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Some Aspects Concerning a Generic Service Process Model Building

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Abstract. In the context of globalization of contemporary service economies there is an increasing need for interoperability, standardization and submission of service processes to common norms and regulations. This stimulates the research effort in elaboration of generic, unified approaches in service processes design. Service Science emerged in the past decade as an interdisciplinary specialization of systems theory, but there is still lack of consensus on its theoretical foundations. Starting from the comparative analysis of some relevant generic service models reported in the literature, the paper raises some specific questions regarding the research effort in this area and, based on a Service Science worldview of a service system and on the generic phases of a business process, deduces a generic model of a service process lifecycle, including part of the ISPAR states. Finally, a simple example from the educational service sector is discussed.

Keywords: Service Science, service, service system, business process, generic model.

1 Introduction and motivation

Contemporary economies are characterized by a shift to service-oriented business organizations, developing interconnected processes, in which IT technology plays a critical role [1]. Motivated by the complexity and diversity of phenomena related to the new emphasis on services, Service Science was initiated in 2004 by IBM, as an interdisciplinary specialization of systems science and theory of organizations [2] dedicated to the study of service systems [3]. As there is still no consensus on the key concepts and theoretical foundations, Service Science needs further development [4]. An important research direction in this context is the development of conceptual service system models, accompanied by activity-based models of service processes.

There was a progress, in recent years, in the formalization and conceptualization of service and service system concepts [1], [5], and a variety of proposals of service system conceptual descriptions is reported and comparatively studied in the literature [4], [6].

The interest for generic activity-based models of service processes, based on the concept of business process [7], is earlier and somehow independent on the systems approach. Important contributions were reported related to various service sectors such as telecommunications [8], e-government [9], [10], industrial product service systems [11] or health related services [12], among others.

The contribution of this paper is twofold. Firstly, a comparative discussion of some diverse approaches concerning generic service models is discussed from several interconnected perspectives, like design methodologies, technologies and degree of generality related to the limitations of the service sector in question. This comparison raises several questions, which are proposed to the research community. Among these problems, an important issue concerns the unity that can be detected in the diversity of modeling approaches dedicated to specific service sectors. Secondly, starting from this question, a high-level model of a generic service process lifecycle is proposed, based on a conceptual description of an abstract service system. The generic model of the service process lifecycle is derived from the basic phases of a generic business process lifecycle and encompasses part of the possible service outcomes, captured in the Interact-Service-Propose-Agree-Realize (ISPAR) model [13]. Also, a clear difference between value-proposition-based and value-co-creation interactions is respectively emphasized. The modeling methodology is deductive and theoretical, and a toy example from the educational service sector serves as a validation scenario for both conceptual and activity-based models, respectively. Also, it is estimated that the information provided in the service performance evaluation phase of the service process may have a double role: for value co-creation and for service innovation.

Section 2 introduces a comparative overview of some classes of generic service models reported in the literature. Section 3 presents the conceptual description of an abstract service system, based on the ten foundational concepts of Service Science and representing a version of the service systems worldview in [14] discussed in [4]. A high level description of a generic service process lifecycle is proposed in section 4 followed by a discussion concerning the role of the information provided in the service performance evaluation phase of the lifecycle. Finally, a simple scenario concerning a master program as a service provided by a university is discussed from both conceptual and activity-based perspectives, respectively, followed by concluding remarks.

2 Some Research Problems in Building Generic Models of Service Processes

Building generic models of service processes was subject of intense research in the past decade, and there is a variety of approaches and solutions reported in the literature. Despite their diversity, the contributions can be comparatively analyzed from several viewpoints. Thus, in an attempt to make a broad classification, one can

distinguish between scenario independent service models [15] and the large category of service models dedicated to specific sectors. These service sectors either already present a high level of automation and integration of IT – like modern manufacturing systems, telecommunications, finance – or they have to obey to general norms, regulations and protocols, and may increase their efficiency by developing IT-based standardization of activities – like public services or health services.

A small set of selected and relevant papers concerning generic service process models dedicated to service sectors is comparatively presented in Table 1. The selection was made in an attempt to investigate how diverse service sectors, facing similar problems, propose specific solutions and to emphasize, if they exist, the common features of these solutions.

Firstly, despite the specificity of the needs in each *service sector*, the *motivations* of the research efforts share several common aspects: (i) there is a lack of consensus concerning the service system concepts, which makes difficult the cooperation between business actors, (ii) non-unified service design solutions are inefficient from a business perspective and (iii) the development of IT and SOA provides a technological background for standardization of design approaches, for automation of service interactions and for business cooperation [16], [17].

The *research results* are represented mainly by design methodologies - some of them implemented as IT platforms [11] – and, if there is a high level of automation of service interactions, also generic process models are reported [8], [10].

The *design perspective* for each of the service process models reflects the choice of a specific stakeholder's view.

The *model building approaches* are generally based on object-oriented descriptions of the conceptual side, and on BPMN descriptions of the activities. The *design methodologies* are diverse: from IT and SOA based methods [8], [10], to empirical studies, literature study and interviews [18], [9].

The *generality* of the service process models is, in principle, limited to the service sector of concern. However, there are efforts to go towards non-scenario specific models, even when the research started from the problems of a specific service sector [8].

Summing up, there are several common issues and questions to be answered for the research in the domain of generic service process models building:

1. Why is a generic service process model necessary?
2. How "general" can be a generic service process model?
3. What are the contributions of technology and of norms and regulations, respectively, in the design of standardized service process solutions?
4. What is the well suited approach and methodology for a generic service process model building?
5. And finally, from a design management perspective, what is the interdisciplinary team requested to perform the modeling task?

These questions, which are rather difficult to be answered even within a specific service domain, may help building a roadmap for initiating and developing a generic service process model, firstly as a theoretical tool for better understanding what is unity in the diversity of services. The high-level model of a generic service lifecycle introduced in section 4, based on the concepts discussed in section 3 is scenario independent, so it may serve to initiate an answer to the second question.

Table 1. Generic service process model approaches in the literature – a selected view.

	Garschhammer, 2001, [8]	Osatsius, 2010, [10]	Koussouris, 2008, [9]	CONTSYS, 2008, [12]	Müller, 2010, [11]
Service sector	Telecommunication, eCommerce	Public eServices	Municipal services, eGovernment	Health related services	Industrial production services
Research motivation	Deregulations and liberalization in telecommunications / lack of service concepts consensus in a global service market, with layered services	Diversity of public eServices/ need of cooperation between authorities for common eService solutions	Opportunity provided by Internet connectivity / Homogenous Service Composition Problem, need of eGov Interoperability	Need for harmonization of concepts and concept and information modeling in health informatics	Lack of generic process models for development of industrial Product-Service-System
Research result/ technology/ **design perspective**	A top-down oriented systematic service analysis methodology & a generic interactions -centered service process model of the usage phase, with potential for recursive application / IT dominant / **service management**	A generic, adaptive eService model in the public sector/ web-based & non Internet, different access media / **authority, laws and norms regulations**	Overall methodology for building the Interoperable Generic Service Patterns/ IT, Internet / **municipal authority** & **alternate service provider**	Generic process patterns and model for Swedish health related services, aimed to *identify* and *treat* health problems / not specified / **clinical perspective**	A generic PSS development process model / web based process guide platform / **mechanical engineering design**
Approach/ methodology	Object-oriented top-down approach for service environment analysis/ the service as a set of interactions	SOA BPM application / use of a behavior model part of the SOA Reference Model	Service Description Worksheets, BPMN process models / Interviews, Greek eGIF guidelines	Clinical processes as BP / activities description in core and supporting clinical processes	Initial empirical study / Interviews and literature
Generality/ perspective of the research	Non-scenario specific procedure/ languages and methods for describing functionality and quality of service parameters in a generic way	G2C, G2B, G2G interactions / seek standards, model eServices, integration of BP	eGov / national standardized documents for pan-European Interoperability	Subject of debate / process-, concept- and information model will form the Swedish information structure	Service systems for mechanical engineering, synchronizing product and service development

3 The Conceptual Description - A Service System Worldview

Recall that Service Science (SS) is based on ten foundational concepts [19], *resources*, *entities*, *access rights*, *value co-creation interaction*, *governance interaction*, *outcomes*, *stakeholders*, *measures*, *networks* and *ecology*, which are described and discussed in the service literature, from different perspectives [20], [4], [6].

From a Systems Approach perspective [2], a service system is a type of organizational system of systems [6], which may generate one or several services. The main task of a service system is to create and realize value propositions [21]. In the same systemic perspective, a service can be regarded as an organizational subsystem of the service system, defined by specific business processes [7]. A formalization of theses relations is given in [5].

The ten foundational concepts of SS can be configured, around the service system, service and value proposition concepts, as a conceptual description or SS worldview. A representation of this worldview, similar to the one discussed in [4], but with a coarser granularity, is depicted in Fig. 1.

The relations implied by the SS worldview in Fig. 1 are described next in brief, based mainly on the already classic paper of Spohrer and colleagues [19] and on the contributions in [20] and [4].

Everything that has a name and is useful can be viewed as a *service resource*, which is integrated by the service system. A service system entity is a type of resource. There are four types of resources: *physical with rights* (people), *physical without rights* (technology, natural resources), *non-physical with rights* (organisations), and *non-physical without rights* (shared information).

Access rights derive from laws, i.e. from the political-legal system, and laws are a type of not-physical-with-no-rights resource. Different types of access rights are *owned outright*, *leased-contracted*, *shared access*, and *privileged access*.

For a service system, the service system *ecology* is its immediate environment.

The four primary types of *stakeholders* are *customer*, *provider*, *authority*, and *competitor*. The *partner* is also a type of stakeholder. The provider belongs to the service system, while the other stakeholders are parts of the service system ecology. Also, their roles are dynamic; for example, a partner can become a competitor.

Service system entities participate in *interactions* via *networks*. Value co-creation is the desired outcome in a service interaction. *Value proposition-based interactions* are intuitively the promises that entities - basically the *customer* and the *provider* - agree to, because they believe following through will realize value co-creation for both entities [19].

The *governance* of a system directs the system towards a final goal. Governance mechanisms can be regarded as a type of value proposition between an authority service system entity and a population of governed service system entities. *Governance interactions* depend on the degree of *compliance* of the governed entities, as well as the degree of coercion that the authority entity is allowed by norms and laws.

The interactions initiated by service system entities are based on a *value proposition* and produce service *outcomes*. However, there are outcomes which are generated by non-service interactions, as detailed in the ISPAR model [13]. When

service entities interact, value co-creation is only one of the possible outcomes. The ISPAR model defines ten possible outcomes of service interaction, which can be regarded as final states of a decision process (Table 2).

The service is evaluated, from specific stakeholders' views, through *service measures*: *quality* is evaluated by the *customer*, *productivity* is evaluated by the *provider*, *compliance* is evaluated by the *authority* and *sustainable innovation* is evaluated by the *competitor*. These measures serve as key performance indicators (KPIs) for service evaluation, i.e for evaluation of the service outcomes.

The *service*, considered both as a service organization, controlled by the service system and composed of interacting business processes, or simply as a flux of interactions generated by the service system, is defined by: a *value proposition*, as a business plan, together with the associated *service interactions*, the *outcomes* they produce and the *service measures* as KPIs.

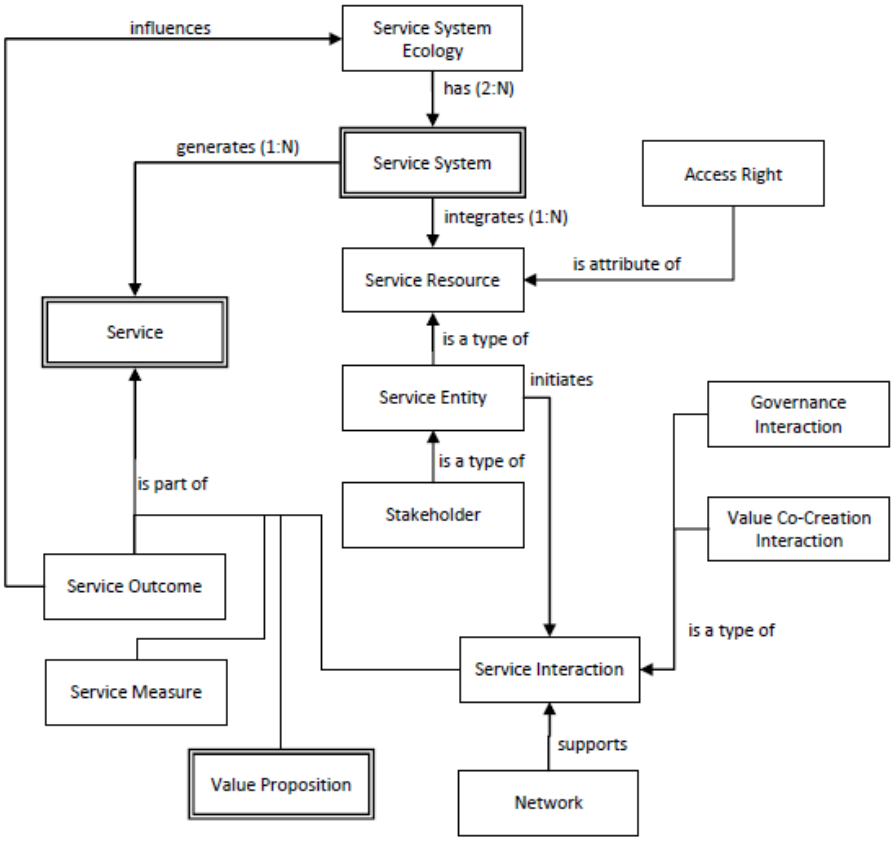

Fig. 1. A Service Science worldview of a service system; service, service system and value proposition are not among the ten foundational concepts.

Table 2. The ten possible final states as interaction outcomes in the ISPAR model (adapted from [13], [19]).

	Final state in the ISPAR model	Significance
1.	**R**:	value is realized, i.e. effectively co-created
2.	**-P**:	the proposal (value proposition) is not understood
3.	**-A**:	the proposal is not agreed to
4.	**-D**:	value is not realized and disputes do not arise
5.	**K**:	value co-creation *disputes* are resolved in a manner that is OK for all stakeholders
6.	**-K**:	value co-creation *disputes* are resolved in manner that is not OK for all stakeholders
7.	**W**:	an interaction is not a service interaction and is welcomed
8.	**-C**:	an unwelcomed non-service interaction is not criminal
9.	**J**:	an unwelcomed non-service interaction is criminal and justice results
10.	**-J**:	an unwelcome non-service interaction is criminal and justice does not result

4 A Generic Model of a Service Process Lifecycle

In the activity-based description, the service is viewed dynamically, as a business process involving the concepts interrelated in the service system worldview.

4.1 A High Level Description of a Generic Service Process Lifecycle

Recall firstly some basic general definitions from organizational theory and business process management. An organizational system can be viewed as a set of business processes performed into two main systems: the management system and the productive system; each of these subsystems contain business processes with associated control, operational and *information system* (IS), respectively [5]. A *business process* is a set of activities that are performed in coordination in an organizational and technical environment, realizing a business goal and possibly interacting with business processes performed by other organizations. A *business process model* consists of a set of activity models and constraints between them. A *business process lifecycle* comprises: the design and analysis phase, the configuration and testing phase, the enactment phase and the evaluation phase [7]. Business process models and business process lifecycles may imply several actors with dedicated roles, developing collaborating, parallel sub-processes, and it is commonly agreed that a well suited modeling language, covering all levels of abstraction, is BPMN (Business

Process Model and Notation) [22]. However, when details and atomic activities are not of concern, a higher level of abstraction view is provided by flowchart diagrams.

A generic service process can be considered as a business process with service delivery as business goal and comprising decisions and phases dictated by the basic service interactions: value proposition-based and value co-creation interactions as well as governance interactions. Following the agreement on the value proposition, a service process basically refers the service delivery (ensuring *the usage service functionality* [8]) controlled by the service management system (ensuring *the management functionality*).

The lifecycle of a new service process comprises the basic phases of a general business process lifecycle and includes the above mentioned specific phases. A high level description of a service process lifecycle is proposed by the flowchart diagram in Fig. 2.

The cycle starts with the *preparation phase* in which, according to the business goal of the service system, essential service data, from the internal service system information system (IS) as well as from the service system ecology, representing potential business advantages and constraints, is fused in order to decide whether or not to create a new service process. In this phase, the *provider* may communicate, through welcome non-service interactions (state **W** in Table 2), with the market environment (for example through interviews with the potential *customer*, external supplier or *partner*) and with the legal system (*authority*) and it may observe the *competitor*. If a new service process development is not motivated, then, after a while, the preparation phase and the decision process are resumed.

In the *service design and analysis phase*, surveys on the service organizational and technical environment are developed and the basic sequence of tasks and associated activities are identified, reviewed, validated and represented as business processes.

Then the service process lifecycle enters *the service configuration and implementation phase* in which, based on the service process model, the service process is implemented and the *value proposition* is created. Depending on the service sector and on the support technology, the service process configuration can be implemented (i) as a set policies and procedures that the employees need to comply to, or (ii) using a platform for a dedicated software system and providing process interoperability or (iii) in hybrid manner, in which employees interact with the system and existing software systems are integrated with the service management system. The implemented solution needs also to be tested, based on specific testing methodology.

Based on the *value proposition* created by the *provider*, the service process lifecycle enters the value-proposition-based interactions phase, in which the customer and the provider negotiate the terms of the value proposition. In general, two main pairs of dual aspects are taken into account: the *level of service quality* promised by the *provider* against the *needs* of the *customer*, on one side, and the *cost* of the service process against the requested *price* that the customer has to pay.

Following the initial negotiation, the value-proposition may *not* be accepted (states **–A** or **-P** in Table 2). If the value proposition can be improved, then the changes are performed and the service process lifecycle returns to the *value proposition-based interaction phase*, for a new negotiation.

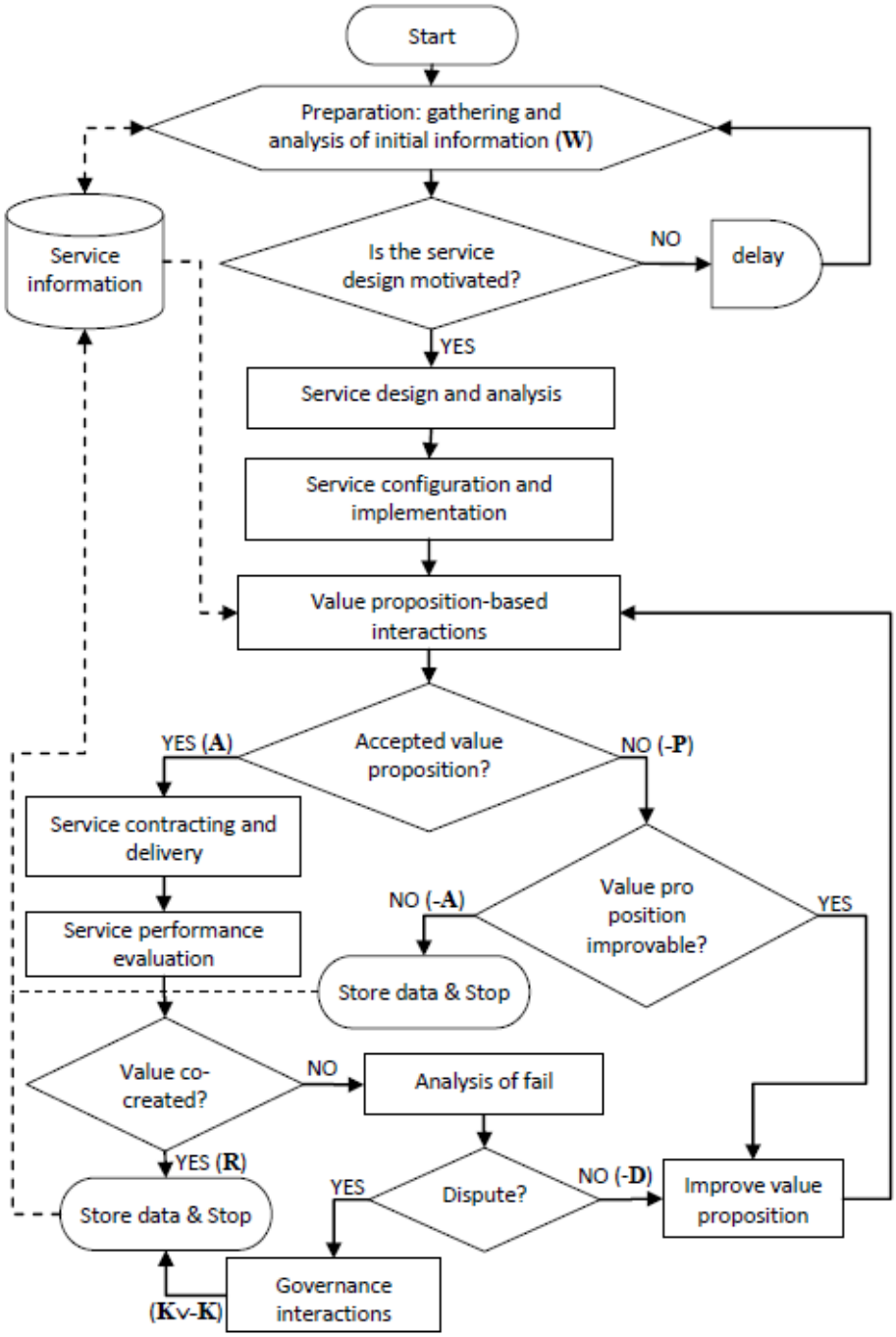

Fig. 2. A high-level description of a generic service process lifecycle; the bold letters correspond to the ISPAR states in Table 2.

If the value proposition cannot be modified, then the negotiation fails. The associated information is stored by the service system IS, for future business decisions, and the process stops (state **-A**).

If the value proposition is accepted (state **A** in Table 2), the service process lifecycle enters the *service contracting and delivery phase*, in which the service is contracted, according to the value proposition, and used by the customer.

The way in which the service is contracted and delivered is investigated, from the stakeholders' viewpoints, in *the service performance evaluation phase*. In fact, the evaluation process in general parallels the service contracting and delivery processes, respectively, as detailed in next subsection. Service performance evaluation implies the choice of relevant KPIs by each stakeholder.

Value co-creation interactions involve basically the provider and the customer, but also the authority.

One can consider that the *value co-creation interaction* is a decision process based on the outcomes of the service performance evaluation process, more specifically as results of the comparison between the expected and the actual levels of the chosen KPIs.

Value is co-created if there is an agreement, between interacting actors, on the results of these comparisons, meaning that, for example, both customer and provider are satisfied by the way in which the service is delivered and the service contract is respected.

If the value is created, then the associated information is stored for future business decisions and the process stops (state **R** in Table 2).

If the value is *not* created, the reasons of the fail are analyzed.

If *dispute* arises, for example because the customer has not paid the service price according to the contract, then the norms and regulations are invoked in *governance interactions*, to legally solve the dispute (states **K** or **-K** in Table 2). The associated information is stored for future business plans and decisions and the process stops.

If disputes do *not* arise (state **-D** in Table 2) and the service delivery process can be improved, then the value proposition upon which the service was contracted is subject to these improvements and the service process lifecycle returns to a new phase of value-proposition based interactions.

Remark 1. Value proposition is a promise for future value co-creation [19], so value proposition-based interactions reflect the negotiation between stakeholders and become the basis for service contracting, as an agreement about estimated future mutual benefits.

Value co-creation interactions take place, between stakeholders, during the service contracting and delivery processes, consequently to the service performance evaluations. Value is co-created if, as already mentioned, the stakeholders agree that the evaluated service performance corresponds to the initial value proposition.

So the significances of value-proposition-based interactions and of value co-creation interactions do not completely overlap

The role of the information provided by the service performance evaluation process is discussed next in brief.

4.2 The Information Flux in Service Performance Evaluation Processes

The service performance evaluation phase comprises several processes developed, from distinct stakeholders' views, during the service contracting and delivery phase and providing information, about the service value. In the mean time, the specific details composing this information can be fused, by the IS of the service system, for future service innovation. These parallel and collaborative evolutions cannot be represented in the flow diagram of a service process lifecycle in Fig. 2 and are captured in Fig. 3.

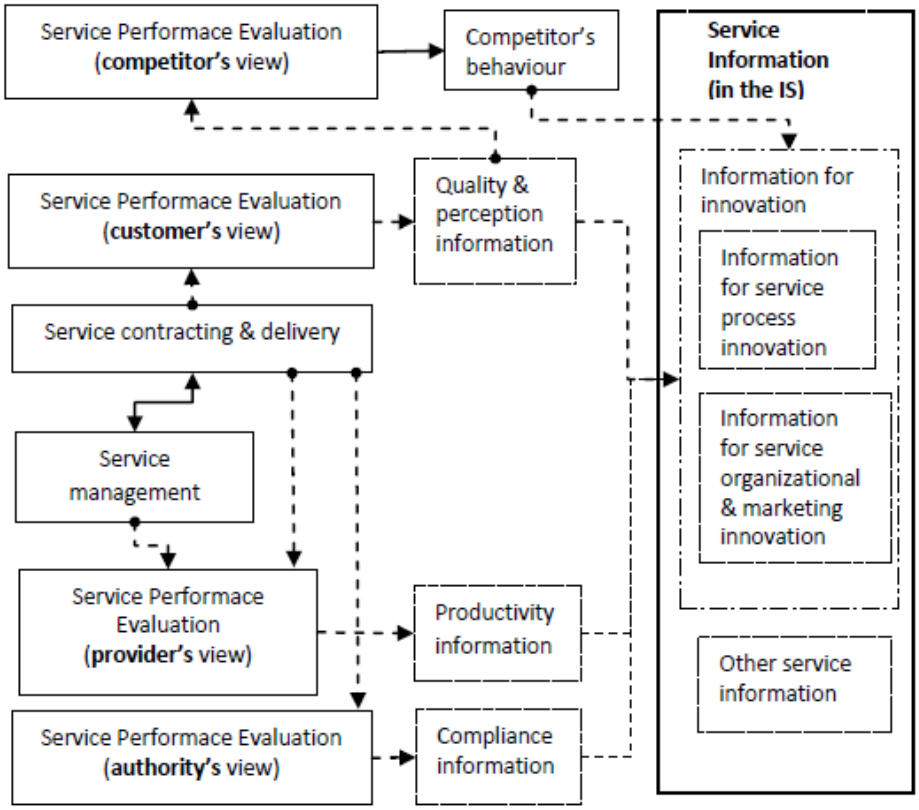

Fig. 3. In the value co-creation process, the stakeholders evaluate the service performance from their own view and the resulted information can be used for service innovation; the dotted lines show the direction of the information and the initial points mark the information sources.

The service *provider* is mainly interested in service *productivity*, and it collects corresponding information directly from the service delivery process and from the service management system, responsible with service resource allocation.

The distinct information provided by the evaluation processes is used for *service innovation* in several aspects: service process innovation, service marketing innovation, or service organizational innovation. The role of the *competitor*, though

indirect, is crucial for *sustainable innovation*. Acting in the service system ecology, i.e. in the market, the competitor observes the quality of the service and estimates himself the needs of the customer. Consequently, competing for the same customer, he may offer similar services with possible higher level performances. This exerts a constant pressure on the service system, which, in order to remain viable, has to improve, in turn, the service performances and to satisfy, in the same time, the feasibility constraints regarding costs and resources. These improvements are constantly observed by the competitor.

4.3 A toy example from educational services: a master program scenario

The conceptual description of a service system and the model of the service process lifecycle are discussed below within a simple example from the educational sector. , Hence the service concerns teaching so, in principle, it does not necessarily imply IT-based implementation, but mostly human interaction. This last feature is common also to an important class of health services [12].

A private university is offering a master program in a domain. Considering the *university* as a *service system* generating *the master program* as a *service*, a proposed description of the basic concepts within the Service Science worldview depicted in Fig. 1 is summarized in Table 3.

For simplicity, only one student and one teacher are considered, with the last one as a human resource of the university. The negotiations between the university management and the teacher concerning the teacher's salary and professional duties are not discussed. The phases of the master program lifecycle follow the general flowchart in Fig. 2 and can be described as follows.

Firstly, the university explores the service system ecology and the domain in question, gathering information in order to decide whether or not to construct a new master program. Also, the needs for related human and material resources are investigated – teacher as physical resource with rights, infrastructure as physical resource with no rights - and their costs - i.e. necessary capital as non-physical resource - are estimated. This is, in a very simplified description, *the service preparation phase*.

If the university management decides that the new master program is necessary, the preparation is started. This phase comprises two types of activities: the creative effort of the teacher, preparing the lectures to be taught within a specified time interval, together with a proposal for the student's evaluation schedule, and the acquisition of material resources, requested by the teaching and learning processes. This is *the service design and analysis phase*.

Based on the prepared lecture notes and on the available infrastructure, a description of the offered master program is published, together with the level of related fees charged by the university (point 8 in Table 3). This is the *service configuration and implementation phase*.

If there is a student that agrees to the value proposition, then he signs a contract with the university, pays the fees charged by the university and starts the master program.

Table 3. Concepts in the Service Science worldview of a service system (Fig. 1) and their instances in the master program service scenario.

	Concepts in the SS worldview of a service system (Fig.1)	Instance in the master program scenario
1.	Service system:	The university as an organization
2.	Service:	Teaching the master program
3.	Service resource:	Teacher with knowledge and competence, infrastructure (library, laboratories), capital
	Access right:	The student has privileged access to part of (teacher's) knowledge and to the entire infrastructure; the university owns the capital outright
4.	Customer as stakeholder:	Student and, after student's graduation, the company employing him
5.	Provider as stakeholder:	The manager of the master program
6	Competitor as stakeholder:	Other universities offering similar master programs
6	Authority:	The Ministry of Education
7.	Service system ecology:	Other universities, students, companies interested to employ human resources in the domain of the master program, authorities in the educational sector
8.	Value proposition:	A description of the master program, a promise for the student to get knowledge and competence in the domain, in view of a future desired workplace, a promise for the university to obtain money from the taxes paid by the student
9.	Service measures:	a) The marks obtained by the student at examinations; b) the perception of the student concerning the quality of teaching; c) the compliance of the master program to laws and norms in the educational sector; d) the fact that, after graduating, the student is employed or not in the master domain; e) if the student graduates and is employed in the domain of the master program, the perception of the company concerning his professional performance
10.	Value as a service outcome:	a) The student pays the fees charged by the university and passes examinations with good marks *and* b) the student is satisfied by the teaching quality *and* c) the master program obeys to educational laws and norms *and* d)e) after graduation, the former student is successfully employed in the master's domain
11.	Value co-creation interaction:	Collaborative processes: the teaching process, enacted by the *teacher*, and the learning process, enacted by the *student*

These two phases evolve in parallel and comprise several collaborative processes, defining value co-creation interactions: teaching and evaluation of the student's skill and knowledge, enacted by the teacher on one side, learning and evaluation of the quality of the teaching process, enacted by the student, on the other side. Following these evaluations, the student may repeat some examinations, or the teacher may improve his explanations or his lecture notes.

Specific to educational services, the *value* is co-created, as described at point 10 in Table 3, based on a conjunction of several conditions. Firstly, the value necessarily implies that both teaching and learning processes have quality. Condition d) states that the master program, as an educational service, is compliant. Finally, value implies also that, after graduation, the former student is successfully employed in the domain of the master program. However, this happens *after* the service delivery, and does not entirely depend on the quality of the teaching or learning processes, but also on the current economic environment. Hence there is a *variable time scale* for service performance evaluation: there is an immediate, *real-time evaluation* of the service quality (the teacher explains and, in response, the student understands and proofs his knowledge and skills by obtaining good marks) and a *long term evaluation*, based on the observation of the graduate's evolution in the jobs market. This reveals also the role of the company employing the graduate as an important but "delayed" stakeholder of the educational service. The company may introduce its own KPI for the performance evaluation of the master program, depending on the professional performance of the graduate as employee.

The information collected by the university a) from real-time and from long term performance evaluation, respectively, as well as b) by observing the behavior of other universities as competitors in the market of educational services, is used for improvements and innovation of the master program. In order to be sustainable, the improvements and innovation measures have to rely on available human and material resources for the educational process. So, innovative measures, together with the constant interest for having adequate available service resources are necessary for the viability of the university as service system.

Note also that a scenario implying educational services in the public sector is more complicated, due to the fact that the customer, i.e. the person who accepts to pay for the service, is distinct from the beneficiary, i.e. the person involved in the teaching-learning interactions.

5 Concluding Remarks

The problem of building generic service process models is receiving much interest in contemporary modern economies in a broader context, in which business process modelling and consulting is becoming mature, stepping to a viable commercial activity [23]. However, the development of unified service process design solutions is not straightforward, as, even within a specific service sector, there may be a great a variety of service scenarios. The rich literature concerning the research on generic service processes model building has, as an important objective, the development of modelling methodologies, serving as design roadmaps [18]. In section 2, a set of

general questions is suggested to be answered by the researchers in this area, one of them being “how general can be a generic service process model ?”

Initiating an answer to this question, the generic, non-scenario-dependent service process model proposed in section 4 provides a theoretical perspective, which is general and simple from two viewpoints. Firstly, it relies upon a rather simple service system worldview, including the foundational Service Science concepts, as proposed in section 3. Secondly, the flowchart representing a high-level, activity-based description of the generic service process lifecycle is derived directly from the classic phases of a general business process, and it includes service interactions and decisions outcomes reflecting the basic final states in the ISPAR model. The analysis performed in section 4.1 shows that value-proposition-based interactions and value-co-creation interactions share the value proposition concept, but they take place at distinct moments of the service process lifecycle, respectively (Fig. 2). The service performance evaluation process plays a crucial role in value co-creation and also as information for future service innovation. Each stakeholder has its own KPIs for service performance evaluation and value is co-created when all stakeholders agree on the levels of all KPIs.

Finally, the proposed service process model is used to develop and analyze, in a simple but consistent way, the lifecycle of a master program, as a worked example of an educational service.

Future research directions imply the development of UML representations of the conceptual service system worldview and of BPMN descriptions of the service process lifecycle flowchart, with emphasis on roles. The worked example suggests that generality can be preserved only for the conceptual model, while the activity-based description can remain general only within a specific service sector. However, the flowchart representation is valuable as it allows the emphasis of those phases and decisions, which distinguish service processes among business processes.

The deduced flowchart of a generic service process can also help, as a starting phase, for developing an interactive tool for service configuration, based firstly on empirical design methodologies, such as interviews with relevant stakeholders from a specific service domain. This tool is supposed to reflect a systems approach [2], and the service is desired to be iteratively configured, based on specifications of the value-propositions reflecting the contract to be agreed between provider and customer.

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