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A service science perspective on business model innovation

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ABSTRACT

Using four basic principles of service science, we systematically explore value-proposition design as one type of business model innovation. Service science combines organization and human understanding with business and technological understanding to categorize and explain service systems, including how they interact and evolve to cocreate value. Our goal is to apply a scientific approach to advance design and innovation in service systems. Our foundation is service-dominant logic, which provides perspective, vocabulary, and assumptions on which to build a theory. Our basic theoretical construct is the service system, entities that are dynamic configurations of four kinds of resources. Our core principles center on the way value is computed within and among entities, how interaction is based on access to resources and their capabilities, and on how value computation and interaction depend on symbol processing and language guided by mutually agreed-to value propositions. In this context, service science can inform and accelerate value-proposition design by systematizing the search for adaptive advantages that improve existing offerings, create new offerings, or reconfigure the value-creating ecosystem.

1. Introduction

The rise of globe-spanning service-based business models has transformed the way the world works. This transformation has been enabled by new information and communications technologies, specialization of businesses and professions, global regulations, and increased use of external service by entities at multiple scales (Wirtz & Ehret, 2012). Service innovation is now a key priority for nations, businesses, and citizens (Council on Competiveness, 2005). In this context, there is a growing awareness of the need for a new interdisciplinary science of service to help make innovation more systematic and more sustainable (Abe, 2005; Chesbrough & Spohrer, 2006; Horn, 2005; IBM Research, 2004; IfM & IBM, 2008; Maglio, Kieliszewski, & Spohrer, 2010; Ostrom et al., 2010; Spohrer, Maglio, Bailey, & Gruhl, 2007; UK Royal Society, 2009; US Congress, 2007). Over the last two hundred years, and accelerating in recent decades, we have witnessed a rise and fall in resources allocated and interactions dedicated to local production of goods, with more reliance on increasingly complex cognitive and social interactions with others (Bell, 1973; Clark, 1940/1957; Fuchs, 1968; Levitt, 1976; Pine & Gilmore, 1999). This represents the rise of the so-called "service sector" of the economy (Fitzsimmons & Fitzsimmons, 2010), and despite its obvious importance, many myths about the service sector persist, including: (1) productivity is stagnant in the service sector; (2) service sector jobs are low skill and low wage; (3) the service sector is all labor and little technology; (4) science, technology, engineering, and math (STEM) graduates cannot find good jobs in the service sector; (5) service quality is subjective and resists systematic improvement; and (6) the service sector is too diverse to be studied systematically. These can all be easily refuted (see Spohrer & Maglio, 2010b).

Business model innovation can aim at differentiation or cost advantage, often unguided by principles or theory (Zott & Amit, 2008). Similarly, value-proposition design can aim for adaptive advantages (improve existing offerings, create new offerings, or reconfigure the ecosystem), without taking proper account of constraints (Ricketts, 2007). Systematic techniques shift the key performance indicators (Anderson, Kumar, & Narus, 2007; Womack & Jones, 2005), the field of competition (Kim & Mauborgne, 2005), toward adjacent spaces (Slywotzky, Wise, & Weber, 2003), toward open ecosystems (Chesbrough, 2006), away from the priorities of the past (Moore, 2011), or otherwise reconfigure the actors or rules of the game (Brandenburger & Nalebuff, 2007). These shifts and reconfigurations can lead to upward spirals in capabilities over time, or boom and bust cycles (Perez, 2003) or collapse entirely (Diamond, 2005).

In this article, we present a new view of value-proposition design in the context of complex service systems, and particularly from the perspective of service science. We first describe our service science perspective, and then elaborate our four core principles of service science. In the end, we show how to apply our principles to value-proposition design and describe managerial implications of this approach.

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2. Rethinking value creation from a service science perspective

Rethinking value-creation from isolated local-processes to interconnected global-networks, IBM has shifted from a manufacturing logic to a service logic, establishing itself as role model in this regard (Chesbrough, 2011; Maglio, Nusser, & Bishop, 2010; Palmisano, 2006). IBM's service division has grown quickly to dominate revenue, now accounting for more than software and systems revenue combined (Spohrer & Maglio, 2008). Providers such as IBM deploy consultants, practitioners, and technologies to help clients transform businesses (Ricketts, 2007). To improve and innovate, providers invest in the talent of employees, the support environment employees operate in, the information systems employees use, the partnership networks that complement in-house capabilities and enable service delivery, and technologies to automate service delivery. Overall, the aim is to raise the competence of the provider side of service systems. Increasing employee competence is critical to improvement and innovation (Johnson, Manyika, & Yee, 2005). And little is known about the operations and capabilities needed to support and improve effective business-to-business services (Oliveira & Roth, 2011).

How can IBM and other companies reliably improve and innovate in service? Is it all about raising human capabilities? What new business models will effectively bring advanced technological capabilities to market? How can firms leverage an understanding of value cocreation and value-proposition design to configure service systems effectively? What is the relationship between technology and human capabilities? How can nations use new rules to accelerate business model innovation? These are just some of the key business model questions facing modern enterprises. And they are also some of the key questions for any theory of service systems. We believe service science can offer insights into effective value-proposition design, accelerating business model innovation through systematic exploration of the space of value propositions.

Consider information technology (IT) outsourcing, in which a service provider enters into a formal agreement to maintain all or part of a client's information technology systems, such as computing, networking, and storage infrastructure, business applications and data, or end-user help (BusinessWeek, 2006). More and more firms today prefer to focus on their own customers and business model, leaving IT to others (Hirschheim, 2009). Shifting to an outsourced service model may lead to productivity gains simply by formalizing agreements between parties and making explicit the costs that govern their interactions (Knittel & Stango, 2010). Nevertheless, service providers must be very focused on understanding and improving practices to improve service and reduce costs. But for IT outsourcing, human labor costs have grown to dominate, accounting for more than two thirds of the overall cost of IT, and the proportion is growing every year (Bozman & Perry, 2010). Increasing labor costs results from increasing technical complexity of IT systems, and also from increasing interaction complexity among businesses, organizations, and technologies. The issues of IT outsourcing illustrate many fundamental service issues (cf. Ehret & Wirtz, 2010).

2.1. The service-dominant worldview

Service arises naturally in the context of distinct entities, such as people, businesses, and nations, that have information-processing and communication capabilities as well as distinct resource-based capabilities. These diverse entities opportunistically and systematically interact to realize mutually beneficial outcomes. Simply put, service phenomena arise in a real-world ecology of entities, their interactions, and their capacity for finding mutually beneficial outcomes.

We take the view that all businesses are service businesses because all value is cocreated between economic entities that possess information-processing and resource-based capabilities (Vargo & Lusch, 2004). In fact, Vargo and Lusch's (2004) service-dominant logic (SDL) is one of the cornerstones for the emergence of service science, providing an appropriate perspective, language, and worldview (Maglio & Spohrer, 2008; Vargo, Lusch, & Akaka, 2010). SDL's primary definition is that service is the application of competences for the benefit of another entity, and its primary tenet is that all economic activity is an exchange of service for service. This worldview effectively flips the usual "goods-dominant" worldview on its head and takes service to be the primary category of economic activity. And it can be difficult to understand, in large part because a goods-dominant logic has served us so well for so long. Despite the conceptual challenge, the growth of the service sector has made the adoption of a service-dominant logic a practical imperative for innovators (Chesbrough, 2011). When all economic activities are seen as direct or indirect exchange of service for service, goods become a vehicle for transmitting service, that is, for applying human competence. On this view, a massage chair becomes a way to package human knowledge and amplify a human competence (Yoshikawa, 2008). All goods can be viewed as packages of applied human competence (Bastiat, 1850/1979). Improvements in massage chair design, production, distribution, and marketing all result from applying human competence. Increasing levels of automation used in manufacturing shift value-cocreation opportunities from the focal production-assembly activity to design, distribution, marketing, and related activities, representing a broad move from vertically integrated companies toward orchestrated value networks or service systems (see also Normann & Ramirez, 1993; Quinn, 1992). Because of the increasing use of technology for routine manual, cognitive, and social activities, value-cocreation opportunities migrate over time toward more expert thinking and complex communication skills (Levy & Murnane, 2004) — in other words, from routine activities to innovation activities (Brynjolfsson & McAfee, 2011).

2.2. Four principles of service science

Following the SDL worldview, we consider an economic entity to be a collection of resources, including people, technologies, organizations, and information (Spohrer, Maglio, Bailey, & Gruhl, 2007). SDL identifies two types of resources, namely operand and operant: operant resources, such as people and businesses, operate on operand resources, such as technology (using tools) and information (symbolic processing); thus, to first approximation, our four types of resources – people, technology, organizations, and shared information – are simply kinds of SDL's two types of resources. Collections of resources or entities interact by granting access rights to one another's resources, forming service systems (Spohrer & Maglio, 2010b). Interacting service system entities form networks that may be fully or partially contained with larger service system entities, such as cities, states, and nations (Maglio, Vargo, Caswell, & Spohrer, 2009).

The service system is the fundamental abstraction of the study of value cocreation or *service science* (IfM & IBM, 2008; Maglio & Spohrer, 2008; Spohrer & Maglio, 2010a; Vargo, Lusch, & Akaka, 2010). The idea of non-zero-sum interactions or value cocreation is not new (see also Wright, 2000): value emerges when entities work together for mutual benefit, the key being design or orchestration of these entities for effective value cocreation in constellations (e.g., Normann & Ramirez, 1993) and networks (Gummesson, 2010). Service systems are physical symbol systems that compute the changing value of knowledge in the global service system ecology (Spohrer & Maglio, 2010b). Viability of entities within the ecology depends in part on their strategies for resource allocation and interaction with others, which influences their relative efficiency and capability (Spohrer & Maglio, 2010a).

In what follows, we describe our four basic principles for service science in more detail, weaving together threads from a number of prior papers to present in one place a single coherent view. First, we describe how service systems, the basic units of analysis for service science, are composed of four basic types of resources (Maglio, Vargo, Caswell, & Spohrer, 2009). Second, we describe how the relationships between entities in service systems are based on value propositions

(cf. Anderson, Kumar, & Narus, 2007). Third, we describe how interactions among entities in service systems are based on access to resources (cf. Hunt, 2000). Fourth, we describe how interaction in and improvement of service systems depend on symbol processing (Simon, 1996; Spohrer & Maglio, 2010b). These are our four basic principles of service science. Finally, we discuss how the principles can be applied in value-proposition design and the systematic search for business model innovations.

3. Service systems: A basic construct for service science

The service system is the basic unit of analysis for service science (Maglio & Spohrer, 2008; Maglio, Srinivasan, Kreulen, & Spohrer, 2006; Maglio, Vargo, Caswell, & Spohrer, 2009; Spohrer, Maglio, Bailey, & Gruhl, 2007). This idea of service emerging out of systems of interacting components goes back much further than our use of it, of course: Some have focused on service systems for optimizing waiting and queuing processes (e.g., Riordan, 1962), some for customer-contact interactions during production processes (Chase, 1978), and some for the larger constellation of stakeholders (including suppliers, competitors, customers, and others) that together conspire in the generation of mutual value (Normann, 1984). For us, the key point is that value cocreation emerges from the interaction of many parts, and it can be formalized, analyzed, and designed despite its complexity.

At a minimum, a provider entity and a customer entity must interact, either directly or indirectly, to cocreate value. The entities may be people, organizations, or even nations. Furthermore, the customer and provider entities must be able to grant each other access to some set of resources. All resources can be logically divided into four types, based on whether they are physical or not physical, and whether they have rights or do not have rights (Spohrer & Maglio, 2010a). For example, a person is physical and has rights; a business is not physical and has rights; a chair is physical, and does not have rights; a sequence of symbols, such as the formula "F = MA", is not physical and does not have rights. However, access to people, businesses, chairs, and formulas can all figure into a value proposition that one entity offers to another. Of course, there are many ways to characterize resources, but characterizing them along these two dimensions has several benefits. The rights dimension makes clear whether a resource has the capacity to enter into an agreement and be responsible for its actions (such as people or corporations). The physical dimension makes clear whether a resource exists on its own (such as people or chairs) or necessarily relies on other resources (such as symbols or corporations). Service systems cannot contain only resources without rights or only non-physical resources — and though these sorts of resources may be needed, they must always be combined with other types to create service systems.

For example in IT outsourcing, a provider may take over management of customer resources. Employees may be re-badged (people), servers, routers, and storage equipment may be transferred and change owner (technology), private information associated with the people and equipment may be transferred (information), and internal and external organizations may be shifted and realigned to allow the provider to streamline and standardize operations (organizations). There are people, technologies, information, and organizations on the provider side and on the customer side, and each type of resource plays a critical role in value creation. The change in access rights to resources (ownership, leasing, sharing, proprietary) between entities as part of an IT outsourcing contract may vary depending on the levels of service (i.e., "show me, help me, or do it for me").

Given today's smarter machines, such as IBM's Watson Jeopardy! supercomputer and Apple's Siri, business model innovation will require systematic exploration of reconfigurations of resources and the consequences for value-proposition design (Brynjolfsson & McAfee, 2011). Over time, routine work (e.g., productivity and basic quality levels) tends to migrate into enhanced technological capabilities of providers (through use of automation) and customers (through use of self-service technology), and non-routine work (e.g., innovation and governance) tends to migrate into enhanced human capabilities of providers (such as entrepreneurs) and customers (e.g., self-governance requires informed citizenry). For example, value proposition design as systematic search for adaptive advantages can use technology to: (a) improve an existing offering (e.g., Apple's Siri provided automation and lower costs), (b) create a new offering (e.g., IBM's Watson provided new computational capabilities and expanded scope of problems that could be addressed), or (c) reconfigure ecosystem partners (Google's Android application environment provided an open standard that disrupted the proprietary incumbent, Apple).

First principle of service science: *Service system entities dynamically configure four types of resources: people, technologies, organizations, and information.*

4. Value propositions: A basic relationship of service

A value proposition can be viewed as a request from one service system entity to others to run a procedure or an algorithm. Business model innovation can be understood as value-proposition design. Value-proposition design is best understood from the perspectives of multiple stakeholders that (a) exploit and disrupt culturally determined, shared value principles; and (b) explore and disrupt potential benefits and risks associated with access to resources. In routine business interactions, value propositions typically describe specific outcomes and key performance indicators that will change as a result of accepting an offer (Anderson, Kumar, & Narus, 2007). At its core, a value proposition defines the pattern of shared access to resources among stakeholders over time. As stakeholder entities gain experience with the strengths and weaknesses of value propositions, they may reconsider the algorithm and suggest systematic refinements based on the historic statistical patterns and anticipated future patterns.

The four primary stakeholders are customer, provider, authority, and competitor. As shown in Table 1, we must consider the value of an offering given the concerns of each. Specifically, in offering a service, the provider must consider the customer's perspective, its own perspective, the government (authority) perspective, and competitor perspective. Each of these raises different concerns about what can be or should be offered, and each requires a different reasoning strategy. Obviously, customer, provider, and authority are traditional stakeholders in any business arrangement, as each has a clear stake in the benefits of value created between customer and provider. Competitors are not usually considered *stakeholders* because what they get from a value-creating arrangement between others is not so clear. On our view, competitors set the business context, which in turn depends on arrangements among others; thus, competitors are stakeholders precisely because we must consider their perspectives when developing value propositions (see also Yoffie & Kwak, 2006).

Value propositions coordinate and motivate resource access across service system entities. Service blueprinting is one practical tool for representing the shared access to resources over time from multiple stakeholder perspectives (Bitner, Ostrom, & Morgan, 2008). Often service providers neglect the time and skill levels of customers in designing value propositions, resulting in suboptimal solutions (Womack & Jones, 2005). And value propositions may take into account estimated lifetime value of the customer to the provider (Rust & Bhalla, 2010).

With growing concerns over economic sustainability, business model innovations will increasingly co-evolve with government rules and regulations as an authority requires value propositions that lower the cost of measuring compliance over time. For example, in IT outsourcing, providers and customers spend a great deal of time negotiating and renegotiating service level agreements (SLA) as it becomes clearer over time what the relative costs and benefits are. A change in government regulations, a disruptive technological innovation, a natural disaster, or

Table 1
Value proposition evaluation given four primary stakeholder concerns.

Stakeholder	Measure	Pricing	Questions	Reasoning
Customer	Quality (revenue)	Value-based	Should we (offer it)?	Model of customer: Do customers want it? Is there a market? How large? Growth rate?
Provider	Productivity (profit)	Cost-plus	Can we (deliver it)?	Model of self: Does it play to our strengths? Can we deliver it profitably? Can we continue to improve?
Authority	Compliance (taxes, fines)	Regulated	May we (offer and deliver it)?	Model of authority: Is it legal? Does it compromise our integrity in any way? Does it create a moral hazard?
Competitor	Differential advantage (market share, unique capabilities)	Strategic	Will we (invest in it)?	Model of competitor: Does it put us ahead? Can we stay ahead? Does it differentiate us?

an aggressive move by a competitor may require adjusting value propositions. For example, some nations restrict the types of data about their citizens, critical infrastructure, and government organizations that can be part of outsourcing contracts when the provider operates service delivery centers around the world. Often the most innovative providers are those with the best models of all the other stakeholders and how those stakeholders are likely to change over time.

Second principle of service science: *Service system entities compute value given the concerns of multiple stakeholders.*

5. Access to resources: A basic operation of service systems

Though provider and customer perspectives have been well represented in the service research literature for many decades, only recently have governance concerns and the role of authority as a stakeholder in interactions been given adequate attention (Dixit, 2004; Ostrom, 2005; Williamson, 1999). Here, we focus on the access rights associated with customer and provider resources and the ways in which these rights are reconfigured when stakeholders agree to value propositions. In fact, we think that this reconfiguration of access rights *is* the fundamental mechanism of interaction among service system entities, and it is obviously related to a non-ownership perspective (Ehret & Wirtz, 2010) and also the "rental" theory of service (Lovelock & Gummesson, 2004).

Specifically, service system entities can grant one of four types of access rights to other entities (Spohrer & Maglio, 2010a): (a) access to resources that are owned outright (i.e., property); (b) access to resources that are leased or contracted for (e.g., rental car, home ownership via mortgage, insurance policies, etc.); (c) access to shared resources (e.g., roads, web information, air, etc.); and (d) access to privileged resources (e.g., personal thoughts, inalienable kinship relationships, etc.).

With growing middle-class populations in emerging markets, business model innovations will depend on value propositions that better exploit billions of new connected people around the world, and the access rights they have to their own information and to others' information. For example, in IT outsourcing, the level of service (i.e., "show me, help me, do it for me") may determine which organizations employees are in, who owns and depreciates equipment, who maintains confidential information, and who holds contracts with internal and external organizations. Beyond IT outsourcing, agents at a call center in India may bring up a customer record and see many fields blanked out, requiring customers to be transferred to call center agents operating in a different country with different levels of information access to resolve requests. Facebook, LinkedIn, and other social network service providers have business models that depend on the nature of access to shared and proprietary information resources.

Third principle of service science: *The access rights associated with customer and provider resources are reconfigured by mutually agreed-to value propositions.*

6. Physical symbols systems: A basic substrate for service system computation

Service is value cocreation (Spohrer & Maglio, 2010a). Service system entities reason about value given concerns of multiple stakeholders. Value cocreation is a joint activity that depends on communication. Reasoning about value and communicating is (often) an effective symbolic process. Formalizing the description of entities capable of sophisticated symbolic reasoning, Newell and Simon (1976) introduced the notion of *physical symbol systems*, and demonstrated that they are equivalent to Turing machines, meaning powerful enough to simulate all other machines (Newell, 1980). Reasoning about the knowledge of others has also been well studied formally (Fagin, Halpern, Moses, & Vardi, 2003).

Symbols guide both internal behavior and mediate interactions. Service system entities often rely on symbolic reasoning about value and worth (Ng, 2012). Value cocreation depends on coordination of activities across individuals, organizations, and firms, often intimate relationships that involve sharing resources, risks, and rewards. Coordination of action across a network depends on information flow. Improvements in processes of valuing are symbolic processes that can be shared and agreed to by service system entities. For example, in IT outsourcing, informal activities and interpersonal interactions account for much of the time spent working on customer issues, including negotiating work items and schedules, seeking and providing information and expertise, and using and sharing tools and practices (Haber, Kandogan, & Maglio, 2011; Kandogan, Maglio, Haber, & Bailey, 2012). And the same is true not just of interactions on the client side or on the provider side, but of interactions between customer and provider as they informally work out the meaning and implications of their service level agreements over time (Blomberg, 2008). Nevertheless, informal activities are conducted outside formal IT service delivery processes and tooling, making them a kind of inefficient add-on. They are almost never considered in cost analyses and almost never supported with tools or technologies. They are the fundamental symbolic processes of valuing and communication at work within and between service system entities.

Fourth principle of service science: *Service system entities compute and coordinate actions with others through symbolic processes of valuing and symbolic processes of communicating.*

7. Conclusion

Over the last four decades, service research pioneers from diverse disciplines, including marketing, operations and management, engineering and design, computing, economics, social sciences, and policy making have all made substantial contributions to our understanding of service. But these contributions must somehow be woven together if we are to understand service systems fully, and if we are to have the tools for effective service innovation to meet the complex business and societal challenges we face today with new business model innovations.

In this paper, we have distilled four core principles of service science that we think can bridge the disciplines, connecting them to practitioner and policy-maker concerns related to the science, management, engineering, and design of service systems. As we see it, service science depends on service-dominant logic, which views all economic exchange as service-for-service exchange between entities that possess resource-based capabilities. Goods are simply mechanisms by which service

system entities package their knowledge to easily distribute and share their capabilities with others across space, time, and scales. Therefore, we define service as value cocreation among distinct entities. To begin to make sense of value cocreation, we have described our four basic principles of service science:

1. Service system entities dynamically configure four types of resources.
2. Service system entities compute value given the concerns of multiple stakeholders.
3. The access rights associated with entity resources are reconfigured by mutually agreed-to value propositions.
4. Service system entities compute and coordinate actions with others through symbolic processes of valuing and symbolic processes of communicating.

But we have merely repeated and clarified these here. It remains to be seen whether they will be truly useful and effective in helping to describe, understand, and ultimately increase value cocreation through new business model innovation as they are applied over time.

In the context of our core principles of service science, value proposition design is a systematic search process that providers can perform to improve existing offerings, create new offerings, and reconfigure their ecosystems, for instance, through acquisitions, divestitures, and partnering. We have illustrated these points through IT outsourcing and other examples. The systematic search for innovation includes looking for adaptive advantages based on resource types (namely technology, people, organizations, and shared information), stakeholder concerns (including provider, customer, authority, and competitor concerns such as productivity, quality, compliance, sustainable innovation), access rights (to resources that are owned, leased, shared, or proprietary), and symbolic processes (of valuing and communication). The service science community is working on new tools and educational programs that will improve the ability of service science professionals and others to make value-proposition design an even more systematic search over time.

For managers, there are three main benefits of viewing value-proposition design as systematic search in accordance with the core principles of service science:

1. Managers can systematically reconfigure internal operations and customer and supplier interactions *to improve existing offerings* to existing and new customers;
2. Managers can systematically reconfigure internal operations and customer and supplier interactions *to create new offerings* for existing and new customers; and
3. Managers can systematically *evaluate broader ecosystem reconfigurations* (through acquisitions, divestitures, and partnering) in seeking to improve or enhance overall value propositions.

To do this, managers will need new and better tools to apply the principles of service science in a manner that co-elevates innovativeness of entities (their firms, customers, and suppliers) equitably, sustainably, and resiliently. Creating these tools is our current priority (e.g., Spohrer & Giuiusa, 2012; Tan et al., 2012).

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