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Are there contagion effects in information technology and business process outsourcing?

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ABSTRACT

We model the diffusion of IT outsourcing using announcements about IT outsourcing deals. We estimate a *lognormal diffusion curve* to test whether IT outsourcing follows a pure diffusion process or there are *contagion effects* involved. The methodology permits us to study the consequences of outsourcing events, especially *mega-deals* with IT contract amounts that exceed US$1 billion. Mega-deals act, we theorize, as *precipitating events* that create a strong basis for contagion effects and are likely to affect decision-making by other firms in an industry. Then, we evaluate the role of different communication channels in the diffusion process of IT outsourcing by testing for the fit of the mixed influence model at the industry level. This helps us to evaluate the consistency of evidence at two different levels of analysis. We also evaluate two flexible diffusion models: the Gompertz and Weibull models. Our results show that the diffusion patterns of IT outsourcing do not appear to be lognormal, suggesting that IT outsourcing does not follow a pure diffusion process. Instead, we find the presence of contagion effects in the diffusion of IT outsourcing. During periods of the most rapid outsourcing growth – the *contagion periods* – the actions of the large and more visible firms may provide exemplars for smaller firms, reducing their inhibitions about committing to IT outsourcing. We also find that the results of the mixed influence and the Weibull models, which provide the best fit for overall IT outsourcing diffusion patterns, are potentially indicative of the existence of spillovers that might drive the observed contagion effects at the industry level.

1. Introduction

IT outsourcing involves "contributions by external vendors [to] the physical and/or human resources associated with … components of the IT infrastructure in the user organization" [34, p. 336]. Over the last two decades, IT spending and outsourcing have grown quickly and spread widely. In 2007, Gartner predicted global IT services spending would grow by 7.3% annually to US$958 billion in 2011 [10]. Forrester Research [11] more recently reported that IT spending in the United States will reach US$568 billion in 2010, nearly one-third of global IT spending of US$1.6 trillion. This includes a 3.8% gain in business process outsourcing, somewhat less than the cumulative annual growth of 10.9% from 2005 onwards that the consultancy, IDC, had been predicting [54]. Another 2010 study by Accenture [40] indicated that business process outsourcing spending has been growing more rapidly than IT outsourcing, with estimates that IT outsourcing spending will be between US$230 and US$250 billion, while business process outsourcing spending is likely to grow to US$300 billion by 2012. Business process outsourcing involves IT outsourcing and contracting to a third party of software, process management, and people to operate the outsourced service [19].

The main objective of our study is to understand the underlying factors of IT outsourcing growth and establish the extent to which the spread of IT and IT-supported business process outsourcing is subject to contagion effects in their observed patterns of growth. In addition to this, we also analyze the factors that influence the diffusion of IT and business process outsourcing, and test models that help us understand the rate and patterns of diffusion at the industry level. In particular, our goal is to provide evidence for the presence of *contagion effects*. They are "the spread of a particular type of behavior through time and space as a result of a prototype or model performing the behavior and either facilitating that behavior in the observer or reducing the observer's inhibitions against performing that same behavior" [42, p. 1006]. Contagion effects are present in the spread of diseases, and have *precipitating events* – like initial infection – that prompt diffusion across a population [43,45]. Such precipitating events often occur at random, independent of each other and across locations [15]. We will look for evidence that runs counter to the observation that IT outsourcing will exhibit linear growth. This is similar to what we might see with the diffusion of diseases also, where

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predisposing factors and population characteristics lead to the non-linear, non-random spread of epidemics. This analogy provides support for understanding how diffusion of IT outsourcing has occurred at the industry level.

For nearly two decades, academicians have been conducting research on outsourcing. Most studies have focused on a particular aspect of outsourcing. Aubert et al. [3] studied the risks that are involved, while Lacity and Willcocks [30] examined best practices in outsourcing. Loh and Venkatraman [33] are known for exploring the reasons that firms engage in outsourcing. Other research by Kern and Willcocks [29] has shown that firms tend to form focal outsourcing relationships with their IT service suppliers. Walden [53] studied how firms deal with intellectual property rights and their division in IT outsourcing relationships, which also are likely to affect the diffusion of outsourcing practices. More recently, Goo et al. [21] evaluated the role of service level agreements in relational management of IT outsourcing, and Benaroch et al. [6] have modeled and analyzed how to price backsourcing options in IT services outsourcing contracts. Also, Han et al. [26] have empirically evaluated the contribution of IT services outsourcing as an intermediate input factor in an analysis of industry-level output and productivity, suggesting its increasing importance in the American and global economy across many different industries.

Two notable studies have explored the sources of influence in the adoption of IT outsourcing. Loh and Venkatraman [34] treated IT outsourcing as an administrative innovation and focused on the factors in its adoption using diffusion modeling at the firm level. They found that, in the adoption of IT outsourcing, internal influences and imitative behavior play a more important role compared to external influences and the mass media. The authors analyzed Eastman Kodak's widely-publicized outsourcing decision in 1989 as a critical event and found that internal influences were more pronounced in the post-Kodak regime. In this research, they coined the term *Kodak effect*, as a means to indicate the influence of one firm's outsourcing announcement on the decision-making at other firms. Another study by Hu et al. [25] used a sample of 175 firms to test for different sources of influence on the adoption of IT outsourcing. They found that the mixed influence model was more effective in characterizing the diffusion of IT outsourcing. They tested for the Kodak effect in diffusion, but found no evidence of any differences between the results of different influence models in the pre-Kodak and post-Kodak regimes, contradicting Loh and Venkatraman's [34] findings.

Our focus is on trying to understand the extent to which contagion effects drive the spread of IT outsourcing, and what are the factors that influence these contagion effects. First, we will empirically examine whether IT outsourcing follows a pure diffusion process at the firm level, by estimating a lognormal distribution. This permits us to evaluate whether there are contagion effects present in our data. Random, independently-occurring large dollar mega-deals may act as precipitating events for outsourcing contagion, and large firms may act as exemplars for smaller ones, reducing smaller firms' inhibition to outsource. We will use firm size as a stratifier, since we were able to obtain data for it for all the observations in our data set, and because it is representative of other possible stratifiers in the illustration of our methodology in this research.

Second, we will test two flexible S-curve diffusion models and the factors that influence the adoption of IT outsourcing at the industry level. These additional tests at the industry level offer four distinct benefits. (1) Evaluating the factors that drive the contagion effects at the level of the industry is a way of providing additional evidence on the phenomenon that we are studying — through "triangulation" with data at the more aggregate level of analysis. (2) Analyzing industry level data gives us an opportunity to evaluate models that posit different structures for the communication channels to the marketplace. In this work, we evaluate the extent to which the internal and external communication channels were active. (3) This also gave us an opportunity to showcase corroborating results with respect to other research. In particular it gives us a chance to explore the explanatory capacity of the mixed influence model as the primary evaluator of the relationships in our data, and from this, to draw conclusions about the importance of the internal communication channel relative to the external communication channel in explaining the contagion outcomes. (4) Further, it provides a basis for us to evaluate other empirical models to obtain insights into the different diffusion patterns for IT outsourcing in several different industries.

We ask: how do IT and business process outsourcing spread at the firm level? Can IT outsourcing be explained by pure diffusion with no contagion effects? Or is there a contagion process involved? What role do different communication channels play? Do mega-deals of more than US$1 billion affect the observed patterns of diffusion? To understand the diffusion patterns and to examine whether IT outsourcing follows a pure diffusion process or there are contagion effects involved, we will estimate a *lognormal diffusion curve* [1]. This permits us to gauge the consequences of outsourcing events, and the effects of different orders of magnitude in IT contract amounts. We also evaluate the sources of influence in IT outsourcing diffusion at the industry level [35,36]. We will asses how firms may act as *market exemplars*, reducing a *market observer firm's* inhibitions against adopting IT outsourcing [42].

This article is laid out as follows. Section 2 presents the theory and hypotheses for this research. We discuss the theories that explain the diffusion process for outsourcing and consider the use and efficacy of growth models in prior studies. Section 3 introduces our two data sets and analysis procedure, and the empirical model that we apply to test our proposed theory. Section 4 provides the results of our base analysis, the influence models and flexible S-curve growth models. We cover the firm and industry levels with our empirical study, as a means to evaluate the extent to which our findings are consistent across the different levels of analysis. Section 5 includes a broader discussion and interpretation of what we have learned, and a summation of the main results and limitations.

2. Theory

IT outsourcing and IT-related business process outsourcing account for a large share of the overall outsourcing activities related to IT, and so they are appropriate for this research. *Business process outsourcing* is the contracting of a specific business process or service to a third party, and often involves IT outsourcing [19]. It includes software, process management, and people to operate the service that is outsourced. We consider the *diffusion of innovation theory* and other precursors to *contagion effects theory* to develop insights on IT outsourcing diffusion at an industry and firm level.

2.1. Diffusion of innovations

The *diffusion of innovation* is the process by which information about an innovation is communicated over time among members of a social system, leading to adoption [45]. Diffusion has been shown to follow an S-shaped curve with five phases. Each represents a proportion of the total number of adopters up to some time: innovators, early adopters, early majority, late majority, and laggards. Diffusion also involves *network externalities*, representing the boost in value a participant derives from the network as others join it [46]. With interdependent demand, multiple equilibria can exist at any price. Another related concept in diffusion studies is *critical mass,* which indicates the time in the diffusion process when the number of adopters is sufficiently large to naturally sustain further growth of adoption [38]. Sometimes, critical mass is referred to as a *tipping point* because the rate of adoption increases rapidly after critical mass is reached. Mahler and Rogers [37] suggest that adoption and critical mass involve decision-making by individuals who have insight about other potential adopters, thus influencing their own decision.