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Using process mining to identify coordination patterns in IT service management

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ABSTRACT

We empirically analyze the database used in the help desk process between a national US public agency and its global outsourcing provider. We considered the question of whether the database might reveal a deeper level of knowledge than was apparent from direct inspection. Our results reveal that four constructs underlie this process. Three are confirmed through covariance-based structural equation modeling and a fourth is implied through existing data. Our results suggest refinement in service level agreements to create a different type of governance coordination to assist in aligning the outsourcing provider's execution more closely with the client's needs.

1. Introduction

IT services have become critical and essential to business operations [1]. The continuing quest for cost efficiency and effectiveness has pushed even large organizations to consider outsourcing as a strategic business decision. The global market for IT services was estimated at $796 billion in 2009, a 1.7% decline over 2008 attributed to the economic recession rather than declining interest [15]. In a recent Gartner survey, 80% of US firms have considered outsourcing IT services [39]. Given the increasing interest in outsourcing IT services, understanding and governance by the client over outsourced IT services is critical to its success [9].

When IT services are outsourced, the process goals can fundamentally be altered based on the contractual structure entered into by the two organizations. While anecdotal evidence for such changes in process governance is becoming more frequent, the way process priorities get altered has not been systematically examined. The main objective of this research is to develop and test an approach to empirically examine the underlying coordination structure within IT service processes in outsourced arrangements. Using data from a large outsourcing relationship, we analyze an IT services database to identify the constructs that influence process coordination within the IT services organization. The results provide interesting and valuable insights by isolating the underlying coordination constructs emphasized in the relationship from the explicit coordination structures put in place through the data model. The driving research question focuses on whether the database may reveal a deeper level of knowledge than is apparent from direct inspection, and if so, how might this knowledge aid coordination between outsourcing customer and the provider.

Using coordination theory as a basis for analysis, we identify the constructs and associated structure driving coordination (Observe, Discovery, Produce, and Context), and we gain insights into how these constructs are influencing the overall coordination process. Building on constructs proposed by [47,48] we develop and evaluate a coordination focused model for an outsourcing provider's organization by taking a process monitoring perspective. There is only limited evidence and illustration of the provider's interest in root cause analysis. This skewed coordination toward process monitoring reveals the source of conflict between the outsourcer's and client's assessment of the outsourcing relationship. The results and their revelation of construct coordination conflict also point to where metrics need to be applied within the service level-agreement (SLA) in order to help align the outsourcer's actual process execution with the client's actual interests.

2. Literature review

Technological support of business processes has resulted in increasing demand for IT services and the associated need for active management. In one study [38], 64% of IT management and C-level respondents indicated that the management of IT services is more

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important now than ever; only 8% responded that it was less important. Reasons include the perceived strategic role of IT in contributing to business success, more sophisticated end user expectations of IT, the trend toward delivering IT functions as services, the need to control costs, and competitive pressure to optimize resources. Calls to IT services support are increasing, from an average of 1 call per employee to 1.36 calls per employee from 1995 to 2001 [6]. The average cost per call to IT services support is estimated at $22 [19]. Considering the direct expense, not to mention opportunity costs due to interrupted business process(es), an organization is obliged to understand much about IT services and IT service management, whether the services are provided internally or outsourced. Previous research has explored outsourcing cost reduction [2,3,20,25,29,49] where executive management regards in-house support largely as a cost burden.

In addition to a cost reduction perspective, improving business performance has also been noted as a strategic motivation for outsourcing [14]. The business performance motivation focuses on the knowledge intensive nature of IT services. IT professionals who are knowledgeable in latest technologies can facilitate improvements in firm's business performance while allowing the firm to concentrate on its core competencies. From this perspective, IT professionals with in-depth knowledge of the client were attributed as a significant factor in the success of an outsourced relationship [20]. Positive perceptions of vendor performance were influenced by the client's belief in the deep knowledge possessed by the provider's staff of the client's operations. This shared knowledge enhances a complementary and positive relationship with the outsourcer [14,29]. In this respect a shared knowledge model relating to the outsourced business process provides the client with an understanding of how the outsourcer executes the service. Lee, Miranda, and Kim suggested that strategic competence and/or technology catalysis arising from an outsourced relationship requires a more cognizant relationship [28].

IT services contractual terms, however, primarily address performance related concerns and drive the information collected during process execution. Most contracts include expectations on services requested ("service level agreements" or SLAs), metrics for setting the threshold goals for these SLAs, standard methods to measure each SLA, and indicators for deviations from actual to agreed-upon SLAs [18, p72–81]. Incentives or penalties may be included to encourage superior performance or to discourage (or respond to) poor performance. Table 1 provides a summary of typical SLA services. The SLA metrics for IT can be categorized as those that attend to *process execution* where the goal is a positive integration of technology into the client's business process and *process interruption* where the technology negatively impacts the client's business process(es). Process execution metrics include those such as availability, accuracy, currency, quality, capacity, and system performance. The goal of these metrics can be viewed as desiring a seamless integration of technology into the client's business process. Not all aspects of IT are totally seamless; there are some such as installing upgrades and user training that, while interrupting the client's general business, are intended to provide improvements and are also included into the process execution orientation. Process interruption activities are often the focus of the IT Services help desk. Process interruption metrics include metrics such as problem resolution, recovery time, repeat call incidences, repair time, percentage of abandoned calls, and security incidents. These activities negatively impact the client's general business process and once addressed merely allow the interrupted process to resume.

For each SLA category element, metrics are established by negotiation between provider and client. Fig. 1 depicts the process relationship between client and provider; at the center is the IT service request or problem. The provider implements a process it believes will satisfy a client's need and focuses on monitoring process efficiency. The client appreciates process efficiency, yet also wants to understand the nature of process interruptions, including both their immediate cause and resolution, and often some level of root cause analysis to avoid future occurrences. The client may not recognize

Table 1
Summary of typical SLA services adapted from: [12].

Sample SLA category	SLA service	Process orientation
Accuracy–installation	Desktop hardware and operating system, directory services, office automation SW	Process interruption
Availability	Application server, desktop access to corporate applications, desktop hardware and operating system, desktop video teleconferencing, directory services, domain name server system services, e-mail services, external networks, file sharing services, intranet access, LAN/WAN network connectivity, mainframe service access, network operations display organizational messaging, print services, proxy and caching service, remote access, voice communications, web access and newsgroup services	Process execution
Capacity	Remote access	Process execution
Currency–software	Office automation SW, software distribution and upgrading (release/version), software distribution and upgrading (patch)	Process execution
Integrity–data	File sharing services, intranet access	Process execution
Interoperability	Desktop access to corporate applications, e-mail services, external networks, information assurance, intranet access, mainframe service access, office automation SW, organizational messaging, proxy and caching service, remote access, WAN network connectivity, web access and newsgroup services	Process execution
Hardware repair	Application server (mean time to repair backbone to server network segment), laptop wireless dial in (mean time to repair HW), voice communications	Process interruption
Performance–technology	Desktop video teleconferencing, e-mail services, external networks, LAN network connectivity voice communications, web access and newsgroup services	Process execution
Performance–staff	Office technology relocation, security user training execution, user training execution,	Process interruption
Problem resolution	Basic help desk services, desktop hardware and operating system, e-mail services, external networks, intranet access, organizational messaging, LAN/WAN network connectivity, security incident reporting, security vulnerability remediation	Process interruption
Reliability	Desktop video teleconferencing, information assurance (certification revocation, public key infrastructure X.509 capabilities, user registration of public key infrastructure)	Process execution
Recovery	File sharing services, software distribution and upgrading (upgrade removal), security product refresh, workstation refresh	Process interruption
Responsiveness–network	Directory services, intranet access	Process execution
Responsiveness–staff	Asset management (implementation and removal), basic help desk services, integration and testing (configure asset), office technology relocation, repeat call incidence, security incident response, user training, technology refresh, voice communications	Process interruption
Performance	Application server, file sharing services, domain name server system services	Process execution
Performance quality	Basic help desk services(% calls abandoned, 1st call resolved %), desktop video teleconferencing (audio and video), proxy and caching service, user training	Process interruption
Security	Security accreditation, 3rd party physical inspections, security integrity	Process interruption
Timeliness–directory update	Directory services, technology refresh timeliness	Process execution