Future Research

In summary, while the finance and accounting based methods of IS evaluation are good at evaluating the quantitative, financial aspects of a potential IS investment, they fail to identify and therefore appropriately value the qualitative, intangible aspects. Thus failing to evaluate the qualitative, intangible aspects can lead organisations to fail to recognise IS opportunities that do not have a direct financial return, and similarly to fail to recognise the intangible risks associated with either implementing or not implementing an IS asset.



The preceding discussion highlights some of the pertinent issues of financial evaluation methods when applied in the IS context. Irani & Love (2001) report that management are uncomfortable with the evaluation methods currently available, which may be one reason why Farbey, Land & Targett (1999) argue that in practice many organisations utilise a combination of different elements of evaluation methods that suit the situation. There is also evidence that methods have a narrow scope when looking at the problem of IS evaluation (Lubbe & Remenyi 1999) causing evaluation to be singly focussed on finance rather than holistic. The arguments and empirical findings all point to the need for a different approach to IS evaluation. Methods of tomorrow would need to consider the wider impacts of IS investments within organisations (Smithson & Hirschheim 1998).

Ideally an approach to IS *ex ante* evaluation would need to promote a multi-faceted, multi-dimensional perspective of IS evaluation, one that includes both quantitative and qualitative measures allowing for subjective interpretation rather than being limited with prescriptive, quantitative based measures. Smithson & Hirschheim (1998) state that new developments in evaluation focus more on the methodology and less on what it is they are meant to do and how they should be used. The challenge for future research is perhaps to better examine the utilisation of evaluation methods in practice.

## References

- Agarwal, R, Tanniru, MR & Dacruz, M 1992, 'Knowledge-Based support for combining Qualitative and Quantitative judgments in resource allocation decision,' *Journal of Management Information Systems*, vol. 9, no. 1, pp. 165-184.
- Al-Yaseen, H & Eldabi, T 2004, 'A Quantitative Assessment of Operational Use Evaluation of Information Technology: Benefits and Barriers,' *Proceedings of the Tenth Americas Conference on Information Systems*, New York, New York, pp. 688-692.
- Bacon, CJ 1992, 'The use of decision criteria in selecting information systems/technology investments,' *MIS Quarterly*, pp. 335-353.
- Ballantine, JA, Galliers, RD & Stray, SJ 1996, 'Information system/technology evaluation practices: evidence from UK organisations,' *Journal of Information Technology*, vol. 11, pp.129-141.
- Ballantine, JA & Stray, SJ 1998, 'Financial appraisal and the IS investment decision making process,' *Journal of Information Technology*, vol 13, pp.3-14.
- Bannister, F & Remenyi, D 2000, 'Acts of Faith: instinct, value and IT investment decisions,' *Journal of Information Technology*, vol. 15, no. 3, pp. 231-241.
- Banniser, F & Remenyi, D 2004, 'How much did we really pay for that? The awkward problem of information technology costs,' *Electronic Journal of Information Systems Evaluation*, vol. 7, no. 1.
- Barua, A, Kriebel, CH & Mukhopdhyay, T 1995, 'Information Technologies and Business Value: An Analytic and Empirical Investigation,' *Information Systems Research*, vol 16, no. 1, pp. 3-23.
- Berghout, E & Renkema, T 1994, 'Methodologies for Information System Innovation Evaluation of the Study Stage: A Comparative Review,' *Delft University of Technology*, Delft.
- Blacker, F & Brown, C 1988, 'Theory and practice in evaluation: the case of the new information technologies, in Information Systems Assessment: Issues and Challenges,' *Bjorn-Anderson N & Davies GB* (Eds), North Holland, pp. 351-367.
- Clemons, EK & Gu, B 2003, 'Justifying Information Technology Investments: Balancing the Need for Speed of Action with Certainty before Action,' *Proceedings of the 36<sup>th</sup> Hawaii International Conference on System Sciences HICSS'03*.
- Clemons, EK & Webber, B 1990, 'London's big-bang: A case study of information technology, competitive impact, and organisational change,' *Journal of Management Information Systems*, vol. 6, pp. 41-60.
- Cronholm, S & Goldkuhl, G 2003, 'Six Generic Types of Information Systems Evaluation,' *10<sup>th</sup> European Conference on Information Technology Evaluation (ECITE-2003)*, 25-26 September, Madrid.
- Dos Santos, BL 1991, 'Justifying Investments in New Information Technologies,' *Journal of Management Information Systems*, vol. 7, no. 4, pp. 71-90.
- Farbey, B, Land, F & Targett, D 1999, 'Moving IS evaluation forward: learning themes and research issues,' *Journal of Strategic Information Systems*, vol. 8, no. 2, pp. 189-207.
- Fasheng, Q & Teck, YK 2000, 'IS/IT Project Investment Decision Making,' *ICMIT 2000*, pp. 502-507.

- Hirschheim R & Smithson S 1988 A critical analysis of information systems evaluation. In *Information Systems Assessment: Issues and Challenges* (Bjorn-Andersen N and Davis GB, Eds), pp 17–37, North Holland, Amsterdam.
- Hochstrasser, B 1990, 'Evaluating IT investments-matching techniques to projects,' *Journal of Information Technology*, vol. 5, no. 4, pp. 214-221.
- Irani, Z & Ghoneim, A 2002, 'Identifying, Managing, and Controlling Information System Costs: An Exploratory Case Study,' *Eight Americas Conference on Information Systems*, pp.1231-1238.
- Irani, Z, Elliman, T, Love, PED & Themistocleous, M 2005, 'Information Systems Evaluation Mini-Track Introduction,' *Proceedings of the Eleventh Americas Conference on Information Systems*, Omaha, NE, USA, August 11<sup>th</sup>-14<sup>th</sup>, pp. 303-307.
- Irani, Z 1999, 'IT/IS Investment Justification: An Interpretive Case Study,' *Proceedings of the 32<sup>nd</sup> Hawaii International Conference on System Sciences*, pp. 1-9.
- Irani, Z & Love, PED 2001, 'The Propagation of Technology Management Taxonomies for Evaluating Investments in Information Systems,' *Journal of Management Information Systems*, vol. 17, no. 3, pp. 161-177.
- Katz, A 1993, 'Measuring Technology's Business Value,' *Information Systems Management*, pp.33-39.
- Keeny R & Raiffa H 1976, *Decisions with Multiple Objectives: Preferences and Value Trade-offs*. New York: John Wiley and Sons
- Khalifa, G, Irani, Z, Baldwin, L & Jones, S 2001, 'Evaluating Information Technology with you in Mind,' *Electronic Journal of Information Systems Evaluation*, vol. 4, no. 1..
- Lay, PMQ 1985, 'Beware of the cost/benefit model for IS project evaluation,' *Journal of Systems Management*, vol. 36, no. 56, pp. 30-35.
- Lin, C & Pervan, G 2001a, 'A Review of IS Evaluation and Benefits Management Issues, Problems, and Processes,' *Wim Van Grembergen (ed) Information Technology Evaluation Methods and Management*. Idea Group Publishing, Hershey PA, USA, pp. 2-24.
- Lin, C & Pervan, G 2001b, 'Issues in IS Investment Evaluation, Benefits Realisation, and Outsourcing in Australian Organisations: Results from a Case Study,' *4<sup>th</sup> Western Australian Workshop on Information Systems Research (WAWISR)*, pp. 1-13.
- Lubbe, S & Remenyi, D 1999, 'Management of Information Technology Evaluation – The Development of a Managerial Study,' *Logistics Information Management*, vol. 12, no. ½, pp. 145.
- Marshall, P & McKay, J 2002, 'Evaluating the benefits of electronic commerce in small and medium enterprises,' *Australian Journal of Information Systems*, pp.135-147.
- Murphy, KE & Simon, STJ 2001, 'Using Cost Benefit Analysis for Enterprise Resource Planning Project Evaluation: A Case for Including Intangible,' *Proceedings of the 34<sup>th</sup> Hawaii International Conference on System Sciences*, pp.1 – 11.
- Patel, NV & Irani, Z 1999, 'Evaluating Information Technology in Dynamic Environments: A focus on Tailorable Information Systems,' *Journal of Enterprise Information Management*, vol. 12, no. ½, pp. 32.
- Powell, PL 1992, 'Information Technology Evaluation: is it different,' *Journal of Operational Research Society*, vol. 43, no. 1, pp. 29-42.
- Schell, GP 1986, 'Establishing the Value of Information Systems,' *INTERFACES*, vol. 16, no. 3, pp. 82-89.
- Serafeimidis, V & Smithson, S 1999, 'Rethinking the approaches to information systems investment evaluation,' *Logistics Information Management*, vol. 12, no. ½, pp. 94-111.
- Sheppard, J 1990, 'The Strategic Management of IT Investment Decisions: A Research Note,' *British Journal of Management*, vol. 1, pp. 171-181.
- Silk, DJ 1990, 'Managing IS Benefits for the 1990s,' *Journal of Information Technology*, vol. 5, pp. 185-193.
- Smithson, S & Hirschheim, R 1998, 'Analysing information systems evaluation: another look at an old problem,' *European Journal of Information Systems*, vol. 7, pp. 158-174.
- Remenyi, D 1997, 'Achieving Maximum Value from Information Systems: A Process Approach,' *John Wiley & Sons*.

- Remenyi, D & Sherwood-Smith, M 1999, 'Maximise Information Systems Value by continuous participative evaluation,' *Logistics Information Management*, vol. 12, no. ½, pp. 14.
- Tam, KY 1992, 'Capital budgeting in information systems development,' *Information and Management*, vol. 23, pp. 345-357.
- Van Wegen, B & De Hoog, R 1996, 'Measuring the economic value of information systems,' *Journal of Information Technology*, vol. 1, pp. 247-260.
- Ward, JM 1990, 'A portfolio approach to evaluating information systems investments and setting priorities,' *Journal of Information Technology*, vol. 5, pp. 222-231.
- Willcocks, L & Lester, S 1994, 'Evaluating the Feasibility of Information Systems Investments: Recent UK Evidence and New Approaches,' *In Information Management, The Evaluation of Information Systems Investments*, Willcocks L (ed) Chapman and Hall, London, pp. 49-80.
- Williams, M.D. and Williams, J. 'A Framework Facilitating Ex-ante Evaluation of Information Systems,' *Proceedings of the Tenth Americas Conference on Information Systems*, New York, New York, August, 2004, pp. 734-741.
- Wilner, N, Kock, B & Klammer, T 1992, 'Justification of high technology capital investment – an empirical study,' *The Engineering Economist*, vol. 37, pp. 341-353.
- Wiseman, D 1992, 'Information Economics: a practical approach to valuing information systems,' *Journal of Information Technology*, vol. 7, pp. 169-176.

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