



Linking the viable system and many-to-many network approaches to service-dominant logic and service science

Linking the
viable system

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Abstract

Purpose – The purpose of this paper is to combine service science (service science, management and engineering, and SSME) and service dominant (S-D) logic contributions with the network and systems-based theories of many-to-many marketing proposed by Gummesson and the viable system approach (VSA), proposed by Italian researchers and highly diffused in Italy during the 2000s.

Design/methodology/approach – This paper is a conceptual analysis based on recent developments in service science, S-D logic and network/systems theory.

Findings – Being grounded in network theory, systems thinking and value co-creation, many-to-many marketing is found to be particularly supportive to both service science and S-D logic. It is also found that VSA, being broad, interdisciplinary and based on systems theory and resource-based theory, and with strong influences from biology, sociology and mechanics, is a key to the interpretation of complex phenomena. Both many-to-many and VSA embrace the whole and the general while still considering the detail and its contextual dependency. Both theories are highly suitable for analysing and designing service systems.

Research limitations/implications – The network and systemic approach to business offer by many-to-many marketing and VSA and applicable to service and the value creation, relationship management and business finalities, are strongly coherent with the one proposed or tacitly implied by service science and S-D logic.

Practical implications – The paper helps practitioners to better manage service and to enable efficient behaviour within multiple contexts with multiple actors and optimising inter-systemic relations.

Originality/value – This is believed to be the only paper to apply network theories and the VSA perspective on service.

Keywords Systems theory, Networking, Customer service management

Paper type Conceptual paper

Introduction

Recently, businesses are increasingly viewed as “organizers of value creating systems” (Normann, 1997) and the classical goods/services dichotomy has been losing its significance (Normann, 1991; Rispoli and Tamma, 1992; Cercola, 1996; Rullani, 1997). This has been noted by many, for example, by Kotler (1977, p. 8) who said in his textbook that the “importance of physical products lies not so much in owning them as in obtaining the services they render” and in a widespread article by Levitt (1981). However, such observations were reported in passing and led to no further elaboration. The service dimension was only given due attention when services marketing and



management started to gather a critical mass of researchers and practitioners in the late 1970s. Since then, services and service, supported by developments in quality, relationships, networks and interaction and recently defined by service-dominant (S-D) logic and service science keep attracting the curiosity of scholars on a global base.

According to Normann (1997, p. 4) “in the neo-industrial era, services is a framework for thinking about value creation, rather than a support activity”. It offers a new logic with its roots in various historic strands and there is a long interpretive trail leading up to S-D logic (Vargo and Lusch, 2008). S-D logic has managed to integrate useful aspects of previous theory and offer a new logic that represents the convergence of much of contemporary marketing thought. In 2004, IBM launched the concept of service science (Maglio and Spohrer, 2008a) and together with S-D logic it contributes to a significant change in our perception of service. Compared to the traditional paradigm, it is redesigning the relationship between goods and services. This is in the cutting edge of research but has still a way to go to enter mainstream thinking.

The traditional approach in marketing management (transaction marketing) developed since the 1950s, aims to attract customers to make a profit. In this approach, the marketing mix (the 4Ps: product, price, promotion, place) plays a central role and relationships, networks and interaction have a subordinate role or even no role at all.

Over the last decades, the changes in competitive environment and in society have caused a paradigm shift in marketing. Relationship marketing as the opposite of transaction marketing, is focused on long term collaboration with customers and the co-creation of value (Grönroos, 1994; Payne *et al.*, 1995). The most frequent term, customer relationship management (CRM) (Newell, 2000; Girishankar, 2000; Rigby *et al.*, 2002) is defined by Gummesson (2008, p. 7) as:

[...] the values and strategies of relationship marketing – with special emphasis on the relationship between a customer and a supplier – turned into practical application and dependent on both human action and information technology.

He further makes the philosophy of relationship marketing and CRM tangible through 30 relationships, the 30Rs, which provide an alternative to the 4Ps. Gummesson (2008, p. 5) defines relationship marketing as “interaction in networks of relationships”. Relationship marketing becomes total relationship marketing and provides a novel and systemic view of marketing management.

The paper proceeds to briefly explain the emerging theories of S-D logic and service science and the network and systems theories of many-to-many marketing and viable system approach (VSA). The core of the paper offers a comparison and discussion of the contributions of network and systems thinking to new service theory.

Emerging service theories

S-D Logic

S-D logic is a theoretical proposal which was originally focused on marketing but is being generalised to the functioning of markets, to general management and all its subdisciplines, as well as to economics and society in general. It highlights a paradigm shift away from the goods-dominant (G-D) logic which lingers in mainstream management thinking since the advent of the industrial era. S-D logic is founded on the co-creation of value and service and resource integration based on interaction and networked relationships (Vargo and Lusch, 2008). For marketing, Vargo and Lusch

offer a new perspective by introducing the dominance of service over products and goods, thus adapting to today's competitive context of a service economy (Levitt, 1981; Grönroos, 1994; Normann, 1997; Rust, 2004).

S-D logic is based on ten foundational premises (FPs). According to these, service should be understood as an application of skills through activities, processes and performances designed to produce benefits for suppliers and customers and for all third parties that are directly or indirectly involved in a network of relationships (Vargo and Lusch, 2008). According to Vargo and Lusch "goods are no longer the only transaction objects, but they appear as an appliance for services provision. Service is seen as the real protagonists of interactions and transactions". Further, service no longer represents a part of an asset or the intangible side of goods; it "is the service to be really exchanged" (Vargo and Lusch, 2008).

Service science

Service science, management and engineering (SSME), in short service science, is an IBM initiative which in 2010 involves 250 schools of higher education and thousands of researchers world wide. It is an attempt to promote service science as a new discipline that elevates the study of service systems to a research and education priority. It is a multidisciplinary, open source project, based on the pillars of computer science, industrial engineering, all the management disciplines of business strategy, marketing, organization and so on, as well as social sciences and the humanities with human behaviour and cognitive studies, and legal sciences. Service science investigates what service systems are and how they evolve, and the roles of people, knowledge, shared information and technology, and not least the role of customers on the demand side, and production processes on the supply side. In terms of management it investigates the improvement of efficiency and its evaluation, relationship sustainability, and systems relations. In terms of engineering it develops new technologies and adequate approaches to improve information processing, measurement, and the diffusion of information.

Service science is emerging as a unique field aimed to discover the underlying logic of complex service systems. This includes the establishment of a common language and systems thinking; the nourishment of productivity, quality and performance; the enhancement of relationships and innovation rates; the development of the skills for a service-led economy; development of knowledge and experience to create competitive advantage; and processes as the key element in organizational development.

Emerging network and systems theories

Recent's literature offers multiple perspectives in several disciplines where network thinking has been applied to interpret both everyday life and business realities. This is so both in social sciences, natural sciences and computer science. Network theory offers an intriguing approach to addressing the complexity of life. It is an umbrella methodology that can be applied on many levels of research.

Networks and relationships were emphasised in the 1970s, when studies of the economy in general and of business-to-business (B2B) marketing specifically noted an increase in connections between firms through exchange of information, continuity in relations, and increased importance of commitment, trust and collaboration (Richardson, 1972; Håkansson and Östberg, 1975). Various terms have been used to

describe these voluntary ties among firms and other economic actors, including “heterarchy” (Hedlund, 1986) and “polycentric structure” (Forsgren *et al.*, 1991). The concept of network has now become generally accepted to describe and analyse the nature of emerging economic entities (Bartlett and Ghoshal, 1990).

Studies of the genesis of networks have identified two basic mechanisms:

- (1) enterprises involved in a common production process decide to combine their competencies and other resources; and
- (2) a leader enterprise attracts other businesses to join in its activities (Thompson, 1967).

In this regard, several authors have taken a particular interest in the so-called “strategic network approach”, primarily in the creation and management of intentionally formed network organizations featuring a specific set of actors (Normann and Ramirez, 1994; Parolini, 1999).

Several approaches have deepened the structure and function of networks. Some have analysed networks in terms of organisational forms, including nodes, connections and aggregating forces and net-based organizational formats (Richardson, 1972; Burt, 1992; Hedlund, 1986; Bartlett and Ghoshal, 1990). Others have focused on the management of networks, deepening issues such as autonomous nodes, central control, dynamic equilibrium and structural variability management (Håkansson, 1987; Burt, 1992; Jones *et al.*, 1997). Still others have examined network strategies, such as resource sharing and common goal achievement (Jarrillo, 1988; Jones *et al.*, 1997) in the attempt to evaluate networking and social relationships for competitiveness reinforcement (Polese, 2010).

This paper concentrates on two network theories that are particularly well aligned with S-D logic and service science: many-to-many marketing and the VSA.

Many-to-many marketing

The past decades have proved that relationship marketing, CRM and one-to-one marketing have often failed in practice. Gummesson (2004) concludes that a major reason for failure is the narrow focus on the dyadic relationship between a single supplier and a single customer. As Figure 1 shows, many-to-many marketing means a transition from the two-party relationship approach to a multi-party, network approach. Basically, no one is isolated, whether it is an individual as the poet Donne (1624) once concluded or a business (Håkansson and Snehota, 1995). We live in an interconnected world and marketers and enterprises cannot elude network connections and strategies that capture the power and usefulness of these relationships (Castells,

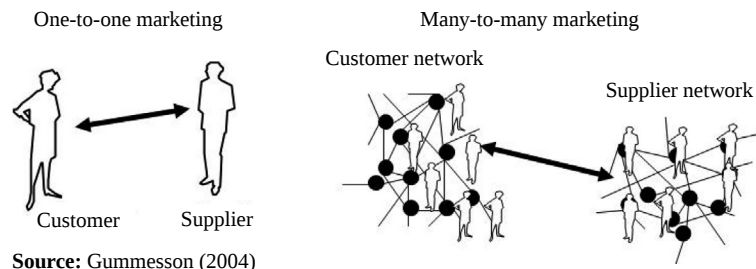


Figure 1.
Many to many approach
to marketing

Source: Gummesson (2004)

1996; Capra, 1997, 2002). The three key variables of marketing remain relationships, networks and interaction (Gummesson, 2004).

The viable system approach

VSA is linked with network analysis but primarily based on general systems theory, more specifically on social analysis which interprets business behaviour within a dense pattern of interactions. The firm is a viable system itself and part of a context of other viable systems and single components. The systemic understanding of organizations and of the relevance of social and business relationships in local environments, affects business behaviour and the survival capacity and future evolution (Barile, 2008a). As a systemic theory, VSA offers a methodology for interpreting the contemporary business arena and manage in it. It is equally useful for understanding everyday decision-making processes of organizations and individuals. It contributes to theory by proposing a new behavioural approach to business and relational interactions in its context. It has practical relevance by suggesting new ways of interpreting established and strategic organizational and managerial models.

The concept of the firm as a system is not new to economic disciplines. Systems theory goes back to the 1950s when a group of scholars from various scientific and social fields (von Bertalanffy, 1956, and others) developed an interdisciplinary theory based on the concept of systems. They rejected the idea that a certain phenomenon could be understood exclusively through an analytical, reductionistic approach. They acknowledged that analyzing complex, emerging phenomena exposed to external influences demanded more than the analysis of the interaction between a few components. A holistic approach was called for.

VSA has more specifically considered a relational approach for corporate management (Golinelli, 2000, 2005, 2010; Barile, 2006, 2008a, 2009). It has merged contributions from multiple disciplines, configuring the enterprise as an open system. The concept of the enterprise as a open system, immersed in the environment with which it interacts and exchanges information, material and energy, was developed by von Bertalanffy (1956). For explanations of the meaning of system, see von Bertalanffy (1968), ("a complex of interacting elements"), Parsons (1965) (systems' hierarchy principle) and Luhmann (1990) ("system elements as rationally connected"). Further, systems theory has a series of important characteristics:

- *Finality*. The enterprise is a goal-directed system trying to fulfil a final purpose and committed to survival (Beer, 1975).
- *Organic*. The enterprise is an organic system with a life cycle like a living organism, pursuing its survival in a competitive environment (principally referred to Hannan and Freeman (1977)).
- *Autopoietic*. The enterprise has the ability of self-organization (taken from biology, see Maturana and Varela (1975)); social autopoiesis claims that every environment is complex and the enterprise is stimulated to align its complexity to the external environment (Luhmann, 1990).
- *Cognitive*. Knowledge is the principal value-creating asset (Clark, 1993).
- *Cybernetic*. The enterprise as a system is capable of self-regulation to maintain a stable equilibrium (homeostasis, from cybernetics, see Beer (1975)).

VSA views the firm as a viable system. Its final goal (finality) is survival and it must constantly increase its survival capacity. The accomplishment of viable behaviour depends on the characteristics of the interaction between the components and thus the relationships and interaction take on a key role in VSA.

When the firm is a viable system interacting with other systems, each firm becomes a unique system. Homogenous groups of stakeholders with whom the firm as a viable system has relations can be identified as either supra- or sub-systems with which the enterprise interacts.

The management of the viable firm has to direct the system towards its final goal by transforming static structural relationships into dynamic interactions with other viable systems. The ability to organize relationships demonstrates top management efficiency and is a main characteristic of viable systems (Barile, 2008a). Top management action consists of transforming survival impulses into choices and decisions that contribute to the equilibrium of the system internally at the same time satisfying overriding, external systems.

The role of relationships is twofold. Relationships can either represent interests (threats/risks) and/or expand resources (opportunities/profit), which the firm as a system needs in order to guarantee its strength over time. In this relational perspective, resources lose their attributes to a more critical issue: the availability of the resource that can be guaranteed through a satisfactory relationship between the viable firm and its supra-system.

To summarise, management has to reinforce the coordination and harmonisation of the relationships created with relevant supra-system (business owners, the financial system, workforce, clients, etc.), to better manage the acquisition of resources. The relationships created should influence behaviour in such a way as to maximise all contributions made on behalf of both the firm's and the other stakeholder interests (Bartlett and Ghoshal, 1990). Moreover, top management must be able to wisely manage structurally embedded resources in order to reinforce the processing of resources structurally incorporated in the firm, which give rise to specific skills that enable the firm to create value for the relevant supra-system. These intricate relationships created by top management transcend a firm's boundaries as management must pursue actions which do not only influence internal components. In VSA, the two concepts of consonance and resonance are used to describe the relationship to other systems and to enable harmonic and sustainable (viable) behaviour:

- (1) Consonance is the compatibility between the actors of a system and represents potential harmonic relations (static image).
- (2) Resonance is the actual and executed harmonic interaction (dynamic vision).

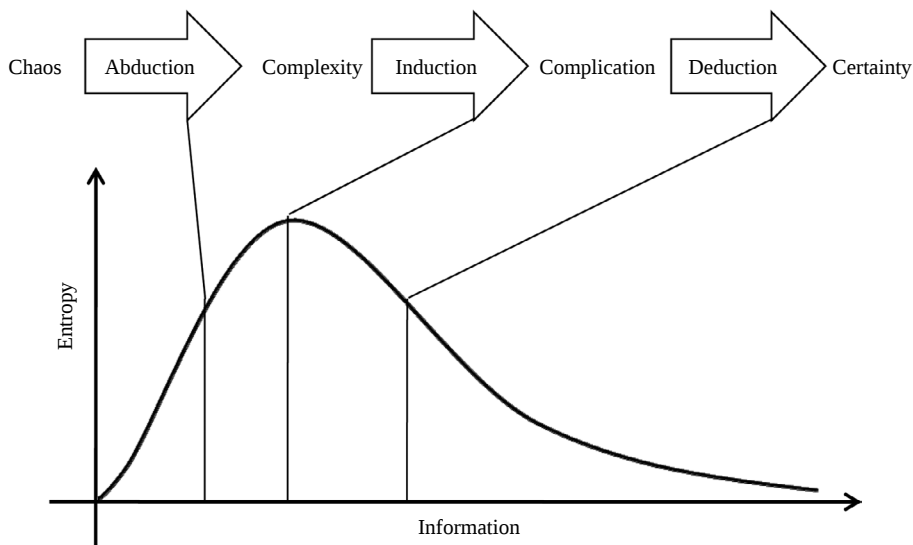
These concepts are connected to the VSA interpretation of structure and system. Structures are composed of several physical components that may be related in numerous ways defining various possible systems. Several systems may arise from a single structure, depending on how it is developed by top management and its decision processes. An arm of our body, for example, is part of our physical structure and from this single structural component many systems may arise. Every time we use the arm, we define a specific function and goal for its use (finality), like lifting a weight, eating or playing tennis. Consonance is a potential positive relation and therefore referred to as the static image of a structure and its relations. Resonance is the effective positive

interaction in and among systems and is therefore referred to as the dynamic vision and its interactions (Golinelli, 2010).

Here is a business example to further explicate the distinction between consonance and resonance. Consonance refers to the design of a business process in relation to, for instance, its distribution partners. A company can design potential market relations by listing distribution networks, solutions and formal agreements. Until the enterprise activates these networks, we only have a static image of the business in which we may evaluate its consonance as potential positive relations. It is only when the company makes decisions and interacts with the various business parties that resonance takes place through concrete, harmonic and positive interaction and add to the success of all involved parties. VSA postulates decision making as a coherent process of aligning knowledge and information. Two actors starting from a distant position of compatibility and information variety can get close to one another in a gradual process of cognitive harmonisation.

Understanding can be developed through the acquisition of new interpretative schemes capable of organizing the complexity of a phenomenon. Figure 2 shows the trajectory from information chaos to certainty as a series of stages. The *x*-axis shows the amount of available information units, and the *y*-axis shows entropy (the amount of experienced uncertainty). These stages are built on Peirce's main passages leading from chaos to certainty. They start with abduction, which is a form of inference that follows a probabilistic or reasonable pattern driving towards the most probable result (Frankfurt, 1958), pass through induction and lead to deduction, which is the only vehicle to certainty in knowledge (Staat, 1993).

During the process of knowledge-acquisition (top of Figure 2), we can note that decision making is based essentially on abductive inferences, later verified inductively. The dynamic mechanisms linked to the process of knowledge-acquisition are



Source: Adapted from Barile (2009)

Figure 2.
From chaos to certainty
in decision making

represented by a curve, expressed by the equation $y = \delta e^{-\beta x} x^\alpha$ (where α stands for the categorical values/strong believes, β for the interpretation schemes and δ for information units), which with the variety of the parameters α , β and δ enables the opportunity to configure possible alternatives in relation to the process of learning, and thus to the decision making deriving from VSA.

Decision making is affected by information. At an early stage of the dialogue or learning process, information is not ordered. It is chaotic and therefore insufficient to enable full comprehension of an issue. Hence the curve is steep, and rises almost vertically towards increased entropy. As information flows and learning effectively takes place, entropy is reduced to lower levels. This is a gradual process that starts from chaos and drives towards certainty.

One of the most interesting inferences of VSA is the rational aspect and the management of the decision-making process in order to design and look for cognitive alignment. If satisfactory decision making is based on knowledge and information resonance between decision makers (Barile, 2008b), a deeper look at their value systems, interests and rooted cultural traits is required. This is true for example for marketers making business communications plans, for businesses when defining service experiences, and for customer communities when dealing with a value proposition from a firm.

Interpreting the deep meaning of VSA through the concepts of consonance and resonance we can infer interesting contributions to new service theories, as well as the structure/system dichotomy. In the attempt to be holistic and overview the whole and simultaneously be reductionistic by focusing on characteristics, parts and single components of every system, VSA adopts the concepts of structure and system. Structure refers to the static, a reductionistic view of the observed reality of components and relations and on how the observed phenomena are constituted. System refers to the dynamics of evolution, a holistic view of observed behaviour of the observed phenomena to enable interpretation of interactions.

Contributions to service theories from net theory

Systems and network theories are similar in the way they address both the whole and the parts and both structure, process and interaction. They have different roots, however, and we have so far become acquainted with several of the characteristics of systems theory. There is social network theory but there is also network theory in natural sciences. It is sometimes classified as complexity theory together with a series of other approaches from modern natural sciences, among them chaos theory, topology, fractal geometry and autopoiesis (which we have already found in systems theory and epitomising the closeness between the two theories). Both systems and network theories enable a deeper and wider understanding of service, characterising many-to-many and VSA. The affinity to the new service frameworks of S-D logic and service science is obvious which will be outlined in the next sections.

Many-to-many, S-D logic and service science

Despite an obvious connection to network theory, when S-D logic was initially presented, it did not give explicit references to networks and relations (Achrol and Kotler, 2006; Grönroos, 2006; Gummesson, 2006). As Vargo and Lusch (2008, p. 285) have later pointed out, "it is not so much that S-D ignores interaction and networks as it

deals with them somewhat implicitly”. In their expanded set of FPs, FP9 initially stated that “Organizations exist to integrate and transform micro-specialised competences into complex services that are demanded in the marketplace.” The new FP9 states that “all social and economic actors are resource integrators”, adding that the context of value creation is networks of networks (Vargo and Lusch, 2008; Payne *et al.*, 2008; and Michel *et al.*, 2008). To explain the relevance of many-to-many to new service theory, we will focus on certain key dimensions, analysing the concepts of resources, relationships and value creation.

In many-to-many, crucial resources are represented by the production and diffusion of information, knowledge and competencies (Gummesson, 2004). Each of these are considered foundational elements of markets, for business strategies and the management of networked systems.

In service science, systems are dynamic configurations of resources (people, technology, organizations and shared information) that create and deliver value between the provider and the customer through service (Spohrer *et al.*, 2007). All actors are considered resources and all service tools are considered useful instruments for business activities (Mele and Polese, 2010). In S-D logic, resources are specialised competences and customers needs, all considered active and operant for knowledge improvement and then for business processes (Vargo and Lusch, 2008).

The many-to-many contribution to service theory basically derives from its general consideration of the dynamic configurations needed to create competitive advantage for survival. This is in line with recent service theory and so is the interpretation of key success factors linked to general information, like knowledge, service tools or technology (Figure 3).

Networks take precedence over single relationships and nodes. They cannot be reduced to the sum of individual nodes, links and interaction. What happens between parties in relationships is called interaction. Networks are complex systems in which everything influences everything (Gummesson, 2008). Networks open up for opportunities but it also imposes constraints on individual members and their interactions; networks give rights but also demand obligations. Interaction takes place among business suppliers and business buyers (B2B) as well as between businesses and consumers (business-to-consumer) and among business customers and among consumers (customer-to-customer interaction, C2C) (Gummesson and Polese, 2009).

In S-D logic, integrated and relational service-providing systems must be supported by the relationships between providers and customers as fundamental actors of a market but also be surrounded by contributing networks of other actors. Business processes are characterised by dialogue and continued interaction and in this sense all business consists of relational service activities.

Therefore, service systems (also in service science) can be viewed as networks in which relations among active participants (Alter, 2008) are the basic elements of sustainable development. Hence, all interacting systems must refer to their own

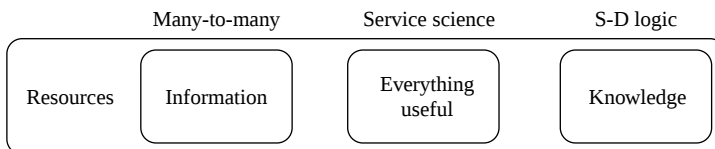


Figure 3.
The prevailing resource
according to the presented
approaches

environments to provide service. In this sense, contributions from many-to-many are determined by the specific composition of nets, in which visible and non-visible interaction, common purpose, and resource sharing reinforce systems performance and its development (Figure 4).

According to network theory, value is created in a many-to-many logic of reticular interactions and is affected by every activity performed by the network actors, their satisfaction and their competitive behaviour.

In service science, value creation is the outcome of value proposition-based interaction mechanisms (Spohrer *et al.*, 2008), in which relations between interacting systems based on a win-win logic, are consciously determined and finalised for mutual satisfaction (Maglio and Spohrer, 2008a; Spohrer *et al.*, 2008).

In S-D logic, the conventional supply chain is replaced by service value networks (Allee, 2000). Firms can only make value proposition, because value is not merely engendered inside a production process and reflected in the market sales price (value-in-exchange), but is the outcome of a co-creation process (Vargo and Lusch, 2008). Value is then perceived and co-created by customers, not drawing value just from the product itself but from its use, transformation and consumption (value-in-use) (Vargo and Lusch, 2008). Service then becomes the mutual benefits and the mutual satisfaction of co-creation processes (Lusch *et al.*, 2007) (Figure 5).

From somewhat different vantage points and concepts, many-to-many, S-D logic and service science arrive at similar conclusions and recommendations. These theories endorse the idea of considering all stakeholders in a network, what Gummeson (2008) calls balanced centricity, and they nourish the win-win logic of collective satisfaction and participation, strengthening the effectiveness of value co-creation processes.

VSA and service science

In service science, service involves at least two types of entities, those applying competence and those integrating the applied competences with other resources and determining the benefits. The interacting entities for value co-creation become service systems (Maglio *et al.*, 2006). Value further depends on the capability of a system to survive and accomplish other goals in its environment. Taking advantage of the service, another system can acquire and offer improved capabilities. In this sense, value means improving systems in an environment.

Figure 4.
Relationships' interpretation in the presented approaches

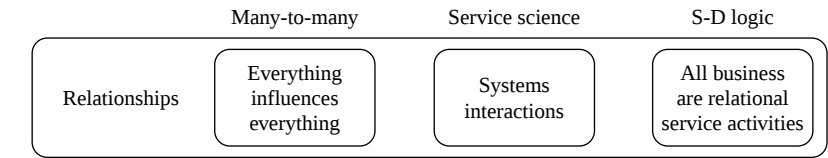
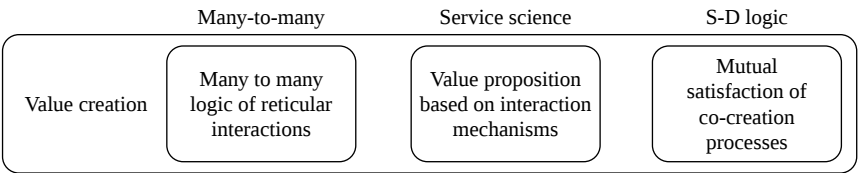


Figure 5.
The evolution of value creation concept



Accordingly, VSA introduces competitiveness (viability), linking it to consonant and resonant interaction among systems that share their own resources for the system's benefit in a win-win relationship. VSA also describes the evolution of a system and captures the dynamics of its components especially with reference to the variation of consonant and resonant conditions between internal characteristics and external opportunities. VSA goes beyond that in the attempt to:

- classify external supra-systems in order to understand which of them are the more critical and influential for business behaviour; and
- establish a qualitative method to assess a system's capability of satisfactory behaviour by defining resonance accelerating processes based on the affinity of cultural, knowledge, value and other dimensions.

In search of overlaps between S-D logic, service science and VSA, and in the attempt to deepen possible integrating concepts, the features of the three theories are compared. The theories occupy different research domains, but in Figure 6, we search for a common interpretation of several explanatory variables (resources, adaption, value, competitiveness, interactions, and complexity) to detect the size of their shared research domain.

Considering the agreement between service provider and service customer, and more in general the information, there is a strong correspondence between service science and VSA. According to service science (Maglio and Spohrer, 2008b; Demirkan *et al.*, 2008):

- Negotiation and re-interpretation of information is at the core of sense-making.
- There is not just one single view on service delivery performance.
- The meaning of information is negotiated in working and organizational relationships.

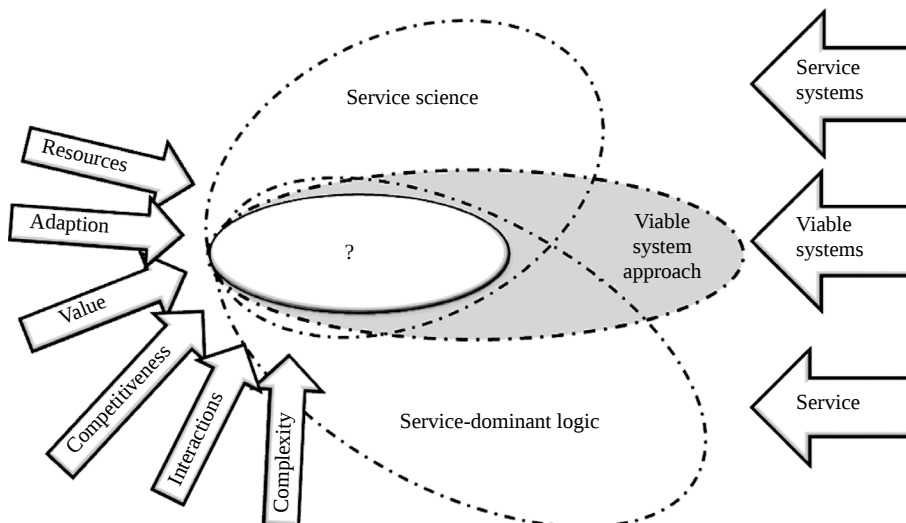


Figure 6.
Overlapping research
domains

- Negotiating the meaning of IT performance is the ongoing work of customer-provider collaboration.
- Tools and processes should support the often unacknowledged work of providing transparency by producing high-quality data, deciding what to expose and negotiating meaning (Blomberg, 2008).

We conclude from this that the relationship between service provider and service customer should be integrated. This can be done through a methodology that supports the relations both from a design and management point of view. Designing service systems requires preventive measures and includes relationships between public and private bodies, organizations and individuals. From a management perspective, the systems design must allow a widely spread satisfactory behaviour capable of promoting value network co-creation.

In the interpretation of VSA contributions to service science, we can note how decision-making processes as shown in Figure 2 are coherent with this service systems design. Processes are becoming technologically more complex, and information architectures and infrastructures attempt to strengthen computing and systems performance (Demirkan and Gaul, 2006), making business virtualisation and complexity management possible. Information variety alignment that supports a service system's ability to satisfy co-operant actors, may be interpreted as the consonant and later resonant interaction between two actors that gradually get into harmonic interaction while their knowledge and information heritage get closer. Agreement can be reached if, and only if, the actors are capable of cognitive alignment. Otherwise, they will not share a value experience that makes service systems performance possible.

Both service science and VSA deepen the analysis of complexity, which is a topic in the current scientific and epistemological debate. Researchers of all disciplines have to pay attention to complexity and negligence to do so can explain contradictions and incongruities of a methodology-in-use. The definition of complexity and the identification of variables and techniques through which complexity can be investigated, assume different meaning in different observed contexts. This affects the reduction of complexity implications for management under uncertainty, and the basic formulation of risk assessment and risk management (Barile, 2009; Golinelli, 2010).

At the same time, according to systems thinking and service logic, service science explores how service value is created in a network context and how the structure and dynamics of the value network as well as customer expectations, influence service ecosystems complexity (Basole and Rouse, 2008). Service value network complexity not only depends on the number of actors but also on the conditional probabilities that these actors are involved while delivering service to the customer.

In service science, service systems characteristics and metrics concern resilience, speed and efficiency of processes, and complexity, variety, rhythm and degree in activities of structures. Processes and structures are general features that can be used to describe any system (Alter, 2008).

Firms must reduce systems complexity to improve their chance of success. They can attempt to measure it by means of system characteristics and the following mathematical representation (Basole and Rouse, 2008):

$$C = \sum_{i=1}^T pt_i \sum_{j=1}^N - (pn_j|pt_i) \log(pn_j|pt_i) \quad (1)$$

where T is the number of types of transactions in the network, N is the number of nodes in the network, pt_i the probability of a type i transaction, $pn_j|pt_i$ the conditional probability that the j th node is involved in given the transaction is type i , and the logarithm is to the base 2.

In summary, complexity is a relative concept, never interpretable in an absolute sense but only relative to a specific context. Complexity refers to qualitative properties of an observed phenomenon and correlates a combination of multiplicities and autonomies with the impossibility of explanation.

Considering the comparison between perspectives and characteristics of the observer, connecting and interactive relationships between events, and perceived phenomena as a single unit interpreted from a holistic perspective, networked systems may be characterised by these parameters:

- variety, possible variants which a phenomenon may present to the observer;
- variability, which can be observed with the passing of time and which is to be added to the existing variant; and
- indeterminacy, linked to the ability to fully understand a phenomenon (Barile, 2008a; Golinelli, 2010).

VSA and S-D logic

S-D logic proposes that customers are co-creators of service and that marketing is interaction with customers. According to Vargo and Lusch (2008) the customer is primarily an active, operant resource, and only occasionally a passive, operand resource. They continue to explain supplier-customer interaction, highlighting in what way customers are operant resources in relational exchanges and co-creation (FP6: “The customer is always a co-creator of value”).

VSA is supportive to S-D logic through the concepts of consonance and resonance; they stress value co-creation processes and experiences. This echoes the idea of FP8 according to which “A service-centred view is inherently customer oriented and relational” (Vargo and Lusch, 2008, p. 7). Interactivity, integration, customisation, and co-production are the hallmarks of a service-centred view and its inherent focus on the customer and the relationship. This parallel is synthesised in Table I in which the concept of relationships is interpreted in accordance with S-D logic, service science and VSA.

How could we have missed in VSA that the relation with customers is just part of the dense pattern of a system that relates its behaviour and potential success to many other systems with which it interacts. It does so searching for viable behaviour through

S-D logic	Service science	Viable system approach
<i>Relationships</i> FP8: service centred view is inherently customer oriented and relational	Systems interactions	Relation are crucial for viability

Table I.
Relationships concept
comparison

consonant and resonant interaction in the attempt of augmenting its internal capacity through external resources. Resources and their criticality for the qualification of supra-systems relevance; and their key role in value creation is underscored also in S-D logic and service science (Table II).

In G-D logic, from a manufacturer perspective and to discriminate goods from services, goods are routinely claimed to have four characteristics: tangibility, the separation of production and consumption, standardisation and non-perishability (Parasuraman *et al.*, 1985). These properties lose significance in the proposed change of perspective, since “standardised goods, produced without consumer involvement and requiring physical distribution and inventory, not only add to marketing costs but also are often extremely perishable and non responsive to changing consumer needs” (Vargo and Lusch, 2008).

A service-centred view, recognising that the consumer is always a co-creator, suggests that businesses should strive to maximise customer involvement. By stimulating customisation to individual and specific needs opportunities for expanding the market are engendered.

VSA contributes to the design and management of positive interaction among customer, suppliers and others who are part of a network. What then are the key elements of positive interaction between producers (with their offerings to the market) and customers (with their needs displayed in their choices)? These elements are not definite, since they are individual to each customer, sometimes related to customer communities or other aggregations and undergoing subjective change. How can businesses design competitive value propositions in such an unstable and diverse scenario? They have to look to dynamic models of multi-criteria decision support systems capable of proposing satisfactory solutions to those involved, and search for continuous feedback to production processes in order to align their propositions to consumer needs. This is co-design, co-production and co-creation. This is what VSA suggests for introducing business behaviour in search of consonant and resonant interaction among systemic actors. The VSA interpretation of value and thus competitiveness is represented in Table III in comparison with S-D logic and service science.

To continue, VSA adopts the concepts of homeostasis (the ability of every system to react to external changes by modifying internal characteristics and arrive at new states

Table II.
Comparison of resource
concepts

S-D logic	Service science	Viable system approach
<i>Relationships</i>		
FP4 cites operant resources, implying their active role in value creation	Everything useful	Resources are determinant to supra-systems qualification

Table III.
Value/competitiveness
concept comparison

S-D logic	Service science	Viable system approach
<i>Value/competitiveness</i>		
FP4: operant resources are the fundamental source of competitive advantage	Value proposition based on interaction mechanisms	Viability throughout consonance and resonance processes

of equilibrium) and equifinality (systems direct themselves towards conditions characterised by high levels of satisfaction but the initial conditions can vary and the goal can be reached in many different ways). A system has the ability to look for and foster dynamic satisfactory evolutionary paths in line with value co-creation processes as suggested by S-D logic. These basically refer to a process in which all actors need to be satisfied in shared win-win interaction. Even to the win-win interaction concept VSA attempts to make a contribution.

VSA considers enactment and sense-making (Weick, 1995) crucial for understanding a context and the action that follows from that understanding forwarded to and satisfactorily processed by stakeholders who possess critical resources (Barile, 2008a). Critical resource owners represented by a supra-system in VSA, just like every potential customer in S-D logic, could have good intentions. Through enactment and sense-making these businesses learn from customer needs and how to fulfil these needs and become more competitive.

The comparison between S-D logic and VSA can be deepened further through the open systems concepts (service systems for S-D logic, viable systems for VSA), leading to dynamic adaptation on external changes influencing business behaviour (Table IV). Both service theories propose a dynamic view of business. The figure highlights how all economic actors are resource integrators which in S-D logic implies dynamic adaptation to changing contextual conditions. Moreover, Table IV shows how service science systems ought to be reconfigurable, smart and adaptive, supporting the VSA proposal of systems being characterised by a dynamic behaviour.

VSA claims that adaptive behaviour of business systems is necessary for survival in a competitive context. In similar vein, S-D logic starts with a G-D logic equilibrium and moves to dynamic systems in transition, defining competitive businesses as “complex adaptive systems” (Vargo and Lusch, 2008). In VSA, when environmental contingencies occur (contingency theory), firms are viable systems if they can survive in a particular context thanks to continual dynamic processes of adaptation through several kinds of internal changes (business adaptation, involving relationships and peripheral components of the select structure; business transformation, relating to the organization design; business restructuring, referring to the organization plan; business rethinking, concerning the business idea like change of identity) (Golinelli, 2010).

In S-D logic, a firm’s interpretation of its performance leads to dynamic behaviour with the goal of gaining market share and competitive advantage through adaptations caused by external changes and stimuli (Vargo and Lusch, 2008). This continuous learning process is crucial in order to achieve positive results. To do so, changes must be constantly monitored and evaluated, to stimulate technological knowledge growth.

Complex innovation processes need constant priority and attention. It is necessary to re-orient needs, tasks and objectives due to internal emerging constraints and

S-D logic	Service science	Viable system approach
<i>Adaptation</i> FP9: all economic actors are resource integrators	Reconfigurable, “smart”	Based on open systems and therefore intrinsically characterised by dynamic behaviour

Table IV.
Adaptation concept
comparison

external opportunities, ideas and innovations. Service innovation derives from co-operating technological aspects and social and organizational relations, together with business and market interaction.

Conclusions

The connections between the discussed theories are obviously close. The basic elements are similar and compatible with one another. Goods, for instance, may be intended as a structural dimension related to consonance since it could represent interaction between providers and customers. Service may be the systemic dimension related to resonance since it represents the implemented positive interaction between service providers and customers. As shown in Figure 7, the systems perception in many-to-many marketing is strictly linked to networks, in VSA to dynamic interactions, and in service logics to dynamic resources reconfigurations.

As theories based on systems thinking, networking and value co-creation, VSA and many-to-many marketing are strongly supportive to the future developments of S-D logic and service science.

Contribution and future research

The purpose of this paper has been to combine and compare service science and S-D logic with the network and systems based theories of VSA and many-to-many marketing. This has been done through discussion and conceptual analysis. The general conclusion is that these four theories are different in focus and methodology but are highly compatible.

Both many-to-many and VSA recognise the complexity of social phenomena in general and of business in particular. Social sciences typically assume away complexity and reduce reality to a few manageable variables, thus losing in validity, relevance and credibility. Network theory and systems theory deal with complexity and place great weight on contextual and dynamic aspects. They address the whole as well as the detail but have a somewhat different history and have developed different procedures for tackling complex issues. They are both used in social sciences as well as in natural sciences. VSA and many-to-many are highly suitable for analysing and developing service and service systems.

Business leaders and practicing managers have to learn the hard way how to simultaneously handle numerous bits of information under time pressure and have to balance demands from a network of stakeholders. They operate in systems that are getting increasingly more complex, global and vulnerable. They are expected to be able to master details as well as the whole picture.

Recently, they are taught models of management, marketing, human resources, economics and so on that are well-established in academia but not adequately based on real world conditions. By learning more about VSA, many-to-many or other systemic approaches, they will acquire better tools for efficient decision making and action.

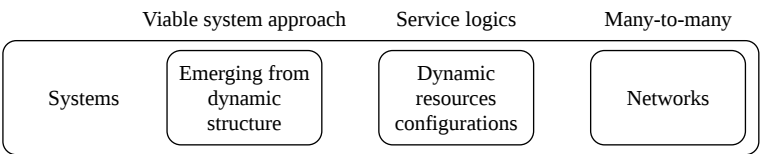


Figure 7.
Systems concept
comparison

We recommend that in the future researchers should study both the detailed mechanisms of service and the whole systems thus addressing the complexity, context and dynamics of business. This can be done by further developing our skills in using applications of systems theory and network theory such as many-to-many marketing and VSA, and by doing studies within the spirit of S-D logic and service science.

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Further reading

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