Service science and service-dominant logic

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Abstract

This paper is an exploration of the relationship between service science and Service-Dominant Logic (S-D Logic). Service science is an emerging area of study, based on ten foundational concepts, with a focus on entities, known as service system entities, which normatively interact via value-co-creation mechanisms. Within the emerging service science community, service is often defined as value-co-creation. The S-D Logic for marketing is an emerging worldview or mindset, based on ten foundational propositions, and being developed in part to provide a new foundation for marketing theory that overcomes the limitations of the Product-Dominant Logic mindset which arose from the success of the industrial revolution. Within the emerging S-D Logic community, service is defined as the applications of competences (knowledge and skills) for the benefit of a party. Both service science and S-D Logic are evolving rapidly. This present exploration raises a number of questions for these two strongly interconnected communities to address as they develop and mature.

1. Introduction

Service science (Chesbrough and Spohrer 2006. Spohrer, Maglio, Bailey, Gruhl 2007) and Service-Dominant Logic (Vargo and Lusch 2004; Lusch and Vargo 2006) are two related areas of research, with many overlapping perspectives, concepts, and community members. In fact, to the degree possible, service science has been conceived of as based on S-D Logic (Maglio and Spohrer 2008; Spohrer, Vargo, Maglio, Caswell 2008). Nevertheless, because these are emerging areas, our conceptions of both must be continuously compared and revised as new insights are gained and consensus views emerge. Science is *the agreed upon methods and standards of rigor used by a community to develop a body of knowledge that accounts for observable classes of phenomenon in the world with conceptual frameworks, theories, models, and laws, that can be both empirically tested and applied to the benefit of society*. Our notion of a logic for marketing, which is not a formal mathematical logic, is more akin to *a conceptual framework, worldview, or mindset*.

For service science and S-D Logic to mature successfully into a more integrated whole, S-D Logic must provide a key part of the conceptual framework for the service science community. For example, what level of alignment in the definition of service should the communities seek to achieve? Steve Alter, a member of the service science community from the information systems area, recently reviewed many definitions of service (Alter, 2008), and concluded with a newly synthesized definition of his own: *Services are acts performed for others, including the provision of resources that others will use*. So one question is: Is it necessary, possible, and/or desirable to achieve a single definition for service within the service science and S-D Logic communities?

This deceptively simple question, on alignment of service definitions, could of course be a paper unto itself. What is clear in all definitions of service is the need to understand the nature of interactions (relationships) between entities as they seek value-cocreation outcomes. Where the emphasis gets placed, explains a large amount of the variation in definitions – is the emphasis

placed on the nature of the entities, the interactions, or the outcomes? Therefore, in service science we focus on understanding the nature of service system entities (how they access and configure resources), their interactions, and the possible outcomes of those interactions. What is also clear is that service system entities from all corners of the world are becoming more and more interdependent. Therefore, service science is increasingly concerned with service system networks and the global service system ecology, as well as disruptions of service and recovery from disruptions.

Thus, service is a type of interaction between particular types of entities aimed at particular outcomes, specifically value-cocreation outcomes (win-win). Over the last few decades, globe spanning information and communication technology has increased the density of service interactions world-wide (Normann 2001). New service offerings and a growing number of associated value-propositions result in more choices for people and businesses – should they become customers of a service offering, or providers of that service offering themselves? The megatrend is greater interdependency through more and more service interactions that seek to more fully utilize all available resources in value-cocreation activities. While this growing interdependency has both an upside (e.g., greater efficiency and lower cost) and a downside (e.g., potentially catastrophic failure cascades in networks), there is also a practical need for more people to have the appropriate historical and philosophical lens through which to view these changes (S-D Logic) and for scientists to rapidly create an appropriate body of knowledge to describe, explain, predict, and where possible design and control the evolution of this phenomenon (service science[1]). In the next sections, we more fully introduce service science and S-D Logic to arrive at an expanded set of questions for these communities to address in their quest for deeper integration.

2. Service Science

Service science is based on ten foundational concepts (Spohrer and Kwan 2009). These ten concepts are frequently mentioned, sometimes with explicit definitions and sometimes left implicit, within the existing service-related literature of academic disciplines. The existing literature has arisen as more and more functions within organizations have adopted a service

[1] Service science is short for Service Science Management Engineering and Design (SSMED). Service science can be conceived of as *a science of the artificial*. Simon (1996) in "The Sciences of the Artificial" provides a great deal of the conceptual foundations for what is now called service science. The outline of Simon's book provides an overview of many related topics: 1. Understanding the Natural and Artificial World, 2. Economic Rationality: Adaptive Artifice, 3. The Psychology of Thinking: Embedding Artifice in Nature, 4. Remembering and Learning: Memory as an Environment for Thought, 5. The Science of Design: Creating the Artificial, 6. Social Planning: Designing the Evolving Artifact, 6. Alternative Views of Complexity, 7. The Architecture of Complexity: Hierarchic Systems). Over two hundred universities in fifty nations have begun SSMED-related education programs (Hefley and Murphy 2008, and personal communications update). These programs use a great variety of reference books, some undergraduate programs start with the accessible book by Teboul (2006), masters programs have started to use Ricketts (2007), and doctorate programs used the well established and top selling Fitzsimmons and Fitzsimons (2007), complemented by many other textbooks, books, and readings (see Spohrer and Kwan (2009) for an annotated reference list, which has been placed on-line - http://www.cob.sjsu.edu/ssme/refmenu.asp). Those seeking to formalize service science have benefited from "Reasoning about Knowledge" (Fagin, Halpern, Moses, Vardi 2003). Economist approaching service science for the first time have benefited from "The Economics of Knowledge" (Foray 2006). Business practitioners approaching service science for the first time benefit from a focus on value propositions provided in "Value Merchants" (Anderson, Kumar, Narus 2007). SSMED books have begun to appear (Springer Series: Service Science: Research and Innovations in the Service Economy, Eds. B. Hefley and W. Murphy), and there are increasing activities, including a nascent professional organization (www.thesriii.org - Service Research and Innovation Initiative), integrations into an established annual conference (Frontiers in Service), as well as integration into an established top-rated journal (Journal of Service Research). A growing number of existing academic and professional organizations have established SERVSIG groups (e.g., AMA, INFORMS, etc.). Finally, nations are creating service innovation roadmaps (IfM and IBM, 2008).

mindset: service marketing, service operations, service management, service engineering, service computing, etc.

2.1. Resources

Everything that has a name and is useful can be viewed as a resource. Intuitively, resources, both physical and non-physical, are potentially useful things. Resources, both specific instances of resources and generic types of resources, have a lifespan (beginning, middle, and end), a relative abundance, and a cost of creating, maintaining, and retiring from access and use. Our world contains many resources, both the physical world (e.g., an instance of an apple that is seen or touched; lifespan of instance from flower to meal; lifespan of type is lifespan of species) and the non-physical world (e.g., the thought that 1+1=2; lifespan of instance lies within the neurons; lifespan of type is the lifespan of the species that associates meaning with these symbols). All namable-things can be classified as one of four types of resources: physical-with-rights (e.g., a person), not-physical-with-rights (e.g., a business), not-physical-with-no-rights (e.g., shareable information or documents, such as a description of a patent), and physical-with-no-rights (e.g., a technology). Rights derive from laws, and laws are a type of not-physical-with-no-rights resource. An observer can interpret every physical resource as a physical-symbol-system, with the sequence of symbols associated with the physical resource a description of the internal states of the resource as well as a description of the external relationships (external state). The descriptions (or observer interpretations) of internal and external state of physical resources are further examples of resources of the type not-physical-with-no-rights. The properties of those descriptions as well as other symbolic operations on those descriptions can create further examples of resources of the type not-physical-with-no-rights (e.g., information). Formalizing the notion of resources consistently across a broad spectrum of disciplines is a challenge for service science.

2.2. Entities

Some complex resource configurations can initiate actions, and these are called service system entities (or just entities, or sometimes just service systems). All service system entities are resources, but not all resources are service systems entities. Intuitively, entities are people, businesses, government agencies, and non-profit organizations, to name a few key types. Service system entities are dynamic value-cocreation configurations of resources, including people, organizations, shared information, and technology. Service systems may interact informally or formally. Informal interactions take place by means of explicit or implicit commitments and promises, and use social norms and sanctions for governance. Formal interactions take place by means of explicit or implicit legally binding contracts within a legal system, with rights guaranteed by an authority service system entity. It may not be possible to legally contract with an informal service system entity, but it may be possible to legally contract with either the sub-entities or super-entity (e.g., one cannot contract with the Almaden Service Research (ASR) group, but one can contract with IBM (super-entity) or with Jim Spohrer and other members of ASR (sub-entity)). Formalizing the notion of service system entities across a broad spectrum of disciplines is a challenge for service science.

2.3. Access rights

Intuitively, access rights deal with the social norms and legal regulations associated with resource access and usage. Access rights, we will see, are important because many value-cocreation interactions are mechanisms for changing an entities access rights to resources. Also, access rights are a constraint on service system interactions and outcomes, though more prone to violations than

constraints associated with physical systems and logical symbol systems. The four dominate types of access rights are owned outright (OO), leased-contracted (LC), shared access (SA), and privileged access (PA). Owned outright occurs when we buy something, and then have all the rights and responsibilities associated with property ownership. Leased-contracted occurs, for example, when one gets a hotel room or rents a car, and as a result receives certain rights, but more restricted than ownership. Shared access deals with resources such as public roads, the air we breathe, and much of the information on the world-wide-web for personal use. Privileged access deals with inalienable rights, such as biological family relationships, personal history, and private thoughts. Formalizing the notion of access rights and further developing the types of access rights is a challenge for service science.

2.4. Value-Cocreation Interactions

Also known as value-proposition-based interaction mechanisms, are intuitively the promises and contracts that entities agree to, because they believe following through will realize value-cocreation for both entities. A repeated value-proposition that creates profits for a firm is known as a business model. A partial enumeration of value-cocreation interactions or generic types of value-propositions would include: thing-for-thing exchange (barter), action-for-action-exchange (division-of-labor), money-for-thing-or-action-exchange (purchasing or buying), thing-for-money (selling), action-for-money (job or labor), money-for-peace-of-mind-and-potential-reimbursement (insurance), money-to-authority-for-security-emergency-response-and-other-routine-public-services (taxes), money-for-attention (advertising), money-for-temporary-use-of-resources (rental or leasing), money-for-chance-at-more-money-in-the-future (gambling and investment), money-for-a-collective-good (donations), money-for-a-greater-good (tithes), etc. Formalizing the notion value-cocreation interactions and further developing the types of value-propositions is a challenge for service science. Mapping the historical origins and usage patterns of particular value-propositions is a challenge. Developing improved methods to create effective value-propositions and business models is an active area of business research (Normann 2001; Slywotzky, Wise, and Weber 2003; Afuh 2004; Lovelock and Gummesson 2004; Kim and Maubrogne, 2005; Watson 2005; Anderson, Kumar, and Narus 2007; Gummesson 2007).

2.5. Governance Interactions

Intuitively, governance mechanisms are a type of value-proposition between an authority service system entity and a population of governed service system entities. Governance interactions depend on the degree of compliance of the governed entities, as well as the degree of coercion (e.g., banishment or death-penalty) that the authority entity is allowed by norms and laws. Two dominate forms of governance, with many intermediary and more sophisticated forms, are to concentrate dispute-resolution power in the decision-making of a single person (e.g., the political ruler) or a judiciary system based on public case law and regulations (e.g., a legal system). Service system entities may not realize, that is they may not actually produce, the value expected from a previously (mutually) agreed to value-proposition. If value is not realized as expected, this may result in a dispute between the entities. Governance mechanisms reduce the uncertainty (and hence risk of engaging) in these situations by prescribing a mutually agreed to process for resolving any disputes that may arise in advance. Governance mechanisms are also known as dispute resolution or conflict resolution mechanisms (March 1988; Williamson 1999; Adams 2000; Omerod 2005; Bernstein 1998). Formalizing the notion of governance interactions and further developing the types of dispute-resolution mechanism is a challenge for service science. Many academic disciplines and sub-disciplines actively study governance mechanisms, including economics and

law, political science, mechanism design theory, game theory, computer science and multi-agent systems.

2.6. Outcomes

When service system entities interact, value-cocreation is only one of the possible outcomes. In two player, non-repeated games, introductory game theory provides for four possible outcomes, that can be described simply as win-win, lose-lose, win-lose, and lose-win. In the real world things are more complex, possibly involving more players, repeated play (short-term and long-term), as well as more possible gradations in outcomes. The ISPAR (Interact-Service-Propose-Agree-Realize) model defines ten possible outcomes of service system interaction (Spohrer, Vargo, Maglio, Caswell 2008). ISPAR has ten possible outcomes which include: (1) value is realized, (2) the proposal (value proposition) is not understood, (3) the proposal is not agreed to, (4) value is not realized and disputes do not arise, (5) value-cocreation disputes are resolved in a manner that is OK for all stakeholders, (6) value-cocreation disputes are resolved in manner that is not OK for all stakeholder (7) an interaction is not a service interaction and is welcomed, (8) an unwelcomed non-service interaction is not criminal, (9) an unwelcomed non-service interaction is criminal and justice results, (10) an unwelcome non-service interaction is criminal and justice does not result. A standard two player game can be thought of in terms of a customer player and a provider player.

However, ISPAR assumes four players or types of stakeholders: customer, provider, authority, and competitor-criminal. By admitting the notion of non-service interactions and competitor-criminal stakeholders, ISPAR goes beyond the normative view of service system entity interactions, and is hence more descriptive of the real-world. Service system entities have the competence to make decisions about relationships over a life time of interactions, not only the history of past interactions but also reasoning about possible future customer-life-time-value of service interactions (Rust, Zeithmal, and Lemon 2000).

2.7. Stakeholders

The four primary types of stakeholders are *customer, provider, authority, and competitor*. Reasoning about multiple stakeholders and their perspectives on resource access is necessary to design new and improved value-cocreation mechanisms and governance mechanisms, as well as to design new and improved types of service system entities. In addition to the four fundamental stakeholder perspectives (customer, provider, authority, competition), other stakeholder perspectives include employee, partner, entrepreneur, criminal, victim, underserved, citizen, manager, children, aged, and many others. Designing business and societal systems that address more than the four fundamental stakeholder perspectives is sometimes considered to be the difference between having a society that is merely ‘prosperous’ and having a society that is truly ‘great’ (Collins 2005).

2.8. Measures

The four primary types of measures are *quality, productivity, compliance, and sustainable innovation*. Each of these corresponds to a stakeholder perspective: customers evaluate quality, providers evaluate productivity, authorities evaluate compliance, and, in a very real sense, competitors evaluate sustainable innovation. Without competitors there is very little drive or incentive to innovate. With regard to sustainable innovation, von Mises (von Mises 1998) states: “Competitors aim at excellence and preeminence in accomplishments within a system of mutual

cooperation" (pp. 116-117). The ongoing challenge that service system entities (e.g., people) perceive is 'self competition' to sustain a balance between too much challenge (anxiety and risk of failure, if skills are lacking) and too little challenge (boredom and risk of meaningless success). A dynamic balance between anxiety and boredom helps to ensure a sense that change has meaning and value (Csikszentmihalyi 1990).

2.9. Networks

Also known as service system networks, service systems entities interact with other service system entities (normatively) via value-propositions. Over time, for a population of entities, the patterns of routine interactions can be viewed as networks with direct and indirect connectivity strengths. The routine interactions may be characterized as relationships, and a great deal insight can be gained on service system networks by considering a relationship marketing approach which deals with creating value for multiple stakeholders (Christopher, Payne, Ballantyne 2002). A service system network is an abstraction that only emerges when one assumes a particular analysis overlay on the history of interactions amongst service system entities. The networks have an upside (e.g. increase the utilization of resources and increase the available investment to improve resources) as well as a down-side (e.g., catastrophic failures that cascade to many entities when the networks are disrupted).

2.10. Ecology

Also known as service system ecology, the macro-scale interactions of the populations of different types of service system entities. Different types of service systems entities exist in populations, and the universe of all service system entities forms the service system ecology or service world (Bryson, Daniels, and Warf 2004). The ecology is characterized both by the diversity of types of service system entities and their relative numbers (population size).

Given these ten concepts, the science of service science is attempting to begin with descriptions of entities, interactions, and outcomes, as well as the mechanism that explain the evolution of value-cocreation. A challenge for service science is to better articulate the ten basic concepts: resources, service system entities, access rights, value-cocreation interactions, governance interactions, outcomes, stakeholders, measures, service system networks, and service system ecology. In the next section, we begin to relate these concepts to the ten foundational premises of S-D Logic.

3. S-D Logic

The ten foundational premises (FP1-FP10) of S-D Logic are:

3.1 Service is the fundamental basis of exchange

Exchange is a type of interaction among entities. People (and other economic actors) specialize in particular skills, and specialization means not doing everything, and thus exchange is required. The more a society depends on specialization, the more exchange is also required, and thus interdependence grows. For example, one individual may specialize in farming knowledge and another in fishing knowledge, so when vegetables are exchanged for fish, what is really being exchanged is farming knowledge for fishing knowledge. When a customer buys a car or a computer, they are really buying specialized knowledge (without which the product would not exist). S-D Logic defines service as the applications of competences (knowledge and skill) for benefit of a party. Thus, service is the fundamental basis of exchange.

3.2 Indirect exchange masks the fundamental basis of exchange

Exchange is a type of interactions among entities. Exchange can be made more efficient, but often efficiency gains come at a cost. For example, over time the exchange process has become increasingly monetized. Barter of thing for thing, or action for action, has been replaced by jobs (actions for money) and purchasing (money for things and actions). Money and goods as well as organizations and networks are vehicles to enhance the efficiency of exchange, but they mask the fundamental service for service basis of exchange. Direct service for service exchange facilitates shared knowledge and mutual adaptation via direct contact, while indirect exchange can be more efficient, but creates lags or time delays in mutual adaptation. Service for service exchange is about direct service system entity interactions, in which each entity is both a customer and a provider, and mutual adaptation can happen through direct contact.

3.3 Goods are distribution mechanisms for service provision

Goods are a type of resource. Well designed goods incorporate a great deal of knowledge that may be the accumulation of the skills of many service providers over many years. Goods help solve the efficient knowledge transfer problem. Goods improve the efficiency of service provision (not all the people have to be present as would be the case for direct service for service exchange), but again at the cost of (often) creating a time lag between customer and service provider when mutual adaptation or change is required.

3.4 Operant resources are the fundamental source of competitive advantage

Resources that can be easily transferred or copied cannot be the source of competitive advantage. One type of operant resource, which is a resource that can take action and make a change in the world, is the service system entity (e.g., people, businesses, government agencies, non-profit organizations). Service system entities always include at least one person, and so cannot be easily transferred or copied. Knowledge embedded in people is the most fundamental type of operant resource. However, knowledge encoded as information or technology is more easily copied and transferred. Knowledge embedded in people or organizations is more difficult to copy, transfer, and combine (e.g., the fact that many mergers and acquisitions fail to create the expected synergy value). Resources that have rights are difficult to copy, transfer, split apart, and combine, while resources that do not have rights are more easily copied, transferred, split apart, and combined. Establishing relationships and value-propositions between service system entities is also a type of resource that is not easy to copy or transfer, and thus service system networks offer competitive advantage, as well.

3.5 All economies are service economies

All economies, be they hunter-gatherer, agricultural, manufacturing, or “services,” depend on human knowledge application to create benefit – that is *service*. Because economics as a science arose during the transition from agricultural knowledge to manufacturing knowledge, the focus on tangible output, or Product-Dominant Logic (P-D Logic) is understandable, as the service for service nature of exchanged was masked by indirect exchange, goods, jobs, and money. Manufacturing knowledge certainly existed during the agricultural era, but it was largely custom and more clearly a service, or specialized application of knowledge for the benefit of a party (the customer). Some prefer to call the current era the information economy or the knowledge economy, instead of the service economy. However, all economic eras have been service, knowledge, and information economies. The fallacy becomes even more apparent when a

manufacturing business, spins off a division and contracts back again for that specialized service using the same employees. At the level of national accounts, economist may now count the same employees, doing the same work, as part of the service economy, instead of as part of the manufacturing economy. All economies are service economies. Economists from the time of Colin Clark (Clark 1957) have also noted that service for service exchanges in the home and local community create significant value, but are not counted in national economic statistics.

3.6. The customer is always a co-creator of value

Customers are entities, which are service system entities. Providers are also service system entities. Every service system entity is interdependent with some other service system entities, because of specialization and exchange. Therefore, every service system entity is both a customer and provider. Together, customer and provider service system entities interact to co-create value. P-D Logic sees value creation stopping with manufacturing, and value consumption starting when the customer receives the product. Excellent service design places a value on both customer-actions as well as provider-actions in order to innovate. Manufacturers who ignore the total cost of ownership of products, such as the customer's costs of acquisition, set-up, maintenance, disposal, do so at their own peril. These manufacturers may lose to competitors who can provide better design and better service, based on their understanding of the customer as a partner in value-cocreation (Womack and Jones 2005).

3.7. The enterprise cannot deliver value, but only offer value propositions

Value-propositions are at the heart of value-cocreation interactions. Both the customer and the provider must agree to the value-proposition, and see the mutual benefit as well as the mutual responsibility. Even when an emergency response team is trying to rescue a person in peril, if that person does not want to be rescued, and does not comply or cooperate in the rescue, then it is more likely that the emergency response team will fail. Because the enterprise, as the service provider, can only perform some of the actions (costs), but not all of the actions (customers actions and cost), the enterprise cannot deliver value, but only offer value-propositions. Only together can the customer and the provider cocreate-value. For example, many educational institutions screen candidates very carefully to determine whether or not the students are likely to be successful at their institutions. Education institutions cannot deliver value, but only offer a value proposition to their students.

3.8. A service-centered view is inherently customer oriented and relational

Less customer knowledge and lower quality relationships often translate into inferior value-propositions, especially for high value service offerings. A service provider's knowledge of a customer, and the quality of their relationship (level of trust) required to gain shared access to that customer's privileged access resources, directly relates to the quality of the value-propositions that the service provider can offer. It would be very unlikely for a service provider to say, "Because I know next to nothing about my customers, and because they do not trust me, I am able to put my competitors to shame in creating value with my customers."

3.9. All economic and social actors are resource integrators

Service system entities are economic and social actors, which configure (or integrate) resources, in order to cocreate-value with other service system entities. S-D Logic pays particular attention to classifications of resources. For example, resources can be divided into three categories: market-

facing resources (available for purchase to own-outright or for lease/contract), private non-market facing resources (privileged access), and public non-market facing resources (shared access). In creating or realizing value-propositions with others, service system entities will reconfigure or integrate resources.

3.10. Value is always uniquely and phenomenologically determined by the beneficiary

Value is more than a decision. Value determination is contextual, history dependent, and unique. Providers have something to learn from each and every customer. Nevertheless, to oversimplify value determination as a decision, just for a moment, does create some interesting thought experiments. Imagine a service system entity that can accurately predict the judgment of value of another – flawlessly, without error. Next imagine a service system entity that can control the judgment of value of another. Clearly, prediction and control can make crafting successful value-propositions much easier (Ariely 2008). While perfect prediction and control are not possible, service providers that take advantage of customers, and manipulate their decision making judgments are not co-creating value. Governance mechanisms are one remedy for these situations. However, service providers that take advantage of mass customization technology to allow customers to have it their way, can make crafting successful value-propositions both more likely, and more in the control of the customer. They are also more likely to learn something unique about each of their customers.

4. Two questions for further consideration

The first question deals with the value of these efforts, and can be concisely stated as: "What is the value of a worldview, such as those developing in the growing S-D Logic and Service Science communities?" Ultimately, the full value of any worldview comes when it is established as a new paradigm (the "new" commonsense) and proves to be fruitful in advancing frontiers of knowledge in productive directions with diverse theoretical and practical implications.

The S-D Logic and Service Science worldviews are forming at a time when the world is coming to grips with a number of mega-trends and potentially disruptive forces: increasing specialization of entities, increasing exchange and interdependence between entities engaged in service interactions, increasing technological change resulting in more complex-technology-and-network-enabled service interactions, increasing organizational change resulting in more complex-organization-and-network-enabled service interactions, and all of this leading to an increasing potential for unintended consequences, both small and large, that disrupt routine service interactions. Examples of disruption of routine service are all too common: US northeastern power grid failure, the grounding of all US commercial flights after the 911 terrorist attack on NYC, Hurricane Katrina's devastation of New Orleans region, the current global financial subprime mortgage and lending crises centered on Wall Street. Major disruptions in routine service, all take resources and investment to heal, and much time before a full recovery is possible.

The hard work of systematically mapping and collecting examples of all of the types of service system entities and types of interactions is underway. For example, at IBM the Component Business Modeling (CBM) initiative is one such effort to systematically map all industry models, including national variations, and key performance indicators (KPIs) internal to, external to, and at the interface of interacting service system entities (Pohle, Korsten, and Ramamurthy 2005).

The table below is intended to be a template for students of service science and S-D Logic who wish to map out service system interactions of a variety of entities:

Type of Service System Entity	**Type of Interaction (daily, weekly, monthly, annually, life-span)**	**Type of Disruption (failures, upgrades, innovations, changes)**	**Balancing Interdependence and Independence**
Person	Utilities	Black-out	Generator/Solar
	Mortgage/rental	Subprime crisis	Risk management
	Transportation	Terrorism	Alternatives
	Retail	Shortages	Stockpiles
	Entertainment	Strike	Reruns
	Communications	Network failure	Redundancy
	Healthcare	Pandemic	Quarantine
Business	Employee payroll	Shortfall	Loans
	Customers	Boycotts	Diversification
	Supply chain	Price increases	Substitutes
Nation	Defense	Multiple fronts	Allies
	Social security	Demographics	Regulations
	Trade	Sanctions	Substitutes
Social-sector org.	Fund raising	Economic downturn	Donor diversity
	Crisis response	No local service	Evacuation

As long as a service system entity can depend on routine service interaction with their customers and their providers (suppliers), all is well. However, when, for example, the power fails or some other disruption occurs, then the customer (service system entity) must seek alternatives (self-service or alternative providers), work to recover, or go without the service for some period of time. Because we take for granted the many service interactions that are part of our daily routines, it is a good exercise to ask "what if" this service was disrupted, then what? Some disruptions just require a little added patience to get through, and service is quickly restored. Other disruptions are more severe, and full recovery may never be completely achieved. Of course, disruptions may also be scheduled upgrades and transitions to new service providers.

The second question we can ask, deals with the scope of service science and S-D Logic, and can be concisely stated as "Are all human interactions, service interactions?" One could argue that interactions that humans, who are conscious, mature, sane, and rational, undertake and perform are by their very nature intended to create a more preferred state of the world over that state which would result in the world if no action were taken. However, what about actions that make us better off in some ways, but worse off in others, or actions that make us better off, but others worse off; or actions that make us better off in the short term, but worse off in the long term? In addition, we cannot know all the consequences of our actions, so what about unanticipated consequences or unintended consequences; or what about actions that are taken, based on assumptions about ourselves, others, or the world that are not valid; or what about actions we indirectly cause through technologies or other arrangements that are not directly under our control?

Finally, what about interactions that began as service interactions, but then became routine and abbreviated, and continue as habits or rituals in spite of the fact that the originals reasons (value-cocreation) are no longer valid? Does service science and S-D Logic have anything to say about these many issues of scoping?

So two fundamental questions that both service science and S-D Logic must more completely address, if in fact there is to be greater alignment between the two communities, are:

What is the value of these worldviews?
What is the scope of these emerging areas of study?

While complete answers to these questions will require further development of both communities and their associated bodies of knowledge, it does seem that both service science and S-D Logic are concerned with increasing our understanding of service system entities and their interactions, in order to both create improved service (more value gains) and more rapidly recover from disrupted or degraded service interactions (less value loss). Furthermore, the scope does cover a very broad swath of knowledge-intensive human interactions.

5. Concluding Remarks

This paper has provided a concise framing for the exploration of the relationship between service science and S-D Logic. The ten foundational concepts of service science and the ten foundational premises of S-D Logic were summarized. From these summaries, it can be seen that service science begins with descriptions of entities, interactions, and outcomes and aims to illuminate mechanisms that explain the evolution of value-cocreation interactions (exchange). S-D Logic begins with descriptions of the nature of exchange (value-cocreation interactions), and aims to illuminate how the evolving nature of exchange has lead to biases in understanding the true nature of exchange. One question that arises is whether service science (service is value-cocreation) and S-D Logic (service is the applications of competence (knowledge and resources) for the benefit of a party) can/should create a converged definition of service. Two further questions dealing with the value and scope of these efforts were then discussed.

In sum, as in structuration theory (Giddens 1986), service science adopts an evolutionary perspective, that structure (service system entities and the resources they configure, access and use) and action (such as value-proposition-based interactions) constrain each other in a coevolving way. The world begins via resource interactions, leading to physical symbol system interactions (entities with symbol manipulation/reasoning and communication/language ability), leading to informal service system interactions (human norms), and then formal service system interactions (national laws). Structures and actions that enhance value-cocreation become self-reinforcing (Wright 2000). Service density increases as structures and actions create and fully utilize more resources (Normann 2001). Resources that are not fully utilized are opportunities. Potential resources that might exist, but have not yet been created, are opportunities.

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End Notes

Exchange is a type of interaction between entities.

What is exchange? What is service?

Networks form when many entities interact in routine and novel patterns.

What is indirect exchange?

Interactions “accumulate”

What is a good? What is a distribution mechanism?

Entities compete

What is an operant resource? What is competitive advantage?

All economies evolve interactions that cocreate-value for entities.

What is an economy? What is a service economy?

Some entities are in the role of customer during an interaction

What is a customer? What is value-cocreation?

Service interactions are based on value propositions

What is an enterprise? What does it mean to “deliver value”? What is a value proposition?

Value propositions design requires knowledge of and negotiation with a customer

What is customer-oriented? What is relational? What is a service-centered view?

All service system entities have social and economic dimensions

What is an economic actor? What is a social actor? What is a resource integrator?

Value estimation is mixed quantitative and qualitative competence of entities

What is value? What is a beneficiary?