The Information Technology Investment Decision Process: Why isn't it working?

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Abstract

As investments in Information Technology (IT) approach the level of 4% of a firms revenues and consist of almost half of corporate America's capital budget, the process of deciding what, when and how to investment in IT is critical to survival. In some studies, the marginal benefits of IT investments have been only 80% of their costs. This implies a devaluing of the firm and, very possibly, a poor process of making these investment decisions. This paper examines the IT investment decision processes in relation to other investment types and suggests improvements in the current process.

Introduction

When it comes to the creation of value in a firm, the investment decision is the most important decision. This decision determines the total amount of assets held by the firm, the composition of these assets and the business risk personality of the firm as perceived by the investors. Using the appropriate investment acceptance criterion is fundamental to the investment decision (Van Horne 1995). Investments in Information Technology (IT) are approaching the level of 4% of a firms revenues (McKeen1993) and are beginning to approach almost half of corporate America's capital budget, as shown in Figure 1. (Joglekar 1993).

This makes the process of deciding what, when and how to investment in IT critical to the survival of a firm.

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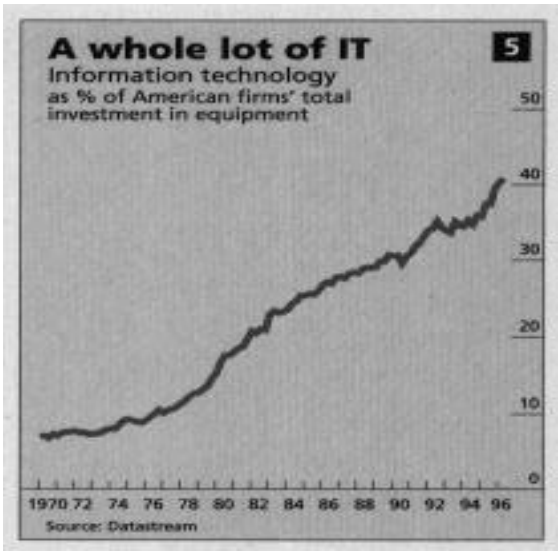

Figure 1: Information Technology Investment Trend (The Economist, Sept. 28th, 1996)

In a 1994 survey of industry IT investment evaluation practices in the UK, just over 50% of the organizations surveyed had formal methodologies for managing the IT investment process. An undefined process is definitely a poor process as well as an unmanaged one.

The purpose of this paper is to examine the IT investment decision process in relation to other investment types and suggests alternatives for improving the current process.

Background and Problem Definition

The current financial investment decision making process

As mentioned earlier, the investment decision process is the most important within a firm when it comes to creating value. An investment is defined as the allocation of capital to a proposal whose benefits are to be realized in the future (Van Horne 1995). Because the future is always uncertain, the risk of not

receiving the benefits must also be considered. This defines the main components of the decision process as the cost of the investment, the benefits to be realized, the timing of those benefits and the "uncertainty" of risk of realizing the benefits.

The generally accepted financial decision making process is based on Herbert Simon's process, figure 2, of *intelligence* activities, *design* activities, and *choice* activities (O'brien 1990).

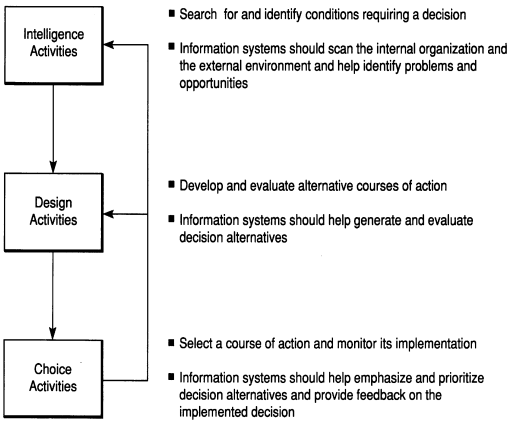

Figure 2. Simon's Decsion Making Model

The financial community (Van Horne 1995) translates this as

1. the generation of investment proposals,
2. the estimation of cash flows for the proposal,
3. the evaluation of cash flows (NPV, etc)
4. the selection of projects based on an acceptance criteria and
5. the continual reevaluation of investment projects after their acceptance.

This process is about making choices. The elements of a good choice are defined by Kepner and Tregoe, the decision making "gurus", as

…the quality of the *definition* of specific factors that must be satisfied, the quality of the *evaluation* of the available alternatives and the quality of the *understanding* of what those alternatives can produce (Kepner 1981).

The financially oriented process outlined above defines all of these elements in a financially oriented way.

The definition of the specific factors, or the selection criteria, are usually based upon average rate of return, payback, internal rate of return and net present value (Van Horne 1995). The evaluation of the alternatives are driven by "hurdle rates" influenced by cost of capital or investment return goals. Many times these are adjusted for "strategic" or political issues. The understanding of what the alternatives can produce is usually limited by the measures of investment return that are driven by future cash flow estimates. These estimates are generally developed using the current functionally oriented accounting and budgeting systems.

In most companies, a future cash flow is simply defined as an increase in revenue or a decrease in cost for the functional unit proposing the investment. In the past, the causal link between the investment and the cash flows has been explained by the investment in machinery used to reduce labor or material costs or improve output in relation to input within the proposing unit. The cost of the investment was clear, the benefits were clear, the timing was clear and the risk was definable and understandable. This allowed a clear understanding of what the alternatives could produce and facilitated good investment decisions that added value to the firm.

Why doesn't this work with IT investments?

Since the fundamental decision making process, Simon's model, is generally applicable to any decision, it should be applicable to the IT investment decision. The same people that make non-IT investment decisions are making IT decisions and they have been successful in the other areas. If this is so, then why aren't these investment decisions resulting in added value to the firm?

The elements of a good choice (Kepner 1981) are still valid for the IT investment decision. Therefore, the answer must lie within this framework of the quality of the *definition* of specific factors that must be satisfied, the quality of the *evaluation* of the available alternatives and the quality of the *understanding* of what those alternatives can produce.

The quality of the understanding of what those alternatives can produce.

A good decision can only be made in the context of what it is that needs to be accomplished (Kepner 1981). Information technology investment outcomes are "variable, complex, interrelated and difficult to estimate" (Wetherbe 1993). McKeen and Smith suggest that one reason for this is that the level of analysis is based upon individual projects rather than on the portfolio of IT investments (McKeen 1993). This artificial decomposition fails to appreciate the synergistic value of the portfolio of projects as a whole. The value and cross functional impact of IT as a coordinating, communicating and leveraging technology across the functions of the company could not thoroughly be understood or evaluated in a project context (Lester 1996).

A distinct lack of causal models is also a problem in understanding and believing in the outcomes on an IT investment (McKeen 1993). Most managers that have been asked to make IT investment decisions have been asked to make them on a "leap of faith" that significantly adds to perceived risk.

McKeen and Smith suggest a framework for understanding IT investment decisions based upon the purpose. This framework categorizes IT investments into *Transactional*, *Informational*, and *Strategic* types.

Transactional IT is used to reduce costs or limit cost increases and should therefore be closely related to the current financial decision making criteria. *Informational* IT provides worthwhile information to be used to prevent problems or identify opportunities to increase revenue or reduce costs. Since the causal links are sometimes unclear, these benefits and relationships become a little bit more difficult to understand and measure with the current financial decision making process. *Strategic* IT is defined as providing a useful product or service and is the most difficult to understand and measure with today's decision criteria.

It appears that the causal links between IT investments and benefits become unclear as you move from transactional to strategic. This would "muddy the waters" when estimating cash flow and risk and therefore add complexity to and decrease the clarity of the decision making process.

The quality of the definition of specific factors that must be satisfied

The specific factors that must be satisfied, or the criteria for the decision, are the specific details of what the decision is to accomplish. The limited criteria used in the financially oriented process (ROI, NPV, etc.) capture only a very limited view of the project results of the IT investment. Therefore, the quality of the definition of the specific criteria is a function of how well the criteria captures the expected outcomes of the investment.

Each of the categories suggested by McKeen and Smith have very different outcomes and measures. Transactional IT is more closely related to the financial measures since it focuses on traditional productivity. For this reason, when using the financially oriented outcome measures, the investments in transactional systems have shown the most investment success (Wilson 1993). Many studies during the last several years have focused on defining the measurement of IT investments in relation to firm performance. Competitive advantage, customer satisfaction, organizational learning, transformational efforts, employee satisfaction and effectiveness are very common themes in the literature.

Wilson suggests viewing IT as an investment in organizational capabilities that create superior performance in speed, quality, flexibility, and innovation (Wilson 1993). He outlines several reasons why these investments are difficult to justify.

First, the investments are spread out over many different departmental and business units budgets thus requiring extensive coordination among different units. Second, most firms do not have accounting systems that can track and monitor performance on these dimensions so that the benefits often become invisible. Third, these types of investments have threshold effects. This means that because they require many parts of the organization to work together in a different way, the benefits are often not realized until the entire new system has been implemented. Finally, organization capability investments may impact the market structure

thus causing a response from competitors, which is very difficult to predict.

In an attempt to further develop categories of investment focus and measures, Sethi and King develop a multidimensional construct called "Competitive Advantage Provided by an Information Technology Application" (CAPITA). The seven dimensions and 29 measures are listed in Table 1 (King 1994). Sethi and King seem to have captured, through a survey of 568 firms in the U.S, a fairly comprehensive list of possible IT investment reasons that can be considered for decision criteria.

It is apparent in the literature that the investment criteria differs by industry, company and IT level (transactional, etc) and should be clearly linked to the business strategy of the business unit making the decision.

One of the most difficult investments to explain is the investment in the IT infrastructure. This infrastructure is the enabling foundation of shared information technology capabilities upon which the business depends (Weill 1993). Could the interstate highway system have been justified using the limited view of the financially oriented investmentcriteria used in IT investments?

TABLE 1: The CAPITA Measures

Factor 1: PRIMARY ACTIVITY EFFICIENCY (PAE)

Impact of the application on the following:

- **E2** Cost of receiving, storing. and disseminating inputs to the product, e.g., material handling, warehousing
- **E3** Cost of transforming inputs into the final product, e.g., machining, assembly
- **E5** Cost of collecting, storing, and distributing the product to customers, e.g., order processing, scheduling
- **E6** Cost of providing service to maintain or enhance the value of the product, e.g., installation, training, repair

Factor 2: SUPPORT ACTIVITY EFFICIENCY (SAE)

Impact of the application on the following:

- **E8** Cost of recruiting. hiring, training, development, and compensation of personnel
- **E9** Cost of general management activities, e.g., planning, finance
- **E10** Cost of coordinating different activities, such as purchasing, processing, marketing, sales,

Factor 3: RESOURCE MANAGEMENT FUNCTIONALITY (RMF)

Impact of the application on the ability of primary users to:

- **F9** Monitor the use of the resource. i.e., keep track of the utilization of the resource
- **F10** Upgrade the resource if necessary, i.e., add to the resource
- **F12** Transfer or dispose of the resource
- **F13** Evaluate the overall effectiveness or usefulness of the resource

Factor 4: RESOURCE AQUISITION FUNCTIONALITY (RAF)

Impact of the application on the ability of primary users to:

- **F4** Order or put in a request for the resource
- **F6** Acquire the resource, i.e.. be in physical possession of the resource
- **F7** Verify that the resource meets specifications, i.e., test the resource for a match with needs

Factor 5: THREAT (THRT)

- **T1** Costs which your company would incur if it changed to alternate suppliers
- **T3** Your company's ability to evaluate various suppliers and choose the most appropriate supplier
- **T4** Your company's ability to threaten vertical integration, i.e., threaten to perform some of the functions performed currently by its suppliers or customers
- **T5** Your company's ability to evaluate various customers and choose the most appropriate customers
- **T6** Cost which customers would incur if they change to alternate suppliers
- **T7** Customers' cost of locating alternate suppliers

Factor 6: PREEMPTIVENESS (PRMPT)

- **P2** The system provides unique access to channels, such as brokers, distributors, or retailers
- **P4** The system's market positioning is such that competitors are forced to adopt less favorable postures
- **P5** The system is protected from imitation by institutional barriers such as patents, copyrights, and trade secrets
- **P6** The system has influenced the development of technical standards and practices in the industry

Factor 7: SYNERGY (SYNRG)

- **S1** The system is aligned with your organization's business strategy
- **S2** The system is aligned with your company's marketing policies and practices
- **S3** Your firm has technical expertise in the area of the application
- **S4** Top management is involved in and supports the system
- **S6** Your firm has the ability to continuously innovate and enhance the application

It is clear from the CAPITA measures that there are significantly more criteria (specific factors per Kepner) in play with an IT investment than a normal investment. This adds complexity into the process and if the criteria are limited to the normal financial criteria, the clarity of the decision is obviously decreased.

The quality of the evaluation of the available alternatives

In order to effectively evaluate all the competing investment proposals, a firm must have clear, objective criteria and an objective process for evaluating alternatives against those criteria. In the financially oriented process, hurdle rates are established that set the minimum requirements for investments. This usually involves the cost of capital. Investments are examined by an investment committee or approving authority and each investment is evaluated against the firm's investment objectives. These objectives are usually financially oriented and the evaluation process is clear.

In IT investments, the hurdle has been suggested to be the strength of the link to the overall business strategy. Since a considerable number of possible benefits of an IT investment are outside of the traditional financial measures, Sethi and King have suggested that an excellent use of CAPITA is the weighted selection criteria for budgeting IT investments linked to a firm's investment strategies. The focus of the firm would decide which measures of CAPITA would be used as a selection criteria and all IT investments would be evaluated using this set of criteria. In this way, Linkage to the firm's strategy would be maintained.

The end result of a good evaluation process is a balanced choice of an alternative that meets the criteria with the minimal risk (Kepner 1981).

Conclusions and Recommendations

In searching the literature, it was found that there are as many approaches to IT investment measures as there are firms or investment possibilities. Several overriding themes came through.

1. The link to the overall business strategy must be a significant driver in evaluating IT investments.
2. A formal decision process, such as described here, is essential in making good investment decisions.
3. The evaluation criteria, and therefore measures of success, are much broader than just the financial measures traditionally used but the criteria depend upon the type of IT investment (Transactional, Strategic, and Informational) and the goals of the firm.
4. The process in the corporations of today is lacking in regards to linkage, formality, objectivity and meaningful criteria.

One suggested approach to address these issues is to broaden the criteria for IT investments, link them to the business goals and strategies and institute a formal process for evaluation. The unit of analysis should expand from a project basis to a "program" or portfolio basis so that the broad impacts of IT can be truly considered. Different types of systems should have different evaluation criteria. Transactional systems should be measured differently than Informational systems since the outcomes and success measures are different. Strategic systems should be closely linked to the strategic business plans and have the involvement of the strategic management level. The CAPITA model presents an excellent starting point for developing the criteria linked to the business strategy.

It seems that there is no "one best way" to justify an IT investment. Each IT investment must be linked to the firm's market, objectives and level of risk. As is often stated, define what you want to accomplish and how you will measure success and evaluate all alternative paths against this. The difficulty comes in predicting the impact of technology on people's performance, which is the only link that an IT investment has to firm performance.

This will always be difficult to predict and measure since predicting currently unknown causal links is impossible. Change brought about by IT is never seen today as important as it may become tomorrow.

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