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Service-oriented technology and management: Perspectives on research and practice for the coming decade

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ABSTRACT

Service-oriented technologies and management have gained attention in the past few years, promising a way to create the basis for agility so that companies can deliver new, more flexible business processes that harness the value of the *services approach* from a customer's perspective. Service-oriented approaches are used for developing software applications and software-as-a-service that can be sourced as virtual hardware resources, including on-demand and utility computing. The driving forces come from the software engineering community and the e-business community. *Service-oriented architecture* promotes the loose coupling of software components so that interoperability across programming languages and platforms, and dynamic choreography of business processes can be achieved. Nevertheless, one of today's most pervasive and perplexing challenges for senior managers deals with how and when to make a commitment to the new practices. The purpose of this article is to shed light on multiple issues associated with service-oriented technologies and management by examining several interrelated questions: why is it appropriate now to study the related business problems from the point of view of services research? What new conceptual frameworks and theoretical perspectives are appropriate for studying service-oriented technologies and management? What value will a service science and business process modeling offer to the firms that adopt them? And, how can these approaches be implemented so as to address the major challenges that organizations face with technology, information and strategy? We contribute new knowledge in this area by tying the economics and information technology strategy perspectives to the semantic and design science perspectives for a broader audience. Usually the more technical perspective is offered on a standalone basis, and confined to the systems space – even when the discussion is about business processes. This article also offers insights on these issues from the multiple perspectives of industry and academic thought leaders.

1. Introduction

The recent convergence of information and communication technology (ICT) design, execution, storage, transmission and reusable knowledge is creating new opportunities. They include redeploying people, reconfiguring organizations, sharing information (e.g., language, processes, metrics, prices, policies and laws), and investing in technologies. The investments are intended to yield technical solutions that adjust to a changing business environment, and effectively leverage the value of knowledge in service relationships that produce high business value (Arsanjani et al., 2004). These are what we call *services* and *service-oriented thinking.*

The *service orientation* is emerging at multiple organizational levels in business, and it leverages technology in response to the growing need for greater business integration, flexibility, and agility. A branch of the computer science literature related to IT infrastructure of Web Services views *service-oriented architecture* (SOA) as "... a technical architecture, a business modeling concept, a piece of infrastructure, an integration source, and a new way of viewing units of automation within the enterprise" (Keith et al., 2006). For greater clarity though, we recommend a definition of service-oriented architecture from the Organization for the Advancement of Structured Information Standards (OASIS) (OASIS, 2006, p. 6), : "A paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact

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with and use capabilities to produce desired effects consistent with measurable preconditions and expectations." Thus, service-oriented architecture is not limited to just Web services, or technology or technical infrastructure either (Brittenham et al., 2007). Instead, it reflects a new way of thinking about processes that reinforces the value of commoditization, reuse, semantics and information, and creates business value (Bieberstein et al., 2005).

In several branches of information systems (IS) research, the issue of service-oriented technologies (Brown et al., 2006; Demirkan and Goul, 2006), especially service-oriented architectures (Arsanjani et al., 2004; Spohrer et al., 2007), and service science (Bitner and Brown, 2006; Chesbrough and Spohrer, 2006; Maglio et al., 2006) are currently being intensively studied and discussed by many researchers and practitioners. Despite the multitudes of publications that can be found on these topics from practitioners (e.g., Horn et al., 2005; Spohrer, 2005) and academics (e.g., Bitner et al., 2008; Lusch and Vargo, 2006; Martin-Flatin et al., 2006), several questions are still left open. They include, for example, the relationship between the business view on services and the underlying technical elements that are required for implementing it. Are services in this regard a new concept and is there a demand from the side of business to study services? What is driving service innovation and how can the concepts that are developed on the technical level be used as a means of support in the organization that creates high business value? What are the current challenges for enterprises and how can they be met by using service-oriented concepts and technology?

In an attempt to shed light on some of these questions, a panel of leading experts from different areas of IT services and service science, representing research in academia and industry, came together to discuss these issues. This occurred in a session entitled "Service-Oriented Technology and Management" at the 2007 International Conference on Electronic Commerce on August 21, 2007, which was held at the Carlson School of Management, University of Minnesota in Minneapolis. The session discussion focused on four key questions:

- **Question 1**: *Why is it appropriate to study leading business problems in IS and technology-related to processes, infrastructures, architectures, and information capabilities from the point of view of services research?*

It is sometimes argued that the current discussion on services is just a revival of discussions that have been occurring for quite a while. On the technical side the encapsulation of functionality in software and its adaptation for other components has been used for several years (e.g., Booch et al., 2007; Lusch and Vargo, 2006). Also, from the viewpoint of economics, a turn toward a service economy cannot be regarded as a new concept; there has been work going on for years that has adopted this general perspective (e.g., Andersen et al., 2000; Baily, 1986; Bosworth and Triplett, 2004). However, it is not clear how the increased amount of services that are now present in the global economy and the current IT architectures which support them should be understood together. Even more important is how service innovations will be carried out in the future and what will be the necessary support structure to make them successful, to maximize business value, and to create high social welfare.

- **Question 2:** *What new conceptual frameworks and theoretical perspectives are appropriate for studying service-oriented technologies and management?*

To provide guidelines to business people and IT leaders and staff members, frameworks that evaluate a range of issues related to service-oriented technologies and management should be beneficial (Maglio et al., 2006; Spohrer et al., 2007). They can provide insights for day-to-day operations conducted under the service paradigm, as well as address longer-term strategic perspectives (Demirkan et al., 2002). They can also effectively harmonize the overall technical considerations and interdependencies with the managerial and strategy challenges that a firm faces.

- **Question 3:** *What value will a science of services and business process modeling offer to the firms that adopt them?*

The representation of business processes and their transformation into executable workflows are issues that are being addressed by new state-of-the-art approaches, including the Unified Modeling Language (UML) (Management Group, 2008; White, 2004) and Business Process Modeling Notation (BPMN) (e.g., Management Group, 2008). Questions remain though: how should these modeling relationships and representation formalisms change in the light of a service-oriented economy on one side and emerging service-oriented architectures on the other side (Arsanjani et al., 2004; Zhang et al., 2006)? And how should changes in the business side influence the composition of information systems, and vice versa? Research into these questions will establish a foundation for the creation of a new discipline, as well as for the creation of new and effective technical and managerial practices (Allen et al., 2006).

- **Question 4:** *How can these approaches be implemented so as to address the major challenges that the enterprise faces with technology, information and strategy?*

For the implementation of service-oriented architectures, some standards and frameworks are available. The choice for specific solutions does not only have to be based on IT constraints though. It may hinge on the strategic implications of a given choice. Thus, these relationships should be viewed as being of high importance, and it is also critical to view them from different perspectives that integrate business and technology-related opportunities and implementation (Marks and Bell, 2006).

The remainder of this article is laid out as follows. Section 2 provides a brief narrative on the motivation in the business economy for the service-oriented approach. It also briefly discusses services, service systems and service science. And it provides some background on IBM Corporation's "Services Science Management and Engineering" (SSME) initiative and its related research agenda (Chesbrough and Spohrer, 2006; Maglio et al., 2006). Section 3 discusses the challenges that enterprises face when they confront the complexity and brittleness of their current infrastructures and business models. The suggested solution for the enterprise emphasizes loose coupling, agility, business and technology semantics, meta-modeling of process relationships within organizations and the reuse of a variety of business process and systems artifacts that are viewed as forming a firm's service-oriented architecture. Section 4 delves more deeply into the nature of services, discusses their shared characteristics, and the related requirements for success. Section 5 discusses economic perspectives on service-oriented technologies and management approaches, and provides some thoughts on how to approach a range of issues and problems that can be evaluated using the related theory. Section 6 offers a number of managerial recommendations, the related research directions, and some final thoughts. Overall, we contribute new knowledge by tying the economics and IT strategy perspectives to the semantic and design science perspectives for a broader audience. Usually the more technical perspective is offered on a standalone basis, and confined to the systems space – even when the discussion is about business processes.