2008

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Journal of Information Technology Management

ISSN #1042-1319

A Publication of the Association of Management

DERIVING A TAXONOMY OF IT TRANSITION COSTS

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ABSTRACT

Those charged with implementing information technology often face the daunting task of assessing the total organizational costs of such initiatives. Our study posits evaluating such expenditures as IT transition costs – organizational resource expenditures stemming from a positive IT investment decision. A content analytic review of academic, IT- related articles yielded 57 cases germane to the construct. Data produced a meaningful and comprehensive taxonomy that distinguished IT transition costs by two dimensions: *goal* (prescriptive, evaluative, adaptive, corrective) and *target* (human, structure, process, technology). The significance of the taxonomy as a useful guide to both practitioners and future research is discussed.

Keywords*:* transition costs, expenditures, taxonomy, content analysis

INTRODUCTION

Despite the recognized importance of taking a comprehensive view when assessing organizational costs of IT initiatives, budgets often only focus on the anticipated tangible expenditures, such as the cost of hardware and software [12]. Costs most often referred to as indirect, soft, intangible, or hidden are usually not identified during the typical IT budget process, although their presence can dramatically influence the budget and success of many IT initiatives [1, 3, 14, 15].

Sociotechnical systems (STS) theory has shed some light on the abovementioned shortcomings by proposing that not only financial and technological costs, but also social subsystem costs, should be incorporated and considered when making various IT project decisions [24]. STS studies often define these costs as subtle human factors associated with the technology change. While work has been done to evaluate when and what type of firms are more likely to consider social subsystem costs in their IT investment decisions [21, 22], scant research has attempted to provide a clear conceptualization of the makeup of these costs that can prove useful to the practitioner looking for guidance in their IT initiatives.

Our study offers a meaningful and comprehensive lens for viewing the organizational expenditures resulting from a positive IT investment. We posit that it is within the IT transition that organizations incur not only the more common tangible costs often included in the IT

budget, but also the less-conceptualized, albeit significant, intangible or soft costs. We perform a content analysis of existing IT-related literatures in order to empirically derive a taxonomy of IT transition costs. The significance of the taxonomy for both practitioners and future research is discussed.

IT TRANSITION

We can map the beginning and end points of an IT transition to the Technology Adoption Model presented by Cooper and Zmud [6]. As indicated by their framework, the IT transition begins after adoption (once an investment decision has been made) and ends when the use of the technology becomes routine and is no longer "out of the ordinary." Thus, the end of the IT transition is characterized by a new equilibrium or dominant technology state marked by patterns of steady utilization of a particular application or system [11, 25].

However, in contrast to much of the technology adoption and diffusion literature, which assumes a positive path through all stages, the concept of IT transition does not assume a positive outcome. Similar to the assimilation gap literature, in which firms may adopt or invest in a new technology but fail to fully deploy or implement it [9], an IT transition may end with a return to the pre-existing technology (possibly the result of total project failure), an unplanned technology alternative (possibly due to problems with the originally-chosen technology or shifting business needs) or the planned technology (a positive investment outcome).

An investment decision triggers an IT transition if it results in a significant organizational change. This perspective is consistent with Johnson and Rice's [16] distinction between adoptive systems that involve little to no change to the organization's activity patterns, and adaptive systems that involve substantial changes to the organizational activities and work processes. Thus, an IT transition can potentially impact the existing structure of the organization. In addition, consistent with the predictions of punctuated equilibrium, an IT transition often results in the organization's entering a change state marked by a turbulent period in which users not only attempt to define the role of the information technology in the work environment, but also the rules, resources, processes, and procedures associated with its use [19].

It is worth noting the discriminant validity between the terms "IT transition" and "IT transaction". IT transaction brings to focus the comparative costs involved in task completion under alternative governance structures before and after an IT implementation [28]. Transaction costs are related to the specificity of assets and the uncertainties and risks involved in changing this specificity. During the IT implementation process, such asset specificity will provoke cost-increasing activities as well as cost-saving activities. While this discussion may appear to correlate with IT transition costs, it is important to note that transaction costs focus on the comparison of the outcomes before and after an IT implementation; thus transaction costs are static and cross-sectional in nature.

CONTENT ANALYSIS

The primary purpose of our study was to use a content-analytic approach to derive a taxonomy of costs related to IT transitions. Content analysis involves choosing a concept for examination and quantifying and categorizing its presence within sampled texts. The focus of the content analysis is the occurrence of selected terms within a text or texts, although the terms may be implicit as well as explicit [27]. From this perspective, each examined article is viewed as a data point or case. This method has been employed in a similar manner by previous researchers [23].

The first step in the analysis was to determine a working definition of the construct that would be used to direct the search for related literature. An *a priori* conceptual definition of the construct was created by explaining the phenomenon of interest as it related to the conceptual framework presented [8]. Therefore, IT transition costs were defined as activities occurring within an organization due to a technology shift, change, or investment.

The initial content analysis involved collecting and analyzing a narrowly defined list of all articles for the purpose of identifying relevant keywords and concepts that would aid in a broader literature search. *Journal of Management Information Systems* (*JMIS), MIS Quarterly (MISQ)*, and *Information Systems Research* (*ISR)* articles published between 1992 through 1994 (n=230) were collected for this initial analysis. These specific journals were chosen because of their consistently high ranking within the MIS discipline [2, 13]. There was no reason to believe that the resulting keywords would be significantly dependent on the year of the journal so the dates were chosen arbitrarily.

Each of the three researchers acted as a coder for the study and was assigned two of the three journals to analyze. This insured that at least two coders analyzed each article to identify relevant keywords and concepts that met the *a priori* conceptual definition of IT transition costs**.** In the event that only one coder identified a relevant keyword or concept within an article, a discussion between the two coders took place to determine the reason for the incongruence. If the two coders could not come to

an agreement, the third coder analyzed the article and provided an assessment for either including or not including the keyword or concept. Interrator reliability was .70

As expected with the content analysis method, the initial round of analysis also served to refine the conceptual definition of IT transition cost. Three additional criteria were added to the initial definition. First, recognizing that our discussion of IT transition is an organizational level construct, the definition was refined to activities that occur at the organizational or sub-unit level, rather than at the individual level. Second, the idea of an *activity* was found to be of insufficient clarity and was refined to mean an action with resource expenditure by the organization (e.g., dollars and/or time). Third, in a departure from Briggs et al [5], our analysis suggested that it is only after the organization has made a positive investment decision in a technology that the type or organization activities that we are concerned with begin. Thus, the definition was clarified to include only those activities resulting from a positive IT investment decision and excluding those required to select the technology. Based on the *a priori* definition and criteria derived from the initial literature search, a refined definition of IT transition costs emerged as *organizational resource expenditures stemming from a positive IT investment decision*.The second round of literature search involved using the derived definition and resulting keywords and concepts to aid in a broader set of both MIS and referent-discipline journals. Each coder performed an independent search within the *ABI Inform*, *Business Source Premier*, and *ProQuest* databases using systematically designed combinations of the derived keywords. These databases were selected because of their broad coverage of MIS and referent discipline academic journals. To reduce the chance that relevant articles would not be collected using the keyword search, all articles published in JMIS, MISQ, and ISR for years 1995 to 2004 were also collected.

Each coder then read the abstracts of the returned articles to assess the likelihood that any article contained an occurrence of a cost consistent with the definition and criteria. If the abstract failed to provide a clear indication of the article's potential to discuss an occurrence of an IT transition cost, the key word was located within the body of the article and an assessment was made by the coder as to whether the context surrounding the key word deemed the article necessary for inclusion in the next round of content analysis. A list of articles deemed worthy of further content analysis was placed in a database and parsed for duplicates.

Each coder then reviewed the abstracts of the entire list of articles contained within the database to ensure the potential of an article's containing an occurrence of an IT transition cost. At least two out of the three coders had to agree on the article's potential before it was included in the detailed content analysis. Interrator reliability was .80

After reading titles and abstracts of all the articles located in databases, researchers selected 57 articles in total. These articles were published among more than 20 journals in MIS, Management, and Marketing fields from 1963 to 2004. The resulting articles were partitioned into three overlapping subsets, so that two coders then analyzed each article.

Detailed content analysis of the articles involved reading the article in its entirety and recording occurrences of costs that met the definition and criteria of IT transition costs. Again, in the event that only one coder identified an occurrence of IT transition cost within an article, discussion took place to determine the reason for the incongruence. If the two coders could not agree on whether or not the concept was an example of an IT transition cost, the third coder read the entire article and provided an assessment for either recording or not recording the expenditure. Interrator reliability for this step was again .80.

DERIVED TAXONOMY

The subsequent analysis consisted of distinguishing salient attributes or characteristics of each occurrence of IT transition costs that were then used to categorize their similarities. Each category and its ensuing transition costs membership emerged *a posteriori* and inductively from the empirical analysis [25]. Thus, both the nature and the number of categories were determined by the population [10], resulting in a taxonomy that aimed to be exhaustive, mutually exclusive, and consistent [7].

Goal of Expenditure

The categories that emerged from the analysis fell within two primary dimensions. The first dimension was distinguished by the goal of the organizational resource expenditure. Within this dimension four subcategories emerged: prescriptive, evaluative, adaptive, and corrective.

IT transition costs that fell within the prescriptive category were purposely intended to effect a direct, targeted change in the business context. These costs were directed at ensuring that the desired solution was developed and implemented as designed. Examples of prescriptive transition costs included training personnel and converting the existing systems to ensure integration with the new technology.

IT transition costs subsumed within the adaptive category were the result of organizational expenditures in complementary resources necessary to improve or ensure transition success. Examples of adaptive transition costs included a change in management roles and the communication of project success to ensure user support.

Expenditures that fit within the evaluative category were incurred as the organization monitored the system and organization during and after the transition. This included measuring the intended and unintended impacts of the technology change, and assessing the technology's impacts relative to organizational goals. Examples of evaluative transition costs included maintaining a help desk and conducting post-implementation reviews.

Corrective IT transition costs resulted from resource expenditures related to addressing unanticipated, noticeable deviations in the expected technology transition. These expenditures may or may not have been the result of evaluative resource expenditures, as deviations may have been so great that there was little reason to incur costs evaluating the technology. An example of corrective transition costs included applying software patches.

Target of Expenditure

The second dimension that emerged from the content analysis pertained to the notion that various IT transition costs were aimed at, or had unintended effects on, changes in a subset of the organizational resources. Thus, the salient character of this dimension was distinguished by the target of the organizational resource expenditure. This dimension was consistent with the perspective of activity-based costing, which first requires the identification of the object to be costed [18]. Within the target dimension four subcategories emerged: human, structure, process, and technology. The subcategories of expenditures that emerged were similar and consistent with those presented by other researchers [4, 17, 20].

IT transition costs targeted at the human category were centered on the social subsystem and human resources. These expenditures were often related to changes that affected employees, as well as outside stakeholders such as customers and suppliers. Examples of human transition costs included training end-users with the skills and knowledge needed to utilize the new technology as well as hiring new personnel to support the technology.

Targeted expenditures that fit within the structure category were incurred as the organization dealt with the formal procedures and configuration of roles within the organization. Examples of structural transition costs included modifications to departmental roles and responsibilities, reporting structures, and physical office spaces and facilities.

Some targeted IT transition costs were aimed at changing organizational processes. "Process" in this context meant the set of logically related tasks which achieve a defined business outcome. Thus, expenditures within the category encompassed a broad class of business process design. Examples of process transition costs included process redesign, standardization, and specialization as well as changes to distribution channels.

Finally, IT transition costs subsumed within the technology category were the result of organizational expenditures related to the subsystems used to transform data into information and add value by enhancing information accuracy, form, accessibility, and timeliness. Undoubtedly the most commonly considered IT costs, such expenditures included hardware and software.

DISCUSSION

The primary purpose of our study was to employ a content analytic approach to derive a taxonomy of IT transition costs, defined as organizational resource expenditures stemming from a positive IT investment decision. Data from relevant academic, IT-related journals produced a meaningful and comprehensive taxonomy that distinguished IT transition costs by two dimensions: *goal* (prescriptive, evaluative, adaptive, corrective) and *target* (human, structure, process, technology).

The very recognition and categorization of IT transition costs serves as a reminder to organizations that there will likely be resource expenditures not normally reflected in the budgeting process, but which are required to ensure the success of their IT projects. In order to estimate the true cost of a technology transition, these additional expenditures should be taken into account. Such a realization can help practitioners who are responsible for assessing the total costs of IT investments to consider indirect and "soft" costs the organization may incur.

In discussing the taxonomy we only examined single dimensions and subcategories. An interactional perspective might prove useful for future research. Scholars should investigate how the interactions of categories might impact the relative cost and success of an IT transition. For example, organizational resource expenditures that are prescriptive and targeted within the human category might ensure that individuals are not only trained in using the technology as intended, but are also aware of and effectively adjusting to all the organizational changes, including how to perform in any new organizational roles resulting from the technology change.

There are several limitations of our study worth noting. The practical validity of the taxonomy is greatly dictated by the degree to which the selected journals are valid in their analysis and assessment of the research domain. We take an optimistic view here that the scholarly peer-reviewed journals indeed accurately and adequately capture the phenomena of interest.

Criticism of content analysis typically centers on issues of reliability and validity mainly due to the ambiguous nature of word meanings [27]. However, as in our current study and consistent with previous research using this method, content analysis is an exploratory inductive process. Its application is especially well suited when the purpose of the research is to increase knowledge of a phenomenon about which relatively little has been documented [27].

We deem our content analytic approach for deriving a taxonomy of IT transition costs as a crucial first step for researchers. However, the most significant future research apparent from our study is the validity of our taxonomy in both describing and predicting the actual resource expenditures occurring within an organization as a result of a positive IT investment decision. This approach would require a focus away from the academic journals that birthed this taxonomy into the intricate domain of the organizations in which our knowledge applies. It is only after this next logical step that a prescriptive or normative element to the taxonomy can be produced.

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