Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 83 (2016) 212 – 220

Procedia Computer Science

The 7th International Conference on Ambient Systems, Networks and Technologies (ANT 2016)

Service Systems and Service Innovation: two pillars of Service Science

Marina Stoshikj[a], Natalia Kryvinska[a,b]*, Christine Strauss[a]

[a]*School of Business, Economics and Statistics, University of Vienna, Oskar-Morgenstern-Platz 1, 1090 Vienna, Austria*
[b]*Department of Information Systems, Faculty of Management, Comenius University in Bratislava, Odbojárov 10, P.O.Box 95, 82005 Bratislava 25, Slovakia*

Abstract

Service science is perceived as a multidisciplinary approach with the service system as its most important element. The services we use are provided through a certain service system, whereas service system has a specific structure and creates value through defined interactions between its entities, as well as through interactions with external service systems. On a large scale, economy as a whole may be interpreted as one huge service system, containing a variety of entities and interrelated sub-systems. Thus, we provide in our work an analysis of how service science deals with the interaction within and between service systems creating value. And, as one goal of service science and service systems is to provide a basis for service innovation, through which cost efficiency and value creation is enabled, we discuss how service innovation explores means of securing knowledge leadership, which is crucial for further growth of the service sector.

Peer-review under responsibility of the Conference Program Chairs

Keywords: Service; Service Science; Service System; Value Co-Creation; Service Innovation;

* Corresponding author. Tel.: +43 1 4277 38088; fax: +43 1 4277 38088.
E-mail address: natalia.kryvinska@univie.ac.at

Peer-review under responsibility of the Conference Program Chairs
doi:10.1016/j.procs.2016.04.118

1. Introduction

The rapid growth of the service sector and its dominance in highly developed economies became evident during the last decades. According to the US Bureau of Labor Statistics, the service sector comprises lot of industries, as for example finance, communication, wholesale and retail, trade, education, insurance, transportation, real estate, healthcare, logistics, postal operations, and other public utilities, etc. The size of the service sector in the national economies speaks for its importance. For example, 80% of the US GDP in 2007 was generated from the service sector, at the same time when the growing service sector in China constituted about 35% of its economy[1]. Services contributed with 70% to OECD GDP in 2011, with wholesale and retail und business services among the top four value added contributors[2].

The fast service development requires also high-speed advancement of research and knowledge base. Many authors exploring the service science field criticize the lack of unified definitions of "services", "service science", "service productivity", "service innovation" etc.[3,4]. That, at the same time, gives the opportunity for exploring different research approaches and combining (interdisciplinary) viewpoints.

Service science has gained importance as an interesting research arena due to the high-speed development of service industry[5,6,7]. It involves several research areas and disciplines, and integrates various concepts[27]. Although there are different approaches in defining service science, most of them recognize the importance of the service system as its basic research unit. Service science deals with the interaction within and between service systems, which in turn creates value. Service science and with it the service system constitutes a solid basis for service innovation, through which cost efficiency, value creation and sustainability are enabled[5,8].

This paper discusses service science and its closely related concepts, and aims at (1) attaining a general understanding of the field, (2) providing insight on how the service sector can be analyzed, and (3) substantiating the importance of service innovation. Accordingly, the organization of the paper is as follows. Section 2 displays service science together with its theory. It explores alternative views on service science, its drivers and related concepts. Section 3 focuses on the service system, its definition and structure, as well as the value creation potential. Furthermore, the paper discussed the driving force of service science - the service innovation through its definition and drivers. The concluding part holds the summarizing view on the presented concepts.

2. Service Science and its Theory

2.1. Service Definition and Characteristics

Diverse approaches for defining and categorizing services have been developed, depending of the context it is used. Explanations on services, on how they may be categorized, together with some examples and shortcomings are given below[9]:

- Acts-based definitions: service means an access to the producer's performance (e.g., theatre, show); is performance for transformation of certain customer goods (haircut, massage); is an act and ownership transfer of (non-)physical goods to the client (e.g., architectural plans, customized jewelry);
- Ownership-based definitions: recognizing the acts-based definitions excluding the ones stating ownership transfer of physical goods; still excluding sales of physical goods, but additionally including sales of non-physical (e.g. patents), insurance, licensing of (non-)physical goods (e.g., cars, patents);
- Other definitions comprise work from[10], who define by exclusion – service is when the service output is not a product of construction; Kotler et al.[11] uses a limiting definition - "is any act or performance one party can offer to another that is essentially intangible and does not result in the ownership of anything";
- Characteristics-based approach: when it has some or all of the well-known unique service characteristics: intangibility, heterogeneity, inseparability, and perishability.

In [12, 13] service is defined as "the application of competences (knowledge and skills) by one entity for the benefit of another"[14]. With it, they point out the collaboration and interaction aspects; therefore service can be interpreted as a system of relations. It involves an exchange between provider and client who receives the service as a certain action or performance in his benefit for a defined value. The most characteristic feature of a service is that it is not only handed to the client, as most of the goods, but mostly - depending on the level of customization and

knowledge intensity - is created with participation and input from the client. Thus, both sides are needed to create the service value[3].

The interactive and network effect of the service is included in the premises of service dominant logic (S-D logic). Whereas the good-dominant logic has the product in focus (its value arises in the product creation process and then is just further passed from the producing company to a non-involved consumer for a certain price, i.e. its value), the service-dominant logic interprets the product as a distribution mechanism and assumes tight connection between the roles of the producer and consumer[5]. The value in this case depends on the perception of the service recipient. The producer can make a value proposition to him. That is why the customer is defined as a co-producer and this service-centered view is customer-oriented and relational[15]. The S-D logic forms the basis of the service science and value creation mechanism within service systems[15]. In terms of the interaction intensity of the services, the ones can be "tell me" (self-service), "show me", "help me" and "do it for me" (IT outsourcing)[3].

In terms of the recipient, services could be delivered to an individual (e.g., education, insurance, legal, transportation, medicine, other public services etc.) and to businesses (e.g. ERP, e-logistics, technical support, sales management services etc.)[1].

Since the development of information and communication technology (ICT) has major impact on service industry in general, and as it highly influences in particular innovative services (services may innovate to a certain extent with fixed, unchanged technology but may be even disruptive with enhanced technology) it is essential not only to classify existing services but considering the evolving ICT impact which results in creation of novel service types.

2.2. Service Science Drivers and Definition

The growth of the service sector in the last 60 years has initiated research interest and performance in studying services. Some of the interrelated drivers for the growth development are: the increased focus of many nations on the service sector and its productivity; the rapid technological change; the outsourcing that is highly correlated with B2B services; change in the business model (leasing over ownership); population movement to the city; longer life; accessible education; changing roles in the family; dependency and cooperation between the universities and research networks, etc. Because of that, the service science studies the holistic service systems, as for example, cities, universities, hospitals etc. They may be described as complex system of systems, such as food, water, energy, health, education, transportation etc. The service science influence represents an improvement of the existing service systems[16, 17, 20].

Common elements of different types of services may provide a basis for the identification and analysis of service science. It refers to the interaction between the involved players, the nature of the created and exchanged knowledge (codified and tacit) and its combination in useful systems, simultaneous production and consumption, the characteristics of the exchanges as a process and experience point, as well as ICT exploration and the role of transparency. The interrelated drivers stated above have already been present for longer time, but it is the ICT factor that increased the Service Science importance. Still, there is no unified view whether service science will grow to be an academic field, and how and where it may be integrated[21, 39].

Spohrer and Maglio see the service science as a systematic, interdisciplinary study approach of service and service innovation, service quality and productivity. The major goal of service science is promotion of service innovation, so that the service productivity is increased[22]. Service science mainly focuses on services, involving multiple clients and providers, which are usually conducted in multi-phase business processes, where the intense use of ICT is needed. That makes transparent the dependency of the development between the service science and the growth of new services arising from IT and Internet progress, as for example Software as a Service, and of implemented services which are now conducted over the Internet (e.g. IT support)[19,23].

A multidisciplinary view on service science is stated by Paulson; he sees service science's aim in bringing together knowledge from diverse areas, so that an improvement in the service industry's operations, performance, and again, innovation can be obtained. The combination of technology with understanding of business processes and the organization itself is seen in the essence of service science[18]. With that, Paulson is one of several authors who see the concurrence of management science and ICT in service science.

As seen above, there are differences in the approaches researchers use to analyze service science. Nevertheless, apart from the differences, also common issues could be identified. Wang et al.[5] have summed up the definition

attempts into four research perspectives: Bitner et al.[24] see that the disciplines orient the definition and the service science combines usage of different disciplines (management, engineering, computer science etc.) in order to address the multi-discipline nature of service; Maglio and Spohrer[25] assume that definition is oriented by the systems and with that, the service science studies the service system, its interactions and opportunities for improvement, in order to achieve service innovation; Vargo and Lusch [15] stand is that value orients definition and the service science studies how value is created by involvement of complex resources; Cai and Su[26], led by the thought that definition is oriented by contents, propose the three layer framework that holds the service needs, service competencies and service resources and claim dependency between the layers so that a total benefit could be achieved. This service map is seen as basis for innovation[5].

In short, service science always observes, involves, analyses and combines the business knowledge and technological use to a certain extend in the analysis of the service system, in order to foster innovation and with it creation of added value. That is why this paper further explores service science through the service system and service innovation.

2.3. Service Science Related Concepts and Disciplines

The definition variants stated above, though to some extend different, recognize the common areas that service science field shares with other concepts and disciplines. In this subsection, selected closely related concepts and interdisciplinary approaches will be discussed. Closely related concept is the one of Service Science, Management and Engineering (SSME). Bitner et al.[24] interpret the SSME-concept and the service science concept as equal[5], whereas Spohrer and Maglio[22] define SSME as an extended service science concept. SSME concept is also traced back to the research work of IBM and the associated research centers[28,35]. By employing science, management and engineering in the service exchanges that the company makes, effective and efficient interaction, engagement and cooperation could be achieved[29,35]. There are different views on the question on how scientific requirements are fulfilled in service science, posed by Demirkan et al.[30]. The traditional economic perspective defines service science as a sub-discipline of economics. Spohrer and Maglio[31] view service science as a mosaic of several disciplines that work on innovation of service systems, meaning that there are several sciences contributing to service science. That is best visible from the service science transdisciplinary framework where both, the complex service systems and areas of knowledge, are presented[30].

3. Service Science and Service System

The service system is the core element as a basic abstraction in service science theory. As discussed above, service science theory aims at explaining what service systems are, how they mutually interact and evolve, the role of people, technology, value propositions, and shared information in the system. In that way it could understand and record service systems and use the understanding for their improvement for business and societal goals. Service science studies the systems' resource application, whereas the study of how the service systems can and should apply their resources in order to create mutual benefit with another system as well as for itself in an economic exchange is called normative service science[33,40]. From a broader perspective, the theory of service systems consists of three parts: (1) science - What are service systems? How do they evolve?; management - How to invest in improvement of service systems?; and engineering - How to develop new technologies so that the system could be improved?[3,32]. Due to the service system's pivotal role in the service science theory, this section of the paper is dedicated to the service system and its characteristics. In the following subsections we will elaborate on service systems and on value co-creation.

3.1. Service Systems and their Structure

The appearance of complex services implies the configuration of complex service systems, which are characterized as information-driven, customer-centric, e-oriented, and satisfaction-focused[1]. Service industry development made a change from the peer-to-peer system model, where a service provider serves its customer by himself, to a value chain and open community model, where for example, IT services are bid on within a

community, and the payment service is provided by another party. The emergence of the Web provided the basis for additional services, such as online gaming, free search and email service etc. Still, the features of the new services again involve the same resources, i.e. people, knowledge and technology, but in another form and in different proportions[26]. The following definitions and system structure components are applicable for both, traditional and modern services. The service definitions (cf. Section 2) assumed at least two parties - one (operant) applying its knowledge and providing benefit for the other party (operand) for whom this represents some value. The existence of these entities and their interaction forms the basis for the service system. It can be defined as "a dynamic value co-creation configuration of resources, including people, organizations, shared information (language, laws, measures, methods), and technology, all connected internally and externally to other service systems by value propositions"[33, 40].

Similarly, Demirkan et al.[17] describe service systems to be complex business and societal systems that are creating benefits for their stakeholders (e.g. customers, providers). They are constituted of human-made systems that in turn provide different entities access to resources such as water, food, energy, transportation, communications, place to live, education, retail, finance, governance and health[17].

Knowledge on structure and composition of such service systems enables better understanding of its functioning and of its potential. Its structure can be understood through the characteristics of its underlying concepts. The system has to contain at least one operant resource creating a change by having an effect on other resources, in order to obtain in total higher properties and behavior of the configuration than the sum of the properties of the individual resources. Service is the actual application of these resources, including skills, competences and knowledge, so that the change can be performed. With that, value is created. Another related concept is the economic exchange, which represents a voluntary and a reciprocal use of the system resources so that a mutual value is created during the interaction of two or more systems[33,41,42].

The[33,40,44] draw certain conclusions for the service system based on its composition. They view it as an open system, which is able to improve the condition of another system through sharing and applying its own resources. Not only the external state, but, through the acquisition of external resources during the same interaction, the system is also able to improve its own state[33].

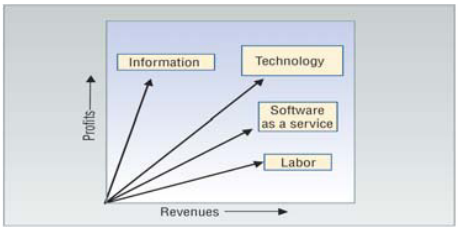

Fig. 1. Revenue and profit scale differently in service systems that integrate different types of resources [3].

The explanations above on system and system structure made transparent the importance of the involved resources, as the system is a unique configuration of resources. Spohrer et al.[33] identify four types of resources – people, organization, technology, and information. Resources may be physical (i.e. people, technology) or conceptual (i.e. organization, information)[33]. In terms of another classification, resources may have rights (i.e. people, organizations) or resources may be property (i.e. technology, shared information)[25]. Lyons[30] recognizes the existence of the four resources, but thinks that the focus should be placed on the exchange and resource interactions between the people and technology as resources in the service system, because people make the organizations, and the technology and information is shared through the people again and the technology. The value is created through the interaction between technology resources (web services, automated processes), through a human resource interaction with technology (online banking) or through human-human interactions (hotel service)[30].

According to an earlier work of Spohrer et al.[3] services themselves involve three resources: people, technology, shared information. The uniqueness of the service systems comes from the involved proportion of these integrate resources. That is in turn a reason for different revenue and profit. Figure 1 visualizes a comparison between the revenue and profit-scaling properties of companies based on software, product, software as a service, and high- and low-skill labour-based services[3].

System structures may be dynamic over time, as it can decompose or recompose including new resources. A persistent one is an open system where the operant resources is fixed (e.g. workers in a factory), and the operand (e.g. the production materials) are fluctuates every day[33].

As stated at the beginning of this section, with the innovation in the services evolves the service system itself: from fully human system evolved to technology augmented system (where people use tools), to delegation throughout the company boundaries (outsourcing), further evolving to fully automated technology based processes[22]. Still, the main difference between the service system and the computation systems lies in the human factor, as people are not predictable and cannot be expressed through a computational model. As complex and adaptive components of the system, they transfer these characteristics to it as well[3].

3.2. Value Co-Creation in Service Systems

In terms of the service system, value is defined as an improvement in the system state that can be measured thorough the system's adaptiveness or its ability to fit in the surrounding environment. Figure 2 shows exemplarily eras and perspectives on measurement of work. Value may be created on a cooperative basis[36,46], and can be measured in various ways. The volume of value created is determined by the rate and frequency of resources input and exchange. In line with the S-D logic explained above, companies, partners and customers in the service system are creating value – companies through their offerings and products, customers through the use and consumption[28].

	1800s	1900s	2000s
Notion of Work	Physical System	Information System	Service System
What is transformed	Matter and Energy	Information	People, Technologies, Organizations, Information
Example (Measurement)	Steam engine (Mass, Distance, Time)	Search engine (Computational Complexity)	Offshore call center (Time, Cost, Skill level)
Compliance Laws	Physical	Logical and Mathematical	Legal, Cultural, and Contractual

Fig. 2. Three eras and three perspectives on measurement of work[28].

In terms of a service system, value is defined as an improvement in the system state, its well-being and it can be measured thorough the system's adaptiveness or its ability to fit in the surrounding environment. How much value is created is defined by the rate and frequency of resources exchange. In line with the S-D logic explained above, both the companies, partners and customers working together in the service system are creating value – companies through their offerings, the customers through their further use[14].

The value co-creation interactions between the systems are called "service interactions" and comprise three activities: (formal or informal) proposal for value co-creation to other system (e.g., employment contract), agreement to the other system proposal and realization of it. Still, at this point the proposal may be refused and no value will be created[33,45]. According to [34], the value proposition involves a mix of different resources (economic, social, technical, emotional, etc.) that is promised to the customer and its structure depends on his or her perception of the value aspects of the involved resources[30]. The ISPAR (Interact-Serve-Propose-Agree-Realize) model maps these interaction episodes between the service systems[33].

How value in the service systems is created is an interesting research question, since "the creation of value is the core purpose and central process of economic exchange"[14]. The process of value creation is closely connected with further evolution and innovation, as it stimulates and generates additional knowledge[14]. The innovation aspect related to value creation will be further discussed in the next section.

4. Service Systems and Service Innovation

Service innovation a driving force in service science, as it focuses on development and delivery of improved services. It is discussed that service innovation, through the application of service science, represents means of securing knowledge leadership, which is important for further growth of the service sector. Based on that, it can be said that SI represents a key driver for socio-economic growth[35].

4.1. Conceptualization of Service Innovation

There are numerous views on innovation in general, involving the appearance of something novel or improved[47 ÷ 50]. IBM defines service innovation to be constituted of educational, organizational, technological innovation, or of a combination of these innovation types[33]. Service innovation is also defined as a combination of innovations in terms of business model, technology, social-organizational innovation and demand, used in order to improve the existing systems, create new value propositions or create new systems. In that sense, some examples of service innovation could be: e-commerce, helpdesk outsourcing, music download, loyalty programs, mobile phones, ATMs and ticket kiosks, bar code, credit cards, franchises, leasing, patent system, compound interest saving accounts, on-line tax returns, etc.[29]

Service innovation brings incremental improvements and/or radical changes to the service systems, so that despite the increasing complexity of customer-producer relation and limited availability of resources, further growth is granted. The ICT support to service innovation leads not only to existing service improvements but also to emergence of new services and systems that deliver value to the involved entities[29].

The switch from services as complements and add-ons to the offered goods in a product portfolio to services as the core value offering asks for constant service innovation. As services contain different elements (supply-sided, customer-sided and institutional/geographical), service innovation can be interpreted as a process of reconfiguration and recombination of these tangible and intangible elements, such as business processes, people, technology, management approaches etc. That makes the evolutionary process of service innovation highly interactive. This process is difficult to manage or control as it is not predictable, and it deals with the uniqueness of each service. The major goal of service innovation is the creation of a unique output for the customer in the service system. Chae[37] suggests that the success of service innovation shows positive correlation with the extent and quality of collaborative interaction between the involved parties in the service system as well as with their knowledge and integration of their competences and the environment in which they operate[37].

4.2. Service Innovation Drivers

The changing nature of the business (switch from transactional to strategic focus) and the ongoing technological advancements ask for an integrated approach – the service science approach – to give frames to service innovation that in turn joins business and technology expertise. In the following selected reasons are given why this is a necessity [38]:

- Established sciences (computer, management, social etc.) have to be brought together to create new skills and markets so that high quality innovative services are offered.
- With growing reliability of Internet services and with those decreasing costs for intra-/intercompany transactions, the technology enables new types of intra- and inter-company services.
- Delivery of software as a service through network; service-oriented architecture (SOA) enabled for independent Web-based service access in a standardized way.
- Technology is tightly connected with business process: new technology enables new business design, and new business design asks for technological innovations.
- Melding of business and technology for innovation improvements requires new skills and closer collaboration between disciplines, where service science could give impetus.

As the e-business perspective on SI is becoming more and more important, a discussion on e-service innovation is perceived as an interesting subtopic. When speaking about e-service innovations, in analogy to the service innovation, it could be referred to as a creation of novel e-services or novel e-service processes that again have an aim to respond better to the customer needs, but through usage of an electronic network. The possibilities that the new electronic means of communication and collaboration offer should be used for services advancement. There are many services that have been restructured due to service innovation, as well as many services that emerged, e.g. reengineered payment and reservation processes, e-banking services, web services, additional marketing channels and tools, switch from some supported to self-services (ATM), enhanced hotel services, games, e-learning, social computing etc. The trend is perceived to continue, following the technological breakthroughs.

5. Conclusions

Services have grown to become a highly important part in the economy and significant value contributor – in fact, it is a major driving force in the dynamics of economic development and wealth. A whole range of services is taken for granted and consumed by many people on a daily basis: transport, water, education, e-mail, phone connection, medical service, banking service etc. Because of their high potential and impact services and service science need to be further studied. As services are present in different spheres of life and researched from various viewpoints, different disciplines are involved, and an integrated approach in their study is needed.

Service science is perceived as a multidisciplinary study approach with service system as its most important element. The service system has a specific structure and creates value through defined interactions between its entities, as well as through interactions with external service systems.

Many services are closely related to and rely on ICT, which provides novel technological alternatives and enhancements at high pace in fast technological cycles and wide range. That forms the basis for additional possibilities of service innovation, service generation and service improvement, which in turn leads to better quality and productivity levels, which in turn stimulates economy progress and growth. Still, the challenge of SI stems from the diversified nature of the services and the different requirements from the players involves. These facts emphasize the crucial importance of service science as an integrated approach of service innovation, so that a systematic innovation could be realized.

In times, when services have taken the pivotal place in economy, it is essential to develop, evaluate and revise a theoretical framework, which supports service science research and development as well as its related disciplines. As the evolvement of service science research and development is highly determined by technological pace, it is a challenging task for researchers in service science to observe and understand the dynamics of service science and define research key questions and milestones.

References

1. Qiu, R.G.: Service Science: Scientific Study of Service Systems. In: Proceedings of the *17th International Conference on Flexible Automation and Intelligent Manufacturing*, June 18-20, Philadelphia, USA, 2007. p. 1121-1127.
2. OECD Science, Technology and Industry Scoreboard 2015. Innovation for growth and society, DOI:10.1787/sti_scoreboard-2015-en, http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/oecd-science-technology-and-industry-scoreboard-2015_sti_scoreboard-2015-en#page19
3. Spohrer, J., Maglio, P., Bailey, J., Gruhl, D.: Steps toward a science of service systems. *IEEE Computer Magazine* 2007; **40**(1): 71-77.
4. Barret, M., Davidson, E., Prabhu, J., Vargo, S. L.: Service innovation in the digital age: key contributions and future directions. *MIS quarterly*, March, 2005; **39**(1): 135-154.
5. Wang, X., Bao, G., Jia, X.: A Brief Study on the Research of Service Science Theory. *Int. Conference on Service Sciences*, 2010, p. 248-252.
6. Kaczor, S., Kryvinska, N.: It is all about Services - Fundamentals, Drivers, and Business Models. *Journal of Service Science Research*, Springer, 2013; **5**(2): 125-154.
7. Kryvinska, N., Kaczor, S., Strauss, C., Greguš, M.: Servitization Strategies and Product-Service-Systems. In: the IEEE *Fourth International Workshop on the Future of Software Engineering* FOR and IN Cloud (FoSEC 2014), June 27 - July 2, 2014, Anchorage, Alaska, USA, within IEEE *10th World Congress on Services* (SERVICES 2014), 2014. p. 254-260.
8. Stoshikj, M., Kryvinska, N., Strauss, C., Greguš, M.: Service Science, Service System and Service Innovation. *Naples Forum on Service 2015*, 9 - 12 June 2015, Naples, Italy, poster session.
9. Kayastha, S.: Defining Service and Non-Service Exchanges. *Service Science* 2011; **3**(4): 313-324.
10. Quinn, J. B., Gagnon, C. E.: Will Services follow Manufacturing into Decline? *Harvard Business Review* (November-December), 1986. p.95-103
11. Kotler, P., Keller, K.L., Koshy, A., Jha, M.: *Marketing Management*, 13th ed. Dorling Kindersley, New Delhi; 2009.
12. Vargo, S. L., Lusch, R. F.: Service-dominant logic: What It Is, What It Is Not, What It Might Be. In: Vargo S. L., Lusch R. F. (eds), *The Service-Dominant Logic of Marketing*: Dialog, Debate and Directions, Routledge, Taylor & Francis Group, 2006. p. 43-56.
13. Vargo, S. L., Lusch, R. F.: Evolving to a new dominant logic for marketing. *Journal of Marketing* 2004; **68**: 1-17.
14. Vargo, S., Maglio, P. P., Akaka, M.A.: On value and value co-creation: A service systems and service logic perspective. *European Management Journal* 2008; **26**(3): 145-152.
15. Vargo, S. L., Lusch, R. F.: Service-dominant logic: Continuing the evolution. *J. of the Academy of Marketing Science* 2008; **36**(1): 1-10.
16. Pinhanez, C., Kontogiorgis, P.: A proposal for a service science discipline classification system. In: 2008 *Frontiers in Service*, Washington, DC. October 2-5.
17. Spohrer, J., Demirkan, H., Krishna, V.: Service and Science. In: Demirkan, H., Spohrer, J., Krischna, V. (eds.) The science of service systems. Service Science: *Research and Innovations in the Service Economy*. Springer 2011. p. 325-358.

18. Paulson, L. D.: Service science: A new field for today's economy. *Computer* 2006; **39**(8): 18-21.
19. Abe, T.: What is Service Science. *Fujitsu Research Report* no. 246. December 2005. The Fujitsu Research Institute Economic Research Center Tokyo, Japan, 2005. p. 1-31.
20. Barile, S., Polese, F.: Smart Service Systems and Viable Service Systems. *Service Science* 2010; **2**(1/2): 21-40.
21. Chesbrough, H., Spohrer, J.: A research manifesto for service science. *Communications of the ACM* 2006; **49**(7): 35-40.
22. Spohrer, J., Maglio, P. P.: The emergence of service science: Toward systematic service innovations to accelerate co-creation of value. *Production and Operations Management* 2008; **17**(3): 238-246.
23. Spohrer, J., Vargo, S. L., Caswell, N., Maglio, P. P.: The service system is the basic abstraction of service science. In: *Proceedings of the 41st Hawaii International Conference on System Sciences*, 2008; p. 1-10.
24. Bitner, M.J., Brown, S.W., Goul, M., Urban, S.: Services science journey: Foundations, progress, challenges. In: Hefley B., Murphy, W. (eds) *Service science, management and engineering education for the 21st century*. Springer US, 2008. p. 227-233.
25. Maglio, P.P., Spohrer, J.: Fundamentals of service science. *Journal of the Academic Marketing Science* 2008; **36**(1): 18-20.
26. Cai, H., Yeh, J., Su, H.: Relooking at services science and services innovation. *Service Oriented Computing and Applications* 2008; **2**(1): 1-14.
27. Spohrer, J.C., Murphy, W. M.: Service science. *Encyclopedia of Operations Research and Management Science* 2013; **1**(1): 1385-1392
28. Maglio, P., Kreulen, J., Srinivasan, S., Spohrer, J.: Service systems, service scientists, SSME, and innovation. *Communications of the ACM* 2006; **49**(7): 83.
29. IfM and IBM: *Succeeding through Services Innovation*. A discussion paper, Cambridge, United Kingdom, University of Cambridge Institute for Manufacturing; 2008.
30. Demirkan, H., Spohrer, J., Krischna, V.: *The science of service systems*. Service Science: Research and Innovations in the Service Economy. Springer Science+Business Media, LLC; 2011.
31. Spohrer, J., Maglio, P.P.: Service science: Toward a smarter planet. In: W. Karwowski and G. Salvendy (eds.), *Introduction to Service Engineering*. New York, Wiley; 2009.
32. Mladenow, A., Kryvinska, N., Strauss C.: Towards Cloud-Centric Service Environments. Springer, *Journal of Service Science Research* 2012; **4**(2): 213-234.
33. Maglio, P.P., Vargo, S., Caswell, N., Spohrer, J.: The Service System Is the Basic Abstraction of Service Science. *Information System and E Business Management* 2009; **7**(4): 395-406.
34. Mele, C., Polese, F.: Key dimensions of service systems: Interaction in social and technological networks to foster value co-creation. In: Demirkan H., Spohrer J., Krishna, V. (eds.) *The Science of Service Systems*, Springer, New York 2011. p. 37-59.
35. Paton, R.A., McLaughlin, S.: Services innovation: Knowledge transfer and the supply chain. European Management Journal 2008; **26**(2): 77-83.
36. Mladenow, A., Fuchs, E., Dohmen, P., Strauss, C.: Value Creation using Clouds - Analysis of Value Drivers for Start-Ups and Small and Medium Sized Enterprises in the Textile Industry. In: *Advanced Information Networking and Applications Workshops* (WAINA), 26th International Conference on, Fukuoka, Japan, March 26-29, 2012, p. 1215-1220.
37. Chae, B.K.: An evolutionary framework for service innovation: Insights of complexity theory for service science. *Int. J. Production Economics* 2012; **135**: 813-822.
38. IBM Research: Service Science: *A new academic discipline*?; 2004.
39. Čik, B., Greguš, M. ml: Strategic enterprise management and SEM product of SAP; Building capabilities for sustainable global business: Balancing corporate success and social good. Volume III. Montclair: Montclair State University. In: *12th international conference of the society for global business and economic development*, Singapore, 21.-23.7.2011, p. 1818-1846.
40. Fonseca, F. J., Pinto, C.S.: From the Classical Concept of Services to Service Systems, *Procedia Technology*, 2014; **16**: 518-524.
41. Greguš, M., Beňová, E., Greguš, M. ml: Strategic Role of Information Systems in Contemporary Management; Creativity and Innovation: Imperatives for Global Business and Development. Montclair: Montclair State University, Kyoto, 8.-11.8.2007, p. 1711-1716.
42. Maglio, P., Breidbach, C.F.: Service science: Toward systematic service innovation. Newman A, Leung J, eds. Bridging Data and Decisions, Tutorials in Operations Research, INFORMS, Catonsville, MD, 2014. p. 161-170.
43. Maglio, P., Spohrer, J.: A service science perspective on business model innovation. *Industrial Marketing Management* 2013; **42**(5): 665-670.
44. Maglio, P.P.: Service Science 2.0. *Service Science* 2013; **5**(2): 85-85.
45. Wieland, H., Polese, F., Vargo, S.L., Lusch, R.F.: Toward a Service (Eco) Systems Perspective on Value Creation. *International Journal of Service Science, Management, Engineering, and Technology* 2012; **3**(3): 12-25.
46. Mladenow, A., Bauer, C., Strauss, C., Gregus, M.: Collaboration and Locality in Crowdsourcing. In: *7th International Conference on Intelligent Networking and Collaborative Systems* (INCoS 2015), Taipei, Taiwan, 2-4 September.
47. Christensen, C.M.: *The Innovator's Dilemma*. Harvard Business School Press, Boston; 1997.
48. Christensen, C.M., Raynor, M.E.: *The Innovator's Solution*. Harvard Business School Press, Boston; 2003.
49. Garcia, R., Calantone, R.: A critical look at technological innovation typology and innovativeness terminology: a literature review. *Journal of Product Innovation Management* 2002; **19**(2): 110-132.
50. Kopetzky, R., Günther, M., Kryvinska, N., Mladenow, A., Strauss, C., Stummer, C.: Strategic management of disruptive technologies: A practical framework in the context of voice services and of computing towards the cloud. *Int.J. Grid and Utility Computing* 2013; **4**(1): 47-59.