



Justifying the investment in information systems

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1 Introduction

The environment in which organizations operate has changed dramatically over the last few years. Increased competition, globalization, the influence of the Internet and international events affect the performance and survival of organizations on a world-wide scale. The Internet has changed the way organizations do business, from the acquisition and servicing of customers to the management of their relations with suppliers. This is not only revolutionizing the way people access information, communicate, shop and entertain themselves, but also the way organizations compete and operate. With the extensive use and familiarity of the Internet, a trend has developed where organizations are moving their information systems to Web-centered information systems. A Web-centered information system interrelates all the different information systems in an organization using Web-based technologies and interfaces. Organizations also use the Internet to electronically provide innovative products and services. Users in organizations are demanding that the information systems used by the organization should become more efficient and effective. Therefore, organizations are forced to invest heavily in the deployment of information systems to obtain value and benefit, and to stay competitive in this new environment. According to the Gartner Group (2002), world-wide spending on information communication technology alone totaled over \$2,7 trillion in 2001, with an estimated wastage of 20% on corporate information technology budgets with purchases failing to achieve their objectives. Although information systems expenditure is regarded as costly and risky, many information systems investments appear to go ahead without the use of formal investment appraisal and risk management techniques (Ward 1996). However, tougher economic times are forcing businesses to treat information technology (IT) investments just like other fixed investments that are driven by sound business considerations and not hype (Van der Merwe 2002:116). The old argument, that it is not necessary to formally justify the investment in information systems because they

are strategically important to stay 'in business', is being questioned. In a business environment where senior managers and decision makers are held more and more accountable to the shareholders for their investment decisions, the need for using generally accepted techniques and methods to justify the investment decisions exists. This research investigated some relevant issues regarding the decision to invest in information systems, as well as the methods that organizations currently employ to justify their investment in information systems.

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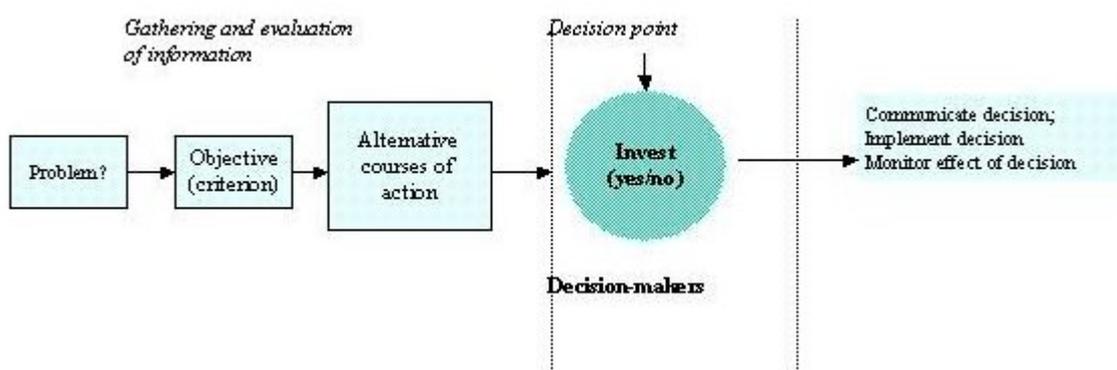
2 Decision-making process

As with all other investments, management must make a conscious decision to invest in a particular information system. The process of making a decision is typically broken into different stages (as adapted from Simon [1960]):

- Problem recognition
- Problem definition and structuring
- Identifying alternative courses of action
- Making and communicating the decision
- Implementation of the decision
- Monitoring the effects of the decision.

When applying this model to the decision whether an organization should invest in information systems, making and communicating the decision will be the point where either an individual or group of individuals take the decision whether to invest or not to invest. For the purpose of this article, the term *decision point* will be used to refer to the moment when this decision is made. Figure 1 illustrates this decision-making process. Before this individual (or group of individuals) can make this decision, more information about the specific investment will be required. The purpose of this information is to illustrate the potential effect of the investment on the future of the organization. The decision maker or decision makers can then base their decision on this information.

Figure 1 Decision point in the decision-making process



Decisions to invest or not to invest will influence the future of the organization. The investment can either have a negative effect, a positive effect or no effect at all on the objectives of the organization, and these effects can be of long-term duration. Good business practice requires that all investments to acquire assets (whether they be fixed assets, goodwill or people) are properly investigated and evaluated with the risk of investing (or not investing) quantified. This is to aid decision makers in making an informed decision to invest

or not to invest. Depending on the type of investment (capital, revenue or strategic), academics and business analysts have developed different techniques to analyse, evaluate and justify these investments.

It is evident from Figure 1 that the important moment of the decision-making process is when the actual decision is being taken (at the decision point). The amount of investigation and evaluation of the potential effect of the investment on the organization can differ vastly between different organizations, investments and decision makers. The extent to which individual decision makers rely on information for the evaluation of the investment also differs between different individuals. Other factors can also play an important part in the decision makers' reasoning when making the investment decision. After the decision is made, it must be communicated and implemented. The effect of this investment should, after implementation, be reviewed and monitored on a regular basis to determine whether the investment had the desired effect or not. During the research undertaken by the author, the focus fell on the decision point. The research attempted to identify the information and techniques that decision makers use in justifying their decision whether or not to invest in the strategic information system of the organization.

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3 Justifying the investment

There is a long tradition in business that capital expenditure must be formally justified in terms of the benefits that it will help accrue to the organization. Therefore, when a new machine or fleet of vehicles is to be purchased or when a new factory is to be built, a capital investment appraisal is undertaken. A capital investment appraisal usually involves a statement of the initial investment cost, the on-going costs and the anticipated benefits, as well as the calculation of a number of suitable investment performance indicators or statistics.

In the earlier years of investing in information systems (up to the early 1990s), capital investment appraisal techniques were applied with relative ease. With the changing nature of the investment in information systems since the late 1990s, managers and academics were finding it more and more difficult to apply the same techniques to these types of investments. To complicate matters further, the tools available for evaluating information systems as well as the techniques accountants or managers use to calculate costs and benefits are not well understood by either line managers or information staff. Many organizations do not perform evaluations or cost benefit analysis on their information systems at all and those who do sometimes report mixed or confused results (Remenyi, Money and Twite 1995:55).

System justification implies first an *evaluation* and then the activity of justification, showing that the information system is appropriate for the particular business context (Remenyi *et al.* 1995:55–56). This, however, is a lot more difficult to apply when formally justifying an investment in information systems (Ward, Taylor and Bond 1996; Willcocks 1996). The main reason is that reliable estimates of information systems costs and benefits are not always available or easy to obtain. This is, at least in part, due to the complex nature of the impact of information systems on organizations, which frequently are a portfolio of tangible and intangible benefits. Tangible benefits are those benefits that can be quantified and assigned a monetary value, while intangible benefits cannot easily be quantified (e.g. more efficient customer service or enhanced decision making) (Laudon and Laudon 2000:354).

Systems are typically replaced or amended when the current system is no longer appropriate for the current business environment (this can be the result of functionality problems, technical limitation, or changes in the business processes) or where the organization aims to

improve its operational efficiency, effectiveness or competitiveness. The justification for investing in a new information system would therefore include not only cost issues but also functionality, alignment with business processes, opinion of users and compatibility with current technology.

The control of the investment in information systems and technology to ensure value for money is currently an issue of major concern to most businesses. In today's increasingly competitive business climate, there is a growing requirement for stricter cost control and a demand for higher returns while minimizing risk in all investments. Recognition of the potential impact of IT systems on the strategic position of companies, as well as increasing levels of IT spent, have made the control and justification of IT investment a critically important issue. At the same time, there has been and still is widespread doubt concerning the suitability of traditional methods of investment appraisal for the evaluation of IT proposals (Powel 1992; Willcocks 1996). Over-reliance on these methods may lead to an excessively conservative IT portfolio and an associated loss of competitiveness.

The high failure rates of new information systems (IS) in organizations that were identified during the research conducted (Willcocks 1996) suggest that there is a wide gap between the level of investment in information systems and a company's ability to achieve the necessary benefits from such investments. Evaluation is defined as establishing by quantitative and/or qualitative means the worth of information systems in the organization (Willcocks 1996). As mentioned, the evaluation or investment appraisal of IS is problematic because of the difficulties associated with the identification and measurement of the benefits and costs associated with such investments. As a result of this, most companies do not formally evaluate their investment in information systems. In 1992, Hochstrasser reported that only 16% of companies used 'rigorous methods to evaluate and prioritize their IS investment' and found that, where investment appraisal of IS did take place, it was usually based on financial techniques specifically designed to assess financial impact in terms of cost.

In recent research and articles about the justification of investing in information systems, a number of issues that inhibit the practical application of methods devised by academics and researchers have been identified. They are:

- the inability to clearly articulate and quantify the value derived from investing in a new information system;
- the complexity of models and methods suggested by academic researchers. These models are difficult to apply in practice;
- the process of humans making decisions (whether to invest in a new information system or not). This incorporates other 'soft' factors (Hinton and Kaye 1994); and
- the reach and range of integrated information systems in the organization.

The inability to clearly articulate and quantify the value derived from investing in a new information system has received considerable attention both in the private sector among major user organizations and consultants and by academic researchers (Brynjolfsson 1992; Farbey, Land and Targett 1993a; Remenyi, Money and Twite 1993; Willcocks 1996). To date, these efforts have generated more controversy than consensus. Measures of volume and spending are relatively easy to identify. Measures of value are much harder to define. The topic of information systems value is not lacking in focus, but it is lacking an approach that has general applicability. Callon (1992) believes that the best answer to the information systems value question lies not in the hands of financial or computer experts, but that it must be found within the context of business management and its contribution to the success of the organization. If the business is productivity driven, then the focus should be on measuring efficiency. If the organization has a high customer value priority, then the measure must address this area. Bannister and Remenyi (2000) argue that there is a lack of common understanding of the concept of value. In their research of the concept of value, they

concluded that the definition of value is far from universally agreed on and that the word 'value' is 'nicely ambiguous'. Investment decisions are based on human perceptions of value, however measured.

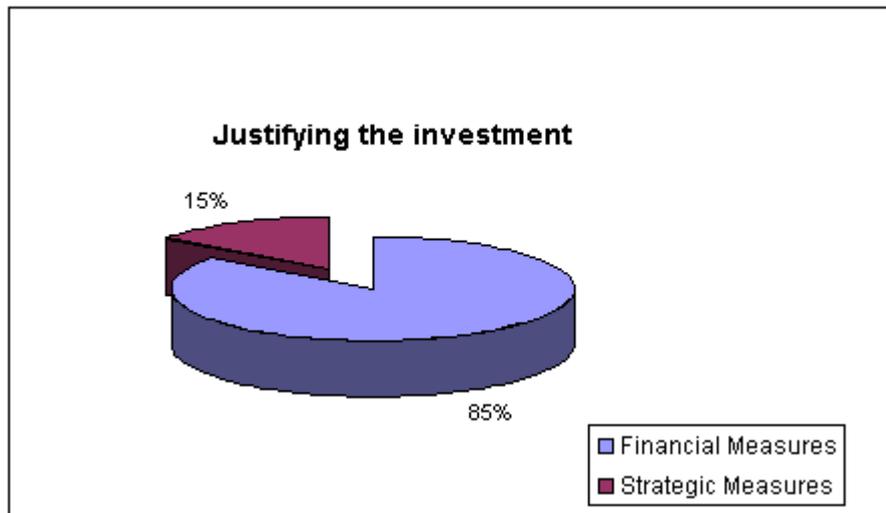
One of the main contributing factors in organizations that do not formally justify their investment in information systems is the inability to articulate the value of information systems within a specific organization. In the USA, government statistics of 1994 suggest that computers and other information technology made up nearly half of all business equipment expenditure – not including the billions spent on software and programmers each year (Sager and Gleckman 1994:36–38). Often, the specification and implementation of information systems are left to professionals only. There is little or no involvement from organizational management or the user community, which can lead to ineffective or failed information systems (Sauer 1993). Earl (1996:100–108) further suggests that if information systems implementation is left to information system professionals and users alone, the investment is rarely recouped.

The complexity of models and methods that have been suggested by academic researchers makes it difficult to apply them in practice (Fitzgerald 1998:15–27). In 2000, Lubbe conducted research on the investment approaches of six major organizations in Namibia. He concluded that the majority of organizations in Namibia defined information technology in a narrow way to include only hardware and software. During his case study interviews, it seemed that organizations were hesitant to include other costs because they might put more responsibility on a department. Costs such as IT consumables were regarded as being part of the departments that use the information technology and did not seem to be well controlled. No return on investment calculations on the information technology investments were done as people believed them too difficult.

In a limited survey conducted with a range of South African organizations, feedback about the investment decision in South African companies was gathered. Sixty-four respondents replied, covering small, medium and large companies (48% of the companies were classified as large organizations with an annual turnover in excess of R1 million and 50% as medium-sized organizations). Of the respondents, 78% were decision makers with their companies for three years or more and 89% of the respondents were on middle management or higher decision-making level.

On the question whether the respondent perceived his or her information system as critical for the survival of the organization, 94% answered yes. However, of those respondents answering yes, only 67% used formal methods to justify the investment in new information systems. The majority used some or other financial measures for evaluating the investment. These measures are illustrated in Figure 2.

Figure 2 Financial versus non-financial measures used



Of the respondents who used formal methods in their justification process, 83% used cost benefit analysis as a tool; 66% stated that they justified the investment on strategic reasons; 45% used return on capital employed (ROCE), 28% used discounted cash flow (DCF) and 28% used the payback method. However, 93% of respondents that did justify their investment used more than one of these methods. Table 1 shows a breakdown of the techniques used.

Table 1 Breakdown of techniques used

	CBA	ROI	DCF	Payback	Strategic	More than two	Total
CBA (Cost benefit analysis)	10%	18%	8%	5%	18%	25%	83%
ROI (Return on investment)	18%	0%	0%	0%	8%	23%	48%
DCF (Discounted cash flow)	8%	0%	0%	0%	0%	20%	28%
Payback	5%	0%	0%	3%	0%	20%	28%
Strategic reasons	18%	8%	0%	0%	15%	25%	66%

This initial survey confirmed the observations of other researchers that the issues, as identified above, are inhibiting the application of complex models and techniques in evaluating information systems. Most decisions makers use their 'gut feel' and easy to apply models (such as cost benefit analysis) and techniques to back their decision (Hochstrasser and Griffiths 1992; Symons 1998). In 1998, Ezingear, Irani and Race (1998) indicated that over half of the companies participating in their study did not formally list the benefits expected of the IT and IS investment, but justified the investment as an 'act of faith'.

In 1996, findings by Wilcocks (1996) indicated that between 82% and 88% of respondents carried out evaluation at the feasibility stage to justify the proposal. On questioning the methods and techniques that were used for evaluation during the feasibility study (e.g. cost-benefit assessment described in monetary terms, allied with managerial judgement), 56% of

organizations used the same evaluation method for all projects, regardless of the different objectives and different types of benefits that might be expected from the investment.

Supporting the findings of other researchers (Farbey, Land and Targett 1993) Hillam and Edwards 2001 and Lubbe 2000), it was concluded that most of the surveyed organizations used cost-benefit analysis at the core of their evaluation. These analyses were often of a traditional, finance-based type. Are these approaches appropriate for justifying investment in integrated information systems? Are they sufficient? The survey suggested that organizations might not only be missing information system opportunities, but also took on large risks. They used narrow evaluation approaches that did not clarify and assess less tangible inputs and benefits. In 1996, Wilcocks (1996:21) found that the unanimous view was that all costs must be tracked down, however difficult to assess, though some 65% of the respondents suggested that they were probably failing to identify full costs through the formal evaluation process.

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4 Conclusion

Various models and approaches are continuously devised and researched in an attempt to design a model that take into consideration the issues discussed thus far. There is, however, no single model that has been universally accepted and currently it is up to the decision maker to adopt whichever approach is preferred. This happens in much the same way as the many conventional financial appraisal techniques. All the formal methodologies and combinations of methodologies are also constrained by the limits of numerical representation, two-dimensional diagrams and the boundaries of modelling human reason. It may be that the closest one can get to the actual workings of the managerial mind in complex situations is to use such tools as Likert scales, cognitive maps and spider charts (Remenyi *et al.* 1995).

Many IT investment decisions are still made or apparently made on purely technical rational grounds. Such decisions may be made using the same type of formal structure that might be used to buy a factory, develop a new product or build a house. For other organizations, particularly for making large and/or complex decisions, the process of evaluating IT is the application and absorption of a range of input information which includes data, evaluation techniques, personal experience, personal knowledge, corporate or departmental politics, personal desires and intuition. It is a process of filtrating and distilling often complex data, information and knowledge to levels manageable to the human mind (Bannister and Remenyeni 2000).

While this contrast in investment justification perspectives does appear to exist, the use of financial evaluation methods encourages companies to take a short-term perspective on investments. Increasingly, information systems projects within business environments are designed to improve the medium to long-term business objectives of a company. Such business objectives must be measured both quantitatively and qualitatively. Benefits of a system designed to cut costs can be measured relatively easily in quantitative, financial terms. However, information system projects that aim to improve customer support or offer better market information might be impossible to quantify in the short-term. As more and more IT projects fall into the latter category, conflicts arise in assessing the value of investments and ongoing support costs designed to support medium and long-term strategies with short-term financial techniques. It is evident from the research that these short-term financial techniques are still used by the majority of decision makers to justify the investment in strategic information systems, in spite of decision makers being aware of the shortcomings of using these techniques. This is mainly because of a lack of universally

accepted, easy-to-use alternatives.

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