A Service Portfolio Model for Value Creation in Networked Enterprise Systems

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Abstract. Service science research is increasingly focusing on modeling value co-creation. However, there are concerns about the practical use of service systems-driven approaches to value creation in actual business settings. In this paper, we focus on the provision of knowledge services by a service system, and present an innovative model for clustering and profiling the value co-creation capabilities of such a service system. We then describe how this model drives the development of a new service management framework for managing the development of knowledge services. Finally, we present our early experiences from a practical deployment of our research findings in the development of a service system that offers knowledge services to enterprises for enhancing their collaboration quotient when participating in virtual organizations.

Keywords: service systems, service science, S-D logic, value co-creation model, business service management, virtual organizations.

1 Introduction

Service is a widely used term, with different definitions in different contexts. According to [13], service is the application of competences (knowledge and skills) by one entity for the benefit of another. The implied interaction between entities is the vehicle for value creation for all participants.

Value, however, is a concept that is hard to define and measure. In this paper, we adopt a simple definition [5]: value for an entity means that after acquiring a service, the entity is or feels better off, as measured by quantitative factors (e.g. revenues, costs) and qualitative factors (e.g. ease of use, trust). Two basic challenges then emerge: to understand how, when and where service value is created; and to manage the development, provision and operation of services, so that "better off" outcomes are maximized (i.e. service value is realized).

To address these challenges, two schools of thought on value creation have emerged. In the traditional goods-dominant (G-D) logic [14], value is created by service providers, is embedded in the service and is exchanged in the marketplace,

usually for money ("value-in-exchange"). In the service-dominant (S-D) logic [15], value is created by services users, when they combine acquired services with own resources (skills, information, infrastructure, etc.) for achieving own goals in their operational context ("value-in-use").

Based on S-D logic, Service Science studies the creation of value within complex constellations of integrated resources, termed service systems [16]. The latter access, adapt and integrate resources in order to co-create value through exchanges of knowledge (knowledge-based services, knowledge objects).

In order to provide a service systems-based approach for resolving the two aforementioned challenges, [2] identify three key success factors: the instilling of the value co-creation concept in the service system; the balancing of innovation and commoditization dynamics; and the configuration of core resources in the service system. Managing these factors is then a matter of understanding the lifecycle of a service system.

However, this and similar research efforts in service systems tend to leave aside established practices in business service management, such as those described in [4]. This, in turn, may raise concerns about the practical use of service systems-driven approaches to value creation in actual business settings.

Addressing these concerns is the focus of our current research. Since every service business can be defined as a service system, we explore how certain key service system principles on value co-creation can be built into established service management frameworks, used by service businesses to develop and manage service offerings. These principles are: the three aforementioned key success factors for managing value co-creation in service systems; and the strong emphasis on knowledge flows as the core source of all value exchanges between service systems [16].

In this paper, we focus on the provision of knowledge services by a service system. Providing knowledge services is an approach to commercially exploit enterprise knowledge assets, offer competitive advantage and extend market reach. Knowledge service provision is a business trend which has been attributed to reasons such as the preference of managers from knowledge seeking companies for outsider knowledge [18] and is especially true in cases when knowledge can be packaged and hence become portable and migrant [11].

We present an innovative model for clustering and profiling the value co-creation capabilities of such a service system. We then describe how this model drives the development of a new service management framework for managing the development of knowledge services. Finally, we present our early experiences from a practical deployment of our research findings in the development of a service system that offers knowledge services to enterprises for enhancing their collaboration quotient when participating in virtual organizations.

2 Related Work

Focusing on value creation in service systems, [16] argue that in service systems, the "producer-consumer" distinction is inappropriate as value is created through chains of

interactions between service system structures. [15] take this statement a step further by defining service system-based value in terms of a system's adaptiveness or ability to collaborate through value propositions. In other words, value creation in service systems is a co-creation process characterized by recursion and collaboration.

The first characteristic is exhibited by the following activities:

- A service system develops and offers services (i.e. value propositions)
- Value propositions are acquired by other service systems, defined as service users (value-in-exchange)
- Service users consume these external, acquired resources and combine them with internal resources for use in their own value creation processes (value-in-use).

The role of collaboration in value creation within service systems is exemplified by business types of service systems, such as networked organizations - highly knowledge-intensive organizational structures stemming from advances in information technology (e.g. virtual organizations). The ECOLEAD project [3] developed a generic model for measuring value co-creation within virtual organizations. The model is comprised of Value Generation Objects (i.e. tangible and intangible resources), a Performance Management System (for evaluating the value creation process) and Ethical Values (for capturing external involvement, at a macro level).

Beyond understanding the concept of value co-creation, the challenge is how to best manage the value co-creation process. [2] identify and analyze three factors that are critical to managing this process: the instilling of the value co-creation concept in the service system; the balancing of innovation and commoditization dynamics; and the configuration of core resources in the service system (i.e. people, technology, organization and shared information). Managing value co-creation then becomes a task of accounting for these factors through a service lifecycle model that is comprised of three phases: the infancy phase; the maturity phase; and the reincarnation phase.

For the purposes of our research, we wanted to explore how the aforementioned critical factors can be accounted for within traditional service lifecycle models, such as those described by [4], [6] and [7]. These models are generic, widely accepted for their theoretical and practical merit and are geared towards managing service development through discrete steps of a service's lifecycle: from service inception to service operation through to service retirement. Integrating the three value co-creation management factors into these models should provide new perspectives (and challenges) on the practical implementation of value co-creation in service systems.

3 A Value Co-Creation Model for Knowledge Services

As described earlier, one of the key elements of value co-creation in any service system is the exchange of knowledge flows (knowledge-based services, knowledge objects).

Based on this fact, our research is focused on exploring value co-creation in a service system that owns knowledge-intensive assets (as a key internal resource) and provides access to them through service offerings. These assets may seem to be relevant only to organizations (service systems) that base their business models on information and/or knowledge-centric activities, such as publishing, software, education, research, or consulting activities. However, even manufacturing firms have a wealth of knowledge assets to expose to other organizations.

In such a service system, much like in any other service system, integration of internal and external resources is the essence of value co-creation, as expressed by e-services (value propositions) offered to other service systems. Value co-creation is then a function of: a) the participation of other service systems in the enhancement of developed services, or the development of new ones. This participation may range from no participation to full-scale involvement; b) knowledge assets, which may range from current best practices already validated by the service system to new knowledge acquired from (or co-produced with) other service systems.

Synthesizing the above concepts led to the development of a service value co-creation model, called Service Portfolio Model (SPM), shown in Fig. 1.

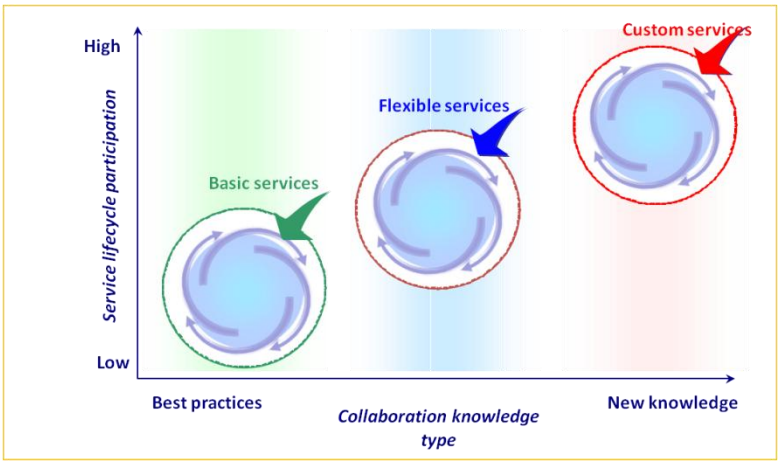

Fig.1. Our Service Portfolio Model (SPM)

This model allows us to create rich value propositions for the chosen type of service system ("the provider"), by defining the following classes of offered services:

- Basic services – these are standardized services that encapsulate best-practices (generic or industry-specific) owned by the service system. External service systems' participation in the service development lifecycle is limited and is provided on an ad-hoc basis. Knowledge assets handled by this service class are expanded through updates generated internally, by the provider's own value creation process.
- Flexible services – these are configurable services that are based on a wide menu of options offered by the provider. External service systems participate in the service development lifecycle to co-develop new service

configurations or new service configuration options, assisted by the provider's resources (human, technical, etc.). Services of this class expand stored knowledge by providing new syntheses.

- Custom services – these are highly customizable and user-driven services. External service systems' involvement in the service development lifecycle is high and should require an equally significant investment of the provider's resources (human, technical, financial, etc.). Services of this class may significantly expand stored knowledge - for example, with industry-specific practices

Based on these service classes, a service system can decide on the desired mix of innovative (but costly) and commoditized (but easily copied) e-services that it will offer. Balancing the mix then becomes a business decision on the desired profile of the offered services, potentially leading to reclassifying a service (upwards or downwards), breaking it into "service packages" belonging to different service classes, redeveloping it, terminating it or developing new services.

4 Managing Value Co-Creation

The SPM model provides certain new insights on how value can be co-created in a service system. Equally important is to understand how the value co-creation process can be managed within a service system.

To that extent, we are currently developing a service management framework driven by the three factors described in [2]: the instilling of the value co-creation concept in the service system; the balancing of innovation and commoditization dynamics; and the configuration of core resources in the service system (i.e. people, technology, organization and shared information). The resulting Service Management Framework is driven by the SPM model and is depicted in Fig. 2.

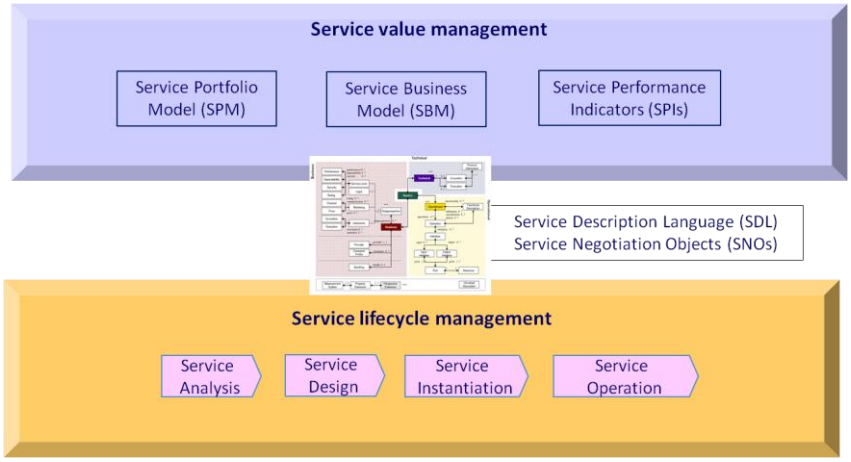

Fig. 2. Our Service Management Framework

The *Service Value Management* layer is comprised of:

- The Service Portfolio Model (SPM), a service classification model for profiling offered services (value propositions) and for balancing innovation and commoditization dynamics in a service system.
- The Service Business Model (SBM), for defining the business parameters that will drive the balancing of innovation and commoditization dynamics in the SPM. These parameters include key resources, cost structure, revenue model, and customer relationship model. Different configurations of these parameters will then drive the decision about breaking a service into "service packages" that belong to two or more SPM service classes. The result is multiple value propositions out of a single service, thus increasing the service system's quotient for value co-creation.
- The Service Performance Indicators (SPIs), a set of value co-creation metrics for SPM-modeled services. Their goal is two-fold: to monitor service execution and to measure overall value creation. Hence, SPIs are linked to and/or extracted from SBM parameters. We have introduced two main categories (financial value SPIs, innovation value SPIs), which comprise metrics relevant to all co-creation participants. For example, revenue sharing is a key SPI for SPM Custom services. The latter, by definition, lead to development of new knowledge assets which can be then offered to others through existing or new services. In that case, additional revenue streams should be shared with the original co-creators of these knowledge assets.

The *Service Lifecycle Management* layer defines a service lifecycle model (based on [7]), depicting the key phases of service development – from service analysis to service operation. In this layer, the service system resources are configured for value co-creation. The Service Analysis phase captures all activities required to identify and contextualize a service, leading to the development of ontology for cataloguing service parameters. This ontology is the key input to the Service Design phase, which captures service requirements and produces a detailed design, including the specification of involved applications, processes, etc. During the Service Instantiation phase, the service is ready to become operational and all contracting activities occur in order to finalize the operating parameters that a service user will require. Finally, during the Service Operation phase, the service is actively consumed and maintained. Related runtime metrics (defined as SPIs) are monitored for the purposes of contract management and billing. The data that is collected is then fed into the Service Value Management Framework for informing its components.

Linking the two layers and ensuring their coordination, the model includes:

- The Service Description Language (SDL), for providing a uniform way of defining the business aspects of offered services, in terms of ontologies. In addition, the SDL-based definition of services provides a way to build the value co-creation drivers of the upper layer into the service lifecycle, thus contributing to instilling the value co-creation concept across services. In this preliminary phase, we are developing SDL based on USDL v3.0 (Universal Service Description Language), which was developed as part of the SAP-led Theseus/TEXO research program for describing business services [1].

- The Service Negotiation Objects (SNOs), based on the SPIs and SDL, for use in service contracting during the Service Instantiation stage of the lifecycle.

5 The Framework in Action

As part of our research within the SYNERGY project (an EU, FP7 project) [8],[10], we applied our service management framework in the realm of virtual organizations (VOs) – a good proxy for service systems [13].

The aim of the project is to support networked enterprises in their successful participation in VOs. A SYNERGY service system is developed, comprised of knowledge assets relevant to collaboration creation and operation, along with services to discover, capture, deliver and apply such knowledge [10].

A key part of SYNERGY service system's knowledge infrastructure is collaboration patterns (CPats), defined as a prescription which addresses a collaborative problem that may occur repeatedly in a business setting. It describes the forms of collaboration and the proven solutions to a collaboration problem, and appears as a recurring group of actions that enable efficiency in both the communication and the implementation of a successful solution. The CPat can be used as is in its application domain or it can be abstracted and used as a primitive building block beyond its original domain [9][17].

CPat services offered by a SYNERGY service system enable other service systems (enterprises) to access the CPats repository. These services provide recommendations for actions and tools to be used, awareness of the state of collaborators and the state of the collaboration work, as well as statistical analysis based on previous and ongoing VO collaborations.

As a scenario of our framework in action within the SYNERGY project, consider the case of a SYNERGY service system ("the Provider") that participates in a VO comprised of pharmaceuticals (other service systems) that want to develop and test a series of new drugs [17]. One of the collaboration activities within this VO is the design of a joint laboratory experiment, which includes planning and scheduling of pre-experiment tasks (e.g. defining and agreeing on the experiment's objectives). An existing CPat called 'OrganizeExperiment' already encapsulates best practices for similar tasks, accumulated over time through this CPat's uses in other VOs. At run time, two types of CPat services can be invoked: CPat Recommender service, which recommends actions to continue collaboration, as well as tools related to the CPat's collaboration tasks; and CPat Awareness service, which provides awareness of the state of collaboration tasks. Both these services are Basic Services, as per our SPM model. The CPat itself will be updated by the Provider, if new best practices arise.

At a different point in time, an external event may lead to changes in existing CPats or even dictate creation of new ones. For example, new rules imposed by public health authorities may require new lab experiments through the participation of new partners in the VO. New CPats may need to be co-created in order to capture new collaboration tasks, which may be specific to this case or may be generic enough to become available to future service users. A CPat Design service will enable VO

participants and the Provider to co-create any new CPats. This is not necessarily a fully automated service. VO representatives may need to consult with the Provider's human experts and collaborate offline, e.g. on defining a commercial exploitation plan for the new CPats. As this is co-creation of new knowledge assets, all participants should agree on SBM parameters, e.g. for revenue sharing or joint equity. These will then be translated into relevant SPIs (e.g. share revenue %) which will be recorded in SDL and taken into account during the Service Operation phase of the CPat Design service's lifecycle. It is important to note that although this is a Custom Service, as per our SPM model, it may depend on other SYNERGY services, such as the SYNERGY Basic Services described above.

6 Conclusions and Further Work

There is no doubt that there is a tremendous need for service innovations or new ways of creating value with intangible and dynamic resources, to fuel economic growth and to raise the quality and effectiveness of services, especially for knowledge-intensive industries.

To that extent, our research work aims to provide a framework for profiling and managing value co-creation in service systems. We are currently developing this framework around three basic pillars: our Service Portfolio Model (SPM); established service lifecycle management processes, that are enhanced to account for SPM-driven value co-creation parameters; and the USDL v3.0 service description language, as a way of instilling SPM-driven parameters in the end-to-end development of a service (value proposition).

Initial results from applying the above in a business setting of collaborating SMEs are encouraging. A next step in this research direction will extend SPM to account for more internal resources of a service system, beyond knowledge assets. In addition, we will be seeking other practical deployments of the framework, in order to test and improve its practicality.

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References

1. Cardoso, J., Winkler, M., Voigt, K.: A service description language for the Internet of services. In: Alt, R., Fähnrich, K.-P., Franczyk, B. (eds.) First International Symposium on Services Science (ISSS'09), Logos-Verlag, Berlin (2009)
2. Chen, Y., Lelescu, A., Spohrer, J.: Three factors to sustainable service system excellence: A case study of service systems. In: 2008 IEEE International Conference on Services Computing, vol. 2, pp. 119--126 (2008)

3. Galeano, N., Romero, D.: D21.4a – Characterization of VBE value systems and metrics. ECOLEAD project (2007)
4. Gangadharan, G. R., Luttighuis, P. O.: BHive: A reference framework for business-driven service design and management. Journal of Service Science, 2, 81--110 (2010)
5. Gronroos, C.: Service logic revisited: who creates value? And who co-creates?. European Business Review, 20(4), 298--314 (2008)
6. Kohlborn, T., Fielt, E., Korthaus, A., Rosemann, M.: Towards a service portfolio management framework. In: 20th Australasian Conference on Information Systems, pp. 861--870, Melbourne (2009)
7. Kohlborn, T., Korthaus, A., Rosemann, M.: Business and software lifecycle management. In: 2009 Enterprise Distributed Object Computing Conference (EDOC '09), pp. 87--96, Auckland (2009)
8. Mentzas, G., Popplewell, K.: Knowledge-Based Collaboration Patterns in Future Internet Enterprise Systems, ERCIM News, 77 (2009)
9. Papageorgiou, N., Verginadis, Y., Apostolou, D., Mentzas, G.: Semantic Interoperability of E-Services in Collaborative Networked Organizations. In: ICE-B 2010 - the International Conference on e-Busines, Athens (2010)
10. Popplewell, K., Stojanovic, N., Abecker, A., Apostolou, D., Mentzas, G.: Supporting Adaptive Enterprise Collaboration through Semantic Knowledge Services. In: 4th International Conference Interoperability for Enterprise Software and Applications (I-ESA 2008), Berlin (2008)
11. Smyth, H., Longbottom, R.: External Provision of Knowledge Management Information Services: The Case of the Concrete and Cement Industries, European Management Journal, 23(2), 247--259 (2005)
12. Spohrer, J., Anderson, L.C., Pass, N.J., Ager, T., Gruhl, D.: Service Science, Journal of Grid Computing, 6(3), 313--324 (2008)
13. Vargo, S. L., Lusch, R. F.: Service-dominant logic: What It Is, What It Is Not, What It Might Be. In: Lusch, R.F., Vargo, S.L. (eds) The Service-Dominant Logic of Marketing: Dialog, Debate and Directions, pp. 43--56, M.E. Sharpe Inc., New York (2006a)
14. Vargo, S. L., Lusch, R. F., Morgan, F. W.: Historical perspectives on service-dominant logic. In: Lusch, R.F., Vargo, S.L. (eds) The Service-Dominant Logic of Marketing: Dialog, Debate and Directions, pp. 29--42, M.E. Sharpe Inc., New York (2006b)
15. Vargo, S.L., Maglio, P.P., Akaka, M. A.: On value and value co-creation: A service systems and service logic perspective. European Management Journal, 26, 145--152 (2008a)
16. Vargo, S. L., Lusch, R. F.: From products to service: Divergences and convergences of logics. Industrial Marketing Management, 37, 254--259 (2008b)
17. Verginadis, Y., Apostolou, A., Papageorgiou, N., Mentzas, G.: Collaboration Patterns in event-driven environments for Virtual Organizations. In: AAAI 2009 Spring Symposium on Intelligent Event Processing. Palo Alto (2009)
18. Zucker, L., M. R. Darby, J. S. Armstrong: Commercializing Knowledge: University Science, Knowledge Capture, and Firm Performance in Biotechnology. Management Science, 48(1), 138--153 (2002)