Prof. Dr. Daniel J. Veit

Interview with James C. Spohrer on "Service Science"

Dr. James C. Spohrer is the Director of Almaden Services Research, with the mission of creating and deploying service innovations that matter and scale well both internaly to transform IBM and externally to transform IBM client capabilities. Prior to joining IBM, Spohrer was at Apple Computer, attaining the role of Distinguished Scientist, Engineer, and Technologist (DEST) for his pioneering work on intelligent multimedia learning systems, next generation authoring tools, online learning communities, and augmented reality learning systems. He has published in the areas of speech recognition, artificial intelligence, empirical studies of programmers, next generation learning systems, and service science. Spohrer graduated with a Ph.D. in Computer Science from Yale University (specializing in Artificial Intelligence and Cognitive Science) in 1989 and a B.S. in Physics from MIT in 1978.

WI: The special issue of this journal focuses on "service-orientation" in computing. Are there semantic relations between the technical "service" term in "Service Oriented Architecture" (SOA), and the management paradigm in "Service Science, Management and Engineering" (SSME), or is that just a linguistic coincidence?

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Spohrer: Not coincidence, but the semantic perspective is important. Service is the application of resources like technologies, information, competence and skills for the benefit of another. The worldview in both cases is entities, interactions, and outcomes. In the case of service science, the entities are complex systems of a managed organizational nature. In the case of service computing and SOA, the entities are complex systems of an engineered technical nature. Do the entities interact via contracts or protocols? Are the outcomes revenue and profit or predictable state changes? One needs only consider the ITIL standard and IT service management to see the two are strongly connected in practice and – from a SSME perspective – in theory as well.

WI: While the computing world describes services as clearly interfaced, interchangeable, reusable components, management services are usually seen as customized, integrated, adapting interactions between the provider as supplier and the user as customer. Computational services providers do deliberately not require joint knowledge in negotiating the exchange with the customer, while management services are practically defined by this characteristic. Are we talking here about two sides of the same coin, or plain opposites?

Spohrer: I would say two sides of the same coin. But the coin has four sides. We define a service system as a dynamic, value co-creation configuration of four types of resources. The four types are exemplified by people (physical with rights), technology (physical as property), organizations (conceptual with rights), and shared information (conceptual as property). Even seemingly pure technological service systems have both a designer and an owner, and some method of being maintained, upgraded, and disposed of, which typically involves people or organizations as well. Service systems can be designed to need more or less information when they interact to achieve specific outcomes. But this is true for either engineered technological services or managed organizational services. The amount of information about the other system is a design point, depending on how closed or open one wants the system interactions to be.

WI: In a recent article (Spohrer and Riecken 2006) you link SOA and service science via the deconstruction of businesses. Many implementations of SOA focus on autonomous, platform-independent software modules for workflow design and management in distributed systems. However, the road to SOA is plastered with earlier information systems concepts, that all heralded reusability and clearly defined interfaces between software components.

In how far do you see SOA as a novel concept – or just a new iteration of former concepts in novel coats?

Spohrer: SOA as a concept certainly enjoys a good pedigree, so I am inclined to say a new iteration of former concepts. Business services and technology services as components, with SOA as design patterns that bridge the business-technology gap is the novel coating to me. The service science worldview dovetails with SOA when one recognizes that business services and technology services both have designers and owners and change over time – so both types of components can be viewed from a service system perspective.

By the way, we now use the term "service science" and not "services science" primarily because the former is easier to say than the latter. Also, people talk about computer science, and not "computers science". For deeper reasons, we prefer to refer to service activities, service industries, and service offerings, rather than just "services". The word "services" can mean so many different things, so we prefer to be explicit.

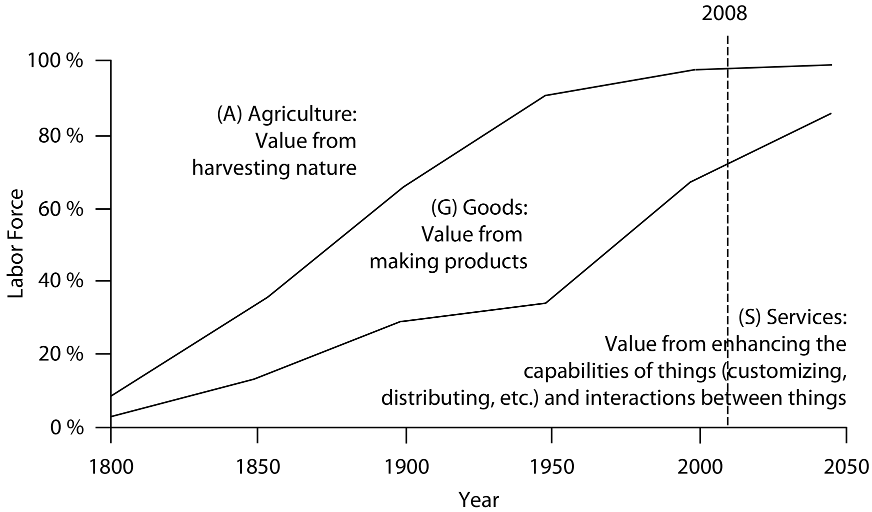

Figure 1 Services Industry in the US (Source: International Labor Organization (ILO))

WI: Apart from SOA, are there specific information systems (IS) concepts that are suited to support service science? Or does service science have no influence on IS or computer science research, neither in methodology nor in research domains?

Spohrer: Multiagent systems and mechanism design are two areas of computer science of special relevance to service science. Mechanism design explicitly looks at social utility functions and can be used to engineer win-win outcomes. Some might see service science as resulting from the integration of computer science and economics. Service science is the emerging integration of many service research disciplines, including service economics, service marketing, service operations, service management, service engineering, service computing, service design, service anthropology, service sourcing, service governance, and service measurement. Textbooks exist for some of these areas. Two concepts, service system and value proposition, are the basis of the integration.

The service system world view is that of service systems that interact normatively via value propositions to co-create value, i.e. win-win outcomes. In this sense, service is the anticipation of or the realization of value co-creation as judged by two or more service systems. Value propositions are a type of shared information with a life cycle: creation, proposition, negotiation, agreement, realization, disputation, re-usage. A service scientist sees the world as populations of service systems (people, organizations, etc.) interacting via value propositions. A physicist might see the world as populations of masses like moons and apples, interacting via gravity. In the case of engineered technological services, the designer of the artifact has the value proposition in mind, as does the owner. Value is not an intrinsic property of the engineered artifact, but is a judgment made in use or in anticipated potential future use of the artifact. Given a usage scenario, value can be associated with logical characteristics of computational systems like space or time complexity or provable optimal outcomes, or with physical characteristics of computational systems like power usage, storage capacity or bandwidth utilization. Both of these types of characteristics of computational systems can be translated into a variety of service level agreements (SLA) in a contract between two service systems seeking to establish a value proposition to connect them and guide their interactions towards value co-creation.

WI: Surveys across the IS industry reveal that most, if not all larger companies define themselves as "solution provider", whatever that means in the concrete case, not as hardware or software suppliers. The service economy has obviously reached IS fully, and innovation for IS customers is no longer defined by using the latest technology, but getting specialized solutions and support. "IT does not matter" is a recent statement, capturing that using whatever technology means nothing, and knowledge about technology makes the difference. With regard to that, does IT matter for service science?

Spohrer: Yes, information technology (IT) does matter for service science. Two of the megatrends driving the growth of the service economy are self service technology and global delivery of labor (cp. Fig. 1). Both of these megatrends are enabled by IT. Financial and information services are especially dependent on IT. Porat and other economists have studied the growth of the information economy, and like Cortada (1998), they note that complexity of work creates new knowledge work, and thereby demand for new information service activities. Paradoxically, our methods of dealing with complexity create new types of complexity, solving a problem creates new problems, and hence growing demand for solution providers. The new rise in interest for "sustainable solutions" can be viewed as a growing awareness of this paradox. Service science seeks to understand how to improve service systems to make them more efficient, effective, and sustainable.

WI: "Software as a service" (SaaS) is another, somehow recurring concept in IS management, which uses the "service" term to describe its novelty. Software delivery by installing licensed packages on the premises of the customer company, according to analysts, will be replaced by on-demand software access "that could be switched to another vendor if the first failed to perform" (McKinsey 2007). This implies small switching costs, achievable only if provider and customer knowledge are not integrated first hand. Does SaaS do "services" justice by reducing the analogies to "pay-as-you-go" schemes, or what can we learn from this?

Spohrer: We can learn a lot about alternative configuration of resources and alternative value propositions (business models). SaaS is not a terribly descriptive name, because whether the software is running locally or remotely, it can be providing a service. However, there are alternative configurations of resources or sharing arrangements in the combined customer-provider service system that can provide a basis for many alternative value propositions. What is important to both the customer and the provider is the availability of a network connection between them that can be exploited in a number of ways. From the customer perspective, the network connection might mean lower switching costs. From the provider perspective, the network connection might mean the ability to create an ongoing relationship that would drive up switching costs. For example, consider the complexity of switching from AOL mail to Gmail, while preserving email archives, from the typical customer's perspective.

WI: How do you see the future interrelation between the subjects IS, computer science, business administration, economics and law? Does – in your perception – service science fill the gap between these disciplines in a novel way? And if so, how would you describe your anticipation of the impact of service science in a 15-year horizon?

Spohrer: In the short run, many of the people around the world working on service science hope that their collective efforts will stimulate SSME certificate programs at more universities and businesses, so that professionals can gain interactional expertise across all these disciplines and more. This was one of the recommendations of the Cambridge SSME Symposium. We often talk about T-shaped professionals who are both deep in their home discipline, like I-shaped professional, but who also have what Harry Collins terms "interactional expertise" across the wide range of disciplines, business functions, and industries that we see as key to service science. Since the time of Adam Smith, if not before, people have thought that increasing specialization and division of labor – more service activities – are the key to the wealth of nations. However, integration is as important as specialization. Physicists know this as they look for unified theories of everything. Mathematicians, general systems theorists, and artificial intelligence researchers know this as they look for modeling and representation formalisms with improved descriptive and explanatory capabilities. And commonsense tells this, as we think about the problems of coordinating people who speak different languages and have different cultures, when they try to work together to get things done collectively. So integration is as important as specialization. Nevertheless, deep integration is not the same as concatenation. Deep integration only happens when fundamental relations are established, such as when Maxwell found the relations that connect electrical and magnetic phenomena, or when Einstein proposed both the relationship between matter and energy, and space and time. To date, the deep integration of disciplines that make up service science remains elusive. Nevertheless, we believe that understanding the life cycles of the four types of resources (people, technology, organizations, and shared information) that make up service systems, and how these resources can be dynamically configured into value propositions that co-create value for interacting service systems is on the right path leading to a deep integration. As we pointed out in the CACM paper, physical laws, mathematical-logical laws, and social-economic laws are all involved in understanding and measuring the amount of work a service system performs. For example, physical laws regarding moving mass through distances in specific times help us understand the work of steam engines, mathematical-logical laws regarding computational complexity of alternative algorithms and information theory help us understand the work of computers and telecommunications systems, and social-economic laws like tariffs and Ricardo's law of comparative advantage help us understand optimal ways of dividing work between countries. So in fifteen years, if we have a deep understanding of service systems and value propositions that allow a truly integrated theory of the many specialized disciplines that make up service science, amazing things might be possible. For example, perhaps a Moore's Law of service system investment might be possible, and provide a roadmap to invest to improve service system productivity, quality, regulatory compliance, and innovation capacity year-over-year. This ambitious goal would require a deep integration, as well as a computer-aided design (CAD) system for simulating populations of interacting service systems. Of course, this is all just speculation. We are only at the beginning of the beginning of service science, and the study of service systems.

WI: Mr. Spohrer, thank you very much for this interesting interview.

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