The Dichotomy Of Measurement: Information Technology Return On Investment In The Public Sector

Information Systems Strategy Track

by

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Abstract

This research examines Return on Investment (ROI) for information technology (IT) and the impact of two variables – performance measurement and processes. Finding value in information technology has been measured and analyzed at various levels. However, few managers or theorists believe that the search for value has produced viable outcomes. Rarely are performance measurement and processes included in cost-benefit spreadsheets. This descriptive study examines ROI for IT investment in the public sector. Based on an earlier study that examined ROI in the private sector, it identifies similarities and differences between perceptions and use of ROI in the private and public sectors.

Prepared for presentation at the Professional Operations Management Society Conference, March 31 – April 2, 2001, Orlando, Florida.

Proceedings of the Twelfth Annual Conference of the Production and Operations Management Society, POM-2001, March 30 - April 2, 2001, Orlando Florida

Introduction

This research centers on Return on Investment (ROI) as it relates to information technology (IT) and the impact of two important variables – performance measurement and processes. Searching for value in information technology is something that has been measured and analyzed at various levels. However, few managers or theorists are satisfied that the search for value has produced viable outcomes. Rarely are the variables that are most valuable for quantifying uncertainty such as performance measurement and processes included in the cost-benefit spreadsheets.

Dichotomy is defined as "division into two usually contradictory parts or opinions." Therefore, the dichotomy of truth or falsehood in the area of IT Return on Investment (ROI) lies in how senior management in the public and private sectors sells IT expansion to the City Council or Corporate Board compared to what actually happens once the system is approved. As organizations expand their technology assets in hope of improving productivity, it becomes increasingly important that the investment is justified.

Research by Lucas (1999) indicates that this is a paradox rather than a dictotomy. According to Lucas, there are many dimensions to the value of information technology. IT produces value in many different ways, some tangible and others intangible. Therefore, measuring the competitive advantages of IT creates a reliable framework for success in today's organizations. The tangible benefit of lower operational costs and increased revenues and cash flows have always been the hallmark of traditional ROI models. However, to realize value from IT procurement, the intangibles such as increased customer satisfaction and enhanced decision making capabilities must be considered.

Why organizations invest and the planning process involved in the investment is paramount to the success of the investment. Lucas (1999) is quick to point out that private sector organizations may invest in IT because others in the industry invest and they do not want to be left behind, or that IT investment may be a fad such as reengineering or total quality management. Researchers agree that the organizations that invest wisely and measure their productivity will be successful in the 21st century.

This research follows a study by Cambridge Information Network (CIN) in 1998 that examined a group of 140 IT executives through questions regarding ROI projections, measurements, and interpretations. The CIN survey explored the feelings of senior IT executives about ROI, its measurements and its use. Additionally, CIN reviewed how culture in the industry and corporation helps define the attitudes about ROI. This study expands on the results of the 1998 survey by CIN with a similar survey conducted in central and south Florida analyzing mid-level managers in public sector agencies. The purpose is to identify some of the perceptions among managers in the public sector concerning ROI on IT investments, identify the principle parties responsible for conducting such analysis, and reveal how and to what extent those analyses are used. Finally, it seeks to determine similarities and differences between managers in the public and private sectors concerning ROI.

Literature Review

Traditional ROI methodologies for deciding if one investment will enable the organization to successfully implement another initiative in the future include a variety of models. One approach that appears to suit IT investment is the options pricing framework. The

philosophy of the options pricing model is that one project can provide the structure for another project in the future. While this approach is controversial among theorists, it has merit when analyzing the intangible benefits of IT investment.

One famous options pricing model is the Black-Scholes model of 1973. This model, as described by Lucas (1999) was built on several assumptions: (1) the interest rate is constant and known up front; (2) there is a stock price with a variance proportional to the square of the price; (3) no dividends are paid on the stock; (4) the only time option exercised is at expiration; (4) there are no transactional costs; (5) the organization can borrow at the beginning interest rate; and (6) there are no selling short penalties. While this model is controversial, it does fit the scenario of investment in IT with anticipation of receiving a return for an organization's investment. Built on the premise that a current investment will allow future technology initiatives, this model is a viable methodology for analyzing technology projects.

Benaroch and Kauffman (1999) evaluated the theoretical basis of evaluating a range of optimal pricing models to IT investment when they looked at a shared electronic banking network. In this research they determined that the Black-Scholes model is effective for IT evaluation in light of the underlying assumptions. They further supported the use of this model, asserting that information systems literature makes a strong case for the use models such as Black-Scholes. Their research indicates that due to the hard decisions necessary in information systems management, traditional models such as net present value (NPV) and discounted cash flow (DCF) are not enough to accurately predict return on investment (Benaroch & Kauffman, 2000).

Organizations utilize a variety of methods to evaluate payback. These include economic value added (EVA) to measure the after-tax operating profits, a standard cost/benefits analysis to measure return on investment, and historical analysis such as data warehousing. However, the most common method is still the net present value method to determine if the initiative justifies the investment (Violino, 2000).

Uncertainty still clouds the methodology when using ROI methods such as NPV. Static valuation models such as NPV and DCF tend to undervalue investments made under uncertain conditions. Analysts then resort to instinctive methods such as "synergy" or "strategic importance" to compensate for the uncertainty. In these cases, analysts call for real options such as a call option. By using the call option, the analyst gets flexibility often missed by DCF and NPV methods. The value of the call option increases as the value of the stock increases (Latimore, 2000).

Other traditionally utilized financial applications to measure ROI include the payback method, accounting rate of return on investment, and a cost benefit analysis. Historically, measuring the time required to pay for the purchase or calculating a rate of return for the investment that includes depreciation and income earned by the investment, was sufficient to measure the return to stakeholders. The vast, but hard to measure intangible benefits of IT, create a unique challenge for managers.

Potential value, as described in research by Davern and Kauffman (2000), is the ability to assess the theoretical framework of potential value with some certainty in order to realize a return on the organization's IT investments. Traditional financial modeling is deemed biased by some researchers when measuring intangible benefits. Information technology creates an immediate financial expenditure, but the payback is over a considerably longer period of time than traditionally reviewed in a typical financial model (Laudon, 2000).

Limitations of traditional financial models include consideration of the political position in the organization. While the political position has very little to do with IT, it usually affects the period of time allowed for ROI. Additionally, traditional ROI models assume that costs and benefits are known and expressed in a common metric such as money (Laudon, 2000). This is not always the case when measuring ROI for IT.

According to Davern and Kauffman (2000), the firm's realization of value is influenced by complementary assets such as human capital and business process design. The research considers potential value for information technology investment by examining the relationship among potential value, conversion contingencies, and realized value. It is understood that IT purchases have value at project selection and post investment evaluation in addition to the actual production required of the system. Therefore, the attitudes and opinions of those managers responsible for IT purchase, implementation, and control become extremely important to the success of the overall project.

Davern and Kauffman (2000) divided ROI for IT into three distinctive categories; (1) potential value, (2) conversion contingencies, and (3) realized value. The premise was to measure ROI at separate phases of the process to ensure processes were in place to increase the success of receiving a return for the technology investment. Many managers go directly for the potential value and forget the contingency impacts on the project. This affects the organization's ability to realize potential from the investment. Additionally, there are a variety of issues that can affect the value once an application or infrastructure has been built.

Measuring ROI in information technology is a noble idea carved from idealists who actually think it is possible to make a plan and work that plan. Experience shows that organizations are reluctant to measure ROI for various reasons. Job security, computer phobia, management freedom, and that ever-prevalent line "we've always done it that way" are among the reasons why it is difficult and sometimes undesirable to measure ROI.

Success through information technology can be defined in numerous ways. If an organization is successful at changing processes to utilize technology for increased productivity or a reduced workforce, then this is a positive action. Additionally, an organization reducing its paperwork or increasing customer access could also be termed a positive action. Any number of technological victories such as the examples cited would reflect positive managerial initiatives. The key is to plan for these from the beginning and build this success throughout the design and implementation of the system. The most effective and efficient organizations throughout the world find a way to do this. It usually begins with dynamic, in-touch, leading-edge management.

According to Collins (2000), the best way to measure ROI is through the combination of document management and workflow analysis. This combines to be the automation of the business process where information and tasks are flowcharted through the system and improvements are made. This allows for timescales and measurement to increase efficiency and improve productivity. Collins (2000) believes that managers must change how they view data. In the past, data mining, data warehousing, and information storage were joined together with document management and workflow. However, while they interact with each other, they must be managed separately. Processes and workflow are the keys to successful document management.

New technology for document management is expensive and the skills to run the equipment are not necessarily available in some public agencies. As much as 80% of businesses expect their document management costs to rise in the next five years. Of the respondents, 24% felt that expenses would rise by more than 61%, while 25% felt that costs would increase

between 21% and 40%. However, despite this, the respondents rated easy document sharing, time critical document access, and improving staff efficiency as major concerns for this decade (Document Management, March, 2000).

Managers are behind the power curve when it comes to measuring the impact of their IT purchases and productivity. In fact, there are those who feel that the size of the budget is sometimes the sole determining factor in the purchase and use of computer systems. Another point is that ROI for technology management is an evolving process. It is still relatively expensive and more technology is being developed as this is written. Issues such as digital paper, imaging, workflow management, wireless technology, bandwidth, and web-based companies are emerging to create a relatively new industry. The implications of these changes are still in question resulting in reluctance among companies and governmental agencies to move quickly (Gingrande, 1999).

Reliable research indicates that managers have adapted to change for generations. End-user computing is relatively new to the business world and prior research is limited. Reacting to change efficiently by using end-user computing innovations is a challenge for today's managers (Mintzberg, 1990). Computing is still in its infancy for most applications, prompting managers to determine if they should delegate tasks or be a hands-on leader. However, expanding computer capabilities are numerous and remaining a hands-on manager is extremely dangerous.

Guimares (1986), in a study of 173 "Fortune 500" companies, identified a lack of company-wide perspective on information systems as a major problem. The ability of managers to improve decision-making capabilities and employee production depends on management innovativeness. The ability to determine if the system is working is dependent upon performance measures. Other examples of task difficulty and lack of productivity were cited by Peters & Waterman (1986) in a study of Frito-Lay, Proctor and Gamble, IBM, and Digital. The solution was to implement performance measurement policies and procedures.

The intense usage of computers incorporated into the workplace in the 1980s and 1990s forced managers to change their traditional methods of management (Williams, Rice, Rogers, 1988). Since different individuals provide different solutions to similar problems, management's approach to end-user computing could produce a vast difference in productivity. This creates a need to address the managers' use of end-user computing by measuring the effects of managerial innovativeness. There is a tremendous gap in the abilities of today's managers and the technical personnel in an organization. Combining technical expertise with the needs of the organization is extremely difficult. Many times the budget drives the change. Managerial innovation is a key to creation and evaluation of performance measures that will ensure efficiency and effectiveness in the use and purchase of computer assets. Managers must know exactly what they want to get from the system they have or propose. Yet, they listen to sales personnel, other managers, their own technical personnel, and any other source of information they have and fail to begin with a basic problem statement prior to jumping into the purchase or use of information technology.

Today's managers must supervise personnel, providing computer utilization guidance to achieve and demand maximum output. However, individual managers may lack the knowledge required to determine efficient computer information system utilization. The level of innovativeness may determine if managers effectively influence change in organizations. Downs and Mohr (1976) contended that technical innovations require a completely different decision process than administrative decisions. Management of end-user computing falls into the technical category and prompts managers to examine the process from a different angle than they are accustomed to (Kimberly, 1981).

Management demands performance measures to improve operations and productivity. Van de Ven (1986) describes four problems relating to management that should be addressed by performance measures: (1) the human problem of managing attention; (2) the problem of managing ideas; (3) the problem of managing a part-whole, or managing an idea as it develops over time; and (4) the problem of institutional leadership, where management must create a structure conducive to measurement. In short, the managers' inability to cause employees to think outside of the box, or innovatively, is a major problem that must be addressed through performance measurement

Poister (1999) indicates that performance measurement is becoming a major issue with public sector organizations. Contemporary management is examining how to integrate the holistic approach of utilizing performance measurements to create efficiency and productive work environments. The IRS recently underwent massive changes spearheaded by improved performance measurement with outstanding results. Three elements now comprise performance measuring under the new IRS plan: (1) customer satisfaction, (2) employee satisfaction, and (3) business results. The focus of the IRS will continue to be ease of filing. They plan to use performance measurement of their three key elements to reach this goal (Jones & Luscombe, 2000).

There are many horror stories about lessons learned in the world of MIS management. However, the one that perhaps rings the most true is that processes are the key to long term success. Viewing the system in a holistic manner and working the processes will produce solid management principles and consistent application. According to Kueng (2000) process organizations are replacing functional organizations in order to create a competitive advantage in today's fast-paced, ever-changing environment. The key to this is performance measurement and management.

Organizations that invest in information technology, whether public or private, continue to wrestle with how to measure and calculate ROI and how to make that knowledge work for them. While the theory surrounding ROI may be on its face applicable to both the private and public sectors, research may actually find that the practice is not as applicable to both. While the private sector examines its "bottom line," the public sector must consider its policy initiatives. Therein may be the real difference between the two sectors. ROI for the sake of reduced costs and increased revenues sounds good to the corporate managers; the public administrator must consider the public good and the public trust.

Methodology

This is a descriptive study that examines the concept of Return on Investment of information technology investments in the public sector. It is based on a survey previously developed by the Cambridge Information Network (CIN), a division of Cambridge Technology Partners. The study conducted by CIN supported the long-held belief that corporations used ROI as a watchdog for traditional investments and confirmed further that the basis for the rationale behind corporate insistence on ROI was simple: corporate managers clearly felt that if they wanted to make money, they had to invest money. CIN found that among corporate managers and decision makers, IT investments are no different. Respondents to the survey distributed by CIN indicated that corporate leaders wanted to know what IT investments could do for them as they experienced increasing calls for accountability to shareholders over such investments.

But what of the public sector? The question addressed in this study is whether or not managers in the public sector, where there is relatively little concern for making money and often only a little more for justifying expenditures, are as interested in justifying investment in information technology. Whereas the private sector has experienced numerous changes in business practices as a result of technology, the public sector has acted in the role of follower, seldom being on the cutting edge of technological changes. Could it be that their reluctance to be a leader in adoption of new technology is in part due to their inability to justify the expense? While this study does not explore any causal relationships surrounding this question, it does at least shed some light on whether ROI is an issue among public sector agency leaders. This study is based on only a small sample of public sector managers and administrators; nevertheless, it presents a glimpse of how the public sector views and uses information concerning ROI for information technology investments.

Subjects for this study included 28 representatives from public sector agencies, including public educational institutions, in the central and south Florida area. Each responded to a survey that asked questions about their perceptions, measurement, calculation, and use of information concerning ROI for investments in information technology. Of the total respondents, the largest government sector represented was education (40%), followed by law enforcement (21%), management information systems (18%), fire/EMS (7%), and finance and administration (3% each). Approximately 21% of those reporting were from a variety of other areas of the public sector.

On the question of the effectiveness of ROI projections for IT investments, results were clearly in the affirmative, as 79% of respondents expressed confidence in the possibility of measuring return on such investments. This approximates the results obtained by CIN among corporate managers. This reported confidence among public sector managers was in part demonstrated as 64% of respondents indicated that they measure ROI on at least some IT investments in contrast to the 75% in the private sector. However, it is important to note that 26% of the respondents in this study who reported previously that effective measurement of ROI on IT investments was possible reported that they in fact did not measure such investments compared to only 8% in the private sector.

The picture became a little clearer when public sector respondents were asked whether or not ROI projections influenced organizational decisions to proceed with a particular IT project. Just fewer than 40% of respondents admitted that such projections had little or no impact on IT-related organizational decisions. Another 32% reported that ROI projects had only moderate impact on IT-related organizational decisions. In the earlier CIN study, only 1% of respondents said that ROI projections had little or no impact on IT-related organizational decisions. Almost 90% of private sector respondents claimed that ROI projections had moderate or high levels of impact on such decisions.

It appears that while public agency leaders may recognize the potential effectiveness of ROI on IT investment measures, they are reluctant to use them in making decisions concerning whether to engage in or continue IT-related projects. This finding begs the question of why ROI is measured at all. Just over 10% of respondents reported that the agency requires it compared to 33% in the private sector. Ten percent of the managers also reported that they personally believe it is a good way to analyze investments. This is in sharp contrast to the private sector where 61% of the respondents believed that ROI measurement made good sense. Just over one quarter of the public sector respondents (28%) indicated that it helped to prioritize IT projects compared to 64% of the corporate leaders. One fifth (21%) of the public manages reported that ROI

measurement helps to justify IT expenditures to the rest of the agency. This was clearly an important issue for private sector managers as 75% agreed.

The practical usage of ROI in IT investment in the public sector also appears interesting. When asked whether measurement of ROI on IT investment was likely to be used to cut costs, respondents indicated overwhelmingly that it was only somewhat likely (50%) or unlikely (36%). Private sector leaders overwhelmingly (72%) declared that they would measure ROI where cost cuts were involved. Further, when asked whether ROI in IT investment was likely to be used to increase revenue, the distribution among public sector managers was slightly different as 29% of respondents reported that it was very likely, 29% that it was somewhat likely, and 42% that it was unlikely. This clearly demonstrates that in something as fundamental as decisions concerning expenditures and revenues, somewhere between one third and one half of government agencies surveyed would not measure ROI on IT investment. Though their percentages were not as low, private sector managers reflected a similar trend as only 49% said that they were very likely to measure ROI as a means of increasing revenue.

Another series of questions concerned who in the organization participates in matters related to measurement of ROI on IT investment. Two questions concerned who sets the criteria for measuring and calculating ROI. The results shows that responsibility for measurement and calculation was evenly distributed throughout the organization with 1/3 falling to IT and Business Departments, 1/3 to the Executive and CEO level, and 1/3 to Other.

The results for a question asking who makes the decision to proceed with IT projects once an ROI projection has been calculated suggest that such decisions are spread somewhat evenly throughout public agencies (players are the same as those involved in setting criteria for measurement and calculation of ROI). Among private sector leaders, it was clear that those decisions were generally made at the executive level. In public sector agencies, it is the combination of IT departments and finance/business interests that is responsible for analyzing post implementation accuracy of ROI on IT investments. Almost three quarters (71%) of respondents reported that these elements within their agencies were responsible for such analysis. This leaves evaluation of IT projects in the public sector demonstrating a decided cost/benefit slant. Quite expectedly, the private sector managers reported similar experiences.

What happens if that analysis shows that post implementation results fall below pre-implementation projections is very revealing. Only 8% of respondents indicated that projects would be cancelled or scaled down compared to 26% in the private sector. Just fewer than 40% said that remedial action would be taken to rectify the situation where this would be much more likely in the private sector (61%). Approximately 20% of public sector managers suggested that the analysis would only be used to refine the process for the next project to be implemented where results among private sector leaders reached 71%. Finally, a full third (32%) of public sector respondents said that the analysis showing less than expected results in ROI would merely be noted for posterity compared to 36% of private sector respondents.

A final question asked over what time period ROI was determined for most projects. The response was typically public sector as slightly over two thirds (69%) of respondents indicated that these projects went out two years or less. This speaks to the short-term thinking of most public sector agencies. Not surprisingly, private sector managers reported that of 52% of ROI calculations are for projects going out over 2 years.

Results of these two studies show that there are both similarities and differences between the attitudes, perceptions, and usage of ROI for IT investment among managers and organizational leaders in the private and public sectors. These similarities and differences are

summarized as follows. Both public and private sector leaders agree that ROI projections for IT investment can be effective. While the private sector does slightly more ROI measurement, a greater proportion in the public sector do none at all. Private sector managers are much more likely to use ROI projections to decide whether to proceed with a particular IT project than their public sector counterparts.

There is a considerable amount of difference in the reasons that private and public managers give for conducting ROI measurement. More private companies require it than public agencies. More private sector managers believe in its value and use it to prioritize IT projects. Many more private sector managers use it to justify IT expenditures to the rest of their organization. The private sector is more likely to conduct ROI measurement if it will reduce costs and closer to the public sector in measurement to increase revenues. Both sectors rely heavily on their IT and Finance departments to set the criteria for ROI measurement and calculation. In the public sector, decisions concerning whether to proceed with an IT project after calculating an ROI projection are likely to be made throughout the agency. In the private sector, these decisions tend to be made at the executive level. Both sectors conduct their post implementation ROI analysis at the IT/Finance level. The private sector is much more likely to scale down or refine an IT project if the actual ROI is less than projected than the public sector. The private sector calculates more ROI projections on projects of over 2 years where the public sector calculates more on projects under 2 years.

Conclusion

Return on Investment on IT investment is clearly an important concern for strategic managers in both the private and public sectors. Equally clear is that private sector leaders have developed attitudes and corresponding processes relative to ROI that go far beyond the consideration given to it by public sector managers. This may be explained in part by the importance given to information technology as a core element of curricula in management and business programs in contrast to public administration programs. In other words, private sector managers may simply be better educated in the concepts and importance of ROI on IT investment. A second explanation may be found in the relative importance given to the "bottom line" by private sector managers. Public agencies seldom consider the bottom line since decisions are much more likely to be made on the basis of the public good, social equity, and revenue constraints and accountability in government.

This research only begins to uncover the truths concerning processes, measurement, and ROI in today's public and private organizations. As such, it raises more questions than it answers. This research should be expanded to discover more about the apparent lack of concern in the public sector over ROI and whether there are other considerations more important that give it a place so far below that found in the corporate world.

This research has some important practical implications that justify its expansion. Public managers have been increasingly faced with demands to act more like their private sector counterparts. This no doubt includes treating IT investments like any other. Public administrators must learn how to use measurement of ROI on IT investment as a means of contributing to the overall management of their processes. It is central to increasing accountability in government, and ensuring that public systems operate with efficiency and effectiveness.

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