Lecture no. 2
Service Science – an introduction

1. Objectives

Service science is a new, interdisciplinary field that combines social science, business, and engineering knowledge needed for individuals and organizations (private, public, or non-profit) to succeed in the shift to the service and information-based economy. At the end of this course, students will understand how researchers and practitioners are defining services and service science and the motivation behind the study of service science.

2. Introduction and Overview of the Course

2.1 Motivation and definitions

During the last 100 years, marketing science has grown to encompass the study of *positive* issues, such as how firms and customers go to market, and *normative* issues, such as how firms should market to customers. Recently, a revised perspective of markets, organizations, economic exchange, and marketing has emerged. This perspective, with a framework of value creation built on service provision, rather than goods production, has been challenging and potentially transforming marketing thought and practice. This new logic has become known as *service-dominant (S-D) logic* [lus08].

The service-dominant logic is an emerging revolution in thinking about business and economics. The worldview of service-dominant logic stands in sharp contrast to the worldview of the goods-dominant logic of the past, as it holds service - the application of competences for benefit of others - rather than goods to be the fundamental basis of economic exchange. Within this new worldview, several new concepts can defined as follows.

Definition 1:

The traditional economics worldview is called the ***goods-dominant (G-D) logic*** *[lus06], [var04]. It is centered on the good, or more generally, the ‘‘product,’’ including both tangible (goods) and intangible (‘‘services’’) units of output*.

Others have referred to goods-dominant logic as the ‘‘neoclassical economics research tradition’’ [hun00], ‘‘manufacturing logic’’ [nor01], and ‘‘old enterprise logic’’ [zub02]. This is the traditional model of exchange and commerce that:

- seeks equilibrium and maximization of profit and utility;
- it is heavily focused on the efficient production of (preferably tangible) goods that are embedded with value through a change in form during the manufacturing process;
- it advocates standardization production away from the market and the interference of customers, and storage of output until sale;
- is a model in which distribution and marketing have the role of adding value by producing place, time, and possession utility;
- is a model in which orientation of value creation is concerned with the production of units of output.

Because of this orientation, in early studies of markets and economic exchange, service was all but ignored. Later, it was treated either as an add-on to the core good or as a residual, intangible output (i.e., whatever could not be defined as agriculture, mining, or manufacturing was labeled services). Over time, services became characterized as products that are differentiated from goods in terms of four relative shortcomings known as the **IHIP** characteristics: *intangibility*, *heterogeneity* (inability to standardize), *inseparability* (of production and consumption), and *perishability* (inability to be inventoried) [sam06].

However, with manufacturing and marketing processes, as well as with engineering science in general, the strong focus was on design for efficiency and not market effectiveness.

A G-D orientation views the central purpose of the firm as producing and selling outputs. Coincidental with this orientation is the belief that value is created by the firm and delivered to customers. This, in turn, informs the firm to focus attention on revenue chasing (*value in exchange*) as a dominant pursuit.

There is a subtle but critical distinction that underlies the difference between the G-D logic and the S-D logic. This view of services as either an add-on or a somewhat less-than-desirable, intangible good is evident in the plural designation ‘‘services,’’ reflecting units of output.1 It points service scientists toward a primary concern with the efficient production of intangible goods, rather than *the effective creation of value through service*. This orientation can be contrasted with the orientation implied by *the singular service*, *which connotes a process of doing something for and in conjunction with another party*.

> ***Definition 2:***
>
> ***Service-Dominant (S-D) logic*** *is a new paradigm for thinking about resources, exchange, and human action*.

The primary tenets of service-dominant logic are:

1) the conceptualization of service as a process, rather than a unit of output;
2) a focus on dynamic resources, such as knowledge and skills, rather than static resources, such as natural resources; and
3) an understanding of value as a collaborative process between providers and customers, rather than what producers create and subsequently deliver to customers.

Service-Dominant (S-D) logic uses special concepts like:

a) operant resources,
b) ‘‘resourcing’’ (i.e., resource creation, integration, and resistance removal),
c) servicing and experiencing,
d) value proposing,
e) dialog,

f) value-creation networks,

g) learning via exchange, and

h) collaborative marketing.

Definition 3:

In S-D logic, ***service*** *is defined as the application of specialized competences (knowledge and skills) for the benefit of another entity, rather than the production of units of output*.

These benefits are always manifested in the context of the customer, rather than in the production of its offering by the provider. The contextual perspective suggests that what firms provide should not be understood in terms of outputs with value, but rather as resource inputs for *a continuing value-creation process*.

S-D logic implies that:

- ‘‘producing’’ should be transformed into ‘‘resourcing.’’, i.e
- resourcing allows *value creation through collaborative value cocreation*, not only involving the provider and the beneficiary but all parties in a *value-creation network*, even that
- goods remain important in S-D logic, but they are seen as vehicles for resource transmission (what some call appliances or tools), rather than containers of value.

Example: what is behind the software-as-a-service movement and service-oriented architecture.

A critical element of S-D logic *involves rethinking the meaning and role of resources*. The key distinction is between *operand* and *operant resources* (see also table 1 that depicts the change of perspective - G-D logic versus S-D logic).

Definition 4:

Operand resources *are those that are acted upon; they are static and usually inert*.

Operand resources require other, more dynamic resources to make them useful. Most natural resources are operand resources. Because many of these resources are often necessary for human well-being and are also capable of being transported, they have historically been the focus of human pursuits, particularly wealth creation and exchange.

Definition 5*:*

Operant resources *are often intangible (e.g., knowledge and skills) and are capable of acting on operand resources and even other operant resources to create value*.

Because operant resources, by definition, produce effects, they enable value-creation through the transformation of inert natural resources (as well as other operant resources).

Example: Silica (silicon dioxide) is a neutral or inert matter; it became an operand resource only after humans acted upon it. Silica, when coupled with the ingenuity of Carver Mead and others, enabled humans to create the computer on a chip.

Table 1. G-D logic versus S-D logic: A change of perspective

From: G-D Logic	**To: S-D Logic**
Operand resources	Operant resources

Resource acquisition	Resourcing (creating and integrating resources and removing resistances)
Goods and services	Servicing and experiencing
Price	Value proposing
Promotion	Dialog
Supply chain	Value-creation network
Maximizing behavior	Learning via exchange
‘‘Marketing to’’	Collaborative marketing (‘‘marketing with’’)

In service-dominant logic, value creation occurs when a potential resource is turned into a specific benefit, an activity known as *resourcing*. This activity, which is termed resourcing, has three essential aspects:

a) *resource creation*. Resource creation, of either operand or operant resources, always involves human knowledge and ingenuity, which are themselves operant resources;
b) *resource integration.* Resource integration is a basic function of all service systems (e.g., firms, households, and governments). At the firm level, organizations can be viewed as resource integrators, which transform microspecialized competences (employee-level skills and knowledge) as well as other internal and market-acquired resources into service provisioning. Novel ways of resourcing can be a source of innovation;
c) *resistance removal*. There are often barriers (tangible and intangible) or resistances that must be removed before potential resources can be made useful. Resistances need not be physical; they can often be intangible, such as cultural resistances. Removal of resistances is a process that involves not only firms or those offering the service, but also consumers, users, or beneficiaries.

S-D logic focuses on the interaction between the firm and the customer. The significance of that interaction is found not in the transfer of ownership of output (as in G-D logic), but in the interaction itself, in servicing the needs of the customer, as experienced by the customer in the unique context of his or her own life and purpose for seeking a market exchange.

The S-D logic views the customer not as a buyer of valuable output created by the firm, but as an integrator of inputs provided by the firm with its other resources to create value. Because it is the customer who integrates resources to create value (a value that is uniquely determined by the customer – we call it *value in use*), the S-D logic recognizes that a firm cannot create value. This is compatible with a conceptualization of a service system as a ‘‘value-coproduction configuration(s).’’ It follows that if firms cannot create value (i.e., can only cocreate it) they can only position themselves through *value proposing*.

Definition 6*:*

Value proposing *is a concept that recognizes that value is a composite of benefits and burdens (or costs) that unfold as the customer integrates the firm-provided resources, often over time. Stated alternatively, the trading off of benefits versus burdens occurs in the*

customer's personal realization of the value proposition, rather than prior to, or at time of, payment or commitment to pay (*value in exchange*).

In brief, firms do not produce value; they can only make *value propositions* and then, with the customer as a collaborator, cocreate value if the proposition is accepted. For competitive advantage, these value propositions should be more compelling than those of competitors.

In fact:

- in G-D logic, customers are usually viewed as operand resources to be acted upon - that is, to be segmented, targeted and penetrated through promotion. This promotion, which is one-sided and intended to persuade the customer to purchase the output of the firm, can be viewed as propaganda, rather than a two-way exchange between the producer and the consumer;
- in S-D logic, the customer is an operant resource and someone with whom the firm can cocreate value. This implies developing a dialog between parties that is founded on trust, learning together, and adaptation to each other. It aims ''at developing an understanding of each participant's point of view, and interaction sets up suitable conditions for listening and learning together.

2.2 Overview of service systems and Service Science

The resourcing conceptualization of service connects well with the concept of *service systems* as market-facing complex systems [wla06]. More generally, the process orientation brought about by the singular ''service'' versus plural ''services'' also connects well with the centrality of service in *service science*.

Definition 7:

*The **service system** is defined as a configuration of people, technologies, and organisations and shared information that interact with other service systems and create and deliver value to customers, providers and other stakeholders* [mag09].

Many systems can be view as service systems, including families, cities, and companies, among many others. The service-system concept can be used to understand how value is co-created. Service systems interact to co-create value.

Example: Viewed as service systems, a package delivery company transports objects from other companies or individuals; value is co-created in that results depend on both transportation contributed by the delivery service and objects and locations contributed by the clients.

Every day we are customers of 13 types of service systems (see also figure 1). Eventually, service system innovations improves quality of life. The smallest service system centers on an individual as he or she interacts with others, and the largest service system comprises the global economy. Cities, city departments, businesses, business departments, nations, and government agencies are all service systems. Every service system is both a provider and client of service that is connected by value propositions in value chains, value networks, or value-creating systems.

The 13 types of service systems are organised in the three groups:

1) systems that focus on basic things people need,

2) systems that focus on people's activities and development, and
3) systems that focus on governing.

The discipline areas are organized into four areas that deal with:

1) stakeholders,
2) resources,
3) change, and
4) value creation.

Service Science offer the abstractions needed to understand and improve service - that is, the scientific understanding, management principles, and engineering discipline needed for effective service innovation [spo08].

***Definition 8**:*

***Service science** is the study of service systems, which are dynamic value co-creation configurations of resources (people, technology, organizations, and shared information)* [mag08].

These four categories of resources are significant because they include resources with rights (people and organizations), resources as property (technology and shared information), physical entities (people and technology), and socially constructed entities (organizations and shared information).

Service science aims to explain and improve interactions in which multiple entities work together to achieve win - win outcomes or mutual benefits [spo08]. More precisely, we define:

- service as value cocreation,
- value as change that people prefer, and
- value cocreation as a change or set of related changes that people prefer and realize as a result of their communication, planning, or other purposeful and knowledge-intensive interactions.

***Definition 9**:*

***Service science** seeks to create a body of knowledge that accounts for value cocreation between entities as they interact - to describe, explain, and (perhaps someday) better predict, control, and guide the evolution of value cocreation phenomena.*

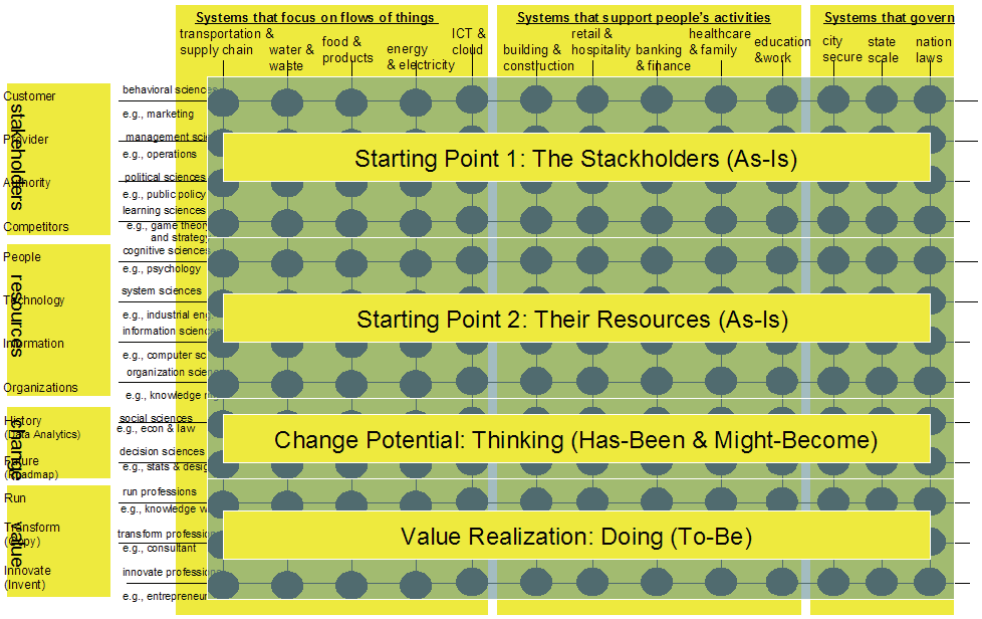

Figure 1. How to visualize service science? The systems-disciplines matrix…

In order to understand the transdisciplinary framework, one just needs to appreciate that discipline areas such as marketing, operations, public policy, strategy, psychology, industrial engineering, computer science, organizational science, economics, statistics, and others can be applied to any of the 13 types of systems.

> ***Definition 10***:
>
> ***Service Science*** *means curricula, training, and research programs that are designed to teach individuals to apply scientific, engineering, and management disciplines that integrate elements of computer science, operations research, industrial engineering, business strategy, management sciences, and social and legal sciences, in order to encourage innovation in how organizations create value for customers and shareholders that could not be achieved through such disciplines working in isolation* [cam07].

Service science provides a transdisciplinary framework to organize problem sets and exercises that help students in any of these disciplines become better T-shaped professionals, and ready for teamwork on multidisciplinary teams working to improve any type of service system.

> ***Definition 11***:
>
> ***Service Science, Management, and Engineering (SSME)*** *is a term introduced by IBM to describe Service Science, an interdisciplinary approach to the study, design, & implementation of services systems – complex systems in which specific arrangements of people and technologies take actions that provide value for others*.

More precisely, SSME has been defined as the application of science, management, and engineering disciplines to tasks that one organization beneficially performs for and with another.

As existing disciplines graduate more students who are T-shaped, and have exposure to service science, the world becomes better prepared to solve grand challenge problems and create smarter systems that deliver modern service. Especially, where students have had the opportunity to work as part of an urban innovation center that links their university with real-world problems in their urban

environment – they will have important experiences to help them contribute to solving grand challenge problems.

The SSMED standard should ensure people know 13 systems and 13 disciplines / professions (the key is knowing them all to the right level to be able to communicate and problem-solve effectively). Multidisciplinary teams can solve problems that require specific discipline knowledge.

2.3 Foundations of service systems

A more formal description of the structure and composition service systems is based on the following basic definitions:

i. A system is a configuration of resources, including at least one operant resource,in which the properties and behavior of the configuration is more than the properties and behavior of the individual resources;

ii. Operant resources can act on other resources (including other operant resources) to create change;

iii. Service is the application of resources (including competences, skills, and knowledge) to make changes that have value for another (system);

iv. Value is improvement in a system, as determined by the system or by the system's ability to adapt to an environment;

v. Economic exchange is the voluntary, reciprocal use of resources for mutual value creation by two or more interacting systems.

Given these, we formally define a service system as an open system:

1) capable of improving the state of another system through sharing or applying its resources (i.e., the other system determines and agrees that the interaction has value), and

2) capable of improving its own state by acquiring external resources (i.e., the system itself sees value in its interaction with other systems).

Given (iii), a service involves at least two entities (see also figure 2):

1) one applying competence and

2) another integrating the applied competences with other resources and determining benefit (value co-creation).

We call these interacting entities service systems, i.e. a dynamic value co-creation configuration of resources, including people, organizations, shared information (language, laws, measures, methods), and technology, connected to other service systems by value propositions.

Service science seeks to add value to many existing disciplines through a focus on value cocreation (i.e., service) and on the dynamic configurations of resources (what we call *service system entities*) that create value when arranged into systems with other such configurations of resources (*service systems*).

Definition 12:

Service System Entity (SSE) is a system that includes one or more people and a number of technologies that adaptively computes and adjusts to the changing value of knowledge (innovation).

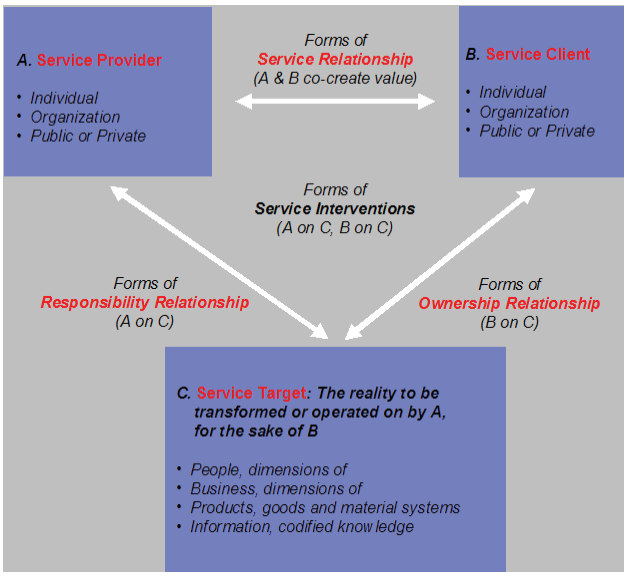

Figure 2. Interactions between service systems

The world view is that of an ecology of service-system-entities [spo] see figure 3. Ecology is the study of the populations of entities, and their interactions with each other and the environment.

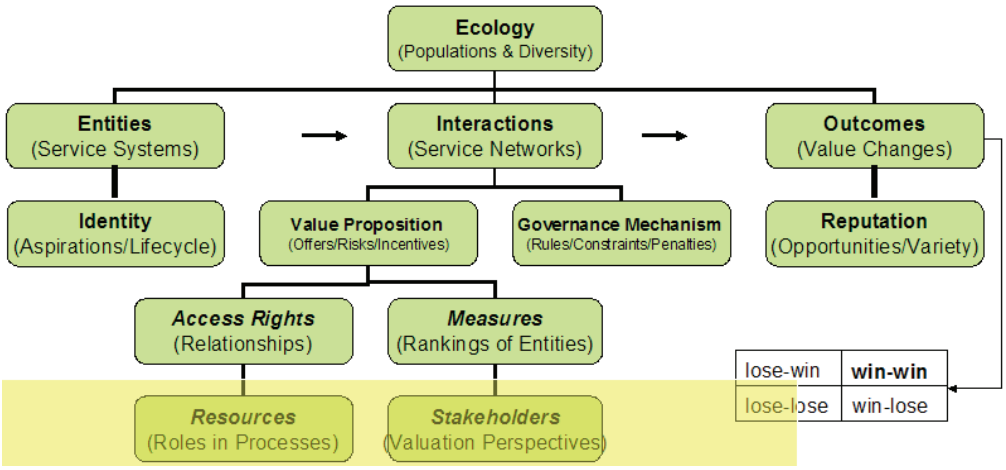

Figure 3. Service Systems Ecology: a conceptual framework

Service systems include: Person, Family/Household, Business, Citiy, Nation, University, Hospital, Call-Center, Data-Center, etc. – any legal entity that can own property and be sued. We see that Resources (People, Technology, Information, Organizations) and Stakeholder (Customers, Providers, Authorities, Competitors) are part of the conceptual framework for service science.

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