Service Science

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This paper extends research on innovation as institutional change within service science and service-dominant (S-D) logic by conceptualizing the emergence of novel solutions in service ecosystems. We pay particular attention to how actors (individuals and organizations) are able to create new solutions that change the very institutional arrangements that guide and constrain them. We propose that institutional complexity—the multiplicity of institutional arrangements confronting actors with conflicting prescriptions for action—drives the emergence of novelty. Institutional complexity reduces the influence of prevailing institutions by activating conscious problem solving and making available multiple institutional "toolkits." These dynamic toolkits consist of the cultural norms and meanings, as well as material practices, associated with specific institutional arrangements, with which actors can jointly reconstruct and change value cocreation practices and advance change in the institutional arrangements of service ecosystems. This paper contributes to service science and S-D logic by providing a more comprehensive understanding of innovation driven by institutional complexity, in which the stability of institutional arrangements is reconciled with the actor-driven creation of novel solutions constitutive of institutional change.

Introduction

One purpose of service science is the creation of systematic service innovations based on a comprehensive scientific understanding of *service systems* that cuts across multiple academic disciplines (e.g., Chesbrough 2005, Maglio and Spohrer 2008, Spohrer and Maglio 2008). The philosophical basis of service science has its roots in service-dominant (S-D) logic (Maglio and Spohrer 2008, Maglio et al. 2009, Vargo and Akaka 2009), which proposes service—the application of resources for the benefit of others (Vargo and Lusch 2004, 2008)—as the central concept in understanding value (co)creation in service ecosystems[1] (Lusch and Vargo 2014). The service ecosystems perspective draws attention to the central role of actor-generated institutions (i.e., formal rules, social norms, and cultural meanings) and institutional arrangements (i.e., sets of interrelated institutions) that guide, constrain, and coordinate value cocreation in service ecosystems (Spohrer and Maglio 2010; Vargo and Akaka 2012; Vargo and Lusch 2011, 2016). For innovation research, this means extending beyond a goods-based view of innovation and its understanding in terms of new outputs (i.e., products and services) to treating innovation as the systemwide emergence and institutionalization of new solutions to shared problems (Vargo et al. 2015).

A defining characteristic of institutions is their enduring and often taken-for-granted nature and their appearance as objective structures of social reality (Berger and Luckman 1966, Giddens 1984). This means that as actors are embedded in institutional arrangements, the interrelated sets of rules, norms, and meanings associated with them constitute largely latent and collectively accepted "rules of the game" (North 1990) from which deviations are either formally or socially sanctioned and are thus quite uncommon (Scott 2014). The literature offers an increasingly rich account of innovation in service ecosystems, emphasizing the role of institutions and the process of institutionalization (Vargo et al. 2015). This work opens up novel possibilities for elaborating how actors in service ecosystems can create new solutions that transform the very institutional arrangements that guide and govern them.

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[1] We prefer the term *service ecosystems* to *service systems*, as the service ecosystems perspective provides a framework for studying the more general role of institutions and looks at technology as an institutional phenomenon (Vargo and Lusch 2016).

To this end, this paper addresses the following question: How do new solutions—new value cocreation practices—emerge in institutionally coordinated service ecosystems? By leveraging insights on institutional change from institutional theory developed in sociology and organization theory, together with the S-D logic, we explain how institutional complexity—the multiplicity of institutional arrangements in service ecosystems, which confronts actors with incompatible prescriptions for action—drives change and innovation. On the one hand, the coexistence of incompatible institutional arrangements elevates actors' conscious and reflective problem solving by reducing the taken-for-grantedness of institutional arrangements. On the other hand, institutional complexity makes available multiple institutional "toolkits," consisting of the cultural norms, meanings, and material practices comprising different institutional arrangements. The availability of multiple institutional toolkits enables the creative reconstruction of value cocreation practices in service ecosystems as actors can reconcile, transform, and integrate elements within them.

Hence, this paper advocates a complexity-based conceptualization of innovation as a process of institutional change. While researchers have already highlighted the centrality of diversity for innovation, particularly at the organizational level (e.g., Bassett-Jones 2005, Hewlett et al. 2013, Milliken and Martins 1996, Williams and O'Reilly 1998), what remains less developed is the theoretical foundation that explains why diversity is important for novelty to emerge. Thus, we find it worthwhile to pursue a conceptual integration of research to prepare the foundation for a more comprehensive understanding of innovation at the nexus of institutions and institutional arrangements on the one hand and actor-driven change and the emergence of new solutions on the other.

To elaborate this argument, our paper proceeds in four parts. First, we summarize the service ecosystems perspective of S-D logic and the way it interprets innovation. Second, we define and clarify the concept of institutions and institutional arrangements and outline the main issues of conceptualizing innovation within the institutional framework. On this basis, we present our main argument in the third section. We propose that institutional complexity, inherent to service ecosystems, reduces the influence of prevailing institutional arrangements for actors by giving access to multiple institutional toolkits with which new solutions can be constructed. We crystallize our main arguments into explicit research propositions and conclude this paper with a discussion of the implications of our work for future research on innovation in service ecosystems from a service science perspective.

Service Ecosystems Perspective of Innovation

S-D logic and service science are based on the view that service, rather than tangible goods, constitute the fundamental basis of exchange (Maglio and Spohrer 2008, Vargo et al. 2010). Vargo and Lusch (2004, 2008) define *service* as the application of competences for the benefit of other actors or the actor itself, distinguishing the singular notion of "service from the plural notion of services" understood as immaterial outputs of firm-driven production processes (Lusch and Vargo 2014). S-D logic perceives all actors (e.g., "producers" and "consumers") as resource integrators who use their competences and other resources to integrate them with resources available through other actors to solve specific problems, thereby creating value for others and for themselves (Vargo and Lusch 2011). The implication is that no actor creates value alone; value is always cocreated among many actors in the ongoing resource integration and reciprocal service exchange (Lusch and Vargo 2014, Vargo and Lusch 2004).

This networked view of value cocreation is encapsulated in the service ecosystems perspective. Driven by the ongoing resource integration that constitutes dynamically evolving contexts for value creation (Chandler and Vargo 2011), networks are transposed into dynamically evolving systems—service ecosystems (Vargo and Lusch 2011)—defined as "relatively self-contained, self-adjusting system of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange" (Vargo and Lusch 2016, p. 10). Service ecosystems are complex systems of many interconnected and nested parts, or overlapping and loosely coupled subsystems (e.g., Koskela-Huotari and Vargo 2016, Vargo et al. 2015). This means that any system can be considered both as a whole system and as part of a larger system depending on the level of aggregation and perspective of analysis.

An essential part of the service ecosystems perspective is its actor-to-actor orientation to value cocreation, which posits that all actors are "enterprises" of varying sizes, ranging from individuals to large firms, and engaged in the process of benefiting their own existence through benefiting the existence of others (Vargo and Lusch 2011, 2016). According to Vargo and Lusch (2016), this generic actor designation should not be confused with a position that all actors are identical. Instead, the purpose is just the opposite: by disassociating actors from their predesignated roles, the stage is set for characterizing them in terms of distinctly constituted identities associated with unique intersections of the institutional arrangements with which they associate themselves,

and within which they cocreate value. Hence, we view individuals and organizations as fundamentally similar kinds of actors who are embedded in the various institutional arrangements of service ecosystems, have distinct identities, and hold a capacity to act.

The service ecosystems perspective suggests that "innovation primarily involves the integration of operant resources—those that are capable of acting on other resources to create value—and the (re)building of structure through interaction and value co-creation among multiple actors, as well as the (de)institutionalization of systems of service exchange" (Vargo et al. 2015, p. 66). In other words, innovation is portrayed as both resulting in, and being driven by, the ongoing value cocreation practices among many actors integrating and exchanging their (specialized) resources with those of others to solve new or existing problems (Coombs and Miles 2000, Vargo et al. 2015). This view not only highlights that innovation is always a cocreational process, but also that new technologies always possess institutional components, that is, components related to the institutionalization of shared forms of social interaction and value cocreation (Akaka and Vargo 2013).

The ecosystems view paves the way for a transcending approach to considering different types of innovation, such as technology and markets (e.g., Vargo et al. 2015). In particular, innovation cannot be considered separate from the surrounding system and the multiple actors who act in concert to cocreate value in new ways. This perspective views value creation and innovation as inherently networked and distributed, shaped by the characteristics of the broader systems as much as the aspirations of specific actors. As an empirical example, Garud and Karnøe (2003) show how ecosystems around the wind turbine industry developed different characteristics in Denmark and the United States. Whereas the former favored local experiments and bricolage as the predominant approach to innovation and was able to leverage this flexibility for market leadership, the latter adopted a research-driven approach, which was aimed at breakthrough technology, but resulted in reduced ability for microlevel learning and adaptation necessary for the emergence of novel solutions. From the perspective of resource integration, this means that the local development of new technologies, or applied useful knowledge (Mokyr 2002), requires the adaptation to, or coupling with, changes in the surrounding ecosystem so as to enable actors to leverage the "becoming" of new resources for value creation (Chandler and Vargo 2011, Koskela-Huotari and Vargo 2016, Lusch and Vargo 2014, Penrose 1995). It also calls for the development of new capabilities which enable the emergence of new technologies for value creation (see also Abernathy and Clark 1985, Damanpour and Evan 1984).

This view calls for sensitivity to the institutional arrangements that shape actors' perceptions of resources. Service ecosystems are dynamically evolving systems of actors that are interrelated through the activities of resource integration and service provision. They are coordinated by shared institutions and institutional arrangements, which constrain actors (e.g., by shaping their views of resources and value) but also enable them to interact and cocreate value by providing the shared basis for collaboration (e.g., Edvardsson et al. 2014, Vargo and Akaka 2012, Vargo and Lusch 2016). This means that actors build on existing and institutionalized assumptions, values, and beliefs in their value cocreation. Simultaneously, however, the collaborative creation of new forms of resource integration reconstructs the institutions and institutional arrangements coordinating value cocreation (Vargo and Lusch 2011, 2016).

Institutions and the Paradox of Embedded Agency

Central to the concept of institutions is that they describe the enduring aspects of social systems and human life (Giddens 1984). In economics, institutions represent the rules of the economic game (North 1990), and in political science, institutions are traditionally associated with the legislative or political structures of the society (e.g., Peters 2012). In sociology, institutions are often understood more broadly as encompassing the social norms and cultural assumptions that are not purposefully designed by "rational" actors, but that guide and constrain behavior by becoming a taken-for-granted part of the way of living in a context or society (e.g., Berger and Luckman 1966, Scott 2014, Zucker 1977).

We build on Scott (2014, p. 56), who defines *institutions* as the "regulative, normative and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life." According to this definition, institutions consist of formalized rules such as laws, more informal norms including social expectations, values and moral codes that define appropriate behavior, and cultural meanings including cognitive frames and schemas that encapsulate the assumptions and beliefs fundamental to making life comprehensible. In alignment with recent developments in S-D logic, we conceptualize *institutional arrangements* as sets of interrelated institutions (Vargo and Lusch 2016), which highlight that individual institutions (e.g., a formal rule or law, or an informal social norm or routine) do not exist in isolation, but as a part of a more general and comprehensive system (or systems) of interrelated institutions that constitute the basis for collective action.

This definition encapsulates the idea that institutions are not inert and objective symbolic structures, which unilaterally govern human actors and value cocreation in a service ecosystem. Instead, it views institutions as instantiated in social practices, in which they are both preserved and modified by human behavior (Geertz 1973, Scott 2014). More elaborately theorized by Giddens (1984) in his structuration theory, this view posits that institutions do not have time-space existence outside the instantiated interactions among actors and their memory traces. "Social structure," therefore, is not something external to actors, but internal and shared among them. This means that institutions and institutional arrangements in service ecosystems can be seen to have only virtual existence that is inseparable from actors and their enactment of value cocreation practices, which produces and reproduces the institutional structure (Giddens 1984). In this context, human agency can be understood as a temporally embedded process of social engagement (Emirbayer and Mische 1998). What gives it power to reconstruct institutions is that, in addition to being informed by the past (e.g., the memory traces or practical bodily knowledge associated with a solution), human agency has an orientation to the future through actors' imagination, and to the present as actors contextualize experiences and visions within the present contingencies (Giddens 1984).

Similar to S-D logic, the current view of institutions places emphasis on resources. Shared cultural schemas constitutive of institutions lose their viability and centrality in the absence of resources empowering them, and, equally, resources without schemas to direct their use eventually dissolve (Sewell 1992). Hence, institutional arrangements frame resources, or give them their "resourceness" (Koskela-Huotari and Vargo 2016), just as actors' roles, positions, and identity are embedded in, and stem from, the multiple contexts and webs of institutions (e.g., Giddens 1984, Holland et al. 1998).

Constitutive of institutional theory in most of its expressions, in contrast to traditional theorizing on innovation, is that institutions explain why actors tend to act similarly. The different institutionalized elements of social life create pressure on actors to adopt and conform to shared forms of thinking and behavior, partially restricting their ability to act otherwise (DiMaggio and Powell 1983, Scott 2014). This view implies that what is not allowed or prescribed by institutions is largely constrained, as it is sanctioned against or beyond actors' imagination of alternatives. This is not to say, however, that institutions are portrayed in the literature only as constraining; institutions are also enabling (Giddens 1984, Sewell 1992) as they allow actors to cocreate value efficiently by providing shared schemas, norms, and rules for resource integration and service exchange among actors (Lusch and Vargo 2014). In this sense, it is useful to think of institutions, and broader arrangements of institutions, as coordinating value cocreation among actors (Vargo and Lusch 2016).

In light of this view, the notion of innovation becomes more complex as it must explain how actors are able to create new solutions that change the very institutional arrangements in which they are embedded (e.g., DiMaggio and Powell 1991, Garud et al. 2007, Holm 1995, Sewell 1992). Consistent with the purpose of this paper, we conceptualize the emergence of new solutions in the light of this paradox of embedded agency, which balances the structure- and agency-centered explanations of innovation and value cocreation. This allows building a broader understanding of innovation which, aligned with recent work on S-D logic (e.g., Vargo et al. 2015), focuses on the emergence and institutionalization of new forms of activity created endogenously by actors within the changing system.

Moreover, this paper can advance the understanding of agency and innovation beyond the mutual constitution of structure and agency. Mutual constitution means that, as stated, institutions are not considered as objective structures external to human practice, but as virtual structures existing in the memory traces of actors and recursively implicated in the situated activities of human agents reproduced across time and space (Giddens 1984). This way of thinking about institutions accommodates the possibility of situated modification of institutionalized practices by knowledgeable actors who are able to apply their knowledge and skills to specific contextual problems in (incrementally) novel ways (e.g., Feldman and Pentland 2003, Giddens 1984, Sewell 1992). Furthermore, it points to the possibility of conceptualizing *when* and *how* new solutions may emerge. The next section addresses these questions by proposing institutional complexity as a driver for the emergence of novel solutions.

Institutional Complexity and the Emergence of Novel Solutions

A potential solution to the paradox of embedded agency stems from the view that service ecosystems are "systems of systems" coordinated by multiple institutional arrangements (Lusch and Vargo 2014, see also Padgett and Powell 2012). The multiplicity of institutional arrangements in service ecosystems, and in the society at large, means that actors (both individuals and organizations) operate and are embedded in multiple contexts coordinated by different institutional arrangements (Ostrom 2005, Vargo and Lusch 2016). For example, the

institutions and institutional arrangements associated with a family, business, community, and nation rest on partially different assumptions, values, and beliefs, and provide actors multiple guiding frameworks and bases for justifying actions (Boltanski and Thevenot 2006, Thornton et al. 2012). This means that institutions and institutional arrangements do not exist in isolation, but can be understood only through their mutually dependent, yet often contradictory, relationships as they intertwine in human practice (Friedland and Alford 1991). It also implies that actors, simultaneously embedded in multiple institutional arrangements, represent (unique) configurations of the institutional arrangements available to them.

The consequence of diverse institutional arrangements is that actors confront incompatible prescriptions for action, or *institutional complexity* (Greenwood et al. 2011). It disrupts the more or less automatic conformation to and reproduction of the rules, norms, values, and meanings of a particular institutional arrangement, evoking ambiguity, uncertainty, tension, and contradiction as the influence of the prevailing institutional arrangement diminishes (Friedland and Alford 1991). Institutional complexity can manifest in many ways (Seo and Creed 2002). For example, actors from different belief systems (e.g., religions) may hold conflicting views (e.g., on what value is and what goals are appropriate) to the effect of preventing collaboration. Dissatisfaction with the inefficiency of current solutions, which stems from the pressures to adopt legitimate forms or activity among constituencies, also highlights a manifestation of institutional complexity. Similarly, conformation to a stable set of institutionalized practices within a subsystem might impair over the long-term the adaptability of the actor to changes within a broader ecosystem. Such changes are then perceived as "exogenous shocks" that place actors in complex situations in which familiar institutional arrangements might cease to provide a viable basis for action. Finally, prevailing institutional arrangements, for example, within a community, might not favor the interests or goals of certain actors that partly identify with alternative institutional arrangements. By confronting the status quo, these actors render the institutional complexity salient.

In service ecosystems, institutional complexity draws attention to the intersecting and overlapping institutional arrangements that can impose diverging views on what value is, fuel conflicting interests among actors, and prescribe incompatible ways for integrating resources to cocreate value. For example, the contradictions between market-based profit generation and sustainable development might impose different interpretations, moral evaluations, goals, actor roles, and courses of legitimate action on firms, which pushes them to find solutions beyond either logic of action. Building on the research cited above, we formulate a proposition regarding the basic structure of service ecosystems:

Proposition 1. *In service ecosystems, actors are simultaneously embedded in multiple institutional arrangements, which gives rise to institutional complexity.*

The result of this view is that actors are forced to respond to institutional complexity in some way to reconstruct continuity, order, and meaning in their social life (Greenwood et al. 2011, Kraatz and Block 2008) and to enable them to cocreate value with others. In this sense, institutional complexity lies at the heart of innovation: when actors encounter incompatible prescriptions deriving from multiple institutional arrangements, the influence of preexisting institutions breaks down as the contradictory or otherwise problematic situation arouses reflection and motivates collaborative efforts toward resolving the conflict (Seo and Creed 2002). Institutional complexity thus drives the creative reconstruction of social patterns based on actors' heightened ability to consciously consider the underlying assumptions, values, and beliefs of multiple institutional arrangements.

This also means that institutional complexity is constitutive in making additional resources available from multiple institutional arrangements with which new solutions to complex situations can be developed (Seo and Creed 2002). In this view, each institutional arrangement embodies an institutional "toolkit," which comprises elements such as cultural symbols, shared assumptions and meanings, material practices and routines, and institutionalized strategies of action that guide (and constrain) action within the institutional arrangement. As a result of institutional complexity, the toolkits of multiple institutional arrangements become available to actors, with which new solutions can be devised to complex problems (Friedland and Alford 1991, Greenwood and Suddaby 2006, Swidler 1986).

In alignment with S-D logic, actors do not develop new resources and associated meanings out of thin air, but rather access them through the institutional arrangements of the service ecosystems of which they are a part (Chandler and Vargo 2011, Koskela-Huotari and Vargo 2016, Thornton et al. 2012). The emergence of new solutions rests on actors' ability to combine, blend, merge, and transform both the symbolic meanings and material practices comprising institutional toolkits, which, in turn, is based on actors' conscious, reflective, and creative attention to the problem(s) at hand evoked by the institutionally complex situation (Seo and Creed 2002). Hence, accessing more diverse toolkits enables actors to reframe resources to reappropriate them in new ways to solve immediate problems (e.g., Baker and Nelson 2005, Orlikowski 1992). This means that, in the

same way as institutions and institutional arrangements, the institutional toolkits must be understood as dynamic and changing resources shaped and reshaped in human practice (Giddens 1984). These insights serve as the basis for the following, mutually constitutive propositions:

Proposition 2a. *Institutional complexity reduces the taken-for-grantedness of dominant institutions and institutional arrangements.*

Proposition 2b. *Institutional complexity makes multiple institutional toolkits available for actors to jointly reconstruct and change value cocreation practices.*

Hence, institutional complexity does not deterministically lead to change, but drives innovation by simultaneously motivating and enabling actors to look beyond the current institutional arrangement for useful resources that can be combined to create new solutions (Seo and Creed 2002). This means that it is possible that complex situations are not reconciled as new value cocreation practices, but make actors cling to and protect their existing practices. As the literature illustrates (e.g., Greenwood et al. 2011, Kraatz and Block 2008, Pache and Santos 2010), multiple possible responses are available to actors confronted by institutional complexity, from the avoidance of particular arrangements to defying or manipulating one or more incompatible prescriptions. It is possible that actors defend current solutions and surrounding institutional arrangements as they protect their interests, or that actors are incapable of finding solutions to complex situations. In this light, it is useful to examine in more detail factors that influence the way actors reconstruct solutions to such situations.

First, the activation of specific institutional arrangements and associated toolkits for problem solving is influenced by actors' life histories and the nature of the institutional arrangements in which they are embedded (Vican and Pernell-Gallagher 2013). This is manifested in the distinct knowledge and skills of actors developed in interaction with social communities in different contexts (Berger and Luckman 1966, Lave and Wenger 1991), illustrating how the histories of individuals affect the *availability* of knowledge embedded in institutional arrangements for solving problems, as well as their disposition toward innovation in general (see also Holland et al. 1998, Kodeih and Greenwood 2014, Thornton et al. 2012). For example, the CEO of a large company might have distinct dispositions and strategies of action that derive not only from her MBA education and experience in a business field, but also from her Christian upbringing, volunteer work in a charity, and role as a parent. In this sense, every individual is a nexus of institutional arrangements that is able to operate, often at least partially unconsciously, in multiple contexts with different rules, norms, values, and schemas of action (Ostrom 2005).

Second, the activation of institutional toolkits depends on the characteristics of the institutionally complex situation, which affect how actors' attention orients to multiple institutional arrangements. This has both actor-specific and contextual aspects. The former suggests that the more extensively an actor is embedded into a particular institutional arrangement, the more accessible and salient that arrangement is for problem solving (Thornton et al. 2012). For example, an immigrant has the symbols, norms, and schemas of her native culture more readily available than the toolkit of her new country of residence. The contextual aspects, in turn, point to the importance of how the situation cues particular institutional arrangements, thus shaping the accessibility of particular symbolic meanings and material practices for constructing a solution to the situation at hand (Besharov and Smith 2014, Thornton et al. 2012). For example, an environmental crisis such as the BP oil spill or Volkswagen's emission manipulation reported in the media might increase the salience and activation of the environmentalist toolkit to executives as they decide upon the future strategy of their firm.

Third, the emergence of new solutions is also shaped by the degree of incompatibility among institutional arrangements activated in a situation (Besharov and Smith 2014, Pache and Santos 2010). With incompatibility over the goals or deeper meanings associated with a specific situation, actors are likely to face more profound conflicts, which cause political contestation and the amplification of the conflict across the ecosystem and provide fewer avenues for compromise solutions. In contrast, when multiple incompatible means prescribed by different institutional arrangements clash, innovation might more likely focus on the reorganization or recombining of material activities and meanings within an established value framework. This distinction is evident, for example, in the difference between the very large-scale political negotiations of global climate policy that balance self-interested economies and shared effort to secure a sustainable future for our planet (i.e., what to do) and the complexities of implementing new sustainable technologies (i.e., how to do). Combined, these insights provide the basis for a third and final proposition:

Proposition 3. *The degree of incompatibility among institutional arrangements, and actors' embeddedness within them, shapes how actors experience and respond to institutional complexity.*

These propositions summarize the main points that advance the conceptualization of innovation as institutional change within S-D logic and service science. This conceptualization extends innovation beyond the development and production of exchangeable goods to the collaborative creation and institutionalization of new solutions (value cocreation practices) across service ecosystems (Vargo et al. 2015). This view encompasses how novel solutions emerge in service ecosystems, as conceptualized in this paper, as well as how actors contribute to their institutionalization by seeking to maintain, disrupt, and change the institutions and institutional arrangements that coordinate value cocreation (Vargo et al. 2015). In particular, this perspective draws attention to actors, who, when facing situations of institutional complexity, can draw from several institutional toolkits to arrive at solutions.

Contributions and Implications for Future Research

Existing literature acknowledges the importance of diversity for innovation, but does so implicitly without elaborating upon the theoretical explanation of why diversity has such a central role in the emergence of novelty. This paper extends the dynamic service ecosystems view of S-D logic (Vargo and Lusch 2011), contributing to its previous conceptualizations of innovation from an institutional perspective (Vargo et al. 2015). While the literature emphasizes institutionalization as the fundamental mechanism of innovation, we elaborate upon the logic of how actors, whether individuals or organizations, become capable of creating new solutions within service ecosystems by changing the very institutional arrangements that constrain, guide, and coordinate their actions. In this work, the role or type of the actor (e.g., individual, group, firm) does not matter, as the purpose of the conceptualization is to analyze the mutually constitutive relationship between an actor and the surrounding institutional arrangements that drives the emergence of new solutions.

The main argument of this paper is that innovation is driven by institutional complexity: the multiplicity of institutional arrangements, which confronts actors with incompatible prescriptions for action. We posit that institutional complexity is inherent, given actors' simultaneous embeddedness in, or identification with, multiple service ecosystems and the institutional arrangements that coordinate value cocreation within them. The incompatibility of institutional arrangements elevates actors' creative problem solving as they come to identify contradictions, ambiguities, or shortcomings among the assumptions, values, and schemas embodied in the arrangements (Seo and Creed 2002). Thus, institutional complexity reduces the taken-for-grantedness of the prevailing institutional arrangements and makes available multiple institutional toolkits associated with different institutional arrangements with which actors are able to create new solutions to problems at hand. This process is not a simple recombination of preexisting elements of available institutional toolkits, but involves and unfolds through the reframing and reconstruction of the preexisting notions of resources (Koskela-Huotari and Vargo 2016). In other words, actors reconcile, transform, and integrate the symbolic meanings and material practices comprising the toolkits as they formulate new solutions and advocate change in the value cocreation practices among actors, shaping their surrounding institutional arrangements in the process. Finally, research also indicates that actors' responses to institutional complexity, and therefore the emergence of novel solutions, are influenced by the degree of incompatibility among institutional arrangements, and of actors' embeddedness in them (e.g., Pache and Santos 2010).

This conceptualization provides a basis for understanding how novel solutions emerge in service ecosystems. The current view of innovation differs from the overly "deterministic" theories of innovation, such as life-cycle models, by giving primacy to the collective negotiation of contradictions and endogenous emergence of (radically) new solutions, as opposed to depicting change as following a prescribed pattern or deterministic law within a predefined and stable context (Van de Ven and Poole 1995). This "constructed" view of innovation (Van de Ven and Poole 1995) is compatible with the systems view of service science and S-D logic, refining the present understanding of innovation as effectual, collaborative, recombinative, and path-dependent processes of making do with resources at hand to devise solutions to current problems (e.g., Arthur 2009, Baker and Nelson 2005, Sarasvathy 2001, Vargo et al. 2015). This establishes the basis for understanding change in service ecosystems as endogenous, open-ended, and nonlinear (Ehret 2013, Vargo and Lusch 2011), aligning with Austrian economics in its system-level interest in the emergence and development of market systems as a result of the interplay among the decisions of numerous individual actors (Kirzner 1978, 1997).

The resulting conceptualization of innovation as institutional change driven by institutional complexity is one in which neither the actor nor the surrounding ecosystem structure is given primacy as the explanation for change. This means that institutions and institutional arrangements are neither static backgrounds for the activities of "heroic" actors nor fully constraining cultural structures that determine the forms and outcomes of value creation with little choice granted for the actors (e.g., Battilana et al. 2009, Holm 1995). Hence, we align

with recent work on S-D logic (Vargo and Lusch 2016, Vargo et al. 2015) by diverging from perspectives that consider actors, whether individuals or firms, as unconstrained and rational actors who are able to innovate in their on right. Instead, we argue that actors are not able to step outside the institutional structure to innovate, but become aware of the institutions and institutional arrangements as they face institutional complexity, which enables them to integrate resources from multiple institutional toolkits as they "hop and bridge from one social world to another in constructing change" (Thornton and Ocasio 2008, p. 117).

The current study focuses on institutional complexity as the driver of innovation. This perspective raises many questions that require additional elaboration and thus provide interesting avenues for future research. First, research points to actor-level factors, such as skills, motivation, and alertness, as important in initiating the innovation process (e.g., Amabile 1983, Schreier and Prügl 2008). According to the current conceptualization, these cannot be thought of as located outside, or existing independently of, the institutional arrangements that coordinate human action. For example, research shows that individuals' personal skills are developed within communities coordinated by specific institutional arrangements (Berger and Luckman 1966, Lave and Wenger 1991). This means that an analysis of "innovator skills," as well as their interests and motivation, must not ignore their institutional origin, as the actors' operant resources, including the deeply held assumptions and values constitutive of one's identity, stem from actors' embeddedness in multiple institutional arrangements (e.g., Thornton et al. 2012).

Additional insights into actors' motivation can be derived from the inclusion of power in the analysis, which is omitted from the current work. Power is relevant both in the sense of actors' ability to mobilize others in support of new solutions and in innovation being driven by actors' motivation to improve their position to "get ahead." This remains an important area for future research (for a recent example, see Laud et al. 2015). To this end, the literature offers many useful frameworks (e.g., Clegg 1989). For example, Giddens' (1984) structures of domination or Bourdieu's (1990) notion of capital might provide useful starting points for a more detailed examination of the influence of power on innovation and how specific actors gain position as the central actors associated with a new solution.

More generally, these findings call special attention to the symbolic resources of meaning construction constitutive of innovation in service ecosystems, as they play central roles in communication, the coordination of interaction, and how actors make sense of and apply resources to value cocreation (Akaka et al. 2014, Koskela-Huotari and Vargo 2016, Vargo and Lusch 2016). The acknowledgement of the role of symbols highlights an implicit but central assumption in the institutional complexity perspective: that the way in which actors see and interpret the world (as guided by institutions and institutional arrangements) is inseparable from resources and their use for value cocreation and, thus, innovation. Hence, we propose that institutional complexity is a driver of both local (e.g., inventions) and large-scale (e.g., social movements) innovations, with no essential difference between their initial emergences. Instead, the difference in the scale of the change depends on the success and extent of institutionalization of new solutions across service ecosystems, as suggested by Vargo et al. (2015). Institutionalization unfolds as a result of the institutional work performed by actors aimed at the maintenance, disruption, and/or change of current institutions (Vargo et al. 2015, see also Lawrence and Suddaby 2006).

Furthermore, the institutionalization of new solutions, and transformation in service ecosystems, depends on the "poisedness" of different systems to reconfigure themselves (Padgett and Powell 2012), as some systems may be more rigid and thus less likely to change. Future research is needed to elaborate both the factors that influence the poisedness of service ecosystems and how the process of institutionalization unfold within systems with different characteristics. Moreover, it is important to integrate these concepts with the emerging discussions of the nature of resources and their appropriation to understand both how actors frame the "resourceness" of potential resources in novel ways enabled by institutional complexity and how this makes the resources available to new combinations that change service ecosystems (e.g., Akaka and Vargo 2013, Koskela-Huotari and Vargo 2016, Orlikowski 1992).

Another interesting area for future research relates to balancing internal demands and external institutional pressures in service systems (especially in organizations). In addition to the pressures of external constituencies imposing specific institutions on organizations, organizations are driven by internal considerations of efficiency that may not necessarily align with the pressures and constraints imposed by external constituencies (Meyer and Rowan 1977). While researchers have elaborated upon the diversity of strategic responses available to organizations (Oliver 1991, Pache and Santos 2010) and the factors influencing the formation of these responses (Greenwood et al. 2011), more work is needed to understand how the reconciliation of complex pressures, or the amplification or avoidance of conflicts among institutional arrangements, affects the capacity of service systems to cocreate value, in addition to their long-term viability and evolution.

This also points to the need for further research on the external basis of firms' strategic advantage. With emphasis on complexity among multiple coexisting institutional arrangements as the driver for innovation, organizations positioned at the nexus of multiple service ecosystems and institutional arrangements are those most vulnerable to complex pressures, but also most exposed to multiple problem-solution patterns from which they may construct new solutions (Burt 1992, Greenwood and Suddaby 2006). Hence, complexity may be an important precursor of firms with dynamic capabilities to adapt to and produce innovative solutions in, constantly changing conditions (Teece 2007). However, this requires that they are able to manage the incompatible aspects of multiple institutional arrangements constructively to leverage their complementarities while reigning in associated tensions (e.g., Battilana and Lee 2014, Jarzabkowski et al. 2013, Kraatz and Block 2008). For example, Garud and Karnøe (2003) suggest that systems that facilitate flexible interactions and construct fewer constraining hierarchies among actors may induce more rapid problem–solution cycles and foster collaborative learning, accelerating the formation of new solutions that are better suited to their context. Similarly, it is worthwhile to examine how initially agile ecosystems stabilize, if at all, and whether the same form of agility is necessary for innovation in all contexts from nascent high-tech industries to basic healthcare or financial services.

Finally, given that service ecosystems comprise multiple institutional arrangements, this work encourages research on innovation in the nexus of large-scale institutional arrangements to examine how pressing societal problems can be solved. For example, the growing pressures for environmentally and socially sustainable practices can be framed as institutional complexity involving partially differing assumptions, values, and beliefs of market capitalism and for-profit corporations on the one hand, and those of sustainable development and environmentalism on the other (e.g., Hahn et al. 2014, Hoffman 1999, Roberts 2003, Smith et al. 2013). In this context, the diversity of organizational responses adopted by different firms, as well as the societywide political contestation around these issues, falls readily within the current framework of institutional complexity as the driver of innovation. While some organizations attempt to resolve environmental threats by developing new (material) technologies, others aim at political interventions relying on symbolic reconstruction of meanings on legitimate corporate and market behaviors. Service science, rooted in the service ecosystems perspective, can offer a robust lens for coconsidering multiple factors in the analysis of such complex situations. With this perspective, it may also be possible to move beyond the juxtaposition between "market" and "social" or "environmental" goals to examine and develop system-level understanding of configurations capable of producing transcending solutions that are sustainable and profitable to all actors involved.

Conclusion

The emergence of novelty in human systems remains undertheorized in social sciences (Johnson and Powell 2015, Padgett and Powell 2012) despite a growing body of research on and perspectives to innovation. We provide insights relevant to this issue by integrating insights from multiple bodies of literature to conceptualize the emergence of new solutions within the metatheoretical framework of S-D logic and service science in a manner sensitive to both macrolevel structures and the creative actor. With the concept of institutional complexity, we provide the first explicit discussion of the theoretical foundation explaining the centrality of diversity in innovation by focusing on the dynamics of the emergence of new solutions in service ecosystems. This is based on a detailed conceptual examination of the mutually constitutive relationship between institutions and institutional arrangements coordinating value cocreation in service ecosystems on the one hand, and the creative actors operating in the nexus of multiple institutional arrangements on the other. Hence, this paper extends the S-D logical conceptualization of innovation by offering an explanation for how actors can create new solutions from available resources while embedded in the very institutions their actions aim at changing. As a result, this paper explicates the theoretical foundation for the many streams of innovation research by elaborating the importance of individual or group diversity.

This paper is conceptual and oriented to theory development. It integrates existing theoretical perspectives and rests on the empirical validation of the findings of previous work. Regardless of its conceptual scope, this paper offers a few direct implications for innovation practice, which also provide interesting directions for future research. First, it encourages actors, whether individuals or organizations, to seek out and foster institutional complexity as it creates conditions that are conducive to the emergence of novel solutions. For example, this may entail hiring new members in an organization with different professional backgrounds, building cross-functional teams, and collaborating with partners from "nonobvious" fields to increase diversity. Second, this work points to the importance of countering the formation of institutional arrangements (e.g., legislative systems, corporate culture, professional norms) that stifle innovation and institutional change by suppressing institutional complexity. For example, it might be advised to avoid overstandardizing practices that support the "innovation activities"

in organizations. Finally, this paper points to the importance of integration and reconciliation across conflicting institutional arrangements in the construction of novel solutions. Within a system fostering institutional pluralism, one means to support innovation is to create "protected" spaces—both physical and mental—within which experimenting with solutions and negotiating conflicts is possible without the immediate burdens of the day-to-day reality.

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