Towards a Service System Ontology for Service Science

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Service Science is a new interdisciplinary approach to the study, design, implementation, and innovation of service systems. However due to the variety in service research, there is no consensus yet about the theoretical foundation of this domain. In this paper we clarify the service systems worldview proposed by Service Science researchers Spohrer and Kwan by investigating its foundational concepts from the perspective of established service theories and frameworks [1]. By mapping the proposed service system concepts on the selected service theories and frameworks, we investigate their theoretical foundations, examine their proposed definitions, discover their likely relationships, and identify a number of issues that need further discussion. This analysis is visualised in a multi-view conceptual model (in the form of a UML class diagram) which we regard as a first step towards an explicitly and formally defined service system ontology.

The basis for the UML class diagram are the ten foundational concepts of the service systems worldview used by Spohrer and Kwan to explain the diversity and complexity of service systems: *entity*, *resource*, *access right*, *ecology*, *interaction*, *value proposition based interaction*, *governance mechanism based interaction*, *outcome*, *measure*, and *stakeholder*.

The definitions of these concepts are compared with alternative definitions originating in six other service frameworks and theories. We aim to identify which additional concepts from these theories and frameworks can be incorporated in the model to further refine and extend the service systems worldview. By mapping the foundational concepts to the concepts used in traditional service research areas we identify commonalities and differences in interpretation which may help to find a common understanding of the service systems worldview. Also, if we want to create one scientific basis for Service Science research it is crucial that established service frameworks and theories connect to this scientific basis.

Our choice of theories was mainly guided by previous Service Science research. In a joint white paper of IBM and Cambridge University's Institute for Manufacturing the worldview of Service Dominant Logic (SDL) is indicated as a possible theoretical basis for Service Science. Furthermore, other proponents of Service Science propose the Unified Service Theory (UST), the work system method and the service quality gaps model as interesting theories to draw from. As recent Service Science research indicates the need to introduce a system focus in the study of service systems, we also

included the system theoretic view of service systems of Mora et al. Finally, we included a service ontology based on the DOLCE upper-level ontology.
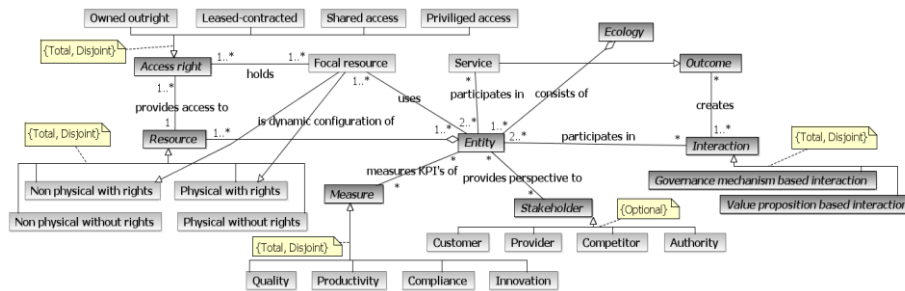

Fig. 1. . UML class diagram of service systems worldview

Our contribution to the emerging research area of Service Science is twofold. First of all, a UML class diagram for the ten foundational concepts is presented (Fig. 1). This diagram is aimed at facilitating the presentation and discussion of the foundational concepts as it also uncovers and shows their relationships. The diagram provides the basis for elaborating a service systems ontology and a meta-model for modelling of service systems. Second, the investigation of the theoretical foundation (if any) and the search for additional concepts which can be marked as foundational, can be seen as a theoretical evaluation of the completeness and relevancy of the set of foundational concepts proposed by Spohrer and Kwan [1]. It provides elements for the further discussion, enhancement, and ultimately (and hopefully) consensual agreement of a service systems conceptualisation for Service Science. Our conceptual analysis points out that more or less all of the foundational concepts and their proposed specialisations are covered by one, many or in some cases even all reviewed service theories or frameworks. We identified a couple of issues that need further discussion and elaboration, e.g., because of conflicting views when mapping foundational concepts to the concepts of different service theories. Overall, however, our analysis shows that there is evidence of theoretical support for the proposed service systems worldview.

An interesting finding is that, although SDL was initially proposed as the philosophical foundation for the service systems worldview, our analysis indicates that the service system conceptualisation put forward by Spohrer and Kwan is developing beyond SDL. The resemblance with the system theoretic approach of Mora et al. shows a shift towards systems thinking which should be further explored in the future.

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1. Spohrer, J., Kwan, S.K.: Service Science, Management, Engineering, and Design (SSMED): An Emerging Discipline-Outline & References. International Journal of Information Systems in the Service Sector (IJISSS) 1, 1-31 (2009