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ABSTRACT

The concept of service-oriented enterprise has great potential. Taken literally, however, it raises many issues, including practical difficulties of creating a service-oriented enterprise in the computer science sense and the huge leap from flexible IT infrastructure to an enterprise that is genuinely oriented toward providing services for customers and employees. This paper is a conceptual contribution showing how work system theory can help in seeing analysis and design issues beyond technical architectures that have dominated research to date. After summarizing background concepts related to service, service systems, and the vision of service-oriented enterprises, this paper explains how work system theory can help in recognizing many obstacles on the path toward that ideal. Recognition of those obstacles supports analysis and design by illuminating the amount of change required to move to a genuinely service-oriented enterprise and by helping analysts and designers decide where service-orientation in its various guises is really appropriate.

Keywords

Service-oriented enterprise, service, service-oriented architecture, service system, work system theory

INTRODUCTION

The service-oriented enterprise (SOE) has become an important rallying cry for technologists trying to develop more effective ways to create, use, and maintain software infrastructures and for technology companies trying to sell corporate-level products and services. Ideally, adoption of SOE should make it possible to develop software and technical infrastructures that are both efficient and flexible by decomposing computer and network systems into service-providing modules that answer service requests using pre-defined message protocols. At least in theory, that type of architecture should make it easier to respond quickly to shifting needs of an entire enterprise.

While the technical architecture has many advantages related to computer systems and networks, the underlying logic of interactions does not translate well to services provided by one person for another. In examples such as obtaining cash from an ATM or purchasing tickets in simple situations, people are happy to receive services through unambiguous requests that are submitted and answered electronically. In many other situations, such as receiving consulting and hospitality services, human clients for services usually want to deal with a person through an unscripted exchange of ideas, information, and feelings. Service orientation in relation to services by people for other people clearly means something different from service orientation in relation to computers responding to requests from other computers.

The term *service-oriented enterprise* brings an implicit promise that the entire enterprise is oriented toward providing service. Research to date and published literature on SOE focuses primarily on issues related to software and network architecture and is less specific about the orientation of enterprises toward providing service for their customers or employees. Instead, it. While that omission is not at all problematic for computer scientists who know what they mean by SOE, the term *service-oriented enterprise* overlaps with sales and marketing rhetoric of technology providers and consulting firms, and sometimes is viewed as overlapping with research in areas such as service marketing, service operations, organization behavior, strategy, and service science (e.g., Chesbrough and Spohrer, 2006). One might wonder whether there is any genuine link between the pursuit of SOE as a technical architecture and the actual service orientation of an enterprise or any of its major departments or processes. Probably more important is the need to think about challenges and practicalities of pursuing service orientation in every aspect of an enterprise.

Overview. This paper uses work system theory (WST) as a link between services, service systems, and SOE. As background, it summarizes static and dynamic views of work systems within WST. Its exploration of SOE starts by reviewing definitions of service from computer science and from service marketing and service operations. After proposing a definition of service that applies across all three areas, it illustrates the vision and promise of SOE and the types of technical details that are involved in moving to SOE. It ties everything together by proposing the concept of a "genuinely service-oriented enterprise" (GSOE) and using aspects of the static and dynamic views of work systems to show that moving toward GSOE would entail major analysis and design challenges that go far beyond the challenges of moving to SOA architecture.

WORK SYSTEM THEORY

Work system theory (WST) is a theory for analysis (Gregor 2006) that provides a way to view a situation as a work system, just as actor-network theory, activity theory, coordination theory, and structuration theory provide ways to analyze situations using other concepts. Since many of the ideas in WST have been published previously, we review basic premises and two central frameworks before using WST in relation to SOE.

Domain of relevance. WST is relevant for describing, analyzing, designing, or evaluating systems within organizations, whether or not IT is involved. It also covers systems that cross organizations.

Unit of analysis. The unit of analysis is a work system, a system in which people and/or machines perform processes and activities using information, technology, and other resources in order to produce products and/or services for internal or external customers. Enterprises that grow beyond a largely improvised start-up phase can be viewed as consisting of multiple work systems. Almost all significant work systems in business and governmental organizations rely on IT in order to operate efficiently and effectively.

Information systems. WST applies to work systems in general and, by inheritance, to special cases of work systems such as information systems, where all processes and activities involve processing information. (Alter, 2008a). Sociotechnical IS include accounting systems in which accountants produce financial statements and planning systems in which managers produce plans. Automated IS include search engines that produce search results and automated stock trading systems that produce and/or execute buy orders or sell orders.

Static View of a Work System

Work System Framework. The nine elements of the work system framework (Figure 1) are the basis for describing and analyzing an IT-reliant work system in an organization. The framework outlines a static view of a work system's form and function at a point in time and emphasizes business rather than IT concerns. Figure 1 identifies four internal elements of a work system (process and activities, participants, information, and technologies) plus five other elements (customers, products/ services produced, environment, infrastructure, and strategies) that are part of even a rudimentary understanding of a work system. Customers of a work system often are participants, as when doctors examine patients. The elements of the work system framework are explained in Alter (2006; 2008a). The framework covers situations that might or might not have a tightly defined business process and might or might not be IT-intensive. Figure 1 says that work systems exist to produce products/ services for customers. The arrows say that the elements of a work system should be in alignment.

System identity and integrity in the presence of change. A work system maintains enough integrity to be described, measured, and managed as a system even though specific features or components may change incrementally or may not operate in accordance with designer intentions. Recognition of incremental change mirrors Feldman and Pentland's (2003) distinction between ostensive vs. performative aspects of routines, which "creates an on-going opportunity for variation, selection, and retention of new practices and patterns of action within routines."

Dynamic View of a Work System

Work System Life Cycle Model (WSLC). Figure 2 says that work systems change over time through iterations involving planned and emergent change. (Alter, 2006; 2008a). Planned change occurs through defined projects in which resources are allocated to create a work system or change aspects of an existing work system. Emergent or unplanned change occurs through incremental adaptations and workarounds as work system participants try to minimize or bypass obstacles that interfere with expeditious achievement of work goals.

The WSLC represents planned change as projects that include initiation, development, and implementation phases. Development involves creation or acquisition of resources, e.g., software development, acquisition, or configuration and creation of procedures, documentation and training materials needed for implementation of the new version of the work system. Implementation means implementation in the organization, not implementation of algorithms on computers.

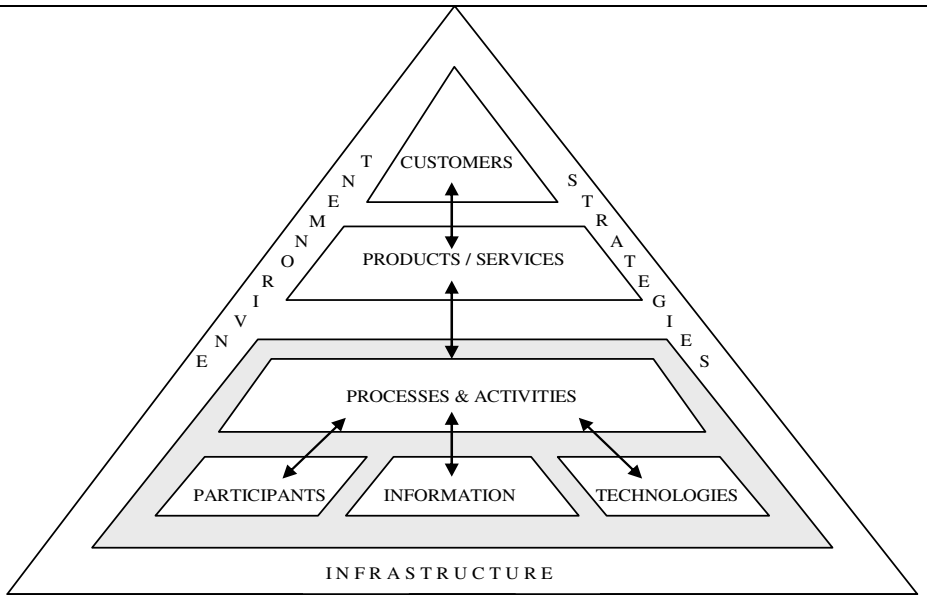

Figure 1. Work System Framework (Alter, 2006, p. 13; 2008a, p. 461)

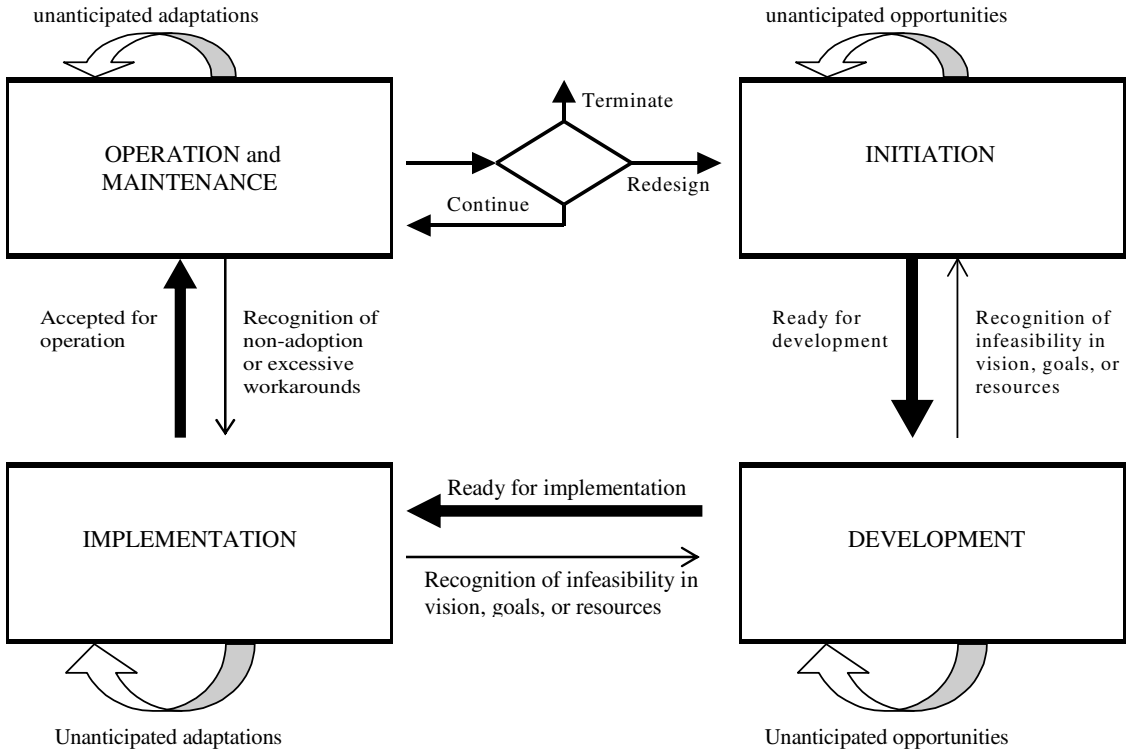

Figure 2. The Work System Life Cycle Model (Alter, 2006, p. 91; 2008a, p. 467)

Figure 2 uses inward-facing arrows to represent emergent change such as ongoing adaptations, workarounds, and experimentation, all of which do not involve separate allocation of significant project resources. The inward-facing arrow for

the operation and maintenance phase also represents emergent changes in practices or goals that occur over longer periods without explicit planning. The inward-facing arrows for development and implementation phases of formal projects represent emergent changes in intentions, designs, and plans based on insights after the initiation phase.

Having summarized WST, we approach SOE by first defining service and service system.

DEFINITION OF SERVICE AND SERVICE SYSTEM

Computer scientists and other researchers who focus on SOE tend to view service within a computing paradigm whereby a server entity produces an unambiguous response to an unambiguous request from a client entity. The client and server are software or machines that interact through definable IT-based interfaces. Neither the client nor the server has the capability of discerning unstated needs, interests, or concerns, methods used by the other entity, or anything else that is not included in explicitly coded messages governed by the requirements of the interface. (Alter, 2010). Statements in *IBM Systems Journal* illustrate this paradigm:

> A service "is generally implemented as a course-grained, discoverable software entity that exists as a single instance and interacts with applications and other services through a loosely coupled (often asynchronous), message-based communication model" (Brown et al., 2005).
>
> "The component that consumes business services offered by another business component is oblivious to how the provider created the business service" (Cherbakov et al., 2005)

The computer science definition of service differs greatly from typical definitions in the service marketing and service operations literature, such as:

> "An act or performance that one party can offer to another that is essentially intangible and does not result in the ownership of anything." (Kotler and Keller, 2006, p. 402)
>
> "Intangible activities customized to the individual request of known clients." (Pine and Gilmore, 1999, p.8)
>
> "A time-perishable, intangible experience performed for a customer acting in the role of a co-producer." (Fitzsimmons and Fitzsimmons, 2006)
>
> Situations in which "the customer provides significant inputs into the production process." (Sampson and Froehle, 2006, p. 331)
>
> "The application of specialized competences (knowledge and skills) through deeds, processes and performances for the benefit of another entity or the entity itself." (Vargo and Lusch, 2004, p. 2)

Each of the service-for-humans definitions is actually problematic because many activities that most people would consider services do not fit those definitions. For example, a public health clinic providing vaccinations transfers ownership of a dose of vaccine that is neither essentially intangible, nor customized, nor well described as an intangible experience performed for a customer, and which involves little coproduction other than appearing at the clinic.

Proposed definition of service. Shortcomings of the above definitions and of other proposed definitions of service lead us to use a simple, dictionary-like definition, "Services are acts performed for others, including the provision of resources that others will use." (Alter, 2010). A more general version that also covers totally automated services replaces the word "others" with "other entities," whereby:

> "Services are acts performed for other entities including the provision of resources that other entities will use." (Alter, 2010)

This definition is meaningful for thinking about SOE because it applies to almost any economic activity directed at external or internal customers that may be people or machines. Service providers in self-service situations provide platforms and other resources that customers use to create value for themselves. This definition does not differentiate between products and services, however. Not differentiating between products and services is consistent with "goods are distribution mechanisms for service provision," the third foundational principle in service-dominant logic, an approach to economic exchange that has been discussed widely in marketing since was introduced in Vargo and Lusch (2004). The definition is consistent with a small revision of the work system framework in Figure 1, whereby the previous term "products & services" is replaced by "products/services" to indicate that the framework makes no effort to differentiate between products and services. Instead, it recognizes that things produced by most work systems combine features that are often viewed as product-like or service-like and therefore are neither strictly products nor strictly services. Finally, the definition is also consistent with statements such as, "Everything is a service. Even products are proto-services, in a sense, because they provide the end-customer with the

means to deliver a self-service: the vacuum cleaner provides the service of cleaned floors, the grocery shopping provides the self-service of meals, and so on. (Graves, 2009)

Service systems. In business enterprises, services are produced by service systems, which are work systems (as defined earlier) that produce services. (Alter, 2010; 2011). Inclusion of "human participants and/or machines" in the definition of work system says that service systems can be completely non-technical systems that provide services for people, completely automated systems that provide services for other automated systems, or sociotechnical systems in which people use technology to provide services for the people. With those definitions, we can now look at the service-oriented enterprise.

SERVICE-ORIENTED ENTERPRISE

Although many sources have discussed service-oriented enterprises and have proposed characteristics of such enterprises, few define that term clearly. Also, some authors have noted that very little evidence supports assumptions and assertions that the potential benefits of SOE will actually be realized. (e.g., Janssen, 2008). We cite several sources to illustrate the vision and promise of SOE and to illustrate the technical methods and details required to implement software-centric visions of SOE.

The Vision and Promise

By one definition, the service-oriented enterprise is "a view of the enterprise in which everything is seen in terms of services and their interactions and interdependencies, providing consistency and simplicity everywhere, and creating new space for agility and innovation in the enterprise." (Graves, 2009, p. 1) "In the service-oriented enterprise, every activity has an explicitly identified customer to whom that service has value; and each of those customers has an outcome that they want to achieve." (p. 23)

According to an executive briefing from a major consulting firm, "SOE is all about reorganizing the enterprise to enable increased collaboration between the company and its customers, suppliers and other trading partners. ... To accomplish this means changing from a silo capability model to a market capability model. ... An SOE is able to change its capability mix quickly and efficiently, and on a fine-grained scale, to continually optimize the business. ... Supporting an SOE are four fundamental elements: sensor technology, Service-Oriented Infrastructure, Service-Oriented Architecture and business processes." (Capgemini, 2005).

An IBM view of the general nature of service-oriented enterprises was presented by Cherbakov et al. (2005), Nayak et al. (2007), and others. Componentization of the enterprise, summarized by IBM component business models (e.g., Cherbakov et al., 2005, pp. 660 and 665) is a basic requirement that enables important characteristics that distinguish SOEs from traditional enterprises. Those characteristics include, among others:

- creation of business value through services provided by participants
- the possibility that the same business need may be fulfilled by multiple providers
- process flows that are net-like and that operate through composition and enhancement of existing services within a business ecosystem
- dynamic process design based on execution of results of sub-processes
- nearly real-time dynamic orchestration
- organizational structure based on relationships between service consumers and service providers. (Cherbakov et al., 2005, p. 659).

Within this highly structured and componentized enterprise, "business services provide the foundation for the business behavior model that describes business operations as viewed within the enterprise and as viewed from outside."... A business service "can have multiple business specifications and multiple service operation models. The service provider can use its own business logic to associate a business specification with an appropriate operation model during service provisioning." ... A business specification "describes a business person's perspective regarding what the service does, how the service is consumed, how its performance is measured, and how the service is managed. Some or all aspects of the business specification can be described by both the service provider and the service consumer." (Nayak et al., 2007, pp. 730-731)

Getting Closer to the Technical Details

In practice, the vision of SOE is based on service orientation in general and the use of service-oriented architecture (SOA) in particular. "Service orientation describes a type of architectural framework that supports the design, development,

identification, and consumption of services across the enterprise, thereby improving software component reusability and facilitating agile responses to change." (Demirkan et al., 2011) SOA is "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 with and use capabilities to produce desired effects consistent with measurable preconditions and expectations." (OASIS, 2006). Welke et al. (2011) extends the vision of SOA in the direction of SOE by presenting an SOA maturity model whose SOA maturity dimension goes from technical concerns to business capabilities. That dimension starts with infrastructure efficiency and reuse and moves toward enterprise flexibility and agility and enterprise transformation. SOA sounds more like a vision of SOE at the latter end of that spectrum.

Brown and Carpenter (2004) defines an SOE as, "An enterprise that implements and exposes its business processes through an SOA and that provides frameworks for managing its business processes across an SOA landscape." Similarly, in a description of IBM's "business architecture for a service-oriented enterprise," Nayak et al., (2007) refers to services being "exposed" through a catalog, "discovered" by searching a catalog, and invoked (automatically) only if a service agreement exists. That terminology summarizes the general logic whereby providers announce availability and characteristics of services and service consumers find and use those services in accordance with contracts, service level agreements, and standards. That approach makes intuitive sense for just-in-time access to Web services, although it seems quite a stretch to use the same terminology for service provision in analysis and design situations where the providers are people rather than computers and where the direct customers are people and organizations.

The details of how SOA actually works in practice are technically complex, even without considering additional requirements for graduating from SOA to SOE. For example, the third chapter of a book on service-oriented enterprises (Khoshafian, 2006) focuses on service definition, discovery, and deployment. Its sections include service registries and UDDI, service description and WSDL, and SOAP. Universal Description, Discovery, and Integration (UDDI) is a platform independent registry for finding Web service applications. Web Service Description Language (WSDL) describes the functionality offered by a Web service. WSDL specifies topics such as the address or connection point to a Web service, the binding, port type, operation, and message. Simple Object Access Protocol (SOAP) is a specification for exchanging structured information using XML.

GENUINELY SERVICE-ORIENTED ENTERPRISES FROM A WORK SYSTEM PERSPECTIVE

Many discussions of SOA and SOE recognize that the challenges go far beyond technology. An overview of the United States government's move toward service orientation stated that SOE is "perhaps the most challenging of the major parts of the Target Architecture because it requires the greatest change to entrenched business practices." (CIO Council, United States Government, 2008, pp. 27). Similarly, an article in *IBM Systems Journal* said, "transforming an enterprise into a service-oriented enterprise involves business challenges that are more difficult to overcome than the technological challenges associated with implementing an SOA infrastructure." (Cherbakov et al., 2005, p. 654)

These challenges are relevant to analysis and design for SOE because any realistic analysis and design effort needs to take into account the target organization and its capacity to change. Most effort to date in making SOA and Web services practical has focused on technical concepts and technical implementations of those concepts. Achieving genuinely service-oriented enterprises requires analysis and design at an organizational level that considers the way people do their work and the organization's capacity to change.

To explore this further without getting tangled in vague definitions of SOE that sound like technical extensions of SOA wrapped in idealistic visions for the future, we will use our proposed definitions of service and service system to define a "genuinely service-oriented enterprise," an artificial construct that facilitates exploring the practicality of SOE beyond computer architectures.

> A GSOE is an enterprise consisting of multiple service systems most of which genuinely provide service for their internal and external customers. (We use "most" instead of "all" to make it more likely that a GSOE could exist.)

The basis for deciding whether an enterprise is a GSOE is the extent to which customers of all of its service systems receive products/services that they want and need. Anthropomorphizing a bit, one might say that Web services and other service systems governed by an SOA paradigm automatically meet that criterion because they provide what their automated clients "want and need" in the form of scripted responses to scripted client requests. Note, however, that using web services and SOA in part of an enterprise does not imply that customers of all service systems in the enterprise receive products/services that they want and need

Sociotechnical service systems with human participants face much larger obstacles to attaining the status of GSOE. We can use the work system framework (Figure 1) and work system life cycle model (Figure 2) to appreciate these obstacles.

Characteristics of Service Systems in a GSOE

Looking at each element of the work system framework shows the enormity of the change that would be required for most enterprises to become GSOEs. These challenges apply to each individual service system and to the enterprise as a whole.

Customers. The customers of all of the service systems in a GSOE presumably want and need the products and services produced by those service systems. A quick look at most organizations surely would reveal that many service systems for internal and/or external customers do not produce exactly what those customers want and need. An additional challenge is that most service systems have multiple customer groups with different, and sometimes conflicting needs.

Products/ services. In contrast with messages passed between computerized modules, the products/services produced by many service systems are not specified precisely and do not operate in accordance with protocols, contracts, or service level agreements. For example, real world order fulfillment systems are not 100% perfect in producing what customers want at the quality level they want.

Processes and activities. In contrast with the operation of software, many processes and activities within sociotechnical service systems are not totally structured. Many processes and activities may be executed in different sequences and may lack well articulated business rules. Many repetitive organizational routines allow for judgment to accommodate unanticipated contingencies and exceptions. Also, as noted by organization behavior and organization theory researchers (e.g., Schmidt and Simone, 1996; Star and Strauss, 1999), a substantial amount of coordination and articulation work occurs outside of the sequences, procedures, and rules within formal specifications of processes. Analysis and design efforts often do not focus enough on anticipating transient problems and ways to address those problems. The mechanisms in coordination theory are certainly relevant here, as are other ideas in the literature related to mutual adjustment and articulation. Finally, a huge leap would be required to move from the largely social operation of current sociotechnical service systems to a highly mechanical logic of service systems in which, using previously mentioned terminology, services are "exposed" through a catalog, "discovered" by searching a catalog, and invoked (automatically) only if a service agreement exists.

Participants. Most people communicate in a relatively informal way. It would be a huge change to require participants in most service systems to perform person-to-person communication unambiguously using predetermined formats. Having said that, it is interesting that many important service systems in manufacturing, medicine, and the military consciously attempt to formalize person-to-person communication to avoid confusion and errors. For example, a surprisingly service-oriented description of "how people connect" in the legendary Toyota production system says, "every connection must be standardized and direct, unambiguously specifying the people involved, the form and quantity of the goods and services to be provided, the way requests are made by each customer, and the expected time in which the requests will be met. The rule creates a supplier-customer relationship between each person and the individual who is responsible for providing that person with each specific good or service. As a result, there are no gray zones in deciding who provides what to whom and when." (Spear and Bowen, 1999, p. 100) In a somewhat similar vein, many hospitals have improved medical outcomes by adopting the SBAR communication pattern when patients are handed off from one individual or team to another individual or team. With SBAR, each participant who knows about the patient quickly conveys their thoughts and observations in four categories: situation, background, assessment, and recommendation. (Landro, 2006)

Information. SOA is based on the processing of predefined information. Although most important service systems involve a substantial amount of predefined information such as information in computerized databases, in most situations there is also room for informal information, invention, and improvisation involving informational entities that may not have been anticipated. Even when SBAR (above) is used to standardize the form of communication, the details of the information are different in each case.

Technology. Sociotechnical service systems involve many technologies that are not information technologies. Activities and communications around those technologies have varying degrees of formality. Even the part of the technology that is related to SOA brings many challenges because of the relative immaturity of SOA in organizational computing.

Environment. The environment of a service system includes the relevant organizational culture, organizational policies and procedures, organizational politics and history, outside stakeholders, competitive factors, and industry and government regulations. Ideally, service systems in a GSOE would fit with all of those interests as well.

Infrastructure. Service systems in a GSOE would be supported by the surrounding human, informational, and technical infrastructure. At least part of the technical side would be handled through SOA. The human side would encounter the participant and process-related issues mentioned above.

Strategies. An additional challenge for a GSOE would involve alignment of service system, organizational, and enterprise strategies, each of which may be vague or not articulated at all.

Life Cycle Issues in Service Systems Moving toward GSOE Expectations

The phases in the work system life cycle model reveal other obstacles that often block a service system's path to becoming genuinely service-oriented.

Operation and Maintenance. The inwardly-facing arrows in Figure 2 represent incremental changes, adaptations, and workarounds that occur in almost all sociotechnical systems. Some of those changes may be workarounds based largely on the personal preferences and needs of work system participants. Such workarounds may conflict with management directives and/or genuine service orientation.

Initiation. Specifications produced in the initiation phase of many projects create ambiguous direction for the development phase because most of the details are not specified in the initiation phase. In many cases, needs of some customers of the service system are never considered and therefore are not reflected in the requirements.

Development. As in any work system, the development phase for sociotechnical service systems involves creation, modification, acquisition, or configuration of software and creation or modification of procedures, documentation and training materials needed for implementation of the new version of the service system. The level of specificity required for service systems in a GSOE would make the development phase much more complicated.

Implementation. Assuring genuine satisfaction of each customer group's wants and needs would greatly increase the duration and complexity of a service system's implementation phase.

Difficult Assumptions about Service Systems Operating under a GSOE Regime

Service systems operating under a GSOE regime would have to satisfy a number of assumptions that seem a huge leap from everyday experience in organizations. Those assumptions include the following:

Assumption regarding communication and customer-supplier relationships between service systems. As mentioned earlier, the SOA capabilities underlying GSOE require scripted, unambiguous communication and customer-supplier relationships that are much more explicit than those in most organizations. Highly scripted interactions in today's service systems occur mainly through automated services (e.g., automated transactions) and much less frequently in person-to-person communication under special circumstances that require conscious adherence to explicit standards.

Assumption of alignment. GSOE requires internal alignment of all components within a service system (including all participants) and alignment between the service system and the customers who will receive products/services produced by the service system. That degree of alignment is not present in many systems in today's organizations due to a combination of inconsistent goals, inconsistent incentive structures, and local optimization (i.e., sub-optimization for the enterprise) that undermines broader concerns of the entire enterprise.

Assumption of compliance. The operation of a GSOE requires total compliance to methods, standards, behavioral expectations, and service level agreements within and between all service systems. It is not clear how a GSOE would identify and correct the many types of non-compliance that are common in today's organizations, including performance gaps, malfeasance, adaptations, and workarounds, all of which occur for a variety of personal and system-related reasons.

Assumption regarding intellectual bandwidth and attention. Applying SOA techniques in a GSOE requires a combination of patience, intellectual bandwidth, and attention that seems far beyond the capabilities and propensities of most business professionals. For example, is not clear who would negotiate all of the service agreements between different departments within an enterprise and between different service systems. It also is not clear how to rationalize or standardize those negotiations. In the terminology of SOA, those negotiations would have to specify details such as how internal and/or external suppliers will expose capabilities through service catalogs and how internal and/or external customers will search service catalogs to discover and invoke whatever services they need, whenever and wherever they need them.

Assumption of safely controlling emergent behavior in multi-layer service systems. It is not clear how to test and debug complex, multi-layer enterprises consisting of service systems that have their own logic and that may be modified by service system owners after the larger system becomes operational. The danger of complex interactions between highly automated systems is illustrated by the May 6, 2011 "flash crash" in which the Dow Jones industrial average plunged 600 points and the blue chip stock Accenture dropped to one penny before recovering quickly. There is still some question about what caused the bizarre behavior of this complex system, although it seems to be tied to interactions between different algorithmic trading systems, some of which were turned off when the market became volatile and some of which were left in operation. (Bowley, 2011; MacKenzie and Telos, 2011)

Steps toward GSOE from a Service System Perspective

Having illustrated various aspects of the enormous difficulty of converting an enterprise to a GSOE, it is worthwhile to identify several modest steps toward increasing the degree of service-orientation in work systems within enterprises. None of the following steps rely on SOA, although robust SOA capabilities surely can facilitate some of the technical changes that may increase efficiency and organizational agility. The following steps toward greater service orientation are discussed in various ways in an article about viewing systems as services (Alter, 2010).

- Analyze systems in organizations as though their purpose is to produce products/services for their customers. The work system framework encourages that emphasis by placing the customer at the top and emphasizing that work systems (service systems) exist in order to produce products/services for their customers.
- Recognize the importance of value creation throughout the service system's interactions with its customers. Possible frameworks supporting that approach include service blueprinting (Bitner et al., 2008) and a proposed service value chain framework (Alter, 2008b). Also, focus on co-creation of value by customers and providers during service interactions within the service system and additional value creation by customers beyond the scope of the service system itself. (Grönroos, 2011)
- Recognize and use service-related design dimensions and customer-centricity dimensions such as those mentioned in Alter (2010, pp. 207-208).

CONCLUSION

When taken literally, the concept of SOE sounds as though it should describe an entire enterprise rather than just an organization's computer infrastructure. The rhetoric of SOE proponents seems to conflate a technological imperative of better computer architecture with an enterprise imperative of greater efficiency and effectiveness of service systems designed to satisfy needs of internal and external customers. SOA may lead to greater technical efficiency and effectiveness, but there is little reason to believe that it necessarily instills service systems with greater capabilities for satisfying customers.

This paper used WST and the idea of GSOE to explore what it would take to extend the idea of SOE beyond the realm of computer-to-computer interaction. The operation of a GSOE requires total compliance to methods, standards, behavioral expectations, and service level agreements within and between all service systems. It is not clear how a GSOE might identify and overcome many types of non-compliance that are common in today's organizations, including performance gaps, malfeasance, adaptations, and workarounds, all of which occur for a variety of personal reasons, system-related reasons, and external contingencies. From a business viewpoint, an enterprise should try to become a GSOE only if that would lead to improvements in important metrics such as profitability, efficiency, customer satisfaction, employee loyalty, and long term health. The technical imperatives that are pushing the trend toward SOA have many benefits within the purely technical realm and may facilitate organizational responsiveness and agility in many ways. While important for those reasons, SOA trends do not imply that most people and organizations should work and communicate in a manner that mimics how computer programs operate under SOA.

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