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# Examining Evaluation Across the IT Value Chain

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## Abstract

*Information technology (IT) investments frequently yield unexpected, uncertain, and undesired results. Therefore, managers must either locate or devise methods for effectively evaluating IT initiatives. Unfortunately, a review of the extant literature suggests that existing methods are frequently either inappropriate or ineffective. In analyzing this problem, we have found that numerous evaluation methods appear to exhibit a tendency toward a 'product-based' view of information technology while ignoring its 'service-based' dimensions. In addition, we believe that a critical gap exists between the discipline's conceptualization of "IS success" and the identification and/or creation of metrics for predicting or measuring the contribution of IT to an organization's value chain. In this paper, we outline our ongoing research efforts to examine the link between IT-based activities and organizational value creation. Specifically, we discuss our motivations for working to develop an IS process model based upon conceptualizations of organizational value chains that is explicitly mapped to the causal relationship models of IS success, such as DeLone and McLean (1992, 2003).*

**Keywords:** IS/IT evaluation, measurement, IT-based activities, value chain analysis

## Introduction

In this paper, we outline a research program to study the link between IT-based activities and the creation of organizational value. While still in the early stages of our program, we have come to believe that the vast majority of extant evaluation techniques exhibit a bias toward a "product-based" view of information technology while ignoring its "service-based" dimension. In addition, our preliminary literature review suggests that a critical gap exists between the discipline's conceptualization of "IS success" and the identification and/or creation of metrics for predicting or measuring the contribution of IT to an organization's value chain. Indeed, our preliminary investigation leads us to believe that evaluation practice may be improved by the development of an IS process model based upon conceptualizations of organizational value chains that is explicitly mapped to the causal relationship models of IS success, such as DeLone and McLean (1992, 2003).

In constructing our argument, we begin by exploring the uncertainty associated with IT investment outcomes. Next, we provide a definition of "value," which is proposed as a unifying measure for performance evaluation. We then discuss the process by which IT activities create organizational value. We then review the suitability of existing evaluation methods to 1) examine both product-based and service-based views of IT, and 2) address the complex and protracted nature of the IT value chain. Finally, we summarize our findings in a statement of problem and describe our research objectives.

### *IT Investments and Uncertain Outcomes*

Organizations adopt IT in order to achieve specific objectives, such as reducing expenses or creating a competitive advantage. Yet, despite widespread investment in IT, many academic researchers and industrial practitioners have questioned whether or not IT adds value to organizations. Indeed, the literature suggests that corporate managers frequently "whipsaw between viewing IT as a source of major differentiation" and "begrudgingly viewing it as a cost of doing business" (Leibs 2002). In aggregate, 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). Yet, Brynjolfsson stated that the effect of IT investments varies at the level of the individual firm (Leibs 2002). Indeed, anecdotal evidence found in the trade press and academic literature supports this assertion of both successes (e.g., Copeland and McKenny 1988; Devaraj and Kohli 2002; McKinsey Global Institute 2001; Remenyi 1991) and failures (e.g., Ehrhart 2002; Malmsten et al. 2001).

### *Defining Value*

Before discussing value creation and measurement, it's important to clearly define the meaning of the term "value" in the context of this paper. Traditionally, productivity and other similar measures have been used to evaluate a firm's performance improvements. Typically, such measures have been limited to tangible and easily measurable outcomes, which are often only loosely coupled to organizational benefits. Moreover, few measures exist that adequately address intangible, non-financial benefits to organizations, such as improved service quality or customer support. As a result, most measurement efforts generally fail to account for the customer/consumer originated value attributable to many of these intangible organizational outcomes. Brynjolfsson asserted that intangible benefits "ultimately lead to significantly greater shareholder return than the ones that are focused purely on cost-cutting and management control," the latter being the focus of most traditional performance measures (Leibs 2002). Indeed, while confirming the difficulty of identifying and measuring these intangible benefits, Byrnjolfsson noted that his previous studies found that up to 90 percent of the benefits associated with IT were intangible.

To deal with the intractable nature of intangibles, Byus and Lomerson (2004) have proposed a metric based on consumer-value that theoretically unifies the concept of value as it has been used and understood in the disciplines of marketing, organizational analysis, and economics. This metric can be used to provide a consistent and comparable measure of both tangible and intangible organizational outcomes. Value presents a particularly compelling performance measure as it is directly associated with the total benefits received by the organization from outcomes provided to its end-consumer. However, in order to employ this metric, a holistic conceptual framework must be developed to explicitly link "IS success" with organizational outcomes. Outcomes, as used within this paper, refer to all intended customer facing activities produced by an organization.

## How does Information Technology create value?

To measure IT performance with respect to its contribution to organizational performance, it is necessary to understand the underlying process by which IT contributes to organizational performance. According to Kim and Kim (2001), organizations may be viewed as a collection of processes that are implemented to support and satisfy the needs of both internal and external customers. All organizational processes must ultimately create or support outcomes that are consumed by external customers, which is the ultimate source of value for the organization. When a product or a service is provided directly to an external customer, consumption serves as the measure of organizational success. However, for internal consumers, the consumption of a product or service is not an equivalent measure of success. Instead, the appropriate measure is the increased capability of the internal consumer to provide a product or service to an external customer. More problematic is the identification and measurement of value in those organizational activities that produce intangible outcomes that are indirectly consumed by external customers, such as marketing activities. The challenge is particularly apparent in the case of IT infrastructure, which generally is not directly consumed externally (some e-commerce activities are notable exceptions) and frequently utilized to support multiple projects.

In examining information technology's ability to add incremental value to an organization, one must first understand the activities associated with IT within the context of a firm. These activities may be either internal consumer or external customer focused, as well as either product or service oriented. In addition, these activities are linked to form an IT value chain across a firm (Ward and Peppard 2002). For example, an IT organization may develop a supply chain management platform that is then provided as a service to the firm's business units. As internal consumers of the supply chain management system, the business units may use this application to both produce products (such as inventory reports) and to perform services (such as optimizing the just-in-time manufacturing process). Ultimately, the supply chain management system may increase the firm's ability to deliver the products that its external customers want, as well as its ability to deliver those products when demanded at lower cost. Such a scenario could provide the firm with a competitive advantage (whether transient or long-term), thereby potentially increasing the firm's profitability. An adaptation of the organization traditional value chain, shown in Figure 1, highlights the IS contribution to achieving organization value.

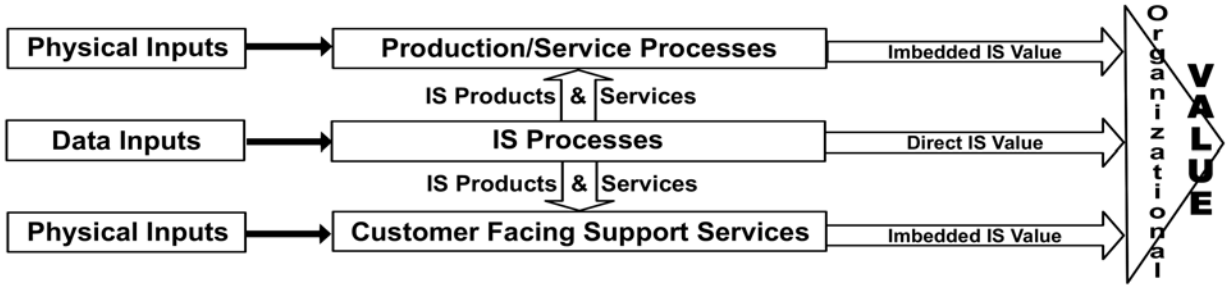


**Figure 1. IS Contribution to Organizational Value (adapted from Davis and Benamati, 2002, p. 166)**

In short, the derivation of value from IT investments results from a sequence of IT-based activities, an IT value chain. What is more, these value chains are frequently complex and protracted. As a result, the net effect of IT on organizational performance may accumulate across the organization's value chain, including a number of indirect benefits and costs. Under these circumstances, the measurement of value derived, or likely to be derived, from IT investments proves to be a challenging task. This view concurs with Smithson and Hirschheim's (1998, pg. 171) assertion that IT evaluation "clearly remains a thorny problem" of significant importance.

## Performance measures, Evaluation Methods, & the IT Value Chain

***Why have traditional performance measures proven difficult to apply to IT performance?***

First, in our initial review of the literature, we have found a number of evaluation methods that focus on IT as a product, assess the process of IT production, or are mostly used in evaluating IT products (despite being seemingly applicable to services). Conversely, we have found relatively few methods explicitly designed for, or commonly utilized in the process of, evaluating IT as a service. The notable exception to this finding was SERVQUAL, a method which evaluates IT performance with respect to the consumption of IT services. This methodology does not associate its results with the benefits to the organization that are attributable to the consumption of these services. The lack of service-oriented evaluation methods presents a significant barrier to effective IS/IT evaluation, since much of IT's contribution is through service delivery activities. Indeed, Kang and Bradley (2002) argued that because traditional evaluation methods are primarily based on products that are tangible, homogeneous and separable from their production and consumption, they don't transfer well to service delivery which is intangible, heterogeneous, and simultaneously produced and consumed. Similarly, Nambisan's (2001) examination of software service businesses vs. software product businesses suggested that differences between each segment are substantial enough that they inhibit/prevent a business in one segment from expanding successfully into the other segment. Nambisian's finding may help to explain why product-oriented IT departments often fail to effectively create or evaluate service-based IT activities, thereby ignoring critical components of many organizations' IT value chain.

Second, our review of the literature suggests that models that establish the relationship between various "IS success" measures and organizational performance do not fully address the complex and protracted nature of the processes imbedded in the underlying IT value chain. For example, in examining DeLone and McLean's IS Success Model (1992, 2003), the relationship between "intention to use / use," "user satisfaction," and "net benefits" seems straight-forward. However, if system use does not directly result in the consumption of the organization's product or service, the net benefits (in terms of organizational performance) derived from the IS cannot be fully measured at that point. Unfortunately, as IS benefits extend across an organization's value chain, their measurement becomes more difficult, because other (non-IS related) effects influence organizational performance. This may well explain the schism between "IS success" measures (which attempt to use surrogate measures to predict and/or measure IS' contribution to organizational performance) and organizational performance measures (which fail to explicitly isolate the contributions of IS and non-IS effects).

## Statement of Problem

To summarize, while the literature suggests that IT investments provide positive economic returns and increased productivity in general, it remains equally clear that individual IT projects at the firm-level continue to yield economically unpredictable results. Given that the purpose of IT investment is to add value to an organization, firms must undertake evaluations using appropriate measures to predict or review the outcomes derived from such investments. To successfully measure value,

however, one must first understand the activities from which value creation emanates. Specifically, the linkages between IS success and organizational value creation must be understood.

Given our understanding of IT value chains, which frequently involve a complex and protracted series of activities, we have come to question whether or not existing evaluation methods are robust enough to handle such contextual richness. We are not alone in this assessment. The extant literature is chock-a-block with researchers who claim that many of the existing evaluation tools and techniques are inadequate (Irani and Love 2001; Jones et al. 2001; Serafeimidis and Smithson 2000; Serafeimidis 2002; Smithson and Hirschheim 1998; Tuten 2003; Walsham 1999). Furthermore, researchers have demonstrated that IT investment decisions frequently result in poor and unexpected outcomes, thereby suggesting a failure on the part of existing measurement and evaluation methods.

Our initial literature review highlighted a tendency of evaluation methods to privilege product-based, as opposed to service-based, views of IT. In addition, our analysis suggests that existing models do not fully explain the relationship between IS success and organizational performance. This observation, if confirmed, could help to explain why existing evaluation practices frequently fail to accurately predict or reveal the organizational value derived from IT investments. Why could this be the case? Returning to our earlier discussion of IT-based activities providing organizational value, recall that organizational value is derived from a pattern of product and service use that in due course results in an external customer consuming a product or service provided by the organization. Accordingly, IT cannot directly deliver organizational value unless it is consumed or used in the immediate process of consumption by an external customer. In cases of the indirect consumption of IT products and services—which likely occurs in the majority of circumstances—the contribution of IT to organizational value must be measured across the firm's IT value chain. Yet, we believe that existing evaluation methods do not adequately address the complex and protracted nature of these relationships.

### *Research Objectives*

Based upon the above discussion, we have defined a series of objectives for our research program:

1. Develop a conceptual IS process model that explicitly links IT performance with organizational performance through the value chain of IT-based activities across both its product-based and service-based dimensions. This model will be explicitly mapped to the IS Success Model. The model will provide an appropriate framework to identify, evaluate and modify elements within the IS process that give rise to the independent variables identified by DeLone and McLean's IS Success Model (1992, 2003).
2. Develop a taxonomy that details existing evaluation methods and describes each technique's ability to assess the outcomes of IT-based process activities. Existing evaluation methods will be classified and presented in a comprehensive framework.
3. Perform a "gap analysis" to discover deficiencies where existing evaluation techniques may fail to adequately assess a category of IT-based activities. In particular the analysis will focus on the applicability of these methods to product-based vs. service-based views of IT.
4. Develop an evaluation model that applies one or more measurement and evaluation techniques to each phase of the conceptual framework across both product-based and service-based dimensions.

Currently, we are actively engaged in addressing the first objective in our research program. Preliminary results of this effort will be presented at the conference.

## Conclusion

In this paper, we have discussed our ongoing research efforts to examine the link between IT-based activities and organizational value creation, as well as appropriate methods to evaluate this IT value chain. While still early in our research program, we have come to believe that most evaluation techniques appear to exhibit a tendency toward a 'product-based' view of information technology while ignoring its "service-based" dimension. In addition, we have come to believe that existing evaluation methods are ineffective in addressing the complex and protracted nature of IT value chains. As a result, we call for the investigation of new approaches to IS/IT evaluation. Specifically, evaluation methods should address both the service- and product-based dimensions of IS, as well as provide a means for tracking the contribution of IT to organizational performance throughout the organization's value chain.

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