

Association for Information Systems  
**AIS Electronic Library (AISeL)**

---

AMCIS 2007 Proceedings

Americas Conference on Information Systems  
(AMCIS)

---

December 2007

# Impact of Service-Oriented Architecture Adoption on Electronic Supply Chain Performance

Sanjeev Kumar  
*University of Michigan*

Follow this and additional works at: <http://aisel.aisnet.org/amcis2007>

---

## Recommended Citation

Kumar, Sanjeev, "Impact of Service-Oriented Architecture Adoption on Electronic Supply Chain Performance" (2007). *AMCIS 2007 Proceedings*. 411.  
<http://aisel.aisnet.org/amcis2007/411>

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2007 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact [elibrary@aisnet.org](mailto:elibrary@aisnet.org).

# Impact of Service Oriented Architecture Adoption on Electronic Supply Chain Performance

**Sanjeev Kumar**

Ross School of Business, University of Michigan, Ann Arbor

sankum@umich.edu

## Abstract

Service Oriented Architecture (“SOA”) has been viewed as a strategic approach to IT that provides increased flexibility. However, there is scant research evidence of SOA adoption leading to tangible performance benefits across a cross section of firms. We fill this research gap by empirically analyzing the impact of SOA adoption on the performance of electronic supply chains for a cross section of large US firms. We estimate the moderating impact of SOA adoption on relationships between supply chain performance and complexity and transparency of information sharing relationship between firms and their suppliers. Our results show that while SOA adoption mitigates the negative effects of information sharing complexity, it also reduces the positive benefits of information sharing transparency. Thus while SOA adoption can lead to potential improvements in performance, the extent of the benefit depends on characteristics of the information sharing relationship.

**Keywords:** Service Oriented Architecture, SOA, Supply Chain, Business Value of IT

## Introduction<sup>1</sup>

Service Oriented Architecture is a software architecture approach where the basic element of design and development is a service (Papazoglou and Georgakopoulos 2003). In SOA, services are self-describing components that can be recognized by client applications through lookup from a registry (e.g. UDDI). The client application and the service provider communicate via standard protocols (e.g. SOAP, HTTP) and exchange information using standard data formats (e.g. XML). SOA has widely been argued to help enterprises become more flexible and reduce costs. SOA provides flexibility and dynamic re-configurability, thereby enabling businesses to meet their end-to-end process realization. Many vendors and user firms have invested billions of dollars on SOA (Taft 2006). Worldwide spending on SOA is estimated to reach \$9 billion by 2009 (Dubie 2006).

At the same time managers have expressed difficulty in extracting tangible business value from SOA. Although practice press has devoted significant energy and space for effective implementation of SOA and difficulty in extracting business value from SOA (Sealy 2006), extant academic research has yet to rigorously study the business value of SOA. While IT managers have to make a decision on SOA adoption to facilitate migration to new technology platforms and to enable efficient information exchange in their supply chain, they have little information available about the organizational impact of SOA adoption, especially about impact of SOA adoption on supply chain performance. Although previous IS research has

---

<sup>1</sup> A previous version of this paper was nominated for the best paper award at the Hawaii International Conference on Systems Sciences (HICSS) 2007.

focused on general benefits from adoption of web technologies (Chatterjee, Grewal, and Sambamurthy 2002) and electronic supply chains (Malhotra, Gosain, and Sawy 2005, Subramani 2004), to our knowledge there has been no broad cross-sectional empirical study of performance impact of adoption of new web technologies or architectural paradigms like SOA. We bridge this research gap in this study by empirically analyzing the impact of SOA adoption on performance of electronic supply chains. In this paper we also attempt to discover the mechanisms through which SOA impacts performance of supply chains.

This research contributes to the business value of IT literature by first providing evidence of the business value of the specific technology paradigm – SOA, and second, by discovering the causal mechanism of business value generation by the technology. This research also provides managers with important insights into the performance impact of SOA adoption and the antecedents of business value of SOA. We believe this research would provide the foundation for technology level business value of IT research in SOA context and also help managers make more informed decisions about SOA adoption.

## Background and Related Literature

Proliferation of specialized software systems like ERP, SCM, CRM, EDI etc. have made integration of software systems costly and difficult. To enable information sharing across organizational departments and information systems a new breed of enterprise and web technologies (e.g. web services) and architectures (e.g. SOA) have emerged which provide a platform for integration. These integrating technologies use standardized protocols and data formats for exchanging information across enterprise applications. By supporting sharing of information and automation of underlying business processes, these integrating technologies improve performance and business agility (Subramani 2004). Malhotra et al (2005) studied the relationship configurations in supply chain relationships and the creation of new knowledge using an absorptive capacity framework. Their work provides important insight into the mechanisms in inter-organizational systems, information exchange and the role of supply chain configurations. Their research however was technology agnostic and instead focused on the interface standards. Subramani (2004) investigated the benefits of IT use in supply chains and found that relationship specific deployment of IT played a mediating role on the benefits from supply chain management systems. Chatterjee et al (2002) have also described the factors affecting the assimilation of web technologies in ecommerce firms.

There is a small but growing body of literature that describes this new technology paradigm including SOA or web services. Sambamurthy, Bharadwaj, and Grover (2003) provide a theoretical model for analyzing the role of information technology in business strategy and how new technologies are leading to strategic flexibility in firms. They further encourage a line of inquiry into how firms achieve this agility and what technologies lead to flexible business processes and business models. Their research, while providing solid theoretical foundations, lacked any empirical support that will enlighten managerial decisions to invest in these new technologies including web services and SOA. Chatterjee et al (2002) also suggest that organizational assimilation of web technologies leads to very useful business process benefits and study the role of top management sponsorship, investment rationale and extent of coordination on such an assimilation of web technologies. These studies point out the need to analyze specific phenomena involving the adoption of integrative web technologies and architecture like SOA and their impact on organizational performance.

## Research Design

We are using the supply chain relationship between firms and their suppliers as the context for this study. Supplier relations have been the traditional focus of IT investments (e.g. EDI and SCM systems) and provide an ideal setting to study performance impact of SOA adoption. Based on prior supply chain literature as well as potential benefits of SOA adoption, we have framed the impact of SOA adoption on supply chain performance in terms of two main characteristics of the information sharing relationship (information supply chain) between the firm and its suppliers: complexity and transparency. Complexity of information sharing relationship measures “how” information is shared: custom reports, real time access, ad-hoc reporting, scheduled access etc. Transparency of information sharing relationship refers to “what” information is shared: production information, customer information, financial information, marketing and promotion information etc. We first look at how these characteristics of the information supply chain impact the performance of the supply chain and then we focus on how adoption of SOA moderates their impact on supply chain performance.

Information supply chain complexity is expected to have a negative impact on supply chain performance as higher complexity will place incremental burden on managers to get and understand the information shared. Information supply chain transparency, on the other hand, will lead to a positive impact on supply chain performance as managers now will have access to more comprehensive information to make decisions. Accordingly, we present the two main effects:

**Hypothesis 1:** *Higher complexity of the information supply chain is associated with lower supply chain performance*

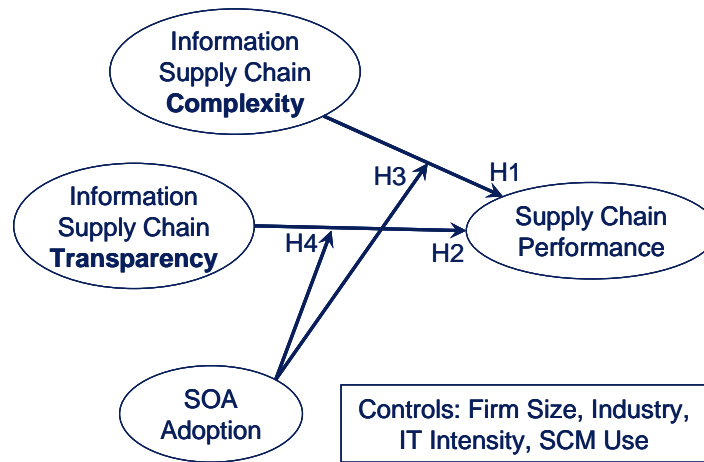
**Hypothesis 2:** *Higher transparency of the information supply chain is associated with higher supply chain performance*

Adoption of SOA in the supply chain can be expected to impact the performance of the supply chain in two ways. First, by improving the flexibility of the information sharing process, SOA would reduce the negative impact that information supply chain complexity has on supply chain performance. Second, SOA adoption would lead to easier sharing of information between the firm and its suppliers, resulting in further augmenting the positive impact that information supply chain transparency has on supply chain performance. Thus, we posit the two interaction effects:

**Hypothesis 3:** *Negative impact of information supply chain complexity is lower for firms with higher SOA adoption*

**Hypothesis 4:** *Positive impact of information supply chain transparency is higher for firms with higher SOA adoption*

The above hypotheses are illustrated in the research model shown in Figure 1 below.



**Figure 1: Research Model**

## Data and Methodology

Data used in this paper about SOA adoption and Information supply chain characteristics was collected by the reputed IT industry publication InformationWeek as part of its annual InformationWeek500 ranking of the IT industry for the year 2003. The survey was answered by 407 firms. We discarded 19 responses because of missing values or data errors. Thus our final sample consisted of 388 firms. The InformationWeek data was supplemented with supply chain performance, firm size and industry control data collected from Compustat.

All the constructs in the research model (Figure 1) are formative constructs with multiple measures. We have used Ordinary Least Square (“OLS”) to estimate the research model. The preliminary model was statistically significant and satisfied conventional OLS assumptions.

## Preliminary Results

Preliminary results support the main effects hypotheses that information supply chain complexity reduces supply chain performance while information supply chain transparency improved supply chain performance. Further, we find significant support for the hypotheses that SOA adoption mitigates the negative effect of information supply chain complexity. However, the impact of SOA adoption on the relationship between information supply chain transparency and supply chain performance was found to be negative. Overall, impact of SOA adoption on supply chain performance was positive and fully mediated through the two interaction effects.

Preliminary results show that while SOA adoption does lead to tangible business value, its impact is not always positive. Specifically, impact of SOA adoption depends on the characteristics of the processes on which SOA is implemented. We believe that this research will provide the foundation for future research on business value of SOA and also provide directions to managers in making SOA adoption decisions.

## Selected References

1. Chatterjee, Debabroto, Rajdeep Grewal, and V. Sambamurthy. 2002. Shaping up for e-commerce: Institutional enablers of the organizational assimilation of web technologies. *MIS Quarterly* 26, (2) (Jun): 65.
2. Dubie, Denise. 6 hot technologies for 2006: SOA. in Network World [database online]. 2006 [cited 03/15 2007]. Available from <http://www.networkworld.com/research/2006/010906-soa-hot.html>.
3. Malhotra, Arvind, Sanjay Gosain, and Omar A. El Sawy. 2005. Absorptive capacity configurations in supply chains: Gearing for partner-enabled market knowledge Creation1. *MIS Quarterly* 29, (1) (Mar): 145.
4. Papazoglou, M. P., and D. Georgakopoulos. 2003. Service-oriented computing. *Association for Computing Machinery. Communications of the ACM* 46, (10) (Oct): 24.
5. Sambamurthy, V., Anandhi Bharadwaj, and Varun Grover. 2003. Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary Firms1. *MIS Quarterly* 27, (2) (Jun): 237.
6. Sealy, Rich. 2006. SOA is hard to do, Aberdeen finds. in SearchWebServices.com [database online]. 2006. [cited 03/15/2007]. Available from [http://searchwebservices.techtarget.com/originalContent/0,289142,sid26\\_gci1235685,00.html](http://searchwebservices.techtarget.com/originalContent/0,289142,sid26_gci1235685,00.html)
7. Subramani, Mani. 2004. How do suppliers benefit from information technology use in supply chain relationships?. *MIS Quarterly* 28, (1) (Mar): 45.
8. Taft, Darryl K. IBM bets big on SOA. in EWeek [database online]. 2006 [cited 03/15 2007]. Available from <http://www.eweek.com/article2/0,1895,2003500,00.asp>.