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Work System Perspective on Service, Service Systems, IT Services, and Service Science

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This document is relevant to both teaching and research. It explains how a "work system" perspective on systems in organizations illuminates many service topics in an understandable and broadly applicable way. It contributes to ISSIP (International Society of Service Innovation Professionals) by providing frameworks and concepts that can be used in describing, evaluating, analyzing, designing, and improving services and service systems.

Work systems. This work system perspective was developed over many years based on the following goals: 1) conceptual clarity, 2) applicability by typical business professionals while analyzing typical system-related business situations and making decisions about those situations, such as proposing system improvements, 3) support for thinking about a system at different levels of detail and conceptual sophistication, depending on the analyst's goals, 4) support of communication between business and IT professionals. The clearest and most current explanation of the basic ideas is in the first 15 pages of:

> S. Alter (2013) "Work System Theory: Overview of Core Concepts, Extensions, and Challenges for the Future" *Journal of the Association for Information Systems*, 14(2), pp. 72-121.

Organization. The following pages are like a presentation with comments interspersed with diagrams and tables that illustrate a variety of points related to service, work systems, service systems, and service science. The source of diagrams and tables is shown with the diagram or table. The topics start with a conclusion about the generality of a work system perspective. Subsequent ideas about service and service systems fit into that conclusion.
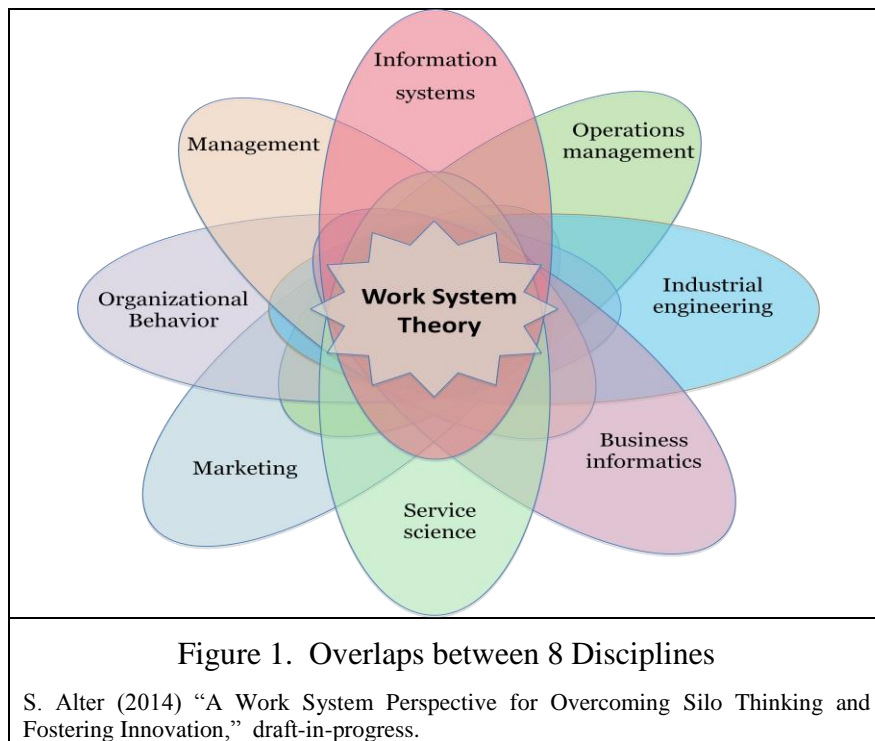1) Work systems as a point of overlap between many disciplines.
2) Three fundamentally different portrayals of service
3) A conceptual model related to a simple definition of service
4) Work System Theory (WST)
5) Interpretation of product/service in WST
6) Fundamental concepts related to customers, service, and value
7) A service value chain framework
8) Work system metamodel: A more detailed view of the link between resources and value
9) Is engineering of sociotechnical services/ work systems a contradiction in terms?

Overarching ideas:
1) Work system theory (and possibly other similar ideas) is fundamental to service science and to other disciplines.
2) A work system lens helps in disentangling the rather confused service science discourse that combines aspects of service marketing, service operations, and computer science.
3) A work system lens helps in questioning many taken-for-granted assumptions about service and service systems.

1) Work systems as a point of overlap between many disciplines.

Many disciplines share a core of ideas and concerns about systems in organizations. They may use different terminology, but they still overlap to a great extent. Figure 1 says that work system theory (or similar ideas about systems in organizations) is at a substantial area of overlap between many disciplines including service science.

Figure 1. Overlaps between 8 Disciplines

S. Alter (2014) "A Work System Perspective for Overcoming Silo Thinking and Fostering Innovation," draft-in-progress.

Disciplines that look at systems in organizations primarily from an individual and group behavior viewpoint are on the left side of Figure 1. Disciplines on the right side tend to use more of an engineering and modeling viewpoint. Each discipline contains many topics that are not considered significant in other disciplines. For example, queuing theory and safety stock calculations are quite important in operations management but are considered peripheral or outside of the scope of other disciplines.

So what? …. The shortcomings of silo thinking have been lamented ever since the term "functional silo syndrome" apparently was coined in Ensor (1988). Silo thinking is inward looking and self-referential. Its "circle the wagons" approach is inconsistent with ongoing business trends that reveal little patience with artificial barriers and great interest in topics such as elimination of artificial barriers and turf wars, working across functions, open innovation, co-creation of value, agility and lean approaches, disruptive innovation, and design thinking.

General conclusion: work system theory has potential value in many disciplines.

2) Three fundamentally different portrayals of service

The everyday language of systems and services has become convoluted because terms such as system, service, service system, IT service, value, capability, and function have different meanings in different contexts, and sometimes have different meanings in the same discussion without anyone noticing.

Different portrayals. Table 1 shows two portrayals of service as applied to the same situations. Viewing service as acts is basically a provider's portrayal. This portrayal implies that the focus should be on whether and how acts are performed. Viewing service as outcomes is basically a customer's portrayal. This portrayal implies that the important issue is the outcome that is attained and the extent to which that outcome facilitates value for customers. That is more of a customer viewpoint because customers care more about outcomes than about the acts that produced or facilitated those outcomes.

Table 1. Services as acts versus services as outcomes		
Situation	**Service as acts**	**Service as outcomes**
Documentation service	The telecommuting technical writer analyzes software, decides how to explain it, and writes documentation.	Availability of documentation produced by the technical writer
Software development service	The IT group interviews stakeholders, analyzes the situation, proposes requirements, and builds the software.	Availability of software produced by IT group
Call center	The call center answers the call, does a preliminary analysis, and escalates the call if necessary.	Incident resolution facilitated by the call center.
Training department	The training department sets up appointments, analyzes user knowledge, and provides person-to-person training and testing.	User's attainment of a particular level of understanding as a result of the training

In all four IT-related examples, the people performing the service have guidelines but need to use judgment to understand the situation and figure out what to do to produce or facilitate the appropriate outcome.

A third portrayal of service that is common in IT has completely different expectations and connotations:

> A service "is generally implemented as a course-grained, discoverable software entity that exists as a single instance and interacts with applications and other services through a loosely coupled (often asynchronous), message-based communication model." (Brown et al, IBM Systems Journal, 2005)

> "The component that consumes business services offered by another business component is oblivious to how the provider created the business service." (Cherbakov et al, IBM Systems Journal, 2005)

A person trying to perform service based on expectations for a "course-grained, discoverable software entity that exists as a single instance" would be ridiculous because that would involve acting mechanically without any use of judgment. Similarly, a

software service entity trying to act like a person would be unreliable at best because we don't know how to model human judgment in unanticipated situations that test the bounds of whatever knowledge went into the software.

Past definitions of service. Table 2 gives examples of the many definitions of service that have been proposed. A glance at the definitions shows that they reflect fundamentally different viewpoints. Some definitions focus more on acts performed by service providers, some focus more on outcomes perceived by customers, and some are about software entities that are meant to be invisible.

Table 2. Three different portrayals emphasized in past definitions of service	
Portrayal	**Definition**
acts	"an act or performance that one party can offer to another that is essentially intangible and does not result in the ownership of anything." Kotler and Keller (2006, p. 402)
acts	"intangible activities customized to the individual request of known clients." Pine and Gilmore (1999, p.8)
acts	"a provider-client interaction that creates and captures value." IBM Research (2009)
acts	Sampson and Froehle (2006, p. 331) defines service as situations in which "the customer provides significant inputs into the production process."
acts	"value-creating support to another party's practices. Grönroos (2011, p. 285) As suggested by Normann (2001), this support may either relieve customers from taking on some task or enable them to do something that otherwise would not be possible to accomplish or would be accomplished less efficiently or effectively."
acts	"the application of specialized competences (knowledge and skills) through deeds, processes and performances for the benefit of another entity or the entity itself." Vargo and Lusch (2004, p. 2)
acts	"Acts performed for the benefit of others" (Alter, 2012) For totally automated services, acts performed by one entity to satisfy needs of another entity.
outcomes	"a change in the condition of a person, or a good belonging to some economic entity, brought about as a result of some other economic entity, with the approval of the first person or economic entity." Hill (1977, p. 318)
outcomes	"a time-perishable, intangible experience performed for a customer acting in the role of a co-producer." Fitzsimmons and Fitzsimmons (2006, p.4)
outcomes	"a simultaneous or near-simultaneous exchange of production and consumption, transformation in the experience and value that customers receive from engagement with providers, and intangibility in that goods are not exchanged." Rai and Sambamurthy (2006, p.328)
software entity	A service "is generally implemented as a course-grained, discoverable software entity that exists as a single instance and interacts with applications and other services through a loosely coupled (often asynchronous), message-based communication model." (Brown et al, 2005) "The component that consumes business services offered by another business component is oblivious to how the provider created the business service." (Cherbakov et al, 2005)

Revised from a table in … S. Alter (2012) "Challenges for Service Science," *Journal of Information Technology Theory and Application*, Vol. 13, Issue 2, No. 3, pp. 22 -37

Instead of assuming that particular definitions are right or wrong, it is more useful to assume each definition makes sense from a particular viewpoint or in a particular context. A definition of service and service system by someone thinking about hospitality situations such as hotels or restaurants probably will not emphasize the same topics as a definition of service by someone thinking about international transportation of goods, water supply systems, software testing, or web services.

Service offerings/ value propositions. As if three inconsistent portrayals of service are not confusing enough, there is also confusion about terms such as "service offering" and "value proposition." These terms may be taken to mean any of the following:

Table 3. Different interpretations of "value proposition"		
meaning of the term value proposition	consumer product example	industrial product example
Subjective impression conveyed by advertising to customer	Playing our online game will make you brilliant and socially adept.	We provide the best service system help at the lowest cost per incident.
A provider's actual intention to do something for a customer.	We plan to provide 24X7 access to our online game for paying customers.	We will provide qualified consultants from 9:00 AM to 5:00 PM for a fixed fee.
An intended perception by a customer	Playing their online game will be an enjoyable social experience.	They provide competitively priced help for problems related to service systems.

Ideally, a service offering or value proposition should be a service provider's explicit intention about future acts and/or outcomes, as in "We will resolve 95% of incidents within 3 hours." In reality,
1) The customer may or may not be able to interpret the intention.
2) The proposed acts may or may not be performed consistent with the proposal.
3) The actual outcomes may or may not satisfy the expectations in the service offering.

3) A conceptual model related to a simple definition of service

The following definition of service covers all three portrayals of service mentioned in the previous section. It applies to most everyday services (hair cuts, medical care, transportation, consulting, customer support through a helpline, development of customized software). It also applies to web services and other invisible services performed by software because those services are the acts performed for other entities.

> *A service is an act performed to produce outcomes for the benefit of others.*

Figure 2 shows how that definition fits with a number of concepts that are often associated with services in general, and also with IT services in particular. It uses the term work system instead of service system to avoid confusion with definitions of service system that don't fit this diagram. Also, it shows how the term service is defined, but uses the term product/service to refer to a bundle of tangible and intangible acts and outcomes that is provided to the customer, thereby avoiding confusion about differences between goods and services that are important for characterizing the nature of the entire economy, but are not useful for understanding what systems do for their customers.
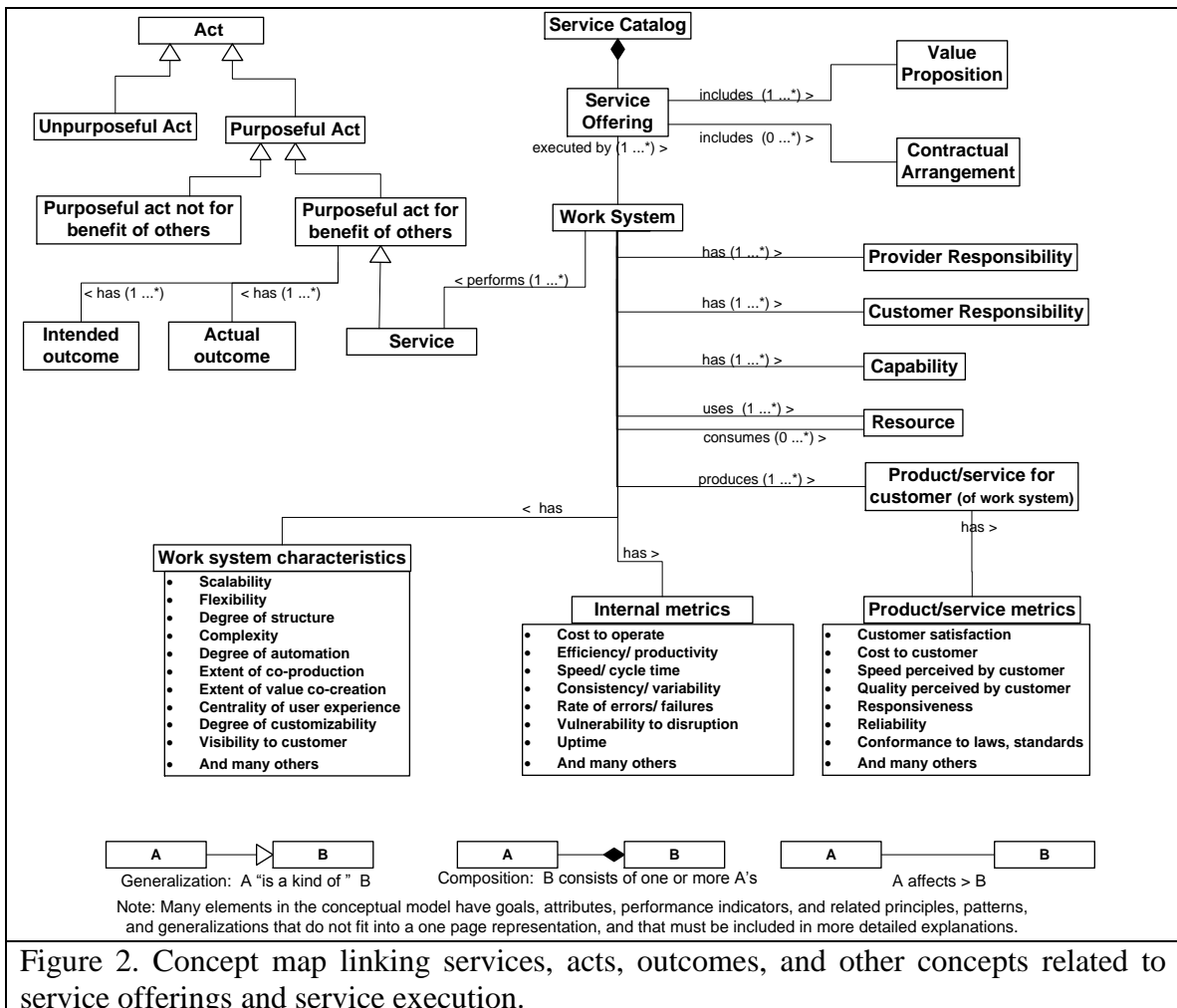
Figure 2. Concept map linking services, acts, outcomes, and other concepts related to service offerings and service execution.

Figure 2 says the following:

- **Acts** can be divided into **purposeful acts** and **unpurposeful acts**.

- **Purposeful acts** include **acts for the benefit of others** and **acts not for the benefit of others**.

- **Service** is a type of **purposeful act for the benefit of others**.

- **Purposeful acts for the benefit of others** have **intended outcomes** and also have **actual outcomes**. The actual outcomes often differ from the intended outcomes. (That is why some service offerings are governed by service level agreements.)

- A **service catalog** consists of (i.e., identifies) **service offerings** from a particular provider, such as an IT department or enterprise.

- A **service offering** includes one or more **value propositions** for customers of the service offering. Those customers may be employees of the firm that provides the **service offering** (e.g., help line for employees who use an internal network) or may be economic customers of that firm (e.g., outsourcing service that a firm provides to its customers).

- In the context of service offerings, a **value proposition** is a relatively general statement about why potential customers of a service offering would want it.

- A **service offering** may (or may not) include **contractual arrangements**. Such arrangements are very important for service offerings such as outsourcing, and are less important for internally directed services such as help lines.

- A **service offering** is executed by one or more **work systems**. Thus, the realization or enactment of a service offering involves a specific set of acts and/or outcomes that one or more work systems will produce for internal customers and/or external customers.

- A **work system** performs one or more **services**. In an organizational context work systems always perform some activities for the benefit of others because organizations consist of interrelated work systems. Thus, while it is possible for some work systems to operate solely for the benefit of a single participant (e.g., playing a one person videogame for personal enjoyment), that type of situation is unimportant in most business settings. A more important point for understanding services is that a work system that performs one or more services may perform many tasks that are internally directed and are not services for its customers.

- A **work system** always has one or more **provider responsibilities**. Those responsibilities are usually implicit in processes and activities within the description of the work system.

- A **work system** always has one or more **customer responsibilities**. Customer responsibilities are important for two reasons. 1) Customers participate directly in many work systems (e.g., providing medical care or producing custom software) and therefore have a direct effect on whatever is produced. 2) Customers are responsible for creating value for themselves from whatever products/services the

work system produces (e.g., customers of an IT department create value for themselves by using software, hardware, and networks that are provided for them). This touches on debates about whether value is always co-created (Vargo and Lusch, 2008) or whether of value co-creation is optional (Grönroos, 2011)

- A **work system** has one or more **capabilities**. Capabilities are summary descriptions of how the work system's ability to use a certain level of resources to produce products/services.

- A **work system** always uses one or more **resources** and may consume some of those resources. The resources may be informational resources, technological resources, human resources, or other types of resources. The distinction between using resources versus consuming resources is a clarification related to the difference between resource usage that does not consume the resource (e.g., using a computer or using information) versus resource usage that consumes the resource (e.g., consuming the charge in a battery or writing on a piece of paper).

- A **work system** produces one or more **products/services for customers**. Introducing the concept of product/service bypasses a controversial distinction between products and services (or goods versus services) that is not important for understanding work systems. A product/service may consist of information, physical things, and/or acts or outcomes. The term product/service is used because the things that a work system produces often have some product-like characteristics and some service-like characteristics. (See Table 5) The distinction between product/services and p**roducts/services for customers** is necessary because some of the things that a work system produces may not be received and used by its customers. For example, the third step in an assembly-line produces one or more product/services for the fourth step, but those products/services may be transformed further before any **products/services for customer**s are produced. Notice also that a work system's customers may be participants in the work system, e.g., a potential user participating in software development.

- **Products/services for customers** have many **product/service metrics**, any of which may be important in some situations and unimportant in other situations. Figure 2 lists some of these and notes that there are many others.

- **Work systems** have many **internal metrics,** any of which may be important in some situations and unimportant in other situations. Figure 2 lists some of these and notes that there are many others.

- **Work systems** have many **work system characteristics**, any of which may be important in some situations and unimportant in other situations. Figure 2 lists some of these and notes that there are many others.

- Some **work system characteristics** such as **extent of coproduction, extent of value co-creation, centrality of user experience, degree of customizability,** and **visibility to customer** are often associated with services**.** Other work system characteristics such as **scalability, flexibility, degree of structure, complexity,** and **degree of automation** are important design variables in many practical situations but often are not directly associated with services.

4) Core of Work System Theory (WST)

WST encapsulates a perspective for understanding systems in organizations by viewing them as work systems. WST consists of:
1) the definition of work system
2) the work system framework, which provides a static view of a work system during a period when it is relatively stable,
3) the work system life cycle model (WSLC), which provides a dynamic view of how a work system evolves over time through planned and unplanned change.

Definition of Work System. A work system is a system in which human participants and/or machines perform processes and activities using information, technology, and other resources to produce products/services for internal or external customers. Enterprises that grow beyond an improvised start-up phase can be viewed as consisting of multiple work systems. Typical business enterprises contain work systems that procure materials from suppliers, produce products, deliver products, find customers, create financial reports, hire employees, coordinate work across departments, and perform other functions.

Examples. Table 4 lists typical work systems that were analyzed by employed MBA students whose assignment was to find a significant work system in their own organization, analyze it quickly, and produce a preliminary recommendation for improvement. All of these examples can be considered service systems.

Table 4. Examples of work systems selected and analyzed by employed MBA students		
Renewing insurance policies	Planning and dispatching trucking services	Finding and serving clients of a marketing consulting firm
Receiving materials at a large warehouse	Scheduling and tracking health service appointments	Determining government incentives for providing employee training
Controlling marketing expenses	Operating an engineering call center	
Performing pre-employment background checks		Planning for outages in key real time information systems
Performing financial planning for wealthy individuals	Collection and reporting of sales data for a wholesaler	Acknowledging gifts at a high profile charitable organization
Approving real estate loans	Invoicing for construction work	

General case and special cases. Work systems are generally considered sociotechnical by default, but can also be totally automated systems. Sociotechnical work systems have human participants. Totally automated work systems operate autonomously and automatically after being launched.

- Information systems are work systems whose activities are all devoted to processing information, i.e., capturing, capturing, transmitting, storing, retrieving, deleting, manipulating, and displaying information.
- Projects are work systems designed to produce specific products/ services and then go out of existence.
- Supply chains are inter-organizational work systems that provide supplies and other resources required for the operation of customer organizations.
- Service systems are (sociotechnical or automated) work systems that produce services.

Significance of special cases: Basic concepts at the work system level are inherited by special cases, providing an efficient way to organize, learn, and use basic ideas at multiple levels.

Work System Framework. As shown in Figure 3, the work system framework is a pictorial representation of a work system in terms of nine elements included in a basic understanding of the work system's form, function, and environment during a period when it is relatively stable, even though incremental changes may occur during that period. Processes and activities, participants, information, and technologies are viewed as completely within the work system; customers and products/services may be partially inside and partially outside because customers often participate in the processes and activities within the work system (e.g., the patient during a medical exam, the customer during design meetings for custom-built software) and because products/services take shape within the work system; environment, infrastructure, and strategies are viewed as largely outside the work system even though they have direct effects within the work system. The work system framework is unconcerned about whether some of the activities in the work system happen to be information processing activities that can be considered part of a separately defined information system. The elements of the work system framework are defined and explained in Alter (2013).
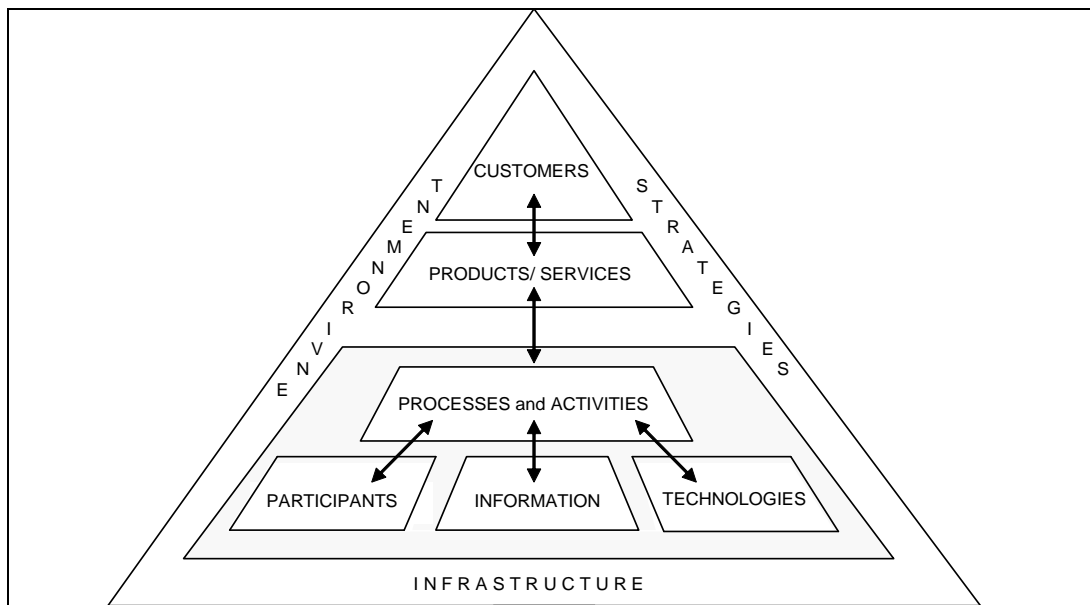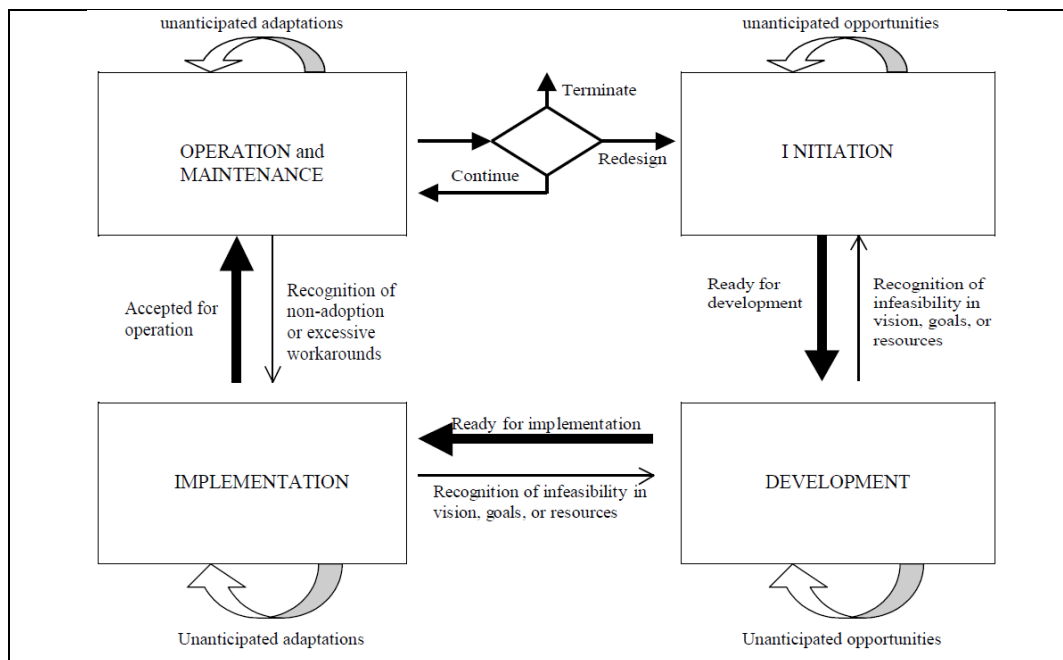

Figure 3. The Work System Framework

S. Alter (2013) "Work System Theory: Overview of Core Concepts, Extensions, and Challenges for the Future" *Journal of the Association for Information Systems*, Vol.14, No. 2, 2013, pp. 72-121.

Work system life cycle model (WSLC). Shown in Figure 4, the WSLC is the other central framework in WST. It expresses a dynamic view of how work systems change over time through iterations involving planned and unplanned change. The WSLC represents planned change as projects that include initiation, development, and

implementation phases. Development involves creation or acquisition of resources required for implementation of desired changes in the organization.

Unplanned changes, represented by inward-facing arrows, are ongoing adaptations and experimentation that change aspects of work systems or work system projects without separate allocation of significant project resources. For example, the inward facing arrow attached to the operation and maintenance phase is typically about small work system changes that do not require formal projects or allocation of significant resources.

The WSLC differs fundamentally from the "system development life cycle" (SDLC), which is basically a project model rather than a system life cycle. Some current versions of the SDLC contain iterations, but even those are basically iterations within a project. "The system" in the SDLC is a basically a technical artifact that is being programmed. In contrast, the system in the WSLC is a work system that evolves over time through multiple iterations that combine defined projects and incremental changes resulting from small adaptations and experimentation. In contrast with control-oriented versions of the SDLC, the WSLC treats unplanned changes as part of a work system's natural evolution. (The final item in this document is a related "theory of workarounds.")

Figure 4. The Work System Life Cycle Model

S. Alter (2013) "Work System Theory: Overview of Core Concepts, Extensions, and Challenges for the Future" *Journal of the Association for Information Systems*, Vol.14, No. 2, 2013, pp. 72-121.

Extensions of WST. WST consists of the definition of work system and the two frameworks mentioned above, the work system framework and WSLC. WST serves as a

platform for a number of extensions that address issues that go beyond the core. These extensions include:

- work system principles,
- work system design spaces,
- various versions of a work system metamodel (included later)
- applications of work system ideas to service systems (included later)
- a taxonomy of work system interactions,
- a theory of workarounds (included later),
- a proposed structure of a body of knowledge for IS discipline.

Work system method. WSM is a flexible system analysis and design method that is based on WST. It treats the system of interest as a work system and builds upon the two central frameworks in WST, the work system framework and WSLC. WSM was created for use by business professionals, and can be used jointly by business and IT professionals as part of the initial analysis for designing work system improvements that may or may not involve producing software. The various versions all follow the same general sequence:

- WSM starts by identifying the work system (service system) that has the problem or opportunity that launched the analysis.
- Tables of internal and external performance gaps related to costs, quality, speed, errors, and other important metrics clarify the nature of the problem.
- The "as is" work system is summarized using a "work system snapshot" that summarizes the six central elements of the work system framework.
- The analysis proceeds by drilling down to look at structure and issues related to the various elements of the work system and their interactions.
- Customer concerns and customer responsibilities are explained.
- Analysis techniques from general problem solving, Six Sigma, and other approaches are used as needed.
- A design phase identifies possible improvements and identifies proposed improvements.
- The proposed "to be" work system is summarized using a work system snapshot, thereby clarifying differences between the "as is" and "to be" work system.
- The proposed changes are justified using any of a variety of rationales that may be relevant.

5) Interpretation of product/service in WST

Products/services consist of information, physical things, and/or actions produced by a work system for the benefit and use of its customers. The controversial distinction between products and services in marketing and service science is not important for WST or WSM, and that is why the term "products/services" is used to denote things that a work system (service system) produces. (For shortcomings of various definitions of service see Alter (2012) below.) For WST and WSM a potentially useful application of product vs. service is as the basis of a set of design dimensions ranging from product-like to service-like. Those dimensions are useful for characterizing and designing the things that a work system produces. Notice how different medical product/services are positioned differently along the various product/service dimensions in Table 2.

Table 5. Approximate placement of five medical services across dimensions for designing products/service offerings (for illustration purposes only; not based on a specific instance of each of the services)

More product-like	<<----------------------------------->>	More service-like
Customer value from things that the customer receives	-------E------------D-A-----------C--B	Customer value from provider actions
Customer value from things that the customer uses	--------E--------- D-A -------------C--B	Value from experience that the provider produces
Production of value by the provider	-----------D-------C---A-E-----------B-	Co-production of value by the provider and customer
Standardized, scripted interactions and products	-E-D------------C-----------------AB--	Customized, non-scripted interactions and products
Value from tangible features of whatever the provider produces	-D-A-B------------C-----E--------------	Value from intangible features of whatever the provider produces
Transferred to customer and used later	---E------------------------A---D----BC	Consumed by customer during production
Produced by provider with little or no co-production	----D-E----------------C---------A---B-	Customer plays extensive role in co-production
Transfer of ownership	------AD-----------E--------------BC--	Non-transfer of ownership
Transaction-based interactions	-EDC---------------------A-----------B-	Relationship-based interactions
Interactions not concerned with internal state of customer	-----E----------D----C--------------AB-	Interactions trying to discern and respond to internal state of customer

A = surgery to install an artificial hip
B= extended courses of physical therapy for recovery from serious injuries
C = pre-employment physical exams
D = vaccinations provided at a public health clinic
E = standardized, web-based wellness course provided by a vendor for employees of a university

S. Alter (2012) "Challenges for Service Science," *Journal of Information Technology Theory and Application*, Vol. 13, Issue 2, No. 3, pp. 22 -37.

6) Fundamental concepts related to customers, service, and value

Figure 5 represents relationships between concepts that link service systems and value for the customer. The details of Figure 5 diverge in useful ways from some of the foundational premises of service dominant logic (Vargo and Lusch, 2004; 2008) and from other parts of the service science literature.
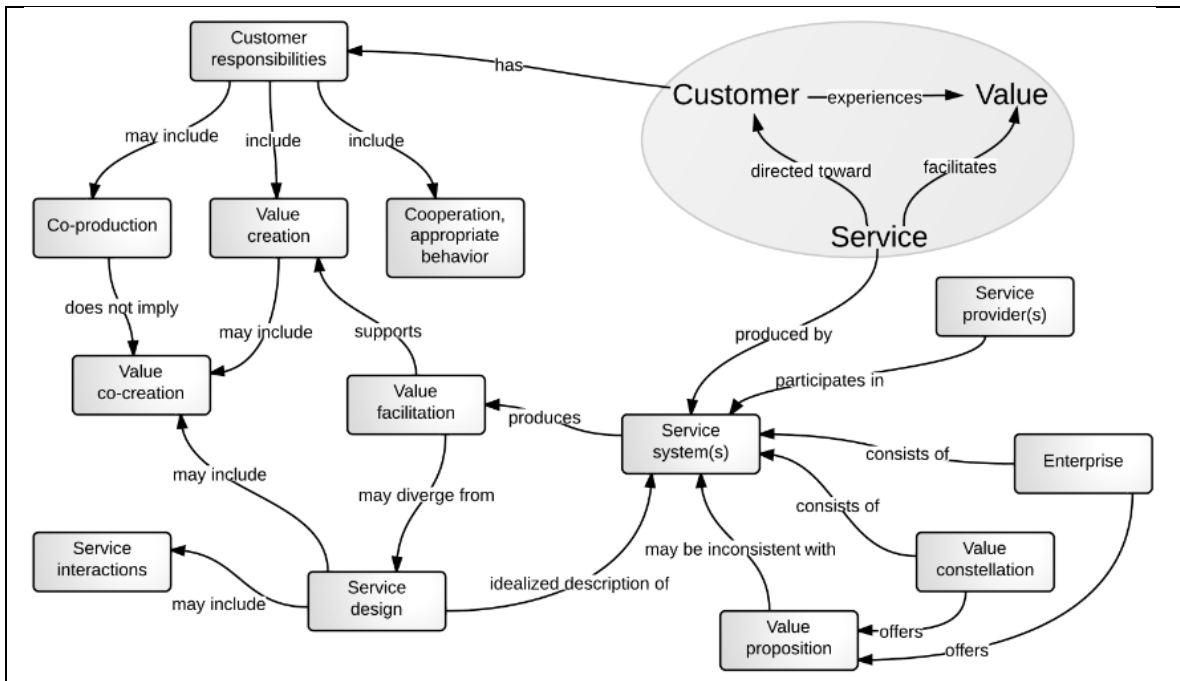
Figure 5. Fundamental concepts related to customers, service, and value

S. Alter "Value Blueprint and Service Design Space for Facilitating Value Creation**,"** *Proceedings of AMCIS 2013, the Nineteenth Americas Conference on Information Systems*, Chicago, Illinois, August 2013

Figure 5 represents an operational, design-focused perspective on concepts related to service. The main tenets of that perspective conform to some parts of the service science literature and diverge from other parts.

Some of the ideas in Figure 5 were introduced in Figure 2, which defined service but used the term work system instead of service system in order to avoid confusion with other interpretations of the term service system. There may be other inconsistencies in the two discussions.)

- Services that are produced systematically (i.e., are designed) are produced by service systems.
- Economic enterprises and value constellations consist of service systems.
- Value is determined and perceived by individual customers, often far removed from services performed by providers. Hence, value co-creation is optional and may not be directly related to co-production of services. E.g., Grönroos (2011, p. 285) defines service as "value-creating support to another party's practices." As suggested by Normann (2001), this support may either relieve customers from taking on some task or

enable them to do something that otherwise would not be possible to accomplish or would be accomplished less efficiently or effectively."

- Customers are direct recipients or beneficiaries of the services that a service system is designed to produce, i.e., not intermediate customers of previous steps within the service system of interest and often not paying customers.
- Customers create value for themselves, without or without direct involvement and interaction with service providers.
- Customers of services and service systems have responsibilities. Those responsibilities include creating value for themselves and cooperating with service providers. Customer responsibilities may or may not include co-production of service activities.
- Service systems produce value facilitation (Grönroos 2011), which supports value creation by customers. A service system is a work system. Service providers are service system participants who perform roles directed at facilitating value for customers. Customers also may be service system participants because they often perform some of the work within a service system during activities involving co-production.
- Internal and external customers should be treated symmetrically in regard to services. Internal customers receive and use services directed internally within an enterprise. External customers receive and use services directed at people or things that are outside of the enterprise.
- Value is a property of a service or thing summarizing its usefulness and importance to a particular person or group. This is consistent with foundational premise #10 in a revised version of service dominant logic, "value is always uniquely and phenomenologically determined by the beneficiary." (Vargo and Lusch, 2008).
- Value creation may or may not include value co-creation, i.e., value co-creation is optional (Grönroos 2011), contrary to assertions that value co-creation is inherent in services (e.g., Vargo and Lusch 2008). Instead, value creation by customers may be geographically and temporally distant from service activities performed by a service provider. Similarly, value creation may not be directly related to co-production of services because co-production activities may help the provider and may not be directly related to creating value for customers. In practice, the important point is not whether value is automatically co-created or whether value is facilitated and value co-creation is optional. For designing and evaluating services, the important question is finding cost-effective/ profitable ways to facilitate value for customers. Just saying that value is co-created provides little guidance for analyzing or designing services.
- The actual operation of a service system and the value facilitation that it produces for specific customers may diverge from its design in various ways. The sources of divergence include behavioral discretion, incomplete specifications, unexpected exceptions, other contingencies, workarounds, adaptations, and other conditions or occurrences.
- Inconsistency often occurs between value propositions, service system design, and value facilitation as it actually occurs in specific cases.

7) A service value chain framework

The service value chain framework augments the work system framework by identifying generic activities and responsibilities of service providers and service customers. It identifies topics and issues that should be considered when analyzing or designing a service system. Each element of this framework is important for many, but not all service systems. The entire service value chain for a service can be viewed and analyzed as a single work system. Alternatively, different subsystems in Figure 6 (such as provider preparation or negotiation of commitments) can be viewed as separate work systems.
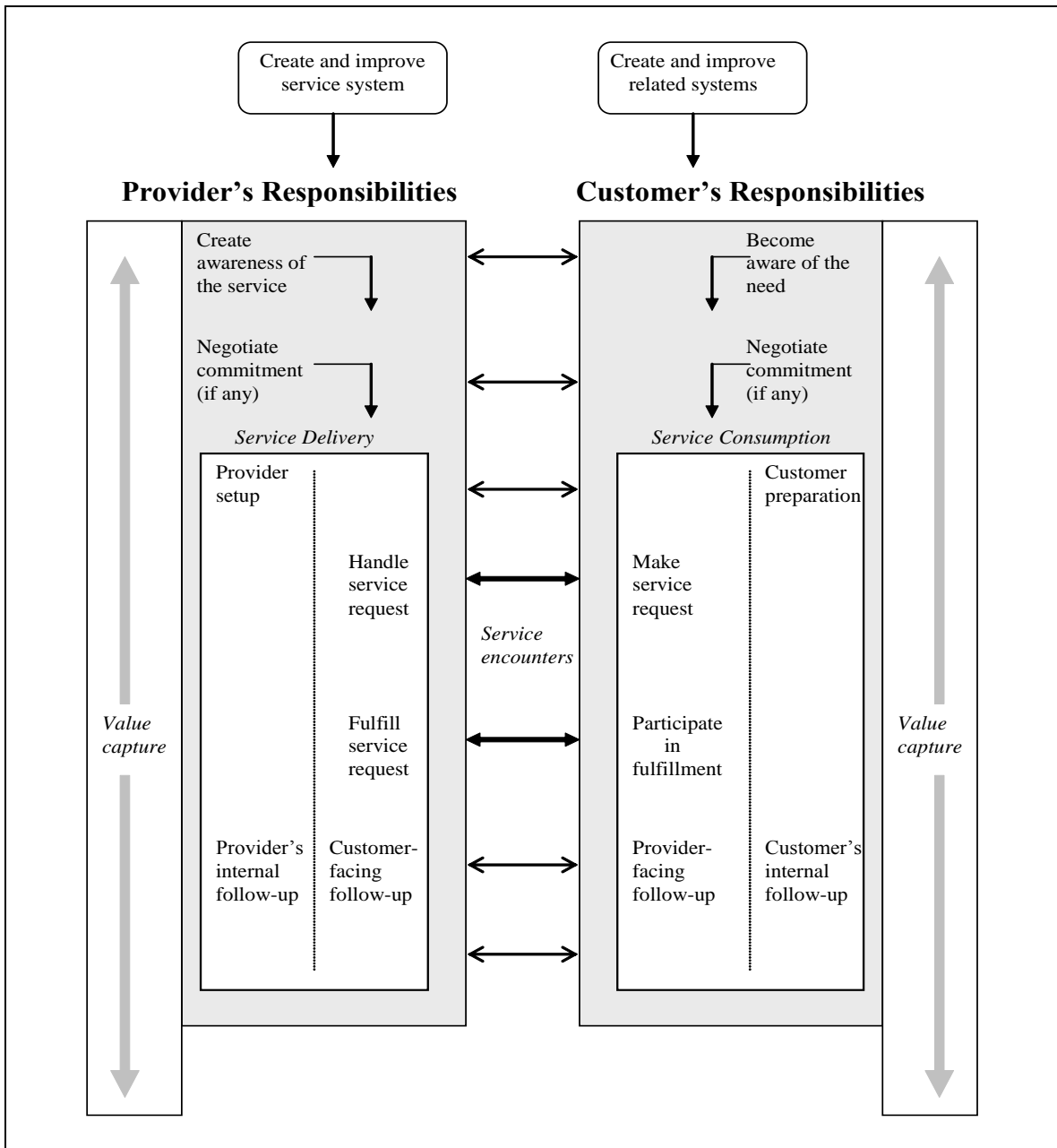
Figure 6. Service Value Chain Framework

S. Alter, "Viewing Systems as Services: A Fresh Approach in the IS Field," *Communications of the Association for Information Systems*, 26(11), March 2010, pp. 195-224

The service value chain framework's form and content encapsulate a series of assumptions related to service:

- **Importance of activities and responsibilities.** Understanding services requires attention to activities and responsibilities of both service providers and service customers.

- **Coproduction.** The bilateral form of the service value chain framework is based on the assumption that services are co-produced, at least to some extent. In other words, both providers and customers perform at least some relevant actions. For example, the success of medical care in everyday life depends partially on the quality of the doctor's diagnosis and partially on the patient's compliance with whatever the doctor prescribes. Similarly, the success of an outsourced data center depends partly on the outsourcing vendor and partly on the company receiving the outsourcing services.

- **Internal and external customers.** Basic ideas about services are largely the same regardless of whether services are directed at external customers, internal customers, or both.

- **Customer experience.** The entire experience that typical customers associate with acquiring, receiving, and benefiting from a particular service affects customer satisfaction.

- **Service encounters.** The quality of service encounters between service providers and customers is often a key determinant of customer satisfaction.

- **Beyond fulfilling a request.** Although the fulfillment of a service request is typically viewed as the core of the service, activities related to awareness, negotiation, setup, handling of the request, and follow-up impact service quality and satisfaction.

- **Negotiated commitments.** Many service situations involve delivery of services based on negotiated commitments under which the service may be requested and delivered repeatedly. For example, the quality and thoroughness of negotiated mutual commitments for outsourcing is a key determinant of whether long term services will meet needs and will be cost effective.

- **Preparation.** Preparation by providers and/or customers prior to each instance of service delivery is often essential for service efficiency and effectiveness.

- **Service request.** For many services, each instance of service delivery includes an explicit or implicit service request. The handling of the service request is an important part of service delivery and often affects customer satisfaction.

- **Front-stage and back-stage.** Services often involve front-stage and back-stage activities by both service providers and customers.

- **Follow-up.** Some services require follow-up by providers and/or customers. Follow-up may be related to a single service instance (Was the installation OK?) or to multiple service instances (How responsive is your account manager?).

- **Value capture.** Customers may experience benefits as the service is produced and/or may experience benefits later. Value capture, represented by the leftmost and rightmost portions of the service value chain framework, includes the customer's experience of attaining value from the service and the provider's experience of attaining value in exchange for the customer's value.

Concepts in the service value chain framework can facilitate the evaluation, analysis, and design of IT-reliant work systems by highlighting ideas and distinctions that a provider-centric analysis might overlook, such as:

- Customer responsibilities, not just internal production processes

- Value capture by the customers and providers, including the observation that value capture occurs across all parts of a service instance, not just the outcome for the customer or the payment for the provider.

- Service encounters before, during, and after the time when the products and services are produced

- Front-stage versus back stage activities of both the customer and provider

- The form and content of negotiations and service requests

- Preparation prior to service fulfillment by the producer and by the customer

- Producer and customer follow-up subsequent to request fulfillment

8) Work system metamodel: A more detailed view of the link between resources and value

Figure 7 is one of a number of versions of a work system metamodel that outline more detailed views of a work system than is provided by the work system framework. The work system framework is useful for summarizing a work system and achieving mutual understanding of the scope and nature of a work system, but is less effective as a tool for detailed analysis. The more complete and rigorous metamodel is more precise about concepts required to support deeper analysis without requiring terminology (e.g., objects and classes) that is impenetrable to most business professionals.

This version of the metamodel is stated in terms of work systems. Earlier versions that used the term service system instead of work system appeared in:
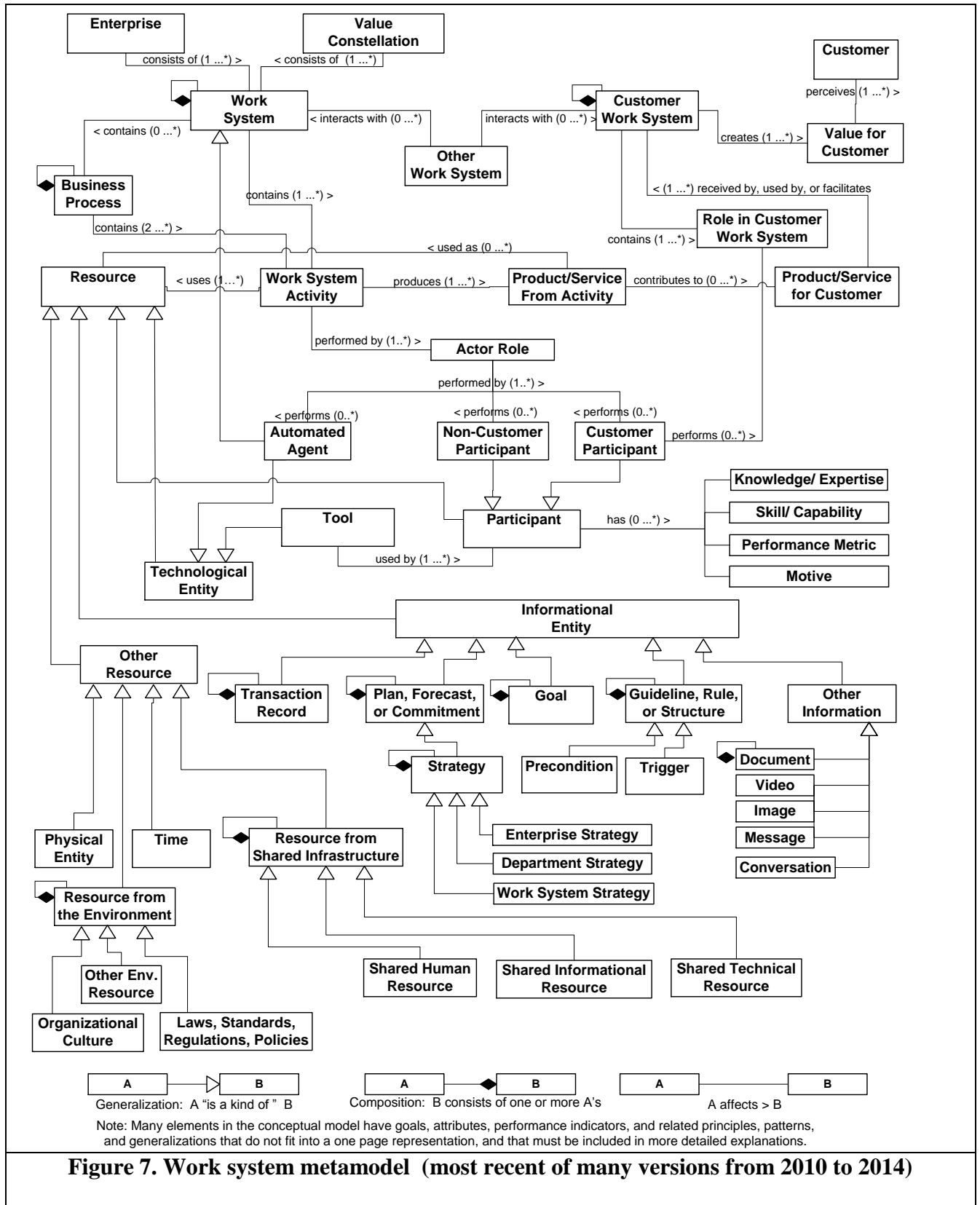
> S. Alter, "Metamodel for Service Analysis and Design Based on an Operational View of Service and Service Systems," *Service Science*, Vol.4, No. 3, 2012, pp. 218-235.

> S. Alter, "From Resources and Activities to Value for Customers within Systems of Service Systems," Proceedings of SIG-SVC 2013 Workshop, Dec. 15, 2013, Milan Italy.

Each version of the work system metamodel builds upon the work system framework by making its concepts clearer, more rigorous, and more useful in work system documentation and software development. This creates a bridge between a summary level description of a work system and more detailed models as the work system is decomposed into subsystems during analysis and design. It does that without requiring the precision, terminology, and notation of BPMN or of rigorous software specifications. When used in conjunction with a second layer identifying common characteristics, metrics, and principles for specific elements, it can support traceability between summary level analysis by business professionals and more detailed analysis and documentation by IT specialists.

Each element of the work system framework is represented in the metamodel, although most are re-interpreted in a more detailed way. For example, information becomes informational entity, technology is divided into tools and automated agents, activities are performed by three types of actors, and so on. Whereas the work system framework does not include the term *user*, the metamodel includes "uses" as a relationship between a participant and a tool (which is one of two guises of technology). Representation decisions in the metamodel try to maximize understandability while revealing potential omissions from an analysis or design process.

Figure 7 hides a large number of important attributes such as goals, characteristics, metrics, and principles that apply to specific elements and relationships in the metamodel. Analysts using the metamodel would consider and apply the hidden attributes while defining the problem or opportunity, evaluating the "as is" work system, and justifying proposed improvements that would appear in the "to be" work system.

Figure 7. Work system metamodel (most recent of many versions from 2010 to 2014)

Generalization: A "is a kind of" B   Composition: B consists of one or more A's   A affects > B

Note: Many elements in the conceptual model have goals, attributes, performance indicators, and related principles, patterns, and generalizations that do not fit into a one page representation, and that must be included in more detailed explanations.

In essence, the metamodel says the following:

- Both enterprises and value constellations consist of work systems.
- Work systems always contain at least one work system activity and may contain one or more business processes if some of the activities are sufficiently interrelated and sequential enough to be considered a process.
- Work system activities use resources to produce one or more "products/services from activity" that may be used as a resource for subsequent work system activities and/or may contribute to a "product/service for a customer." Thus, only some of the products/services produced are products/services for customers.

- Customer work systems create value for customers using "products/services for customers" produced by the work system.
- The resources used by a work system activity may include human resources (participants), informational resources, the logical resources, and other resources, each of which have a number of specific types that are worth including in order to minimize the likelihood that it will be overlooked in an analysis.
- Work system activities are performed by actor roles.
- Actor roles can be performed by three types of entities, automated agents, noncustomer participants, and customer participants.
- The outcome of work system activities that use human resources (participants) depends on the knowledge and expertise, skills and capability, motives, and other characteristics of those participants.
- The technological resources that may be used in the work system activity may include tools that are used directly by participants (e.g., person driving a car) or automated agents that perform work autonomously after being launched (e.g., a search engine).
- Informational resources that may be used in a work system activity may include many types of informational entities such as transaction records, plans, forecasts, commitments, goals, rules and structures, documents, video images, messages, even conversations.
- Other resources that may be used in a work system activity include physical entities, time, resources from the environment such as organizational culture, laws, standards, regulations, and policies, resources from shared infrastructure, such as shared human resources, shared informational resources, and shared technological resources.
- Both the work system and customer work system may interact with other work systems in ways that may have positive and/or negative impact on the operation of either work system.

9) Is engineering of sociotechnical services/ work systems/ enterprises a contradiction in terms?

The theory of workarounds (Figure 8) raises questions about four important issues:

- Why should one assume work system or service system will operate consistent with the original assumptions and intentions of management and/or designers?
- If one assumes that workarounds will occur, what is the meaning of work system or service systems design?
- What can be done to design work systems or service systems in a way encourages beneficial workarounds (i.e., workarounds that actually should occur) and discourages harmful workarounds?
- How should work system participants design workarounds when obstacles occur that make it difficult or impossible to perform work in the expected manner or to produce expected results?
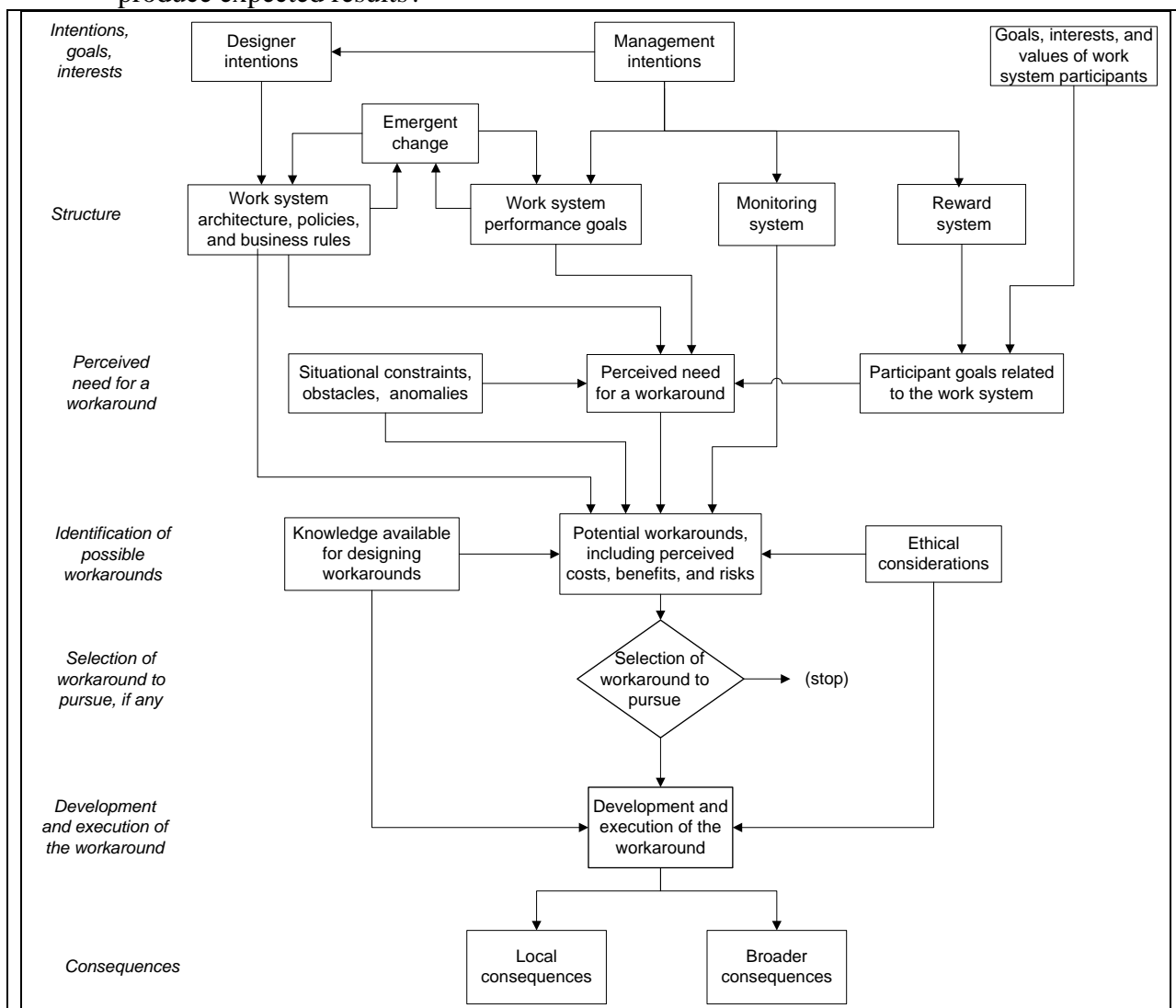
Figure 8. Theory of Workarounds

"Theory of Workarounds," *Communications of the Association for Information Systems,* 34(55), 2014, pp. 1041-1066.