

Conceptual Frameworks

This chapter presents four theories from different academic disciplines that provide a comprehensive view of service. According to Gregor’s taxonomy of theory types [6], the theories presented are theories for analysis. This means that they offer concepts to describe, understand and analyze an object of study (i.e., what is), but do not explain or predict phenomena (i.e., why something is or what will be), nor provide prescriptions to create objects or cause events (i.e., how to do something).

2.1 Major Theories

The four reviewed theories are suitable for developing a concept base that can be used for selecting concepts when designing a conceptual service system model as the basis for the LSS-USDL service description language (see Chap. 3). The service concepts described by these theories constitute an interdisciplinary knowledge base that allows achieving rigor when designing the intended model and language, providing a theoretical foundation and justification for their construction [8].

The theories selected for this chapter are:

- Service-Dominant Logic [20] (Sect. 2.2).
- Unified Services Theory [18] (Sect. 2.3).
- Work system metamodel [4] (Sect. 2.4).
- Resource-Service-System model [15] (Sect. 2.5).

The Service-Dominant Logic is a descriptive theory of service from the Marketing discipline. It has been proposed as the philosophical basis of the new inter-disciplinary field of Service Science, Management, and Engineering (SSME) - Service Science in short - which studies service systems with the aim of creating the systemic knowledge required for sustainable service innovation [19].

To complement the marketing perspective of service, with its strong emphasis on the creation of customer benefits, the second reviewed theory is drawn from the Operations Management discipline. The Unified Services Theory describes the service production process and allows analyzing the efficiency and quality of this process. Thirdly, a “work system” perspective, i.e., viewing an object of study as a system in which work is performed, allows understanding service as a system (socio-technical or automated) in an organizational context [3]. The Work system metamodel provides an operational view of service systems (and work systems in general) that offers the basis for detailed analysis of the system’s form, function and environment [2].

This operational view is finally complemented by an economic view that also considers aspects related to the exchange of service. This view is obtained through application of the Resource-Event-Agent ontology, originally from the Accounting discipline, as a model of economic exchange. Applying this ontology to service systems has resulted in the Resource-Service-System model of service exchange, which is the fourth theory presented in this chapter.

The combination of theories from multiple disciplines, each offering a partial perspective on service, leads to the creation of a more complete concept base that covers different economic, management, and engineering aspects related to service. This ambition is fully in line with the purpose of the new SSME field as it is with the design of a conceptual model of service system that can serve as the foundation of a white-box service description language.

The next sections will present the selected descriptive theories of service. To build the concept base for the intended service system conceptualization, an integrated concept map with concepts from the different theories is gradually constructed throughout Sects. 2.2 to 2.5. A summary is given in Sect. 2.6.

2.2 Service-Dominant Logic

The growing importance of service and service systems and the rising demand for service innovation and, hence, increasing investments in service R&D have often been motivated by the global sectorial shift in gross domestic product and employment from agriculture and industry to service (see, e.g., [9]). The difference between the declining second economic sector and the rising third sector is traditionally (and officially in governmental reports) made on the basis of the output of economic actors, producing either goods (second sector) or services (third sector).

Services are seen as products that are different from goods in terms of the IHIP characteristics: intangibility, heterogeneity, inseparability (of production and consumption), and perishability [13]. From a management perspective, the IHIP characteristics are considered as shortcomings, making it more difficult to properly handle services, e.g., with respect to their design, production, quality assurance, and marketing. To find answers to these shortcomings, ded-

icated service research disciplines like service management, service operations, service design, service engineering, etc. emerged.

2.2.1 A New Service Definition

The IHIP characteristics as distinguishing features between goods and services are not without their own shortcomings, casting doubts on the usefulness of separate service research disciplines like service marketing [21]. The Service-Dominant Logic [20, 10, 22] is the outcome of a counter-movement to the separate treatment (and researching) of the service sector. It promotes an economic world view in which all economic exchange is seen as the exchange of service for service.

According to Service-Dominant Logic, *service* is the application of one's competences for the benefit of someone else. Both goods and services (according to the traditional economic classification) can be used in the act of applying competences for the benefit of someone else. Hence, whether something officially classifies as a good or service is of minor importance as it is the act of applying competences that matters. The actual benefits of this act (i.e., service in singular) are determined by the beneficiary in terms of value-in-use (i.e., what utility is assigned to the application of competences) and value-in-context (i.e., how are the benefits experienced in the subjective ad-hoc context of the beneficiary), rather than value-in-exchange (i.e., what is the monetary value of the goods or services (in plural) when exchanging them).

2.2.2 Foundational Premises

The descriptive theory of Service-Dominant Logic has been expressed through the following set of ten foundational premises (FPs) [23]:

- FP1.* Service is the fundamental basis of exchange.
- FP2.* Indirect exchange masks the fundamental basis of exchange.
- FP3.* Goods are a distribution mechanism for service provision.
- FP4.* Operant resources are the fundamental source of competitive advantage.
- FP5.* All economies are service economies.
- FP6.* The customer is always a co-creator of value.
- FP7.* The enterprise cannot deliver value, but only offer value propositions.
- FP8.* A service-centered view is inherently customer oriented and relational.
- FP9.* All social and economic actors are resource integrators.
- FP10.* Value is always uniquely and phenomenologically determined by the beneficiary.

The first foundational premise (FP1) recognizes that what economic actors exchange is the application of each other's competences. This fundamental axiom of Service-Dominant Logic goes back to 18th century economist Adam Smith's views on efficiency in economic activity through specialization [24].

Economic actors specialize in what they are best at doing based on their own knowledge and skills. Economic exchange occurs when actors apply their own specialized competences for the benefit of others. In this sense all economies are service economies (FP5) rendering the official classification in economic sectors irrelevant. For instance, farmers (first sector) specialize in crop growing and apply their competences in doing so to feed animals and people. But rather than having farmers work our own gardens, they sell us their crop in which they have invested their crop growing skills and knowledge, hence, goods are a distribution mechanism for service provision (FP3).

Likewise, manufacturers (second sector) specialize in goods production and apply their competences in doing so to satisfy people’s needs for goods for which they lack the competences to produce themselves. But of course, to make the actual exchange of “I do this for you when you do this for me” efficient, money was invented; hence, indirect exchange (e.g., goods for money) masks the fundamental basis of exchange (FP2). As a final example, a service company or professional like a hairdresser (third sector) specializes in service provision and applies its or his competences in doing so to satisfy people’s needs for services for which they lack the competences to provide for themselves. In case of the hairdresser, the essence of these specialized competences are not the goods like scissors, shampoo, hair gel, etc. which are only used as appliances through which the specialized hairdressing competences are conveyed, and which can easily be acquired by the customers themselves. The essence is the knowledge and skills related to hairdressing, which is far more difficult to acquire (and apply to oneself). Hence, FP4 states that *operant resources*, meaning skills and knowledge, are the fundamental source of competitive advantage.

The sixth foundational premise (FP6) introduces another fundamental concept of Service-Dominant Logic: *value co-creation*. Co-creation of value implies that the service beneficiary is always involved in the creation of value as he is the sole determiner of value (meaning value-in-use and value-in-context) (FP10) and the actor that applies specialized competences (i.e., operant resources) can only offer value propositions (FP7) which help to create value with and for the beneficiary. While the interactional nature of service is further stressed by FP8, the ninth foundational premise (FP9) introduces another activity of actors besides applying their specialized competences: *resource integration*. Actors need to integrate the resources they acquire as service beneficiaries into their own resources in order to survive and prosper, and to continue being able to apply specialized competences themselves. FP9 thus explains the exchange component in FP1.

2.2.3 Service-Dominant Logic Concepts

The concept map of Fig. 2.1 summarizes the key concepts that Service-Dominant Logic uses to describe service. *Resources* are of two kinds as determined by the service context under consideration: *operant resources* represent

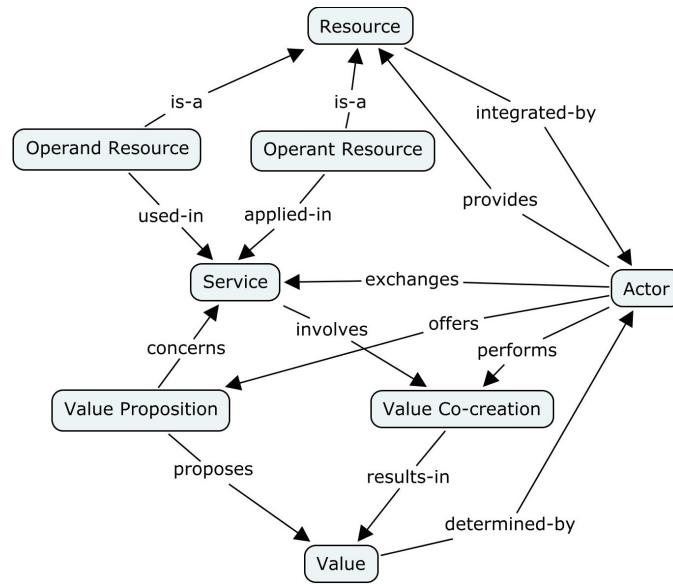


Fig. 2.1. Concept map Service-Dominant Logic

competences (i.e., knowledge and skills) or their embodiments (e.g., persons, organizational units, software agents, automated devices) that act upon other resources; *Operand resources* are resources that are acted upon or with like passive resources such as tools, materials, and data, but possibly also resources that may be active in another service context like persons, machines, and software. *Actors* exchange services by providing resources. The acting of operant resources on operand resources is what is called *service*, meaning an actor applying competences for the benefit of another actor. Through the exchange of service for service actors integrate resources that are made available, accessible or more valuable (as determined by the service beneficiary) by other actors, into their own resources. *Value* is always co-created by the beneficiary actor. It is the beneficiary actor who determines whether a service resulted in *value*. Therefore, an actor can only offer a *value proposition* concerning some service and cannot solely create value for the beneficiary actor.

2.3 Unified Services Theory

The Unified Services Theory [18] was developed for providing a distinctive, yet integrative paradigm and common language for service management researchers. It is meant as a descriptive theory that defines concepts relevant to service management from a primarily, though not exclusive production perspective. As opposed to the Service-Dominant Logic, the Unified Services

Theory recognizes the distinction between services and non-services. Its operational implications, therefore, address the challenges that are unique to the management of service processes.

2.3.1 Defining The Service Process

The theory does not define the concept of service directly, but talks about service processes. The object of study is the *production process*. An enterprise is a production system consisting of possibly multiple production processes.

The basic tenet of the Unified Services Theory is that a *service process* is a production process in which each individual consumer provides significant inputs. *Inputs* are resources available to production. Consumer inputs can be of three kinds: the consumer himself (e.g., going to a hairdresser), information provided by the consumer (e.g., providing information to a solicitor for preparing a legal case) or tangible belongings of the consumer (e.g., getting one's car repaired). Inputs that are not considered significant and hence do not allow qualifying a production process as a service process are general consumer feedback (e.g., a market research that provides ideas and requirements for a new product and, thus, informs production processes) and selecting and consuming the output from production processes. The latter activity is part of a *consumption process* in which consumers extract value by interacting with the output of production processes or with the service providers themselves.

The operational implications of the theory for service management focus strongly on what makes a production process a service process, i.e., the necessity of consumer inputs. For instance, according to the theory service quality depends in large part on the quality of the inputs that the consumer provides. Also, service processes can be made more efficient by reducing the variability in consumer inputs. Overall, it is the presence of consumer inputs that makes service processes harder to manage than non-service processes. The consumer-producer interaction required for service processes implies that consumers are also suppliers and, hence, service supply chains are always bidirectional [16].

2.3.2 Unified Services Theory Concepts

The main concepts of the Unified Services Theory are shown in Fig. 2.2. A process is a series of actions. Amongst different kinds of processes are production and consumption processes. Note that the theory also defines other kinds of processes like business processes and IT processes [17], but these are at this moment not relevant for understanding service. A production process is a process that transforms inputs into outputs. An *input* is a resource available to production. Generally, the *producers* that own the production processes provide inputs to these processes. *Service processes* are production processes in which also *consumers* provide or make available input resources (either themselves or information they have or their property). An *output* is a result of production. Consumers select outputs from production processes to satisfy

their *needs*. The extraction of *value*, which is the satisfaction of consumers' needs, is performed in *consumption processes*. A concept not explicitly shown but present in the chain of relations in the concept map is that of consumer-producer interaction, which is bidirectional. Consumers influence producers by providing production inputs and producers influence consumers by acting on the consumer inputs.

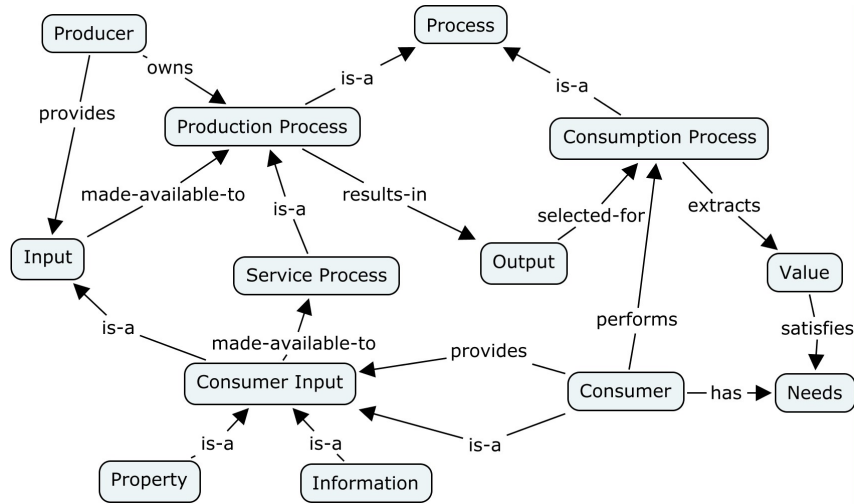


Fig. 2.2. Concept map Unified Services Theory

2.3.3 Service Process Versus Service as Process

Joining the concept maps of the Service-Dominant Logic and the Unified Services Theory is not an easy operation, given their fundamentally different view of service. While service is defined as a process in the Service-Dominant Logic, it is not the same as the service process as intended by the Unified Services Theory which employs a more restricted meaning and distinguishes between service and non-service situations (such distinction would be nonsense in Service-Dominant Logic). While service in the Service-Dominant Logic requires co-creation between the producer/provider and consumer/beneficiary, the acts of the service provider (or producer) and beneficiary (or consumer) might overlap completely or partially but also be completely independent in space and time; hence, the resource integration and resulting value capture by the beneficiary might happen long after and in a different location than the provider's activities. This scenario is consistent with what happens in the consumption process of the Unified Services Theory where the consumer may extract value from outputs of non-service production processes without

any interaction with the producer. However, to qualify as a service process, the production process needs consumer inputs, which implies some degree of overlap in time and space between producer and consumer activities. As noted in [18], this interaction is, however, not as restrictive as requiring co-production as the provision of the consumer’s labor is only one possible type of consumer input into the production process.

2.3.4 From Service Process to Service Exchange

The notion of value as satisfying needs in the Unified Services Theory is close to the notion of value-in-use in the Service-Dominant Logic, hence, value seems a common concept in both maps. Also in both theories it is the consumer/beneficiary that determines and captures the value. The resource integration in the Service-Dominant Logic and the value extraction to satisfy needs in the Unified Services Theory are, therefore, similar. To integrate both concept maps, value can, therefore, be used as an anchor point. Further we see that consumer and producer in the Unified Services Theory are specializations (and actually roles) of actor in the Service-Dominant Logic. The inputs in the Unified Services Theory are resources in the Service-Dominant Logic.

As the purpose of the conceptual model we develop in this chapter is the creation of a concept base for the design of a white-box service description language and the Unified Services Theory offers more details on the “internals” of service, we start the integration from the concept map of this theory. Given the differences between both theories, the integrated concept map should allow for multiple interpretations of concepts to co-exist. Hence, we include in the concept map of Fig. 2.3 concepts from the Service-Dominant Logic to extend the concept map for the Unified Services Theory (Fig. 2.2), without claiming to have integrated the theories themselves.

Additions from the Service-Dominant Logic are the concepts of service, value co-creation and value proposition (though the latter concept is a component of the Unified Services Theory concept of business process, not shown here). Also, the distinction between operant and operand resources is added, e.g., a consumer providing his labor to the service process (i.e., co-production) would allow qualifying the consumer as an operant resource that is applied in the service (process). Also service exchange is a new element not covered by the Unified Services Theory. A further elaboration of the exchange nature of service is given in Sect. 2.5, where we introduce the Resource-Service-System model. In general we can see that the extension with concepts from the Service-Dominant Logic allows widening the Unified Services Theory’s scope of service processes to service exchanges.

2.4 Work System Metamodel

The Work system metamodel [4] is an extension of the Work System Theory [1]. The Work System Theory defines a work system as a “system in

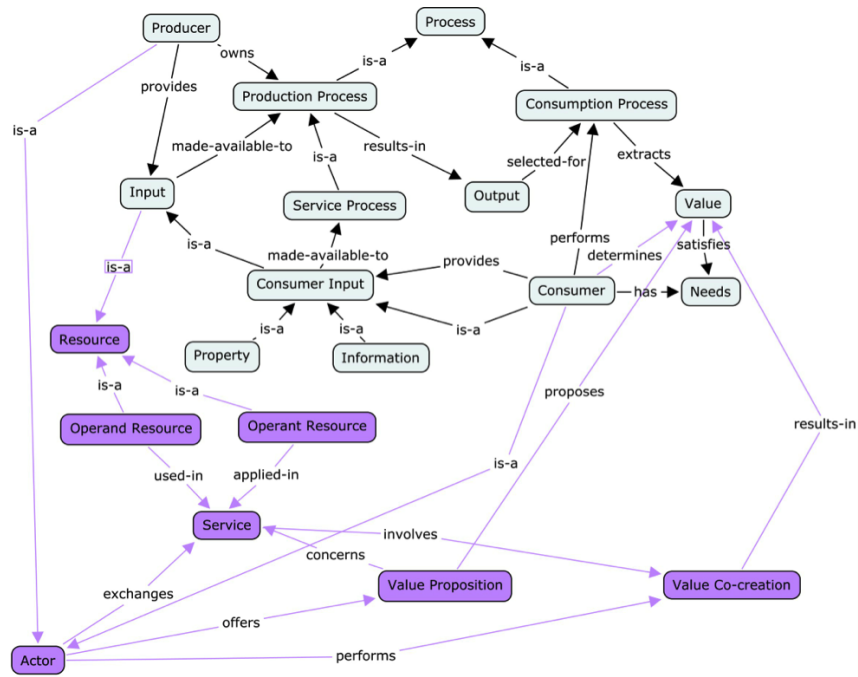


Fig. 2.3. Integrated concept map of the Unified Services Theory and the Service-Dominant Logic

which human participants and/or machines perform work (processes and activities) using information, technology, and other resources to produce specific products/services for specific internal and/or external customers” (p. 75, [1]). Services are defined as acts performed to produce outcomes for the benefit of others. The Work System Theory encompasses a descriptive framework called Work System Framework that can be used to describe and analyze work systems. Given that service systems are work systems and most work systems are service systems (except those work systems not directed at others), the Work System Framework can be used to describe service systems. While the Work System Framework is intended to provide summary-level descriptions of work systems, the Work system metamodel expresses a more detailed operational view on work systems. In the remainder we will not use all these details (e.g., different types of technological, informational, and other resources used in service systems), but focus our discussion on concepts that might provide for interesting new additions to our current concept base (as in Fig. 2.3).

2.4.1 Work System Metamodel Concepts

The main concepts of interest of the Work system metamodel are shown in Fig. 2.4. A *service system* is a work system in which work is performed for

the benefit of internal or external customers to the enterprise that offers the service. The benefits for an internal customer are other than for performing work activities within the service system itself. The service system contains *service system activities* that use *resources* and produce *products/services*. Resources can be *technological entities*, *informational entities*, (human) *participants* or other resources. The term product/service refers to a bundle of tangible and/or intangible acts and outcomes that may be more goods-like or more services-like. Note that Work System Theory recognizes the traditional distinction between goods and services but does not consider it important to understand service systems. Service system activities are performed by *actor roles* which can be performed by *automated agents* (which is a technological entity and a totally automated service system on its own right), *non-customer participants* (e.g., an employee of the enterprise) or *customer participants* (i.e., in case of co-production). Products/services may be used as resources for other activities within the same service system, however, at least one product/service produced by an activity of the service system contributes to a *product/service to the customer*, meaning physical things, information, acts and/or outcomes used or received by a *customer work system* in which they facilitate the creation of *value for the customer*.

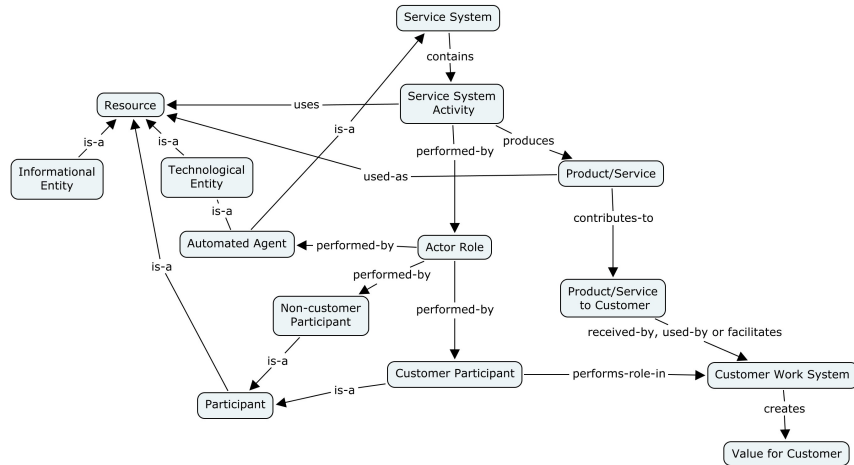


Fig. 2.4. Concept map Work system metamodel (simplified)

2.4.2 From Service Process to Service System

Comparing the Work system metamodel with the Unified Services theory, we see that the distinction between provider service system and customer work system is similar to that of production process and consumption process in

the Unified Services Theory. Though not shown in Fig. 2.4, the Work system metamodel includes the concept of (business) process when two or more service system activities “are sufficiently interrelated and sequential enough to be considered a process” [4]. Hence, the production and consumption process are part of the provider, respectively customer work systems and contain themselves work system activities. A work system perspective, thus, allows describing Unified Services Theory processes in more detail, for instance by showing that the outputs of production process activities might be used as inputs for other activities within the same or different production process (belonging to the same provider work system), and, thus, not all outputs are directed at internal or external customers. Likewise, it can also show the resources of different kinds that are used as inputs in individual production process activities, whereas the Unified Services Theory focuses on different kinds of consumer inputs into the overall service process.

2.4.3 Reconciling Value Co-Creation Definitions

The Work system metamodel is also interesting as it can help bridging the Unified Services Theory and the Service-Dominant Logic. The service brought about by the provider service system does not directly create value for the customer, but “facilitates” value creation [7], which is done in the customer work system. The product/service for customer is, thus, similar to the output of production processes that is selected for consumption processes in which value is extracted to satisfy consumer needs. Although the customer always has certain responsibilities, customer participation in service system activities (in the sense of co-production) is optional, so the absence of a distinction between service systems (or service production processes as in the Unified Services Theory) and “non-service” systems (or non-service production processes as in the Unified Services Theory) is similar to the Service-Dominant Logic where all economic activity is service (i.e., Foundational Premise FP5). Also, the definition of service is very similar to that of the Service Dominant Logic.

An apparent difference with the Service-Dominant Logic is the view of value co-creation which is optional in the Work system metamodel but strictly required for service in the Service-Dominant Logic. The difference is actually more a difference in definition as the value creation in the customer work system based on the products/services of the provider service system is what resource integrators (FP9) do and what qualifies as value co-creation in the Service-Dominant Logic. The Work system metamodel employs a more restrictive notion of value co-creation as customer work system activities that coincide in time and location with provider service system activities, implying that value co-creation is a more narrow form of co-production. More important is that the service system produces a “service as a process” (as in the Service-Dominant Logic), which facilitates value creation by customers/consumers (as in the Unified Services Theory).

The concept map in Fig. 2.5 shows how the Work system metamodel can be linked to both the Unified Services Theory and the Service-Dominant Logic. The product/service for customer is equated with the output that the consumer selects for the consumption process in the Unified Services Theory. Hence, the value for customer created by the customer work system is the value that is extracted in the consumption process performed by the consumer. The link with the Service-Dominant Logic is that service is performed by the service system.

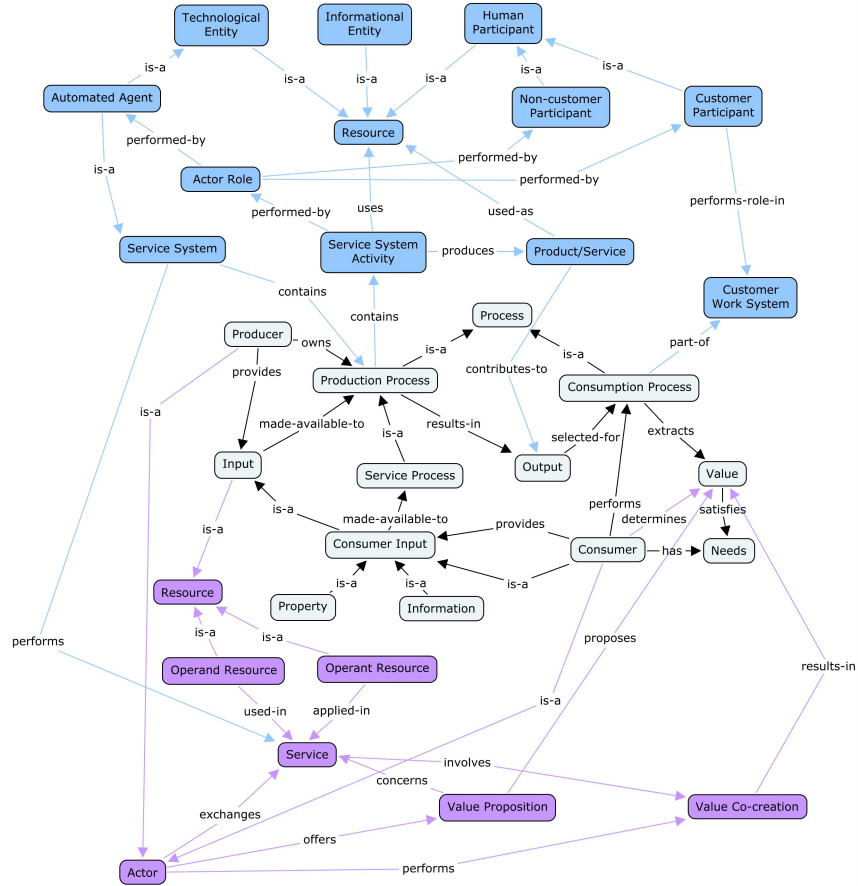


Fig. 2.5. Integrated concept map of the Unified Services Theory, Service-Dominant Logic and Work system metamodel

2.5 Resource-Service-System model

The Resource-Service-System model [15, 14] interprets the Resource-Event-Agent (REA) model of economic exchange [5] according to the Service-Dominant Logic. In REA, economic exchange results from the economic reciprocal actions (called economic events) of independent entities (called economic agents) that provide each other the resources that they control (called economic resources).

2.5.1 Resource-Service-System Model Concepts

Rooted in Accounting, REA employs the traditional economic classification of products as goods and services, hence, services are a type of resource exchanged between economic agents. This means that a service resource (e.g., a consulting service) and the event that transfers this resource from a providing agent to a receiving agent (e.g., the contracting and executing of the consulting service) are explicitly distinguished, whereas such distinction is not recognized in the Service-Dominant Logic (i.e., the consulting process is the service).

The Resource-Service-System model, therefore, replaces the REA notion of economic resource by the Service-Dominant Logic notion of *operant/operand resource* (see the concept map in Fig. 2.6), the REA notion of economic event by the Service-Dominant Logic notion of *service* (as operant resources acting upon operand resources (e.g., as service target) or with operand resources (e.g., as tools or appliances)), and the REA notion of economic agent by that of *service system entity*. The latter concept is inspired by systems thinking in Service Science [12], where service systems are seen as supra-systems composed of sub-systems (i.e., service system entities) that improve their state (and, hence, the state of the supra-system) through service exchange.

As dynamic configurations of resources, service system entities possess the means to engage in *service exchanges* with other service system entities. Based on the REA axiom of economic reciprocity in economic exchange, also described as the duality of economic events, the Resource-Service-System model posits that service exchange is the reification of the dual relationship between economic reciprocal events as a series of actions and interactions undertaken by service system entities. Fig. 2.6 shows that a service exchange is composed of *service system interactions* which are described by an *interaction episode* [11]. Such an interaction episode represents a series of activities, separately or jointly performed by the service system entities, as they occur in reality and, thus, lead to a certain outcome or interaction episode type. The purpose of service exchange is *mutually beneficial value co-creation*, meaning that service system entities engaging in service exchange employ their resources to integrate them with the exchange partner's resources in order to jointly create value for all parties. Whereas mutually beneficial value co-creation is the intended favorable outcome of service exchange, the model

recognizes other possible (and unfavorable) outcomes in line with the ISPAR model of service interaction outcomes [11].

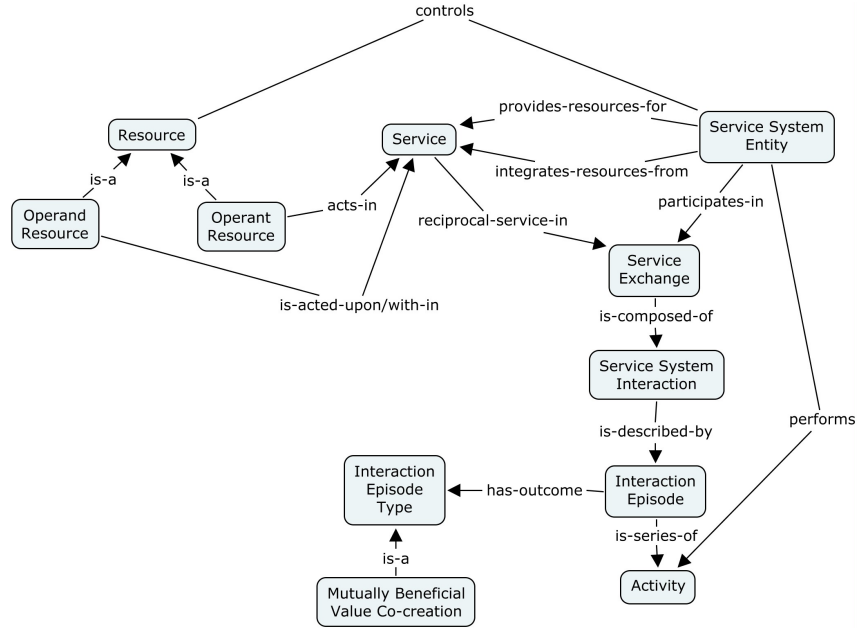


Fig. 2.6. Concept map Resource-Service-System model

2.5.2 Mutually Beneficial Value Co-Creation

The Resource-Service-System model fully adheres to the service-dominant economic world view put forward by the Service-Dominant Logic. Therefore, both descriptive theories are very similar and concepts like operant/operand resource and service are shared. Further, while the Service-Dominant Logic does not employ the term service system, it is clear that the actor concept is the same as the service system entity concept in the Resource-Service-System model. The integrated concept map of Fig. 2.7, therefore, replaces the actor concept by the service system entity concept. Nevertheless, adding the Resource-Service-System model further enriches the conceptual model of service that we gradually built throughout this section. First, the Resource-Service-System model stresses more than the Service-Dominant Logic does that in an economic context, service is exchanged for service through interactions between service system entities. The kernel concept of the model is service exchange, not service. As a corollary, while the Service-Dominant Logic focuses on value co-creation as the creation of value by two actors for one of

them, the Resource-Service-System model clarifies that the purpose of service exchange is mutually beneficial value co-creation, i.e., value is created jointly for both service beneficiaries. Second, the Resource-Service-System model recognizes (like the work system perspective described in [4] does) that this intended outcome might differ from the actual outcome of the interactions between service system entities.

2.5.3 From Service System to Service Exchange Between Service System Entities

The detailing of service exchange in terms of interactions between service system entities, in the form of joint and/or separate activities, provides for bridges with the two theories that focus more on the production/operational side of service processes and systems. Clearly, a service system activity as in the Work system metamodel is an activity as defined by the Resource-Service-System model, however, this is also true for an activity in the customer work system (coinciding or not with a provide service system activity). The concept of interaction episode is defined similarly to the concept of process in the Unified Services Theory, though it is used to represent the actual conduct of the activities in a single instance of service execution and should, therefore, be distinguished from a process “model”. The service system concept of the Work system metamodel is different from the service system entity in the Resource-Service-System model as a service system entity (or actor in the Service-Dominant Logic; hence, producer/consumer in the Unified Services Theory) needs a work system (containing production processes) to perform a service.

A service system entity can itself be a resource in a “larger” work system. This is consistent with the systemic view of the Resource-Service-System model (i.e., a service system entity can be used as an operant resource that acts in a service that is exchanged by the supra-entity controlling the entity), but also covers scenarios like consumers that are used as input in service processes according to the Unified Services Theory and fully automated service systems that perform actor roles in activities of a higher-level service system as made possibly by the Work system metamodel. The operational details of the Work system metamodel surpass that of the Resource-Service-System model, but on the other hand service exchange as a concept is missing, which makes the integration valuable as it allows creating a more complete concept base for identifying the elements that compose a service system conceptualization for designing the intended white-box service description language.

2.6 Summary and Conclusions

At the end of this chapter we wish to stress that the concept map shown in Fig. 2.7 was obtained by gradually integrating the concept maps of the selected

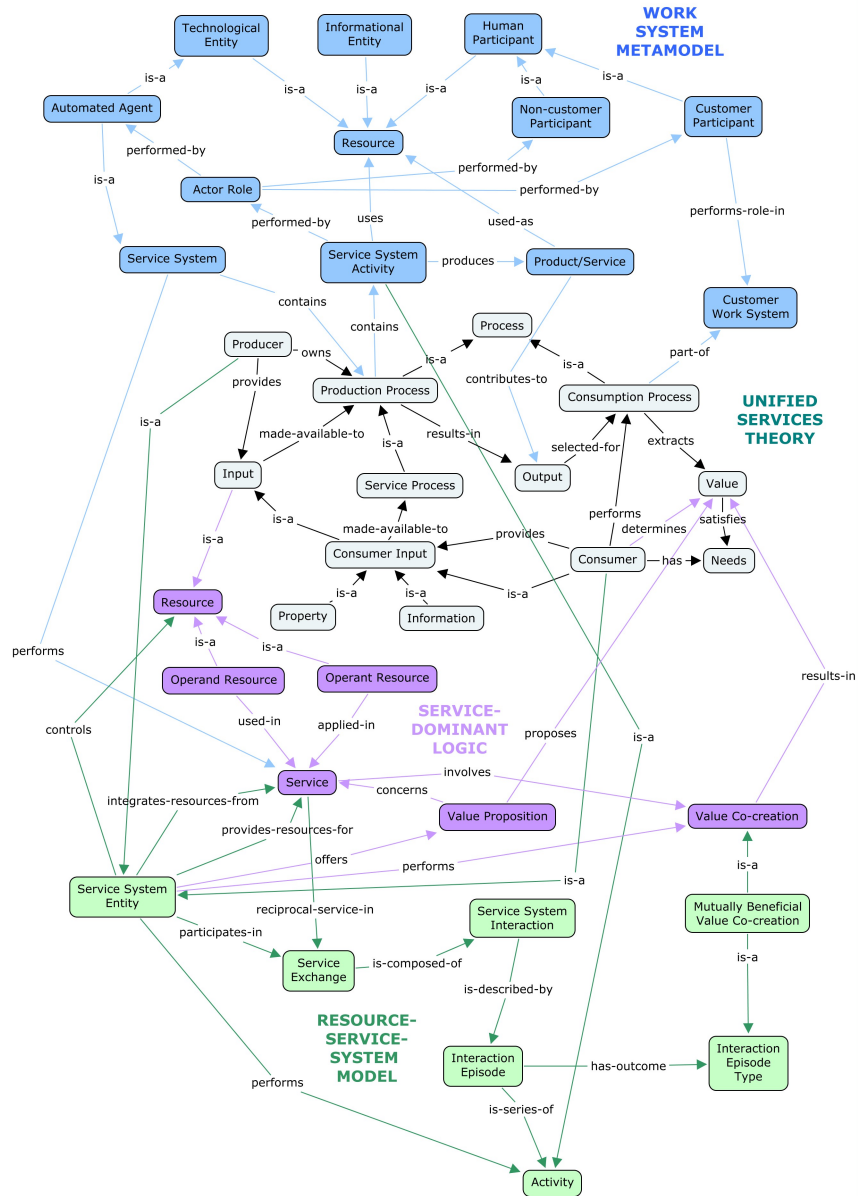


Fig. 2.7. Integrated concept map of the four theories

theories. Where possible, concepts from different theories with identical or very similar definitions were united. This way also relationships that cross theoretical boundaries could be established. The map shown in Fig. 2.7 is, however, not a conceptual model of an integrated descriptive theory of service

due to some fundamental differences in view on the nature of service and value creation. Therefore, multiple interpretations of service and value creation co-exist.

All four theories consider service as an “occurrent” or “perdurant” rather than a “continuant” or “endurant”, meaning *something that happens* rather than *something that exists*. While the definition of service in the Service-Dominant Logic, the Work system metamodel, and the Resource-Service-System model is (almost) identical, i.e., service is defined as a process in which something is done that benefits someone else, the Unified Services Theory, which does not directly define the concept of service, recognizes the existence of non-service processes. But as those non-service processes still produce outputs that consumers turn into benefits, the other three theories would argue that service was brought about.

The real difference in view on service depends on how service is “produced”. The Unified Services Theory is clearly the most restrictive as service processes need individual consumer inputs, which, given the many kinds in which those inputs can exist, is still much broader than requiring services to be co-produced. Co-production is recognized by the Work system metamodel as customers participating as actors in the provider’s service system activities, however, it is optional. There can be service without co-production, even without individual customer inputs that are made available to the provider’s service system.

All four theories agree that the determination of value is the consumer/customer’s business. For the Service-Dominant Logic and the Resource-Service-System model, this value capture by the service beneficiary is co-creation of value. For the Work system metamodel, this value capture, by the customer work system (or as in the Unified Services Theory, consumer’s consumption process) is not co-creation unless activities in the customer work system coincide with activities in the provider service system. So there is a fundamental difference in the definition of value co-creation between on the one hand the Work system metamodel and on the other hand the Service-Dominant Logic and the Resource-Service-System model. Despite this different conceptualization of value co-creation, the notion of service is almost the same in these three theories.

The Resource-Service-System model adheres to the same service-dominant economic worldview as promoted by the Service-Dominant Logic and, hence, does not differ from that theory. It does stress, more than the Service-Dominant Logic does, the praxeology of service. Economic actors exchange service for their mutual benefit, hence, the exchange of service for service is a mutually beneficial value co-creation phenomenon. Further, it also recognizes, like the Work system metamodel does, that service is an outcome which is not always achieved, even when intended.

Despite these differences, we believe that the end result of our analysis and modeling exercise (Fig. 2.7), is a rich, multi-perspective concept base for designing a service system model that provides a conceptual foundation for

the LSS-USDL language. Each of the reviewed theories has the ability to add concepts that are potentially relevant to a white-box service system conceptualization. The Service-Dominant Logic emphasizes that service is a process of operant resources acting upon operand resources. The Unified Services Theory sees the service production process as different from the value extraction process. The Work system metamodel adds operational details to service production, involving different kinds of operant and operand resources, and puts forward the notion of service system. Finally, the Resource-Service-System model adds the service exchange aspect and stresses that, in an economic context, value co-creation should be mutually beneficial. From a white-box perspective, this mutually beneficial value co-creation results from a series of activities, separately or jointly performed by service system entities, where these activities are part of the provider service system and/or customer work system, and can be organized as processes. Processes, activities, and resources used as inputs or produced as outputs, are all relevant concepts for a white-box service system conceptualization.

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