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Evaluating Information Technology Investments in an Organizational Context

Paul Tuten
Nova Southeastern University

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Paul M. Tuten
Nova Southeastern University
tuten@nova.edu

Abstract

Information technology (IT) investments yield uncertain and unexpected results; successful outcomes are not guaranteed. Because of this organizations must strive to manage their IT investments effectively. Evaluation plays a critical role in successful IT management; however, it presents many difficulties for both the practitioner and researcher. In the literature, most IT evaluation methods are highly prescriptive in terms of their procedures and evaluation criteria. Paradoxically, many researchers have suggested that successful evaluation must be contextual—it must address the social and organizational aspects of evaluation and decision-making, as well as their effects on IT investment outcomes. These circumstances present a conundrum: how can researchers create contextually-sensitive evaluation methodologies while simultaneously providing practitioners with enough methodological guidance for conducting their evaluations? In this paper, the author presents a framework for his dissertation research—research that investigates and will attempt to assist in resolving this paradox.

Keywords: IS/IT evaluation, IS/IT investment, interpretive evaluation, feasibility analysis

Introduction

Organizations have increasingly adopted information systems (IS) and information technology (IT) to assist in achieving their objectives, such as increasing efficiency or creating competitive advantages (Chou 2002; Porter and Millar 1985). Correspondingly, widespread technological adoption has significantly increased global IS/IT expenditures—a well-established and continuing trend (Willcocks and Lester 1999). Yet despite broad investment in information technology, many researchers have questioned the value of IT to organizations and have critiqued its ability to improve organizational productivity. Such criticisms likely arise from an abundance of both successful and failed IS/IT projects found within the academic literature and trade press. Instances of successful IS/IT implementations have been identified at American Airlines (Copeland and McKenny 1988), Xerox (Remenyi 1991), Dell (McKinsey Global Institute 2001), and Wal-Mart (Devaraj and Kohli 2002). Chou (2002) also cited the well-known successes of Baxter Healthcare, McKesson HBOC, and the Otis Elevator Company. Conversely, numerous cases of failed IT projects also exist, such as those of the FoxMeyer Drug Corporation (Ehrhart 2002) and the London Ambulance Service (Hougham 1996). Similarly, Spitze (2001) described a "major U.S.-based company" whose failure to successfully implement a global IT strategy cost the company, and more importantly its shareholders, a 50 percent decline in its stock price and market capitalization.

Clearly, the empirical evidence suggests that organizations may obtain either positive or negative outcomes by undertaking IS/IT initiatives. Furthermore, these consequences may range from relatively minor to extremely significant in their degree of organizational impact. For this reason, organizations must carefully manage and evaluate proposed IS/IT projects. Lucas (1999) supported this view by asserting that "organizations that flourish in the future will make wise decisions about investments in information technology."

Although recent studies have demonstrated the ability of IS/IT investments to provide positive economic and financial returns (Anderson et al. 2002; Bharadwaj et al. 1999; Brynjolfsson and Yang 1999), the value of effective IS/IT evaluation extends beyond the identification of financially rewarding and competitively strategic investments. Equally important, evaluation serves a vital role in avoiding the deleterious effects of unsuccessful IS/IT initiatives: cost overruns, the inability to obtain desired

benefits, and the partial or complete organizational failures associated with implementing an unsuccessful IS/IT project (Khalifa et al. 2000). Along with the importance of evaluation, Powell (1993) posited that IS/IT investment decisions are often more difficult and complex than other types of investment decisions. In short, researchers agree that IS/IT investment evaluation, in the words of Smithson and Hirschheim (1998), "clearly remains a thorny problem" of significant importance. Although numerous approaches, methodologies, and techniques exist (e.g. Renkema and Berghout (1997) identified over 65 methods), researchers disagree over their appropriateness and applicability for IS/IT investment evaluation. Broadly, IS/IT evaluation approaches can be roughly divided into two categories: prescriptive, mechanistic, positivist approaches; or informal, contextual, interpretive alternatives.

Traditional Evaluation Approaches

According to Smithson and Hirschheim (1998), IS/IT evaluation in practice focuses primarily on efficiency (i.e. how well a given technology works) and to a lesser degree on effectiveness (i.e. the usefulness of a given technology). Such evaluation approaches are grounded in a positivist (rational/objective) epistemology. Serafeimidis (2002) outlined a number of technical/efficiency stream evaluation methods and tools that focus on increased performance, reliability, and cost-effectiveness including software development quality models and cost estimation techniques. Additionally, Serafeimidis also described a number of economic/effectiveness stream methods originating in the disciplines of economics, finance, and behavioral science. Examples of such methods include cost-benefit analysis (King and Schrems 1978), return on investment methods (e.g. financial techniques such as discounted cash flows, internal rate of return, and net present value), and return on management (Strassmann 1985). Furthermore, Renkema and Berghout (1997) identified a number of multi-criteria and portfolio approaches that are best described as rationale/objective (i.e. positivist) in epistemology, such as Information Economics (Parker et al. 1988).

In general, traditional evaluation methods tend to be described as formal, overt, mechanistic, quantitative, and/or prescriptive in their efforts to determine the costs, benefits, and risks associated with IS/IT investments (Serafeimidis and Smithson 2000; Walsham 1999). However, researchers have suggested that formal evaluation frequently fails to be undertaken with rigor (Willcocks and Lester 1999) and is completely avoided by practitioners in many cases (Jones and Hughes 1999). Nevertheless, Walsham (1999) maintained that when organizations perform IS/IT evaluation, they employ traditional positivist methods that have "considerable legitimacy" with senior executives and business managers.

Interpretive Alternatives

Over the past decade, many authors have called for interpretive alternatives to traditional IS/IT evaluation approaches (Irani and Love 2001; Jones et al. 2001; Serafeimidis and Smithson 2000; Serafeimidis 2002; Smithson and Hirschheim 1998; Walsham 1999). Numerous reasons are cited in arguing the case for interpretive evaluation methods; primarily, researchers have pointed to the inadequacies of traditional evaluation methodologies and have suggested potential areas of improvement. According to Pennington and Wheeler (1998), traditional evaluation approaches have tended to eschew less quantifiable variables such as the political environment within an organization, and cultural and attitudinal differences among stakeholders. Walsham (1999) suggested that traditional evaluation is often performed by IS professionals and non-user stakeholders, thereby ignoring critical user opinions within the organization. Serafeimidis and Smithson (2000) concurred with this assessment by positing that traditional evaluation approaches tend to overlook and undervalue the views of end-users. Given these circumstances, traditional IS/IT evaluation approaches seem to contravene the view that information systems are, first and foremost, social systems in which the roles of social actors are vital (Hirschheim and Smithson 1999; Irani et al. 2001; Walsham 1999).

Moreover, recognition exists among practitioners and academics alike that strategic IT investment decisions frequently result in poor outcomes and that many of the existing evaluation tools and techniques are inadequate (Willcocks 1994). As previously noted, Willcocks and Lester (1999) suggested that traditional evaluation fails to be undertaken with rigor. This finding could be explained by Walsham's (1999) contention that traditional IS/IT evaluation frequently serves as a form of organizational ritual—an act that continues to perpetuate the myth of the rational manager. Given these circumstances, the argument for interpretive alternatives arises from more than divergent philosophical viewpoints; instead, the limited successes of traditional approaches necessitate the investigation of new and potentially more effective IS/IT investment evaluation methods including holistic, contextual interpretive alternatives.

Problem Statement and Objective

To summarize, while recent studies have demonstrated that IT investments provide positive economic returns and increased productivity, it remains equally clear that individual IT projects continue to yield uncertain results. These circumstances underscore the importance of and need for effective IS/IT evaluation—a difficult and complex task. Given this need, numerous IS/IT evaluation methods have been developed that are highly prescriptive in terms of their procedures and evaluation criteria. Researchers have described these methods, which hold significant legitimacy with practitioners, as mechanistic, ritualistic, and positivist and have questioned the efficacy of such approaches. In contrast to these prescriptive methods, many researchers have suggested that successful evaluation must be contextual—it must address the social and organizational aspects of evaluation and decision-making, as well as their effects on IT investment outcomes. In short, researchers have called for interpretive alternatives to traditional evaluation methods. These circumstances present a conundrum: how can researchers create contextually-sensitive evaluation methodologies while simultaneously providing practitioners with enough methodological guidance for conducting their evaluations?

Moving beyond the dichotomy of traditional, positivist evaluation methodologies versus interpretive alternatives, the researcher will develop a comprehensive meta-methodology that facilitates the creation of contextual evaluation models. The resulting evaluation models will guide practitioners in performing a holistic evaluation across the continuum of Hirschheim and Smithson's (1999) classification of evaluation approaches: efficiency, effectiveness, and understanding. In doing so, the researcher recognizes the benefits and limitations of both positivist and interpretivist methods—a view supported by both Hirschheim and Smithson (1999) and Walsham (1999).

Research Questions

Based upon the above discussion, the following research question has been developed for this study:

1. What is the feasibility of using a meta-methodology to create contextual IS/IT investment evaluation models, utilizing both positivist and interpretive evaluation techniques?
2. Do the resulting models provide an effective means of IS/IT investment evaluation?
3. Are the resulting models sufficiently easy to operationalize in the practitioner environment?
4. Are the resulting models temporally appropriate in the practitioner environment?
5. Would this approach likely be supported by key organizational stakeholders (e.g. end-users, IS professionals/management, and executives)?

Approach

The researcher proposes a multi-stage approach in this study, consisting of four main phases: the foundational research and literature review, the development of a meta-methodology for building models that facilitate the contextual evaluation of investments in telecommunications and data networking infrastructure by practitioners, the assessment of the meta-methodology through the development and implementation of a contextual evaluation model in one or more a pilot studies, and the analysis and reporting of results. While each stage is distinct with a finite set of deliverables, each stage also builds upon its predecessor. The figure below graphically depicts the research design and is followed by a brief description of each stage.

Foundational Research and Literature Review

Due to the conceptual and theoretical nature of constructing a meta-methodology, the researcher will undertake a thorough review and analysis of the available literature, including the domains of IS/IT evaluation and methodology/model building. The researcher must identify, categorize, and analyze existing IS/IT evaluation methods, models, and techniques. Additionally, the researcher must consider the philosophical implications of the various evaluation approaches. The researcher will also investigate the literature related to the organizational, cultural, and social aspects of IS/IT evaluation practice. Given the limitations of this study, special attention must be directed toward determining each evaluation method's applicability and approach toward evaluating telecommunications and data networking in particular. In all, the literature review provides a critical foundation for the study.

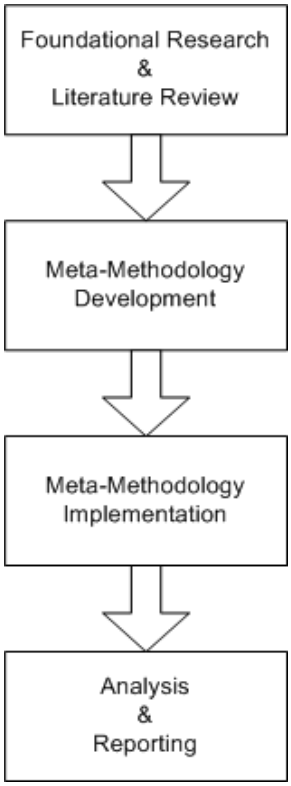

Figure 1. Overview of Research Design

Meta-Methodology Development

The development of the meta-methodology will be theory-based and attempt to address a range of technical, economic, organizational, and social considerations. Although necessary to perform a comprehensive contextual evaluation, this broad range of evaluation factors could result in a meta-methodology that proves too cumbersome or unwieldy to operate in practice. For this reason, the scope of the meta-methodology will be limited to IT infrastructure, specifically telecommunications and data networking investments. In addition, the meta-methodology will not construct organizational and/or IT strategy or governance policy (i.e. goals, objectives, constraints, etc.); however, the meta-methodology will demand that such guidelines either exist or be created. Finally, the meta-methodology will not attempt to identify alternative solutions; the evaluation process will be limited to assessing each alternative and selecting the most appropriate one based upon organizational objectives and constraints.

Once developed, the initial design of the meta-methodology will be assessed by an expert panel of individuals familiar with evaluating telecommunications and data networking projects. The expert panel will provide feedback along a number of dimensions, such as errors of omission, errors of inclusion, overall applicability, and ease of use. Following the review, the expert panel's recommendations will be analyzed, and the meta-methodology will be adjusted accordingly. This process may require numerous iterations of refinement prior to implementation of the meta-methodology in a pilot study.

Meta-Methodology Implementation

Following the preliminary validation and revision process, the meta-methodology will be implemented in one or more (assuming appropriate research sites are available) pilot studies. At this stage, the meta-methodology will be utilized in the field to create a contextual model for evaluating a telecommunication or data networking project in the subject organization. This step is critical to the research program, because the success of the resulting models depends directly on the efficacy of the meta-methodology. In short, the feasibility of the meta-methodology must be inferred through the successes or failures associated with its practical application.

Analysis and Reporting of Results

The feasibility assessment of the meta-methodology will be based on the pilot studies in which the meta-methodology was used by practitioners to conduct "real-world" IS/IT investment evaluations, as well as the data captured in the expert panel review process. Consistent with this design, the researcher will employ a case study approach in conducting the pilot studies. Likewise, a number of techniques may be used to collect data for analysis: collection of textual artifacts, interviews, observation, and questionnaires. Under these circumstances and consistent with a qualitative research paradigm, the researcher will exercise caution when attempting to generalize the findings of this study (Newman and Benz 1998).

Significance and Unresolved Issues

The researcher expects the results of this study to be significant to the IS discipline by both advancing knowledge and assisting in improving professional practice. Specifically, the study will investigate the feasibility of utilizing a meta-methodology for the development of contextual IS/IT investment evaluation models—a need reflected in the IS/IT evaluation literature as a call for meta-methodological approaches that provide contingencies for addressing a range of technical and organizational variables (Farbey et al. 1999; Hares and Royle 1994; Serafeimidis 2002). In short, the development of this meta-methodology may serve as an iterative step in the ongoing effort to improve IS/IT evaluation; a practice that has been demonstrated as critical to an organization's performance.

However, the limited scope of both the study (investigation at a small number of sites) and the meta-methodology (limited to telecommunications and data networking infrastructure) implies that claims about both this approach and the meta-methodology's applicability should be measured. Nonetheless, important lessons regarding the use of such a meta-methodological approach may be learned through this research program. Therefore, the researcher remains cautiously optimistic regarding this study's long-term implications.

Finally, in addition to the limitations explicated in earlier sections, two important issues remain largely unaddressed by this study. First, additional research and analysis is required to address issues associated with divergent stakeholder viewpoints and desires. The researcher expects the meta-methodology to assist in selecting an alternative investment based upon explicit organizational objectives and constraints, without specifically addressing the genesis of these guidelines. In the case of this study, this issue is mitigated by the nature of the technology involved; that is to say IT professionals, managers, and end-users typically share more similar expectations and concerns for telecommunication and data networking infrastructure performance (e.g. reliability, availability, security, etc.). Likewise, end-users may be more disassociated from their utilization of network infrastructure than their interaction with application software. Thus, these factors mitigate stakeholder differences in the context of this study. Second, as previously discussed, practitioners frequently perform IS/IT investment evaluation without sufficient rigor or avoid the practice entirely. Therefore merely creating more effective evaluation methods may not result in improved professional practices. Instead practitioners may first need to be persuaded that evaluation is a critical success factor in IS/IT projects. Without such a persuasive appeal, any attempt to improve IS/IT evaluation may be viewed as irrelevant and with skepticism by practitioners.

Conclusion

Creating contextually-sensitive evaluation methodologies while simultaneously providing practitioners with enough methodological guidance for conducting their evaluations presents researchers with a significant challenge. This paper summarized a research program directed at investigating this concern. Hopefully the meta-methodology, constructed as a part of this study, will provide a means by which organizations can develop telecommunications and data networking evaluation models based upon their unique technical and organizational objectives and constraints, utilizing a number of positivist and interpretive evaluation techniques. Moreover, the researcher hopes that this investigation of a meta-methodological approach to IS/IT evaluation will encourage a new stream of similar research—research that may lead to improvements in existing evaluation techniques, methodology building, and the development of new evaluation meta-methodologies, as well as the further refinement of the meta-methodology developed in this study.

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