Mehdi Snene
Michel Leonard (Eds.)

LNBIP 169

Exploring Services Science

5th International Conference, IESS 2014
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Preface

Service science is an interdisciplinary approach to the systemic innovation in services systems, integrating management, social, legal, and engineering aspects to address the theoretical and practical aspects of the challenging services industry and its economy. Service science leverages methods, results, and knowledge stemming from these disciplines toward the development of its own concepts, methods, techniques, and approaches thus creating the basis for true transdisciplinary gatherings and the production of innovative results. The conference on Exploring Service Science (IESS) is now an established conference where researchers from around the world present innovative ideas, research, and applications in the design, experimentation, and management of services. The 5th IESS Conference was held at the University of Geneva, February 5–7, 2014. The papers presented ideas and issues related to innovation, service management, service engineering, and service discovery.

The conference attracted 31 papers from 14 countries and the Program Committee accepted ten full papers. Given the novelty of the domain of service science, we would like to acknowledge and thank all the authors for their contributions and their trust and the Program Committee memebers for their valuable and professional work in reviewing the submissions and crafting the program of this fifth IESS conference. The conference featured the keynote presentation of Prof. Yves Pigneur from HEC Lausanne, Switzerland.

We would like to thank the local Organizing Committee and the Institute of Services Sciences (UNIGE, Switzerland) for all the effort and support in setting up and organizing the conference. We wish you a pleasant reading and a fruitful use of these research results in your research and applications.

December 2013

Mehdi Snene
Michel Leonard

Organization

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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.

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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.

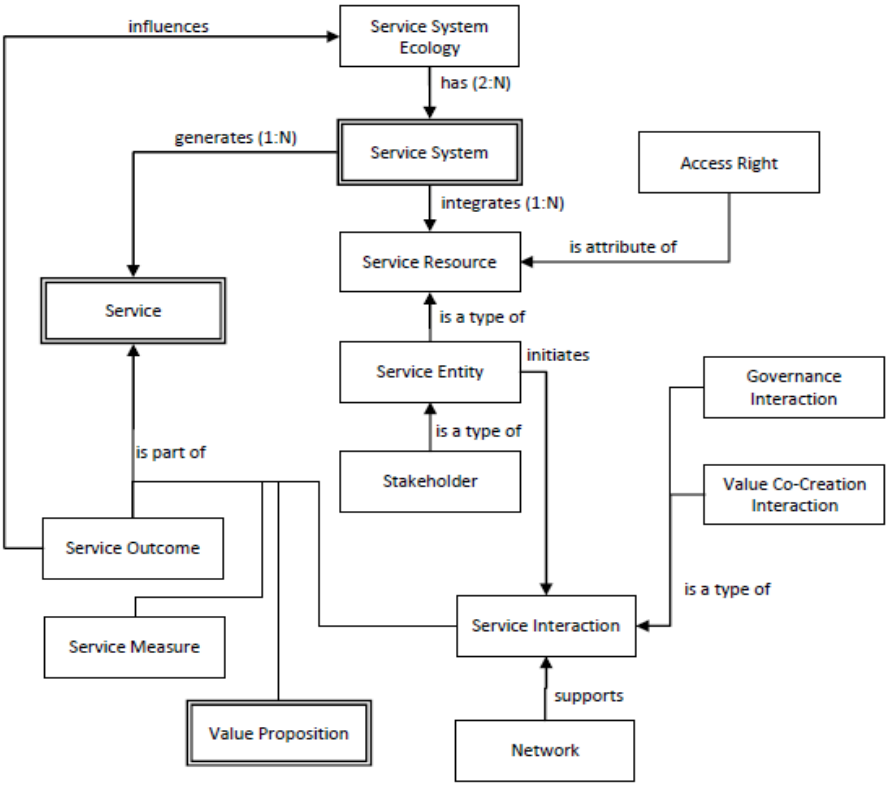

Fig. 1. A Service Science worldview of a service system; service, service system and value proposition are not among the ten foundational concepts

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.

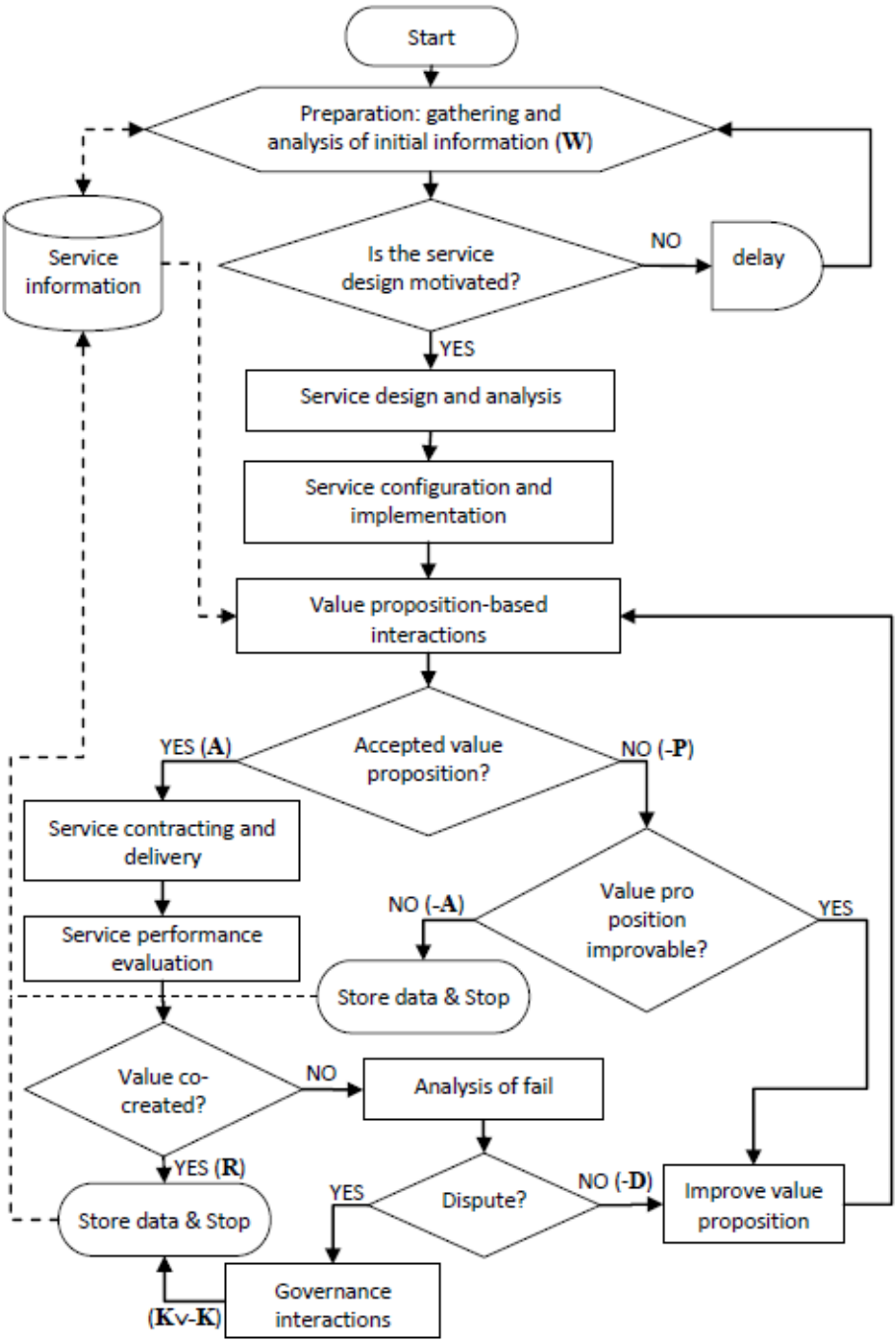

Fig. 2. A high-level description of a generic service process lifecycle; the bold letters correspond to the ISPAR states in Table 2

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.

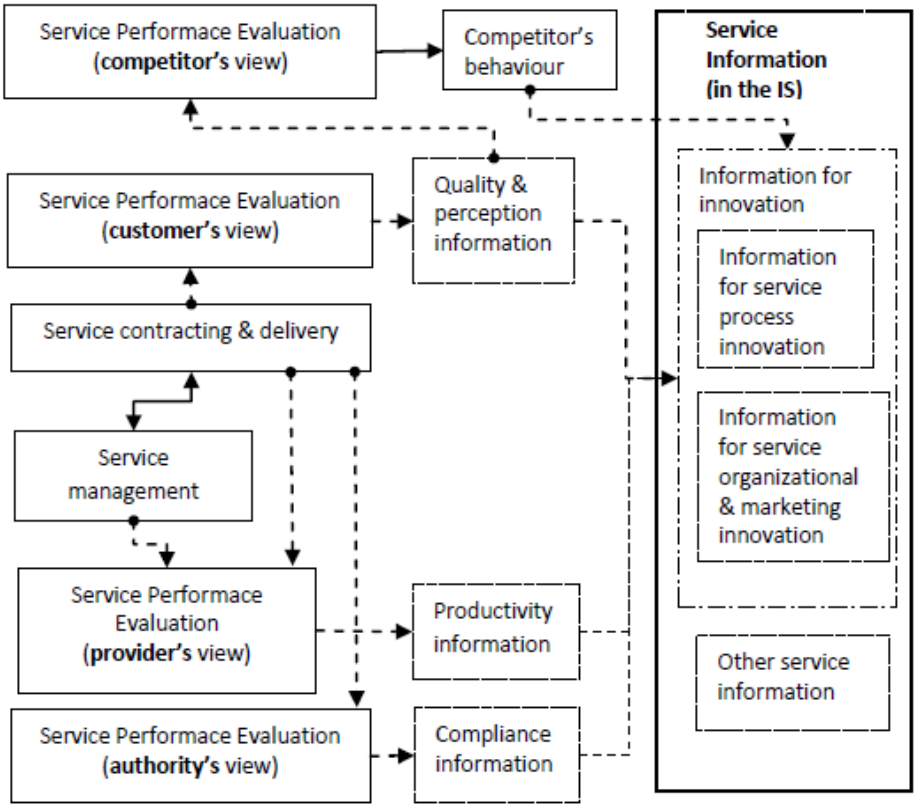

Fig. 3. In the value co-creation process, the stakeholders evaluate the service performance from their own view and the resulted information can be used for service innovation; the dotted lines show the direction of the information and the initial points mark the information sources

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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Building an Extended Ontological Perspective on Service Science

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Abstract. This paper presents an approach accounting for the classification of the main knowledge resources related to the new Science of Service. The main knowledge categories are defined as concepts integrated in an **extended Service Science ontology**. The ontology derived from several sources was captured using UML and Protégé, and then, through a RDF/OWL transformation, a semantically annotated wiki has been directly implemented offering an execution of the ontology together with implemented use cases. Further, a dedicated application was developed – the Service Science Knowledge Environment (SSKE) – in order to grant user access to different knowledge categories created along with the proposed ontology. The SSKE is a cloud based collaborative software service, aiming at providing co-created knowledge resources shared by academia, industry and government organizations. This application can be accessed through the Web (http://sske.cloud.upb.ro/) and it can be used for managing service related knowledge.

Keywords: Service Science, service systems, ontology.

1 Introduction

The service sector accounts now for over 70% of the activities and employment in the more advanced economies, and has been growing in all countries. Innovation in services is critical for sustainable societies, and there is an increasing support from information technologies in providing new services [1]. Service Science is an interdisciplinary approach to the engineering of service systems in which specific arrangements of people and technologies take actions that have value for others.

Recently, some research directions towards the development of an ontological foundation for Service Science have been put into action ([2], [3], [4], [5] and [6]). Each of them draw a clear conclusion to establish an unifying framework of service representation in different perspectives, based on the Service-Dominant

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Logic view [7] that considers services as value co–production complex systems consisting of people, technology, other internal and external service systems, and shared information (such as language, processes, metrics, prices, policies, and laws) [8]. In [5] the design of the Onto-ServSys ontology on service systems is reported, this integration being realized through a Systems Approach, that mainly consists of an *organizational system* view and a *service system view*. In [9] an investigation related to foundation concepts from the perspective of established service theories and frameworks is proposed. It maps the proposed service system concepts on the selected service theories and frameworks. The analysis is visualized in a multi-view conceptual model (UML representation), trying to explicitly and formally define service system ontology. In [10] main concepts related to service orientation in manufacturing are presented that a special extension of a general ontology (related aspects to service innovation and fundamental concepts in Service Science domain) should include for later developments.

All the above mentioned approaches refer only to specific parts of knowledge that can be related to Service Science and its supporting technologies.

The novelty of the approach proposed in this article is the *holistic view on knowledge* dedicated to this domain. According to this approach information related to the multidisciplinary sub-domains that can be gathered under the umbrella of the broader term "Service Science" is classified as specific *knowledge resources*. Based on literature review, including the DELLISS project [1], [11], section 2 describes the definition of a *knowledge model* in a *Knowledge Environment*, represented as a tree of interrelated concepts (an ontology-based classification of *knowledge resources*). Section 3 proposes a general integration perspective towards a Service Science ontology development, that is further reflected as a foundational step in the design of the extended SSKE ontology. Section 4 is based on an extended literature review and draws clear steps to extend the general Service Science ontology towards the formation of connections with other knowledge resources in the extended SSKE ontology. Section 5 presents a brief description of the Service Science Knowledge Environment. The article concludes with final remarks on the appropriateness of this application as an environment to bring together academia, business and governmental institutions, allowing them to contribute on building and sharing knowledge in the field.

2 Requirements Definition

During the last decades a huge amount of literature on Service Science was delivered on paper as well as digital content, drawing a clear need on designing a detailed classification of the main concepts related to this interdisciplinary domain. Starting from here, specific requirements for a dedicated environment were drawn. In this respect, the proposed *Knowledge Environment* was supposed to include and classify *knowledge resources* related to Service Science, for example `Articles`, `Projects`, `People` knowledgeable about `Projects`, that write

`Articles` and use `Technology` in certain `Service Sectors`. It would have to host digital content collaboratively available to a whole community, to be used in three different perspectives [10]: (1) to exploit a database highlighting an educational *knowledge path* on Service Science, fostering *service innovation* in different *service sectors*, based on *fundamental concepts* related to Service Science; (2) to increase the service companies visibility; (3) to report new methods, tools and software applications in order to *develop IT services* and to accomplish *service automation*, fostering *service innovation*.

According to the approach proposed here information related to the multidisciplinary sub-domains gathered under the umbrella of the broader term "Service Science" was classified as specific *knowledge resources* in the **extended SSKE ontology** (Fig. 1). The relationships between the main *knowledge resources* were identified and they were interconnected to each other.

`Domain fundamentals` is a knowledge category in the ontology that refers information concerning specific fundamental concepts approached in three perspectives: (a) *business oriented*, b) *IT oriented* and c) *service orientation of processes* (Fig. 2). Two important and inter-related `Service Theory` approaches have emerged in past decade: a) *Service Science*, as an interdisciplinary approach to the study, design, implementation, and innovation of service systems, developed in 2004 by IBM [12] and *Service Dominant Logic*, developed in the marketing research community [13], [7] and considering the service as the basis of exchange. `ServiceScienceConcept` category (Fig. 3) undergoes entities, interactions, and outcomes to explain the evolution of value co-creation interactions. It can be derived by the generalization of the concepts offered by the study of service systems and by the emerging service dominant logic [14].

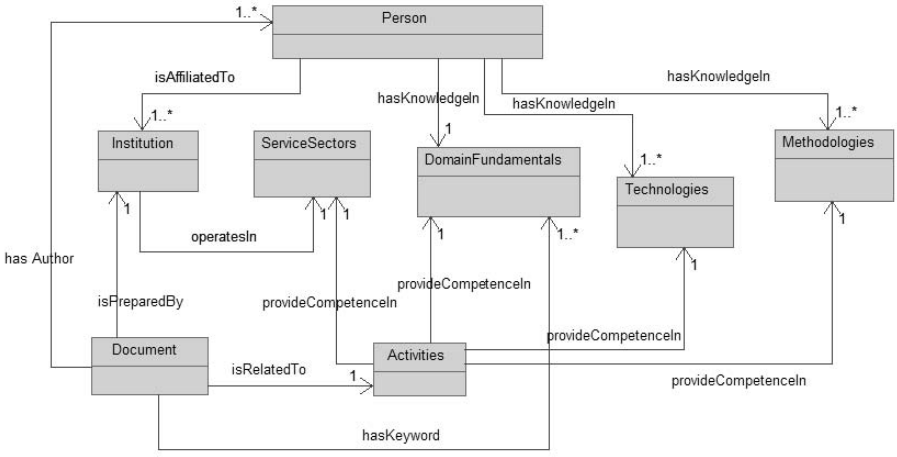

Fig. 1. Knowledge resources classification - extended SSKE ontology concepts

`Document` represent a knowledge category that describes the documentation stored on the knowledge environment, consisting mainly of articles, journals, case studies, books, patents, proceedings, reports, standards, theses and standard specifications. All the above-mentioned types of documents are built in the ontology as sub-classes of a main class called `Document`.

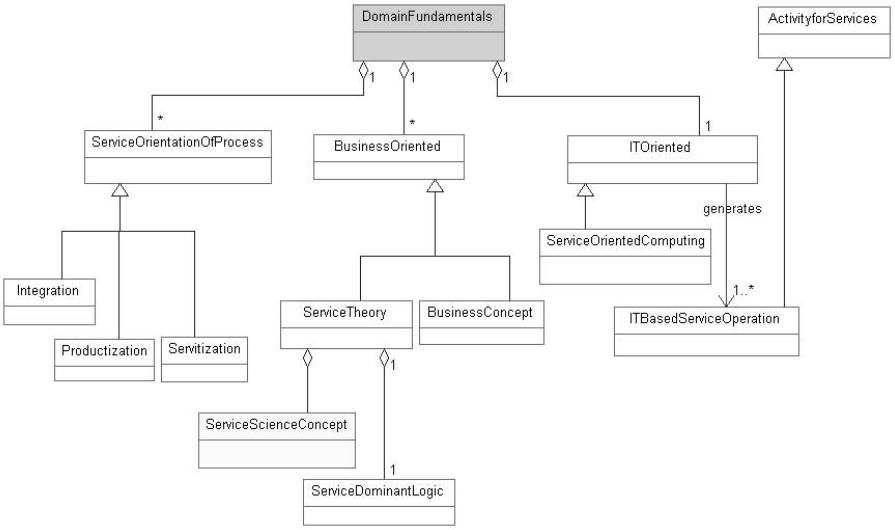

Fig. 2. Extended SSKE Ontology - `Domain Fundamentals` related concepts

`Institution` category sub-classifies in `Academic` and `Business` institutions. A subsequent classification divides the Academic institutions into `Faculties` and `Universities`. An `Institution` may operate in a certain service sector (usually this is available in the case of business companies, but also for some academic centers).

`Activities` is a class that records various initiatives, holding a subclass for each of them: `Project`, `Educational Program`, `Event` and `Support Activities for Services`.

`ServiceSectors` is a special class dedicated to the areas where Service Science can be applied. It refers to different service sectors such as E-Administration, E-Government, Software Services, Manufacturing, Supply Chains and Logistics, E-Health, Telecommunications, Smart Grids.

Technology plays an important role in service innovation, that is why it was considered to be a stand-alone topic in SSKE that requires a dedicated class in the ontology, `Technologies` (e.g. *4G technology*). It is considered that a certain technology can be of either a software or a hardware nature, leading thus to a specialization of two subclasses from the main parent class: `Hardware` and `Software`. The current classification doesn't offer too much insight on further sub classing, leaving enough room for future sub-categorization if needed. `Methodologies` is

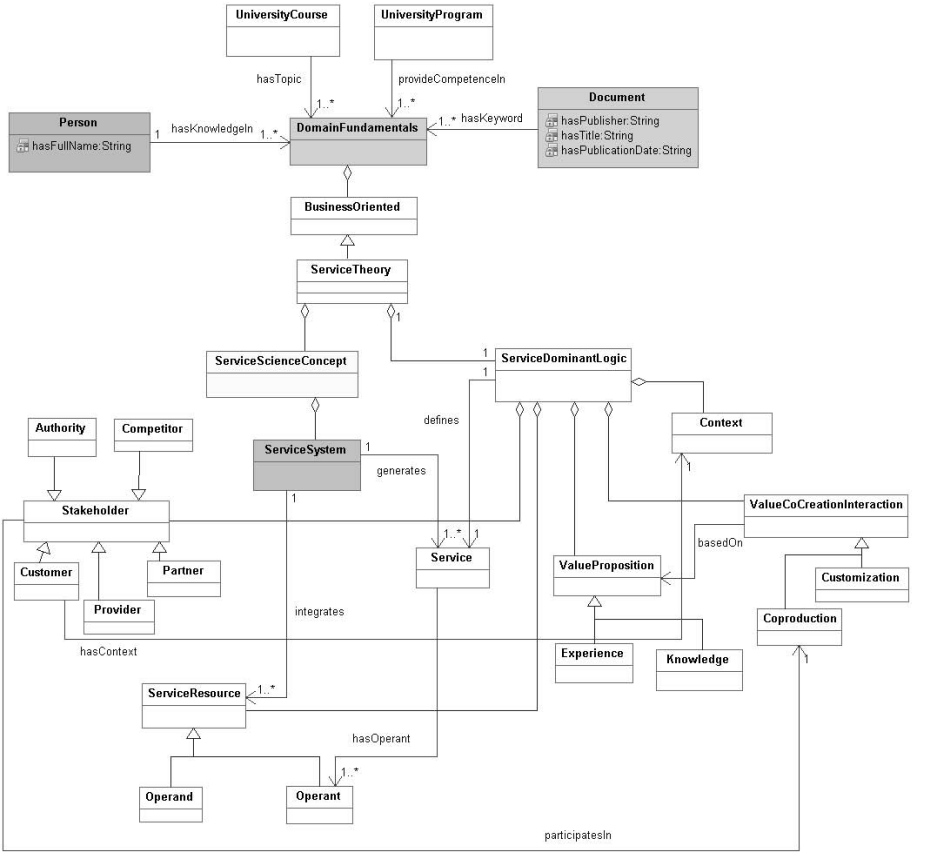

Fig. 3. Extended SSKE Ontology - Service Science related concepts

an ontology class created as a category for different instances of methodologies that apply in the Service Science, be they theoretical or practical (e.g. *Business Process Modeling*, *service blueprinting*, etc.).

3 A Systems Approach for a General Service Science Ontology

This section presents a novel approach towards the integration of different multidisciplinary concepts related to the Service Science domain. It basically starts with the integration of a systemic approach towards an ontological description of service systems, correlating major knowledge categories from three perspectives: *Service Science*, *Theory of Organizations* and *Systems Theory*. It is reflected in the extended SSKE ontology under the `Domain Fundamentals` knowledge resource category, in Fig. 3. This structure was firstly proposed in [5], based on

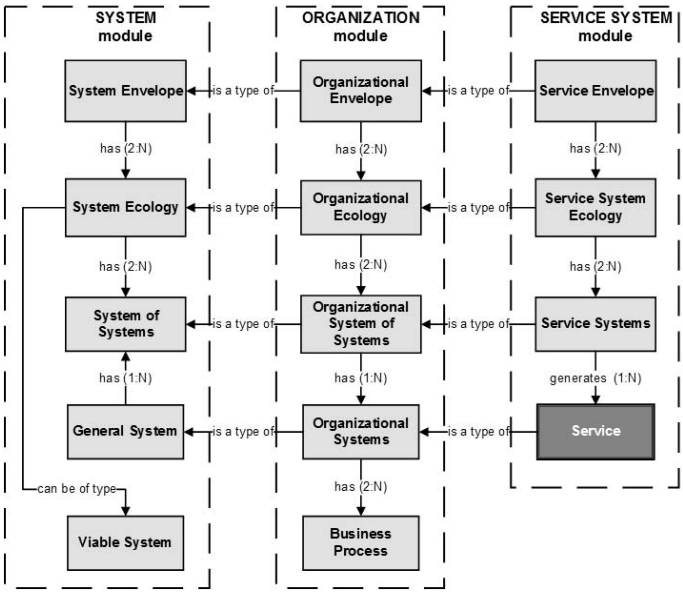

Fig. 4. A general ontology structure for Service Science domain as reflected by the extended SSKE ontology

the *Systems Approach* introduced by [18] and on the *systems models formalization* discussed in [19] and [20]. The version adopted here (Fig. 4) is simpler and reflects directly the basic concepts and relations derived from Service Science, and the relations of these concepts with the more general basic concepts derived from *organizational systems theory* and *systems of systems and viable systems theory* [18], [21], [17], [22], [23], respectively.

As current literature reflects, Service Science is an interdisciplinary approach to the study, design implementation of service systems that was developed in 2004 by IBM [15]. Service Science is based on ten foundational concepts [16]: (1) **Resources**, (2) **Entities**, (3) **Access rights**, (4) **Value co-creation interaction**, (5) **Governance interaction**, (6) **Outcomes**, (7) **Stakeholders**, (8) **Measures**, (9) **Networks**, and (10) **Ecology**, which are described and discussed in the service literature, from different perspectives [17]), [9], [5], see also Fig. 5.

The ontological description for Service Science domain, thought from a systemic perspective, is structured here into three main modules, with increasing levels of generally, respectively (Fig. 4): (1) service system description (the *SS module*); (2) organizational system of systems description (the *Organization module*); and (3) systems of systems description (the *Systems module*).

There are two main reasons for adopting a philosophy very similar to the one proposed in [5]. Firstly, OntoServSys [5] relies upon a very rigorous formalization of the concepts of *System of Systems*, *General System*, and *Organizational*

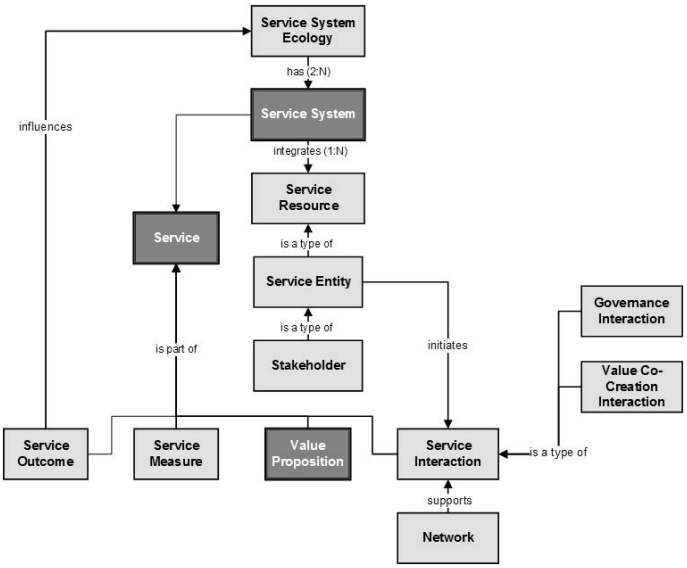

Fig. 5. Ten foundational concepts for Service Science

System, respectively, presented in earlier works [19]; this permits proposing non-ambiguous relations between more specific concepts, like *Service System*, and more general ones, like *Organizational System of Systems* or *System of Systems*. Secondly, considering Service System from the System of Systems perspective allows an adequate description of the role and place of System Viability. The *Viable Service System* concept [17] plays an important role in understanding the implementation of intelligent, IT-based Service System instances; in this view, a *Viable Service System* is thus only a subclass of a *Viable System*.

The methodology proposed here for building the ontological description comprises two major processes: (1) a gradually refinement of the granularity of the service system description, starting from the ten foundational concepts, on one side, and (2) the interconnection of the *Service System* description with the *Organizational System* description and *System of Systems* description, respectively. These design stages are briefly discussed below.

A. A Basic Service System Ontology. Fig. 6 describes a first approach in the description of the Service System, based on the ten foundation concepts of Service Science. The relations, or conceptual links, are of same types as the ones proposed in [5]. Except the central concept, `Service System`, the other two concepts which are not among the ten foundational Service Science concepts are: `Service` and `Value Proposition`. In the proposed *Service System* basic ontology, the concept `Service` collapses a twofold significance: (1) A *classical economic meaning*: `Service` as a client-provider value proposition based interaction and (2) A *Systems Approach meaning*: `Service` as a subsystem of

Type of link	Significance
B is a type of A	The concept named B is element of an upper category named A
B can be of type A	A concept named B can be abstractly instanced in a category named A. The "can be of type" relation is less restrictive than "is a type of" relation.
B is part of A	The concept named B is a mandatory part of the concept named A.
A has(min:max) B	The concept named A has between a min and a max number of concepts named B.
B is instance of A	The concept named B is a particular real or conceptual case of a concept named A.
B general relation A	The concept named B is in a user defined relation with a concept named A.

Fig. 6. Relations and their significance (adapted from [5])

the `Service System`, composed of interconnected `Business Processes` aimed to generate value propositions and corresponding service interactions.

With this last meaning, the `Service` is composed of its major parts: `Service Outcomes`, `Value Proposition`, `Service Interactions` and, of course, the `Service Measures` making possible the performance evaluation of the outcomes. `Value Proposition` - if successfully repeated, understood as a business model [16] of the firm modeled as `Service System` - is the promise the provider makes to the customer, if the last one accepts to interact and "buy" this promise. The relation "`Service System` *generates* `Service`" emphasizes the fact that the `Service System` triggers the events that start the business processes in the `Service`, considered as a subsystem. In this view, the `Service Resource` and `Service Entity` concepts, i.e. the means and actors, are related to the `Service System` upper level, and not to the `Service` lower level.

B. Including Details: A Finer Granularity Service System Ontology. An increase in the granularity of the basic Service System ontology can be obtained by processing the specifications concerning the ten foundational Service Science concepts [16], [17]. This drives to a richer domain and a richer set of relevant conceptual relations [24].

In this proposal, the details included in the basic Service System ontology refer new relations between existent concepts (Fig. 7) and new concepts (Fig. 8) together with the new corresponding relationships (Fig. 9).

Source Concept name	Relation	Destination Concept name
Stakeholder	Evaluates	Service Measure

Fig. 7. The basic Service System ontology – new relations between existent concepts

C. A Systemic Perspective – Integrating the Service System Ontology with a System Ontology. In the sense discussed in [24], one can consider the Service System ontology a domain ontology that can be related to more general, upper level ontologies.

New concept name	Significance
Service Envelope	Supra-system for Service Envelop
Economic System	Subclass of Service Envelope
Socio-Cultural System	
Technological System	
Political-Legal System	
Natural Ecological System	
Owned Outright	Subclass of Access Right
Leased-Contracted	
Shared Access	
Privileged Access	
Technology	Subclass of Service Resource
Shared Information	
Person	
Organizational System of Systems	
Customer	Subclass of Stakeholder
Partner	
Authority	
Competitor	
Provider	
Quality	Subclass of Service Measure
Productivity	
Compliance	
Sustainable Innovation	
Value	Subclass of Service Outcome

Fig. 8. The basic Service System ontology – relations between new concepts [16]

Source Concept name	Relation	Destination Concept name
Service Envelope	has(2:N)	Service System Ecology
(Economic System, Socio Cultural System, Technological System, Political Legal System, Natural Ecological System)	Is part of	Service Envelope
(Owned Outright, Leased Contracted, Shared Access, Privileged Access)	Is a type of	Access Right
(Socio Cultural System, Political Legal System)	Influences	Access Right
(Technology, Shared Information, Person, Organizational System of Systems)	Is a type of	Service Resource
(Customer, Partner, Authority, Competitor, Provider)	Is a type of	Stakeholder
(Customer, Partner, Authority, Competitor)	Is part of	Service System Ecology
Service Measure	Can be of type	(Quality, Productivity, Compliance, Sustainable Innovation)
Service Outcome	Can be of type	Value

Fig. 9. The basic Service System ontology – new relations between new concepts and other concepts

Fig. 4 depicts the fundamental aspects of this integration process. The **System** module is a simplified representation of a *System of Systems* top-level ontology, while the **Organization** module is a simplified representation of *Organizational System of Systems* ontology. This last ontology refers artificial Systems of Systems and it has a higher degree of generality than the Service System ontology. The `Business Process` concept included in the management subsystem in the operational subsystem of an organization [19] represents an upper class for the service processes evolving in the `Service` as a subsystem of the

Service System. Note also that the link from the Service System concept to the Organizational System of Systems concept, and, finally, from this point to the System of Systems concept and to the Viable System concept illustrate the high level of generality of systems′ viability, as key survival condition: natural and artificial systems may both share this attribute. In a specific way, modern IT-based technologies provide the opportunity, for artificial systems, to mimic the specific behavior patterns of viable natural systems.

4 Extending the General Ontology Structure for Service Science

This section presents a working style in extending the general Service Science ontology towards relation formation with other knowledge resources in the extended SSKE ontology. It presents the integration of a specific knowledge category, Activities for Services. As Fig. 4 presents, an Organizational System is a type of General System and consists of a set of business processes performed into two main subsystems: the management system and the productive system [19], [5]. According to [25], a Business Process consists of a set of activities that are performed in coordination in an organizational and technical environment. These activities jointly realize a business goal. Each Business Process is enacted by a single organization, but it may interact with business processes performed by other organizations. At the same time, an Activity for Services (Fig. 10) is a kind of Business Process.

The activities that a company fulfills in order to achieve its business goal or business functions [25], [26] can be partitioned into primary, or core functions and support functions. Each of Core Activities for Services, Support Activities for Services, Service Performance Evaluation *is part of* Activities for Services. Also, as the management system always needs a feedback to its decisions, and as value co-creation is a characteristic desired Service Outcome, creating value makes necessary the process of Service Performance Evaluation. In a Service System, the Service Performance Evaluation process is aimed to monitor and analyze the information provided by Service Measures (Fig. 11). From different perspectives, defined by the Stakeholder′s interests, the service measures as Key Performance Indicators (KPIs) contribute to define the service performance.

5 SSKE Implementation

The extended SSKE ontology for Service Science was implemented in a collaborative physical platform available on-line at http://sske.cloud.upb.ro and the map of information classified in the SSKE as knowledge resources dedicated to the Service Science domain can be inspected in the Keywords section. Wiki technologies were chosen to store the environment in the cloud [27].

The flow of work consisted on firstly building the ontology and then integrating it in the cloud-based deployed wiki. The entire flow actually consists of multiple steps, briefly described as follows:

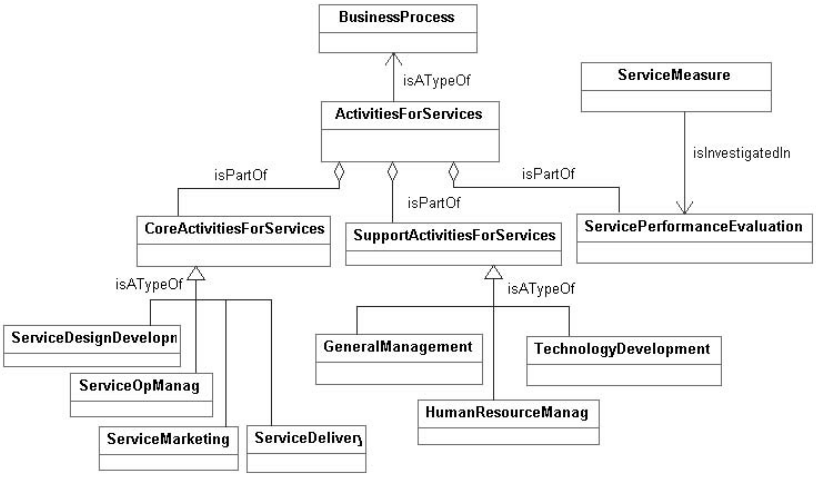

Fig. 10. Extending the Service Science ontology - `Activities for Services` in the extended SSKE ontology

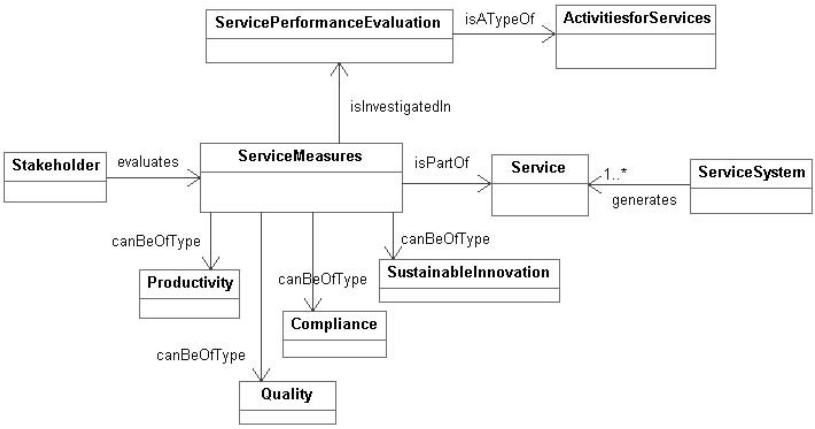

Fig. 11. Extending the Service Science ontology - Service Measures

1. The *design of the ontology* dedicated to Service Science *knowledge sharing*. The main entities and the relationships between them were identified and presented in section 2. Further, the ontology was built using an ontology editing tool (e.g. Protégé), that stores the internal representation of the graphical UML model in one of the possible ontology languages, like RDF or OWL. Next, the conceptual model exported in a RDF file was imported it into the wiki. Once the model is imported into the wiki, the wiki engine offers a graphical view of the ontology;

2. *Deployment in the cloud.* The SSKE is the knowledge resource sharing component of the INSER@SPACE [28] for which the cloud computing technology along with its related business model were used;
3. *Knowledge retrieving.* This working capability allows stored knowledge to be retrieved on a graphically form through the query interface.

6 Conclusions

The main goal of the approach proposed in this work was to define an extended view on different concepts related to the development of the Service Science domain of study, reflected in the **extended SSKE ontology**. Based on this extended ontology classifying different knowledge resources related to this domain, a collaborative environment – the **Service Science Knowledge Environment** (**SSKE**)– intended to gather together different academic partners was developed with the overall aim of creating a body of knowledge in the areas of *science*, *design* and *management of services*, while promoting *service innovation* in different service sectors. It supports sharing relevant information on Service Science stored in a structured way based on a common vocabulary using the extended integrated ontology.

The perspective introduced by this approach connects Service Science fundamental concepts to business related concepts. The SSKE was developed on three directions, i.e. *research*, *education* and support for *business alliances*. In a *Service Science* approach, service *organizations* are studied as *service systems* evolving in their environment (*service system ecology*), in the pursuit of their business goal, according to a specific business model called service business model. Service business models reflect the features of the *service sector* to which the organization belongs to and finally they describe *activities for services* as *business processes*. Successful *service business models* are crucial for the *service system viability* and they are related to *service innovation*.

As this work describes, specific items of service business models such as a) target markets and *customers*, b) product offerings or *value propositions*, c) distribution channels (*activities for services*), and d) constraints and profits, together with the description of case studies and business solutions in various *service sectors* are subject of intense research and debate in the *Service Science* literature.

The SSKE platform foster service innovation by allowing different stakeholders to arrive to a consensus in terms of Service Science fundamentals and build together the future knowledge in the field of Service Science. In the future, research groups can also come together to further extend the proposed shared conceptualization.

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How Open Data Are Turned into Services?

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Abstract. The Open Data movement has mainly been a data provision movement. The release of Open Data is usually motivated by (i) government transparency (citizen access to government data), (ii) the development of services by third parties for the benefit for citizens and companies (typically smart city approach), or (iii) the development of new services that stimulate the economy. The success of the Open Data movement and its return on investment should therefore be assessed among other criteria by the number and impact of the services created based on those data. In this paper, we study the development of services based on open data and means to make the data opening process more effective.

Keywords: Open data, service design, best practices.

1 Introduction

Since 2009 and the rallying of the U.S. government[1,2] to the openness philosophy, the open data movement has grown remarkably. It has allowed releasing thousands of datasets on the Web from the eGovernment, eHealth and cultural heritage sectors in particular. In Europe, in 2013, a new release of the Public Sector Information directive[3] was issued by the European Commission to include in particular cultural heritage data in the public data that has to be made openly accessible by public institutions in Europe.

The Open Data movement however has mainly been a data provision movement. The release of Open Data is usually motivated by:

1. government transparency (citizen access to government data),
2. the development of services by third parties for the benefit for citizens and companies (typically smart city approach), or
3. the development of new services that stimulate the economy (Martin et al., 2013).

[1] Obama B., Memorandum on Transparency and Open Government (Jan. 21, 2009), available at http://www.whitehouse.gov/the-press-office/freedom-information-act

[2] Office of Management and Budget's (OMB), Memorandum M-1 0-06, Open Government Directive (Dec. 8, 2009), available at http://goo.gl/LcxbZE

[3] Directive 2013/37/EU of the European Parliament and of the Council of 26 June 2013 amending Directive 2003/98/EC on the re-use of public sector information known as the "PSI Directive"

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The success of the Open Data movement and its return on investment should therefore be assessed among other criteria by the number and impact of the services created based on those data. While many platforms are supported by initiatives dedicated to the creation of services based on open data, so far the development of sustainable services based on open data has been extremely disappointing. In this paper, we study the development of services based on open data and means to make the data opening process more effective. In many cases, services are delivered through applications. We nevertheless use the generic term of services as "a set of deeds and acts performed by or on behalf of an agent for the benefit of a citizen, a business or another agent" as an extension of the definition provided in the Core Public Service Vocabulary[4].

2 Existing Approaches to Encourage the Creation of Services Based on Open Data

Existing open data initiatives are often accompanied to some extent of actions dedicated to facilitating the creation of services.

2.1 Intellectual Property Rights and Reuse Conditions

The Singapore open data platform[5] insists on having well documented IPR on each dataset, while the Europeana[6] initiative has set the Data Exchange Agreement which all data providers have to sign in order to have their data included in the platform. The Data Exchange Agreement specifies the release of all data (metadata in this case) transferred to Europeana with a CC0 license, i.e., the data is in the public domain. The stated objective of this policy is to ensure the lowest possible barrier to reuse and in particular that reusers will not have to address heterogeneous reuse conditions when reusing multiple datasets in conjunction. Nevertheless the enforcement of a single and so open license has created a number of issues with cultural heritage institutions which have invested large resources in the manual creation of these metadata for years. In France in particular, the legislation applicable to cultural heritage metadata was an obstacle; in 2013, the French Ministry of Culture and Communication has therefore launched a study to verify the actual financial revenue that sold cultural data were bringing so as to weigh these revenues in regard with the Open Data release potential.

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[4] Core Public Service Vocabulary 1.01, designed under the auspices of the ISA programme of the European Commission (Interoperability Solution for European Public Administrations), available at `http://goo.gl/cThwGX`

[5] Launched in June 2011, `http://data.gov.sg` brings together over 8600 datasets from 60 government ministries and agencies.

[6] `http://www.europeana.eu/`

2.2 Dataset Discoverability

In order to make datasets accessible, Open Data portals at regional, national and international level aggregate metadata on datasets. Many different vocabularies can be used to describe datasets, from VoID to POWDER, the Dublin Core Collection application profile or DDI (Foulonneau, 2012). The current heterogeneity of metadata is clearly an obstacle to their discovery (Martin et al., 2013). The harmonization of metadata, typically through such vocabularies as DCAT[7] can help the discovery of datasets.

2.3 Training and Support

Generally the release of open data is not sufficient to make them accessible and understandable by reusers. The European Network for Transparency Spending Accountability (ETNA) for instance which promotes a citizen's control over the expenditure of the public sector attempts to make financial information more understandable. Indeed reuse requires technical skills and extensive knowledge of the context of data that are beyond the reach of a large part of the population (Remiti, 2012). They therefore propose to simplify the presentation of the public accounts, open an API to exploit the well-organized data and develop applications, grounded in part on social networks.

In its report for the German Open Data platform (Klessmann & al., 2012), the Fraunhofer FOKUS institute advises the creation of a platform to support reusers and help them reuse the data.

In order to lower the technical barrier as well as the time required to develop a new service, certain data publishers create APIs. In France Logica has been appointed to develop an API that facilitates the development of services based on the open data sets of *data.gouv.fr*. In Singapore, an API provides access to the datasets recorded on the portal. Reusers therefore do not have to address format heterogeneity and the learning curve to reuse open datasets is steeper.

In May 2013, the White House ordered federal agencies to create public APIs that could be used by government and private developers to tap in to data. Furthermore, within Project Open Data[8], free, open source tools are released on Github to accelerate the adoption of open data practices by providing plug-and-play tools and best practices to help agencies improve the management and release of open data[9]. Anyone, from government agencies to private citizens to local governments and for-profit companies, can freely use and adapt these tools starting immediately (Cohen, 2013).

The World Bank platform is one of the few exceptions and provides various training services. It offers training material to help potential reusers how to get data and to represent data it into maps[10]. These first elements do not provide the

[7] http://www.w3.org/TR/vocab-dcat/

[8] http://project-open-data.github.io/

[9] For example, one tool released automatically converts simple spread-sheets and databases into APIs for easier consumption by developers.

[10] http://data.worldbank.org/node/2379

knowledge that may be required for a deeper use of data by advanced re-users data, but represent at least a basis. In addition they may be used for courses in secondary education and prepare students for a pervasive use of public data in the long term.

To acquire more knowledge, service developers can rely on initiatives from third parties, for example the Open Knowledge Foundation, which offers courses on open data[11]. For stakeholders who may not have extensive technical knowledge but wish to work on the data (e.g. data journalists), it founded a School of data in 2012[12]. At a further level, the Open Data Institute and the University of Southampton have developed an academic training focused on open data, including a module named "Consuming open data"[13].

2.4 Publicizing Datasets

When data producers publish new datasets, they have to make the datasets known to reusers to optimize the chances that reusers will take advantage of datasets. The French National Library for instance has established contacts with the semantic community to make new datasets known so as to facilitate the creation of new services. They publicize on virtual community channels the information and reach potential reusers for their data.bnf.fr datasets.

Many Open Data initiatives include competitions for service creations. Hackathons consist in locking developers, whether citizens, public sector employees, researchers, company programmers or any other interested party to create services in a short amount of times, typically 1 or 2 days. The development can be individual or the result of joint code developed on site. Europeana for instance organized several hackhatons. The Paris city in France has organized an open data competition[14] in collaboration with companies opening their data (e.g., JC Decaux which manages the bicycle service in Paris or the local transportation companies). Off-site competitions can also be organized, such as the *Veni, Vidi, Vici* competitions organized by the European LinkedUp project to encourage reuse of educational datasets. It is accompanied by monetary prizes (39.500€). Other types of competitions can be organized only for service ideas, such as the Global Service Jam[15] (not specific to data driven services). People compete in teams around the world to propose the best service idea/concept. It does not have to be accompanied by working code however but can be presented as prototypes, slides, videos, animations or any other means that can be uploaded on the Internet.

These actions show the variety of services that can be created based on open datasets. They are effective at raising the awareness of developers and service creators on the potential for reuse of the open datasets. They do not however contribute to the creation of sustainable services and most often services created in these contexts do not lead to the development of actual sustainable services.

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[11] http://okfn.org/training/
[12] http://schoolofdata.org/
[13] http://theodi.org/pg-certificate#module2
[14] http://www.paris.fr/mobilierurbain
[15] http://www.globalservicejam.org/

2.5 Ensuring the Creation of Sustainable Services

In order to ensure the creation of sustainable services however the Singapore government organizes co-funding of services. All the same, the European Commission co-funds the development of services to take advantage of geographic information coming from the Galileo satellite[16] and services that reuse open datasets (open access to scientific outcomes experimentation calls in ICT-PSP and services based on open geographic data).

2.6 Publicizing Services to Show Reuse and Encourage Service Usage

Most Open Data portals include a section to show services and applications that use the datasets. The App showroom suggested by the FOKUS report on the Berlin Open Data portal "Anwendungen"[17], the "Apps" section[18] on the data.gov.uk portal, the "Mobile Apps Gallery"[19] section on the data.gov portal, the "Application Showcase" on the Singapore portal[20], and the "Application showcase" section[21] of the World Bank data portal illustrate the systematic addition of a section dedicated to services.

2.7 The Selection of Datasets to Open

In order to identify the datasets to open, it is either possible to investigate which datasets are already available, whose IPR conditions would allow a publication under an open licence, and whose quality is sufficient. However recently Open data promoters are also investigating what citizens and potential reusers are interested in. The FOKUS study advises to launch a survey to collect potential reusers' opinion. In 2013 the French ministry of culture launched a survey for the selection of priority datasets for open data release.

3 Typology of Created Services

It can be difficult to monitor the services created based on open data sets. The World Bank for instance makes its datasets available only through APIs. It is therefore easier to monitor actual reuse of the data. However, most often open data catalogues list datasets that are available for download. The number of downloads can be monitored (Fig. 1). However the effective reuse of the data is more difficult to trace if reusers do not establish a direct contact with the data publishers.

[16] http://www.gsa.europa.eu/galileo-0
[17] http://daten.berlin.de/anwendungen
[18] http://data.gov.uk/apps
[19] http://apps.usa.gov/
[20] http://data.gov.sg/AppShowcase/AppList.aspx
[21] http://data.worldbank.org/developers/application-showcase

Fig. 1. Most popular datasets on the Paris Open Data portal[22]

Services created based on Open Data are listed on the UK Open Data portal as well as the Singapore Open Data portal. As of 2013, the data.gov.uk portal lists 301 apps and the Singapore open data portal around 110. On the UK portal in particular, the domains of the application include economy (e.g., Property prize , jobmarket), environment (e.g., Use of renewable energies), transparency (e.g., Availability of governmental financial data with the famous application « Where does my money go? »), society (Criminality map), local services (e.g., best surgery services next to me, postal code where I am, fuel station search), education (e.g., geological layers where I stand), and citizen life (e.g., elections results, « UK arms export licence browser »). On the Singaporean portal, available applications concern mainly navigation and mobility (traffic, maps), Tourism, Environment, Security (Emergency contacts points), Religion (places of worship), Business (Multiple listing of companies registred in Singapore) and open jobs in public administrations.

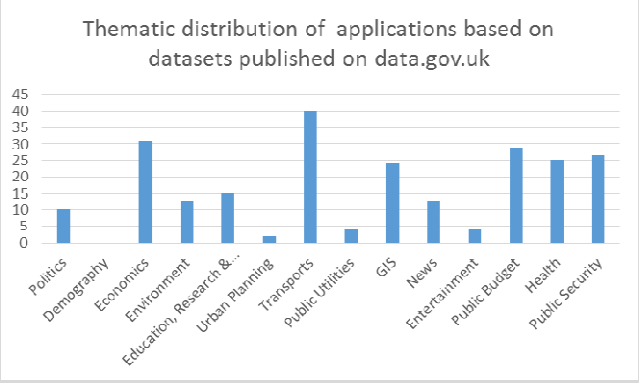

Fig. 2. Distribution of applications reusing open data sets on data.gov.uk

[22] http://opendata.paris.fr/opendata/

Fig. 2 illustrates the domain of the applications created based on datasets from the data.gov.uk portal, while Fig. 3 shows the distribution of the domains themselves. Although categories are not exactly similar, the comparison of both figures shows the discrepancy between the low number of geographic and transportation datasets and the very large proportion of transportation services. Although there is no direct equivalence between the domain of the dataset and the domain of the service that reuses it, this suggests the quite uneven potential of datasets for reuse. While transportation datasets appear to have a high reusability potential, education datasets attract less reusers in proportion of their quantity.

The domain is clearly not the only element to take into consideration when assessing the reusability of a dataset. Nevertheless it should be noted that data opening decisions only recently consulted potential reusers regarding the selection of datasets to open.

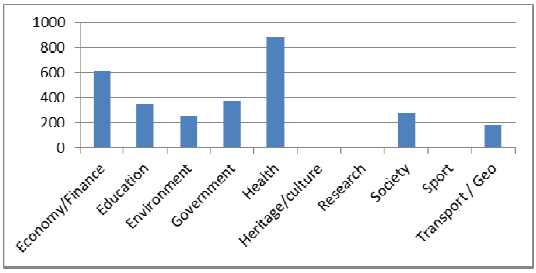

Fig. 3. Distribution of datasets by topic on the data.gov.uk portal

4 How Are Datasets Reused?

We investigated 106 UK applications and the way in which they reuse datasets. 78% (83) only reuse a single dataset. As an exception, Sketchmap.co.uk uses 19 datasets. The most reused datasets are Code-Point® Open and the National Public Transport Access Nodes (NaPTAN). However it should be noted that it is sometimes due to application clones. The first application providing information on postal codes being successful, clones have been created and reuse the same dataset. This also suggests that transportation datasets are indeed popular.

Overall, 80% of applications (184/231) are available for free. Others are most often sold for less than 1£. The most downloaded app available via GooglePlay is NHS direct app (medical diagnostic) with more than 100.000 downloads. This application was however created by the same administration which released the data.

In (Martin et al., 2013), we showed the distribution of the formats of open data. A study of visualization applications for open data shows that in most cases the RDF serialization is not used (Atemezing, 2013). Although the popular NaPTAN dataset is available in RDF among other formats, it is impossible to know which format was reused.

5 Evaluation of Open Data Initiatives

The success of open data should be evaluated also according to the usage, audience, and uniqueness of the services, according to the changes it has entailed in the public institutions that have opened their data (e.g., improved data management, increase information sharing culture), the business opportunities it has created, the citizen and business perception of the city (open data as a communication tool on how modern a city or country is), the modification to particular markets it has entailed (e.g., make available traffic data not only to big players such as Google who have their own large scale data collection mechanism but also to smaller players who cannot afford the entry barrier on the market raised by the use of a massive crowdsourcing approach (e.g., NL, ref Stijn) or on the opposite the capitation of all the learners around large institution with widely established reputations, leaving them a large advance on the marketable data (usage data of MooCs sold to recruiters for instance and paid certificates) with which smaller players will never be able to catch up), or the sustainability of the services created, or even the new dialog created with citizens (e.g., open legislation process in the UK).

6 Conclusion

Existing studies suggest that reusers are not really interested in open datasets. It is clearly not a demand driven initiative but rather an initiative of data providers who assume to a large extent and hope for a possible impact particularly in terms of service creation. The inadequacy between the datasets released and the services actually created as well as between the claims of huge potential service creations and the low demand from service creators, particularly companies raise questions. Are reusers aware of the potential reuse of datasets or do not they really need them? Is there an adequacy between the datasets that are of interest to reusers and the datasets actually opened? Can we measure the potential for reuse of particular datasets? Which are the obstacles to reuse?

Generally is the potential impact of open data in terms of service creation really inflated or are there obstacles to data reuse that have not been sufficiently addressed?

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A Classification Framework of Value Co-creation in Electronic and Mobile Services

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Abstract. The concept of value co-creation provides a new perspective in the research and the operation of service systems. In the literature we can find plethora of references to the significance of value co-creation and the disruptive impact it may have on research, the business practices and the social life. However, we still lack comprehensive frameworks of value co-creation that would help understanding deeply and in a systematic way the characteristics, the dimensions, the methods and the implications of value co-creation. This paper makes a step in this direction by presenting a classification framework for value co-creation in electronic and mobile services. The proposed framework is developed in three dimensions referring to the leading actor in the co-creation process, the domain of activities for value co-creation and the scale of customer participation and proposes ten types of value co-creation activities.

Keywords: value co-creation, service systems, e-services, mobile services, service science.

1 Introduction

The concept of value co-creation refers in general to the active participation of the customer in a variety of activities performed with the support of the service provider, in order to create value collaboratively. The concept of value co-creation has added new dimensions in the research in many fields and it plays today an increasingly important role in science. In information systems, in particular, 'service science' was emerged as a movement for the scientific study of service systems that would challenge and boost service innovations [8]. Service systems are envisioned as a "dynamic value co-creation configuration of resources, including people, organizations, shared information, and technology" [44]. Value co-creation is assumed to be "the primary object of study in service systems" [45]; service science is seen as "the systematic search for principles and approaches that can help understand and improve all kinds of value co-creation" [45], boiled down to "the study of value-co-creation phenomena" [45]. In a similar way, in marketing value co-creation is not

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anymore restricted to business-to-business collaboration, but it includes also the end user/ consumer [33, 38]. Hence, value co-creation rebalances the focus of interest from the conventional business-oriented approaches (e.g. the unidirectional flow of goods and value from producers to consumers by adjusting, for instance, the marketing mix) to customer-oriented ones (e.g. collaboration with the customer in the different phases of the product life cycle, emphasis on complete solutions for the customer, etc.), reflecting the contemporary spirit of marketing as an 'open' value creation and dissemination procedure [43].

Technology is a key enabler of value co-creation, as it is a typical kind of 'operant resource' [46]. Information technology, especially, is very critical for the development of service systems, as services are information intensive and, therefore, prone to digitalization and electronic provision [42], customization, personalization and aggregation [3]. The Internet, Web platforms and mobile applications provide a basis for collaboration and value co-creation with the customer/ user. Many recent technological trends, quite often summarized under the term 'Web 2.0', are related to the customer/ user empowerment, engagement and participation in the different phases of the production processes and in the creation of value. The European Internet Foundation [12] proposed 'mass collaboration' as the key activity that will potentially shape the world by 2025.

Today there are numerous Web applications and business models that are based on the customer participation and contribution in the development of software or content, the sharing of resources, the initiation of new projects, etc. Mobile technologies and applications are seen today as the most fast-forward segment of Information and Communication Technologies (ICT). Mobile services are characterized by increased personalization (as mobile applications are usually personal) and context awareness. Both these characteristics are important in value co-creation, rendering mobile services a fertile ground for value co-creation.

By preserving a primary role for the customer, value co-creation provides a very challenging concept for the development of innovative applications and business models, especially in the era of thriving of social networks, mobile services and other user-oriented technologies. In the literature we can find plethora of references to the significance of value co-creation and the disruptive impact it may evoke on the technological progress, the business practices and the social life in general.

However, value co-creation is a multifaceted concept that encompasses many different aspects of customer participation, directly or indirectly. Hence, different people tend to attach to value co-creation (very) different meanings, which contribute to the complexity and sometimes the vagueness of the term and may cast doubt on its potential to redefine the role of the customer and introduce new business and social models. Gronroos [14] points out the metaphorical use of the term in many cases, aiming to emphasize the importance of the customers in the value creation process. But he [14] warns that sometimes, when a term becomes too broad and tends to be used to describe or explain almost everything, it runs the risk of becoming empty of meaning. Others have also pointed out the difficulties in the analysis of value co-creation [35] and the need for further study requires further study [45].

The rational for this paper comes from the limited understanding and the lack of methods for the analysis of value co-creation processes. In particular, we still lack comprehensive frameworks of value co-creation that would help understanding deeply and in a systematic way the characteristics, the dimensions, the methods and the implications of value co-creation. The paper aims to make a step in this direction by providing a framework for value co-creation that emphasizes on electronic and mobile services. The proposed framework distinguishes the key types of value co-creation, the key roles of actors and the potential for collaboration. Electronic and mobile services and applications are used to explain the types of value co-creation.

The rest of the paper is structured as such: in section 2 we review the literature to analyse the concept and the characteristics of value co-creation and the basic ways with which it is manifested; in addition we review the characteristics of value co-creation in ICT, in e-services and mobile services and applications. Based on the review of the literature, we propose in section 3 a framework for value co-creation in electronic and mobile services and we analyze the types of value co-creation. In section 4 we provide examples of electronic and mobile services and application to clarify some aspects of the proposed framework. The paper finishes with the insights and implications of the research, the conclusions and directions for future research.

2 Literature Review

2.1 The Concept of Value Co-creation

Value co-creation is extensively studied in the service marketing and management literature. A major contribution in the discussion of value co-creation comes from the Service Dominant (S-D) logic [46, 47, 48], which is assumed to provide also the theoretical foundations for the study of service systems [45]. In S-D Logic value co-creation is ‘a positive condition’, as value is manifested as ‘value in use’ and ‘value in context’ that is always co-created in collaborative networks between the customer and other economic and social actors. In particular, the value is not created until the customer integrates and applies the resources of the provider(s) with other proprietary resources that exist in his/her context. Thus, value is uniquely co-created at a given place and time and is ‘phenomenologically’ determined by the customer [48], based on prevailing circumstances and the existing resources and capabilities.

S-D logic views the customer not as a buyer of output with embedded value, created by the firm, but as an integrator of inputs/ resources provided by the firm, together with other proprietary (knowledge and skills) and external resources to create value. Firms cannot create and deliver value by themselves, but they can only make value propositions and provide service as input to the value co-creation process; if the proposition is accepted, value is co-created, in concert with the customer and possibly other economic and social actors. In S-D logic, all economic and social actors are resource integrators and the distinction between the producer and the consumer is void. The role of the customer in value co-creation is fundamental and it is performed by providing his/her resources (e.g. knowledge and skills), integrating resources or simply providing the context for the creation of value.

From a practical point of view, it is possible to develop services with various levels of customer input and participation. Meuter & Bitner [32] suggest that the degree of user involvement in co-production of services can be aligned on a continuum between firm production, joint production and customer production. In a similar way, Gronroos [14] suggests that value co-creation exists only in the joint activities between the customer and the provider, while both the customer and the provider can also follow their own value creation processes.

In general, the value co-creation processes can be characterized by a variety of factors, such as the identity of the customer (e.g. business, individual, group, etc.), the roles of the provider and the customer (e.g. initiator, contributor, process director, etc.) and the activities the customer performs (e.g. production, design, refinement, finishing, selection, feedback, etc.), the kind of value/ benefit created (e.g. economic or social value, personalization, complete solution, etc.), allocation and the recipient of value (e.g. self, another, the provider or the society), the ways of interaction (e.g. face-to-face, technology-mediated, etc.), the motivation of participation, etc.

In the literature we can distinguish the following key ways of participation and collaboration with the customer for the co-creation of value: co-production, open innovation, customization, personalization and integration. Each of these ways has certain attributes that make it suitable to certain processes, situations and value co-creation goals, while they are inappropriate for others.

Co-production refers in general to the participation of the customer in some phase(s) of the production process as 'partial employee' [6] or 'partial marketer' [16] for the execution of some tasks related usually to the design, the production of the core offering, the assembly, the finishing, the transaction, the delivery or the consumption. Hence, co-production is related to the direct contribution of labor by the customer [30, 37], such as in self-service operations. Besides, co-production emanates a producer-oriented view of customer involvement [35]. In S-D logic, value co-creation and co-production are related in a nested scheme, with the latter being defined as a way of value co-creation, in which "the customer participates directly in the firm's production process somehow" [47]; in addition, co-creation refers mostly to the usage/consumption stage, while co-production refers to the production process. Co-production is largely supported by ICT [32], such as ATMs, web platforms or other online and mobile applications that permit and enable the customer to execute some steps of the production and transaction processes.

In new product development, co-creation is related to co-innovation or open innovation. Open innovation [7] is based on the assumption that innovation can derive from the combination of internal and external ideas and resources; it refers, hence, to opening up the innovation process to customers, communities of users and partner companies. A good reason to do it is the acknowledgement that customers know more than the producer about their needs, their context, their constraints and their desired outcomes. 'Lead customers/users' [19] especially can envision uses and needs and help co-designing ways to support in attaining their needs. The degree of 'openness' of the innovation process can range from totally open to totally closed [20].

Individualized marketing refers to adjusting a product/ service prototype or even re-designing it to bring it closer to the preferences and needs of the customer. With

regard to the role of the customer in these activities and value co-creation, we can distinguish the concepts for customization and personalization. Customization allows tailoring a standardized business offering and making a 'custom' version of it that fits better to the customer on an individual basis [26]. Customization is related in most cases to providing a (short) list of choices to the customer and allowing him/her making his/her choices accordingly. In other words, it can be seen as 'a la carte' selection [10]. In the literature the term 'mass customisation' is widely used and it can reveal better the character of this function. Customization is mostly related to (tangible) products and to manufacturing processes, whereas customization in services is studied only marginally. Kannan and Healey [21] explain that in services the customer participates always in the value creation process to develop an individualized offering.

Personalisation aims to allow modifying and adapting an offering by adding or enhancing or altering its features to meet better the customer needs. The relationship between personalisation and customization is widely discussed in the literature, not always leading to consensus. Prahalad and Ramaswamy [39] consider customization as provider-guided procedure, with the provider designing an offering in a way to fit after some adaptation to a variety of customer preferences, while in personalization the key role goes to the customer, who designs, forms and co-creates an offering that meets his/her preferences; the difference, in other words, is between selecting from a wide range of options and creating your product or service. Kumar [27] suggests that personalization fits better to services and e-business processes.

Integration refers to the combination of inputs and resources from various origins for the creation of (enhanced) value. Integration is necessary because of the complexity of needs, which cannot be met by atomic resources elements and simple services. All economic activities are based on the integration of resources, competencies skills and specialisations. In S-D logic [48], all economic actors, including the customer, are resource integrators. Hence, the customer is not a buyer or consumer, but an integrator of inputs to co-create value. The inputs in the value co-creation process may originate from firms, peers and other stakeholder, as well as they can be self-contribution of the customer himself (e.g. personal skills, possesses resources, etc.). In many cases resource integration takes place in networks, such as 'value constellations' [33] and 'value networks' [30].

2.2 Value Co-creation in Electronic and Mobile Services

ICT has great effect on the integration of resources and the opportunities for value co-creation. First of all, in electronic services value is indeed manifested as 'value in use', as a part of the interaction with the service provider and the technological media used, according to the intentions and the skills of the customer. Normann and Ramirez [33] proposed the term 'density of value' to describe the potential of products and services for value creation. The density of value depends of the information and knowledge capacity that exists about the additional uses the product may has, the capacity for integration with other resources and the possibility for the creation of added value. With ICT, the density of value of all products, especially the digital and

digitized ones, increases, creating more opportunities for value co-creation. Mashups, for instance, is a good example of the increased density of value of digital resources and the added value they may provide.

ICT affects also significantly the opportunity for customer participation in value creation processes. The Internet, the Web and especially certain technologies and applications related to the Web 2.0 (social media, social software/ computing, etc.) provide several new ways of interaction with the providers, peers and other stakeholders. Social media allow the creation and exchange of user generated content, defined as the sum of all ways in which people make use of social media [23]. The social media landscape includes social networks (generic or specialized), content development communities, media sharing sites, blogs and micro-blogs, social news sites, social bookmarking sites, real-time and presence aware sites, virtual game worlds and virtual social worlds. Social computing empowers individual users with relatively low technological sophistication in using the Web to manifest their creativity in the development of content, to engage in social interaction, contribute in social projects, share content, disseminate information and collaborate in building new applications [34].

Kasper, Koleva and Kett [24] defined five types of social media activities for companies that reflect on the opportunities for customer participation and value co-creation: content development, interaction/ dialog with the customers, listening to the customers, application development (for the customers and potentially by the customers) and networking for maintaining relationships with the customers and stakeholders. Kietzmann et al. [26] describe seven types of attributes of social media that represent specific aspects of the user experience: identity, conversations, sharing, presence (related to the situation and location of the user), relationships, reputation and groups (communities). Linders [28] provides a typology for citizen co-production patterns in social media; the co-production types derive the key roles of the actors on the one dimension (provider and beneficiary) and the stages of service delivery on the other (planning and design, execution, monitoring and evaluation).

Mobile technologies and applications are today at the crest of technological progress; besides they exercise great impact on the social practices. As a result, many of the Web-based applications acquire mobile characteristics and are offered as mobile services and applications, i.e. services and applications that can be accessed and used with mobile technologies and with a mobile appliance. For example, we speak for mobile software computing [29], mobile social media [22], etc. Notice, however, that mobile technologies are not simply an alternative to other physical and online services, but they provide new types of value, new ways for value configuration and the potential for more added value [3]. For example, Verkasalo [49] argue that mobile services provide more value when people are commuting.

The key advantages of mobile services (and their differentiation factors from other e-services and physical services) are often summarized in: ubiquity, localization, personalization, contextualization [17, 29]. In mobile services value is also created as 'value in use', such as with electronic services. Moreover, the use –and consequently value– is manifested in a specific situation in a contextual and idiosyncratic way, that is adapting to environmental conditions and personal traits and preferences.

The idiosyncratic character of mobile services stems largely from the individual use of mobile appliances (i.e. mobile phones are strictly personal and the common use with others is usually avoided). Accordingly, mobile services can be personalized to individual customers and adjusted to user-specific circumstances. In many cases mobile services are provided based on the profile of the user [50]. In mobile applications the centre of the interaction is always the user; user interactions can be focused on the content (user-content), other users (user-user) or content and other users simultaneously (user-user-content [9]. In addition, mobile services can serve the requirements for 'situation dependent services', that is services that significantly depend on the customer's situation and his/ her individual needs [1].

Cortimiglia, Renga and Rangone [9] propose a classification that contains five categories: dynamic content applications, social content applications, social network applications, social matching applications, and social communication applications; the distinction between these application types is not clear-cut, as they tend to mix and share characteristics. Heinonen and Pura [17] suggest that mobile services are formed by the consumption setting, the context, the social setting and the relationship.

2.3 Related Work

In the literature we can find some other related work for the classification of certain aspects of value co-creation. For instance, Roser et al. [40] suggest a 'co-creation family of concepts' that include open innovation, mass customisation, user-generated content, co-production, mass-collaboration and collaborative innovation. Frow el al. [13] describe different types of value co-creation, such as co-conception of idea, co-design, co-production, co-promotion, co-pricing, co-distribution, co-consumption, co- maintenance, co-disposal, co-outsourcing, co-creation of meaning, and co-experiencing. Piller, Ihl and Vossen [36] suggest a typology of methods of co-creation, with an emphasis on open innovation with customers, that is based on three dimensions, addressing the customers' autonomy in the process, the nature of the firm-customer collaboration (dyadic versus community based), and the stage of the innovation process. Related work for the classification of operant and operand resources is provided by Arnould et al. [2], who focus on the consumers, and Baron and Warnaby [5], who focus on organizations.

3 A Proposed Classification Framework of Value Co-creation in Electronic and Mobile Services

It this section we propose a classification framework for value co-creation in electronic and mobile services/applications. The conceptualization of the framework derives from the review of the literature on value co-creation in general and in particular on value co-creation in electronic and mobile services and applications, as it was presented in the previous section. The proposed framework is depicted in fig. 1.

3.1 The Structure of the Framework

The proposed classification framework of value co-creation in electronic and mobile services is developed along three axes:

- The leading partner in the value co-creation process.
- The domain of the value co-creation.
- The scale of user participation.

Value co-creation is about the collaboration of the customer and the provider in the creation of value. The initiative for this, as well as the effort required, is not usually equally balanced between these two actors. Moreover, certain types of co-creation or certain practices are inclining towards the one of the two actors. For instance, as presented in the previous section, co-production and customization are supposed to be producer-oriented processes, while personalization is regarded as customer-oriented; open innovation and integration can be either provider-oriented or customer-oriented, according to the specific environment in which they take place. For this, we suggest that a classification framework is necessary to take into account who has the leading role in the process and distinguish between provider-oriented or customer-oriented value co-creation processes.

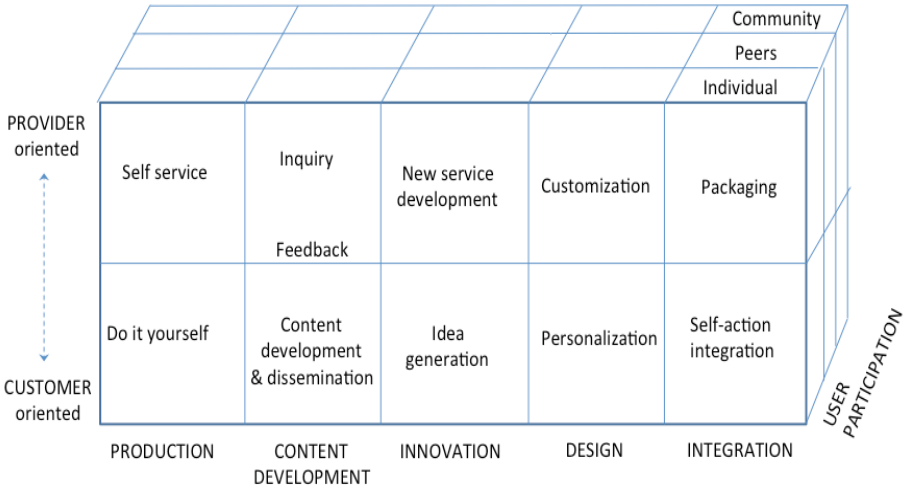

Fig. 1. A Proposed Classification Framework of Value Co-Creation in Electronic and Mobile Services

Value co-creation can refer to different domains of activities. The proposed classification framework includes five domains of value co-creation activities:

- Co-production
- Content co-development
- Co-innovation
- Co-design
- Integration

Co-production is the execution of some tasks by the customer, who substitutes, complements or enhances the service provider in the service production and delivery processes. It usually occurs with the provider offering a platform for collaboration and the customer participating and contributing -either voluntarily or necessarily- in order to achieve personal objectives, support the provider in the execution of his tasks or improve the characteristics of the service.

Content co-development refers to certain activities related to the production and dissemination of content. One can argue that content it the outcome of some kind of co-production process; however, the uniqueness of its nature and its pre-dominance in electronic services and especially social media applications suggest including content as a separate domain of value co-creation. This will give us the chance to study content development as a separate domain of value co-creation activities, to analyze its underlying attributes and discern its differences from value co-creation in other domains.

Co-innovation refers to the activities performed for the development of a new service or application, or the improvement or enhancement of existing ones with new features; such activities move beyond the regular/ core product development processes and they may cover all the phases of the product life-cycle, from idea generation, to design, to marketing and after sales services.

Co-design refers to making decisions for the features of a service or application in order to bring it closer to the customer's preferences and needs. The customer sets the (new) requirements of the service or application and the provider adjusts it. So, in co-design the customer does not participate in the production process, which remains the job of the provider.

Integration refers to the aggregation of services and applications, either from the same or from different providers, and their functional integration in a new service composition or a service sequence. Service integration becomes necessary because of the complexity of customer's needs, that cannot be met frequently by simple, atomic services.

The third axis refers to the scaling of customer participation in the value co-creation processes. On the one hand, we can have binary relationships between one customer and one provider; on the other hand, we can have multilateral relationships with more than one customers and providers that form and participate in value networks or service ecosystems. The proposed framework reflects the possibility to have many customers participating in the value co-creation process. We distinguish between one-to-one relationships with the provider and one-to-many relationships; in the latter case we can have 'peers' (only) participating in a small scale and 'familiar' value co-creation process, as well as the wider community participating in a large scale and open value co-creation process. In all cases it is supposed that one or many providers can participate.

3.2 Types of Value Co-creation

The framework results in the following types of value co-creation, which derive from the two basic dimensions, the identity of the leading partner in the value co-creation

process and the domain of the value co-creation activity; the third axis, peers and community participation, provides depth in the framework, but does not change in the first place the types of value co-creation.

In *co-production* we have two types of value co-creation: 'self-service' (provider-oriented) and 'do-it-yourself' (customer-oriented).

- In *self-service* the customer executes some activities/ tasks that are normally performed by the supplier, without much freedom to deviate from the procedure and redesign the activities or the outcome. An example of self-service is the web/ mobile banking or the e-government services, in which the customer operates in a strictly pre-defined environment and follows specific instructions in order to receive specific services.
- In *do-it-yourself*, on the contrary, the customer receives input from the provider and he/she transforms it into a valuable outcome, according to his/her preferences and needs. In e-commerce, for instance, the customer receives information and he is free to choose, revise and receive electronic services according to his preferences and needs. The customer receives the platform/ infrastructure, as well information and incentives, but operates then according to his/her judgment.

In *content co-development* we have 'inquiry' (provider-oriented) and 'content development and sharing' (customer-oriented); 'feedback' can be included here as a third, intermediate type, that can be either customer-oriented or provider-oriented, according to the way it is performed.

- *Inquiry* is a customer-initiated activity, in which the provider responds to the customer request by offering specific content or service. Hence, even if the customer initiates the process, the provider is the key performer. Submitting an inquiry e-form to receive back a service or transmitting the customer's location in a location-aware service/ application are examples of this type of value co-creation.
- *Content development and sharing* refers to the activities of the customer for the development, adaptation, dissemination and sharing of content; it takes place after the initiative of the customer and it is usually a creative process. Participation in social media, such as social networks, forums, wikis and blogs are typical examples of this type of value co-creation. Notice that content development and sharing are taken here together, however they are not necessarily combined (e.g. content development for personal use or sharing without previous personal development effort).
- *Feedback* is an activity of the customer, who expresses opinion and judgment for a service received. Feedback can be customer-oriented, when the customer is free to express his/her opinion in a free style, such as in review and recommendation systems. On the contrary, feedback is provider-oriented when the customer is asked to answer specific questions set by the provider, such as in rating systems. The type of feedback is important to understand that it is usually the exact setting that makes a type of activity customer-oriented or provider-oriented, rather than absolute, pre-defined criteria.

In *co-innovation* we have two types of value co-creation: 'new service development' (provider-oriented) and 'idea generation' (customer-oriented).

- In *new service development* the customer participates in certain phases of the development process, such as testing a prototype (e.g. beta testing), contributing to the production process (e.g. in software development communities) or in marketing activities (e.g. in co-branding). These activities are developed in a platform or in general a setting created by the provider and the customer is required to follow certain guidelines and rules.
- In *idea generation* the customer uses a platform for the expression of his/her ideas, imagination, creativity regarding new products, new features, new processes and new uses or the improvement of existing ones. It is not only that the customer operates in a more flexible environment, but most of all he/she provides the input.

In the *co-design* of a service's features through an adaptation and modification process, we distinguish between 'customization' (provider-oriented) and 'personalization' (customer-oriented).

- In *customization* the provider offers a standardized, but modularized service that can be modified in a small range of its features. Hence, the customer is free to adjust some limited aspects of the service (the ones decided by the provider) to bring it closer to his/her preferences. A typical example of customization is the configuration of certain applications and services to the user profile or the uses and preferences of the customer. Here the user has to select from a pre-defined list of alternatives the one that is better for him/her.
- In *personalization*, on the contrary, the customer is quite free to design a new service that meets his/her preferences and needs by modifying even the core attributes of the service in certain cases. The use of APIs that modify the attributes, the execution or the delivery of the service into the personal choices of the user is an example of personalization.

In *integration* we distinguish between 'packaging' (provider-oriented) and 'self-acting integration' (customer-oriented).

- In *packaging* the integration of services is decided by the provider, who proposes comprehensive solutions, that include many separate service elements. In software applications and services the provider may offer some alternative packages of solutions, which include different features and complementary options.
- In *self-acting integration* the customer decides for the services that will compose the offering, sometimes by collecting inputs from a network of providers and other stakeholders, and he/she may also add proprietary inputs (resources, knowledge, skills, etc.) and perform supplementary tasks for the composition of the final service. In software applications and services, the user may collect and combine services from different providers to develop particular solutions that meet unique needs.

4 Insights and Research Implications

The classification framework for electronic and mobile services suggests that ICT can be used to support all the spectrum of value co-creation activities, beyond the software and content development activities. ICT, hence, serves as an enabling technology and operant resource for value co-creation. We can see also that in parallel to the typical value co-creation activities of the physical world we can have value co-creation activities that take place with the use of electronic and mobile services. For instance, with regard to co-production, self-service and do-it-yourself are typical value co-creation activities of the physical world, but they refer also to value co-creation with the use of electronic and mobile services. In addition, many value co-creation activities in the physical world are supported, enabled and implemented with the use of electronic and mobile services. For instance, with regard to integration, a travel agent can propose a full vacation package (transportation, accommodation, food services, entertainment services, etc.) or the customer may receive information, decide, perform (make exchanges) and coordinate all the activities by himself.

We can also infer that the use of electronic and mobile services is always related to value co-creation. It is not just that value co-creation is assumed to be a normative phenomenon, as Vargo and Lusch [48] argue. Moreover, it is that in electronic services we have always interaction between the customer and the service provider, either as a company or simply as a platform, as suggested by Gronroos [14]. In the setting of automated processes, moreover, the initiating as well as the primary role in the interaction with the electronic platform is assigned to the customer. Based on this, one could argue that the benefit/ value provided to the customer of electronic and mobile services is the opportunity for value co-creation.

The proposed framework helps to understand better the characteristic and the differences of the one type of value co-creation from the other, which otherwise may seem vague or even confusing. First of all, some business models tend to combine more than one types of value co-creation, making it a multifaceted process; Trip Advisor, for instance, supports inquiry, feedback and content development/ sharing, while value co-creation takes place in a do-it-yourself style supporting also self-acting integration of services. In addition, some business models may provide different options for value co-creation activities. For instance, some companies may allow their customers to adapt the services to their preferences, either by choosing from the existing patterns and modifying them partially (customization), or by developing their own design patterns (personalization) to produce personalized outcomes. Similar services can be related to different value co-creation activities along all the three axes. For instance, different business models for open innovation and crowdsourcing platforms may emphasize on ‘idea generation’, ‘new service development’, ‘content development and dissemination’, ‘do-it-yourself’, etc.

5 Conclusions

Value co-creation provides a very challenging concept for the development of innovative applications and business models, especially in the era of thriving of social networks, mobile services and other user-oriented technologies. The paper proposes a framework for value co-creation in electronic and mobile services that can help better understanding what value co-creation is, how to implement it and how to engage the customer in value co-creation processes in different situations and for different purposes. The proposed framework can serve also as an orientation map for the companies that intend to develop value co-creation practices or they want to expand or alter the existing ones. For instance, companies could move from provider-oriented to customer-oriented value co-creation practices or move to the one to another domain of value co-creation. The framework can be used also for the analysis of existing services and value co-creation processes, the understanding of the way the customer is engaged and the recognition of the reasons they succeed or fail.

The proposed framework is based on the finding of the review of the literature; it is developed in a structured approach, along three axes referring to the leading role in the value co-creation process, the number of participants and the domain of value co-creation; previous similar works do not follow a similar methodology. In addition, similar works in electronic and mobile services focus on their general characteristics and they overlook the issue of value co-creation.

Future research should validate in a systematic way the proposed classification framework. The identification and mapping of specific value co-creation practices as examples and case studies should explain better the characteristics of the types of value co-creation and their relationship and will allow the development of specific value co-creation practices that are suitable for each value co-creation type. Future work could also provide a methodology for relating value co-creation types to specific circumstances and goals.

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Transition and Delivery Challenges of Retained Organizations in IT Outsourcing

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Abstract. Outsourcing their IT is a difficult endeavor for many enterprises. Remaining IT organizations often face a multitude of challenges but lack the necessary capabilities for managing the outsourced services. In this paper, we provide rankings of these challenges with regard to the implementation of retained organizations and their daily business. While the most critical issues arise at the interface with the service provider, the interfaces with the own business units are problematic as well. Our findings reveal that particularly the early involvement of the own business units and the development of sufficient awareness of upcoming changes are key success factors. Our research is based on the results of an extensive explorative study. With our work, we lay the basis for a better understanding of the transition challenges of retained organizations and, thus, a mature implementation and operation of these.

Keywords: IT Outsourcing, Retained Organization, IT Organization, Outsourcing Relationship, Service Management, Transition.

1 Introduction

IT Outsourcing has become an established business model and should reach a world wide volume of $288 billion in 2013 [1]. Despite all efforts, it is still a challenging business and many outsourcing clients have difficulties in managing its various aspects [2]. Particularly, the ongoing management of service providers is a key challenge [3]. Accordingly, Tramacere [4] recommends outsourcing clients to focus on improving provider management.

During the outsourcing project, client and provider form a service system. Once the delivery responsibilities have been transferred to a service provider, the "retained organization" – the parts of the client's former IT department that are not outsourced [5] – performs the provider management. Forming the key interface with the provider, its role shifts from a delivering to a managing one [6]. Although academic literature has analyzed capabilities needed for the management of IT (e.g., [5–6]), retained organizations often lack the necessary ones [7]. Urbach and Würz [8] argue that further research regarding the implementation of retained organizations is needed.

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In order to identify insufficiently built capabilities and, thus, ensure outsourcing success, the understanding of the specific challenges of retained organizations is of great importance. Our literature review, however, revealed that research regarding these challenges is still sparse and a clear and comprehensive understanding of these does not exist. This knowledge, however, would provide a solid basis for a mature implementation and operation of retained organizations [9]. Further research is needed to obtain meaningful insights into this important topic.

The contribution of our work is twofold: We provide rankings of the challenges in two lifecycle phases of retained organizations, namely transition and delivery. We will learn that the most critical issues arise at the interface with the service provider. However, the retained organization's interfaces with the own business units are highly problematic, too. In addition, we test three hypotheses that are derived from a number of expert interviews: We examine how (1) the clients' awareness of upcoming changes, (2) their sufficient technical expertise, and (3) the involvement of their business units do impact the problems of retained organizations and whether they are, indeed, success factors. Our analysis reveals that especially clients who sufficiently involve their business units and who develop a high awareness of upcoming changes achieve significantly better results. That way, we provide important insights for outsourcing clients and identify research problems to be addressed in the future.

Our research is based on the results of an extensive explorative study. It consists of a preliminary literature review, a qualitative study followed and a principal quantitative study. We had the opportunity to conduct this study in cooperation with a major IT outsourcing provider. All participants of our study are working in key roles of the provider-side interfaces and have long-standing experience with IT outsourcing for a variety of clients. All results gathered are based on their insights and broad knowledge. We are convinced that these IT outsourcing experts are best qualified to state the most important and typical challenges of retained organizations.

The following section gives an overview about retained organizations and the key literature covering them. Next, we describe our research methodology and discuss the research sample and data examined, before we present the key findings of our quantitative study and statistically test hypotheses. Finally, we conclude the paper discussing key findings, limitations and topics for future research.

2 The Retained Organization

In the context of an outsourcing project, the retained organization forms the key interface between client and provider. It consists of those parts of the former IT department that are not outsourced [5]. Naturally, the role and responsibilities of this organizational unit fundamentally differ from the former ones: The focus shifts from the delivery to the management of IT services (see Fig. 1) [10].

The key responsibilities of retained organizations are to manage and govern the outsourcing project. This includes the management of the provider as well as the demand of the own business units. Regarding the governance of the outsourcing project, retained organizations are responsible for the outsourcing relationship, the mitigation of risks and the continuous alignment of business and IT [5][6][10].

Many contributions to the ongoing discussion regarding the client's outsourcing organization are based on Willcocks et al. [7]. In their work, the authors describe a framework of core IT capabilities needed to successfully govern and manage IT. It has repeatedly been tested in research and applied to retained organizations (e.g., [6][10]). Originating from this framework, research defined the organizational design of retained organizations and their interactions with the provider and business units.

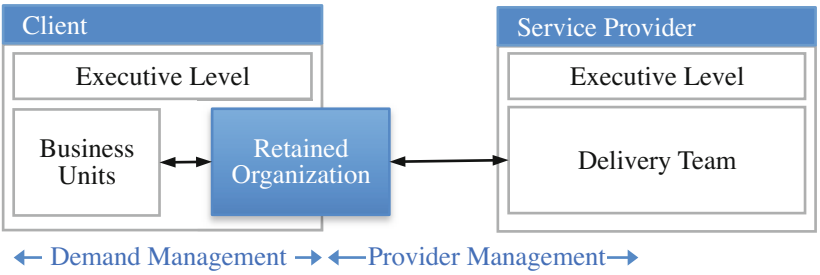

Fig. 1. The basic role of retained organizations (based on Gewald and Helbig [10])

Gewald and Helbig [10] propose a governance model for managing outsourcing partnerships. Their framework establishes key relationships on the strategic, functional and operational level. Literature also describes the organizational structures of retained organizations as well as its basic processes and roles (e.g., [10–12]). In particular, Urbach and Würz [8] propose a comprehensive management framework for steering outsourcing providers.

2.1 Lifecycle Phases of Retained Organizations

An outsourcing project can be split into five distinct phases that as a whole are referred to as the outsourcing lifecycle (e.g., [12–14]): pre-deal, contractual, transition, delivery and exit phase. In terms of retained organizations, we distinguish the following four phases that overlap with the phases of the outsourcing lifecycle: design, transition, delivery and exit (see Fig. 2).

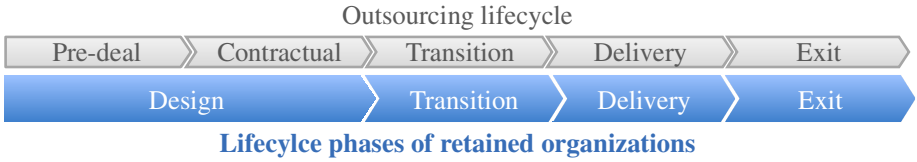

Fig. 2. The lifecycle phases of retained organizations

According to Cullen et al. [13] as well as our interviews, the design of retained organizations is usually shaped both during the pre-deal as well as the contractual phase. Therefore, in our study, we combine these two phases to a single design phase. During this phase, outsourcing clients define the organizational design of their

retained organization. Within the transition phase, clients execute the plans made during the design phase. They implement structures, communicate changes and prepare their employees for the new situation. When the transition is completed, the outsourcing project enters the delivery phase and the retained organization takes over the main responsibility for the outsourcing project on the client side managing it according to the outsourcing contract. When the outsourcing relationship ends, the retained organization is dissolved in the exit phase or – if the outsourcing deal is continued with a different provider – is re-designed in another design phase [12–14].

3 Research Methodology

In the remainder of this chapter, we outline the research approach followed. We carried out an explorative study to gain a better understanding of the challenges of retained organizations. Our staged research approach consisted of a comprehensive literature review, a preliminary qualitative and a principal quantitative study.

In this paper, we investigate challenges of retained organizations. Our quantitative study assessed these in retrospect asking our participants which challenges posed problems to the client. Hence, we use the words problem and challenge quasi-synonymously when talking about the same things from different perspectives.

3.1 Literature Review Regarding Challenges of Retained Organizations

An initial literature review revealed that no comprehensive view regarding challenges of retained organizations does exist. Based on existing literature on related topics such as IT outsourcing, organization design and IT transformation, we derived an initial set of challenges for our study. Our literature review followed the methodology proposed by Webster and Watson [15] along with an extensive forward and backward search without temporal restriction.[1] This initial search discovered about 160 papers. In an abstract based examination, we identified those papers that specifically deal with challenges, problems and risk. We further reviewed these papers in a careful perusal selecting papers that promised insights into our research topics. Finally, we selected 25 papers as a basis for the ex ante definition of challenges.

In a grounded coding analysis that followed the approach introduced by Jerayaj et al. [16], we systematically extracted relevant challenges from the 25 papers. The initial list consisted of 52 individual challenges. This initial set of challenges was the basis for the subsequent qualitative study.

3.2 Qualitative Study

In the qualitative study, we ran a series of in-depth interviews with a group of experts. The qualitative study pursued two main goals: validating and refining our list of

[1] We used Google Scholar for our research with combinations and variations of the following keywords: IT outsourcing, retained organization, risk, success, outsourcing organization, provider management, IT transformation, organizational change.

challenges identified in the literature as well as deriving basic hypotheses from the interviews. The qualitative research methodology is based on Gläser and Laudel [17].

Based on the insights of two initial design interviews, we decided to select the interviewees based on a predefined profile from the following three key roles on the provider side of the outsourcing relationship that have direct insight into the client's retained organization [12][14]:

- *Transition Managers* lead the transfer of the client's outsourced IT services and are involved in the setup of joint processes and structures.
- *Account or Contract Managers* are owner of all strategic activities for the outsourcing contract and responsible for its ongoing management.
- *Delivery Managers* are responsible for the overall management of the delivery activities of an outsourcing engagement.

Table 1. The 25 transition and delivery challenges of retained organizations

Transition Phase Challenges	
• Alignment of expectations	• Ensuring the retained staff understands or lives its new roles
• Appropriate communication with staff or other stakeholders	• Fears and rumors
• Changing of mindsets	• Resistance among staff or other stakeholders
• Changing of processes and ways of working	• Sufficient motivation of affected staff
• Ensuring sufficient contract knowledge in retained organization	• Transformation of organization and governance structure
Delivery Phase Challenges	
• Appropriate communication with the service provider	• Provider lacked understanding of client's business
• Determination of business requirements	• Provider not informed about the client's business strategy
• Difficulties with performance measurement	• Retained organization missed major shifts and new trends in the company
• Getting different sub-contractors and suppliers to work together	• Too incomplete outsourcing contract
• Endless cost-service debates	• Too inflexible outsourcing contract
• Lack of partnership and trust	• Too high staff turnover
• Misunderstandings about scope of services	• Translation of service requirements into service requests
• Neglecting long-term strategy and getting caught in fire-fighting	

In total, we surveyed two *Transition Managers*, four *Account or Contract Managers* and four *Delivery Managers*. The semi-structured interviews were held with an interview schedule, digitally recorded and transcribed. The interviewees exploratively described the typical challenges of retained organizations and validated our initial set of challenges extracted from literature. Subsequently, we analyzed the transcripts in a grounded coding approach [18] gradually eliminating redundant and

aggregating similar challenges. The result was a total of 25 transition and delivery challenges that we used as the basis for our main quantitative study (see Table 1). In addition, we asked the interviewees for common mistakes and success factors. From these, we derived hypotheses a selection of which we test in Section 5.

3.3 Quantitative Study

In our main quantitative study, we assessed the 25 challenges as well as success factors identified beforehand. We decided to carry out the questionnaire with the same roles we interviewed in the qualitative. The questionnaire consisted of five sections using closed, prompted and pre-coded questions [19–20].

At the beginning of the questionnaire, we asked each participant to select only one of their outsourcing projects and answer the questionnaire based on this specific project. They had to take part in this project in their current role and should consider it typical according to their experience. Due to this condition, we are now able to relate the success factors to specific challenges and evaluate their impact in that project.

The first section consisted of general and screening questions about the participant, the chosen outsourcing project and the client. These questions included the success factors that we identified in the qualitative study (see Section 5).

The two main questionnaire sections aimed to rank the 25 challenges (see Table 1) related to the retained organization in the transition and delivery phase. We used 4-point Likert scales [19–20] to rank the challenges of the selected client on a verbalized scale ("Minor problem", "Tending towards minor problem", "Tending towards major problem" and "Major problem") in retrospect.

3.4 Research Sample and Data Collected in the Quantitative Study

In total, we received 37 completed questionnaires. Targeting 125 participants, we had a response rate of about 30%. In total, ten account or contract managers, 24 delivery managers and three transition managers participated in the study.

We explicitly tried to identify common challenges that clients are facing. As no clear pattern exists that might elicit which type of companies in terms of size or industry are likely to outsource [2], we aimed to collect a broad basis in order to abstract from industry and size specificities. The selected projects cover virtually all different types of industry and client company sizes. The company sizes are spread from small companies with under 50 employees to corporations with more than 100.000. Most of the investigated companies had between 1.000 and 10.000 employees (see Fig. 3 and Fig. 4).

Regarding contract volumes, the major part of responses is concentrated on small to medium sized deals with a total contract volume between €10 million and €100 million. But, responses range from very large (more than €500 million) to very small (under €10 million) outsourcing deals (see Fig. 4).

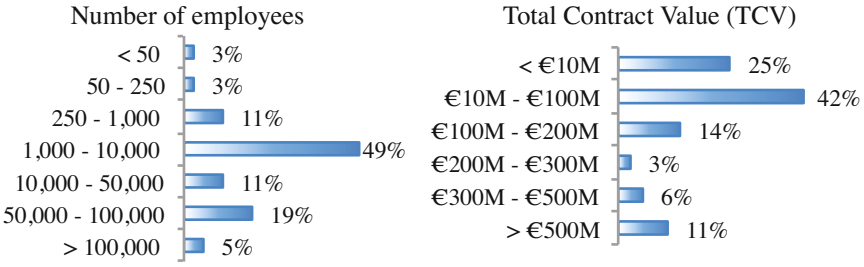

Fig. 3. Sizes of the investigated client companies and contract volumes (N=37)

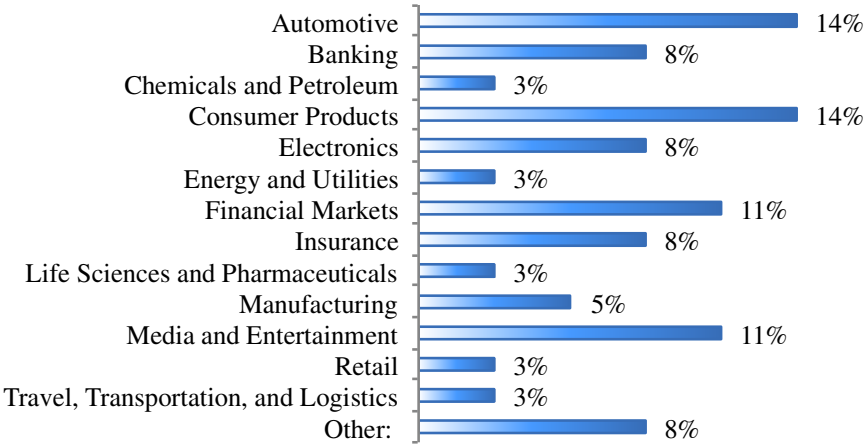

Fig. 4. Industries of the investigated client companies (N=37)

4 Findings and Analysis of the Study Results

The following chapter presents the results of our quantitative study. We will outline the findings regarding the transition and delivery challenges of retained organizations. We provide and discuss rankings of the top five challenges of each phase selecting them based on the share of participants ranking them as major problem.

4.1 Transition Phase Challenges of Retained Organizations

During the transition phase, clients – among other things – implement structures of their retained organizations and communicate the changes. The five top challenges of the transition revealed by our study are depicted in Fig. 5.

In our study, the most significant challenge in the transition phase is the *changing of mindsets*. The challenge has been described in organizational change management and outsourcing literature (e.g., [21–22]). Our interviewees particularly emphasized the clients' difficulties to understand the service nature of outsourcing.

34% of the study participants perceived the *changing of processes and ways of working* as a major challenge. It is closely related to the changing of mindsets. According to our interviewees, client employees often tend to keep working the same way they were used to. However, outsourcing requires clients to adapt IT processes and their internal behavior to the new situation (e.g., [13][22]).

Another challenge that is widely recognized in outsourcing as well as organizational change literature is the *appropriate communication with staff or other stakeholders* (e.g., [21–22]). It is ranked third with major problems in about 24% of the outsourcing projects in our study.

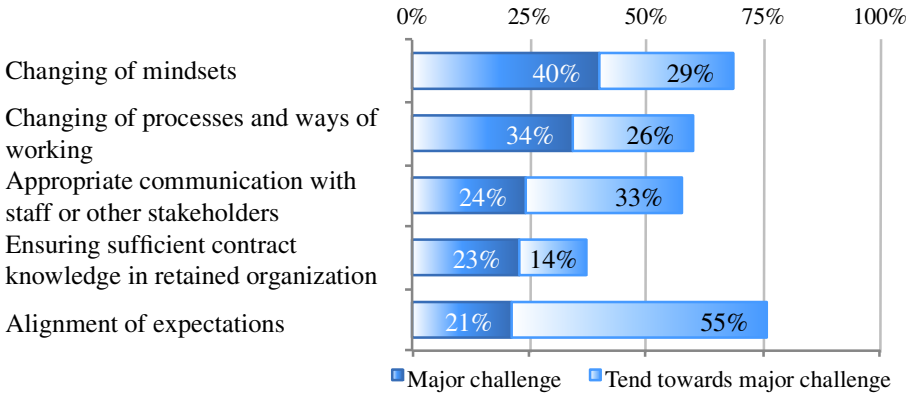

Fig. 5. The five major challenges of the transition phase

Our interviewees mentioned that clients often fail in *ensuring sufficient contract knowledge in the retained organization*. Their staff often is not sufficiently familiar with the contents of the outsourcing contract. The challenge had been added in our qualitative study and we identified it as the fourth top challenge. According to our interviewees, the personnel defining the outsourcing contract often are not part of the retained organization and fail to sufficiently transfer their knowledge.

The *alignment of expectations* is the fifth top challenge. If we take into account the answers of participants that tended towards major problems, however, it would be top ranked at 76%. Willcocks and Craig [22] found that unrealistic expectations are a major difficulty and our interviewees also agreed that many outsourcing relationships suffer from unaligned expectations.

For the transition phase, we identified the five major challenges described above as most important. Interestingly, all five address “soft changes” involving people and their behavior. These are usually addressed in organizational change management approaches [21]. The importance of organizational change in the context of technology changes has been frequently acknowledged in literature (e.g., [21][23]) and is supported by our findings.

The remaining five challenges of this phase (see Table 1) are less critical. However, they cause major problems for 3% to 20% of the outsourcing clients, as well.

4.2 Delivery Phase Challenges of Retained Organizations

During the delivery phase, the retained organizations take over the main responsibility for the outsourcing project on the client side. The top challenges of this phase are depicted in Fig. 6.

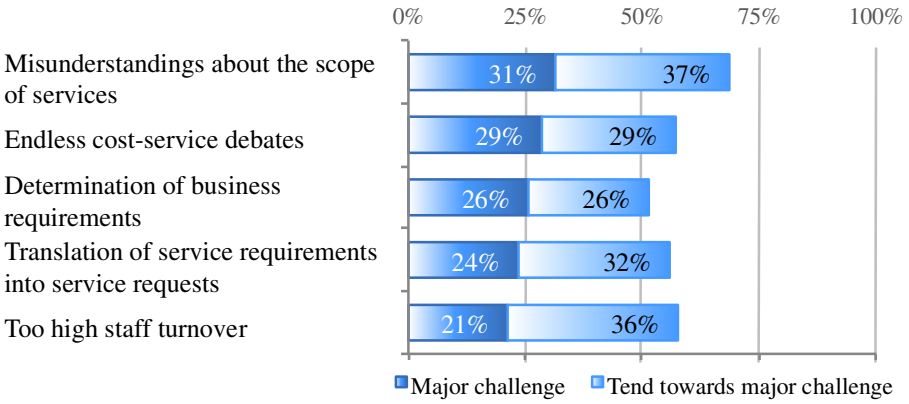

Fig. 6. The five major challenges of the delivery phase

With 26%, *endless cost-service debates* is ranked second. We think that it is closely related to the scope misunderstandings. It means discussions about how much the client has to pay for a specific service covered by the contract and whether it has been delivered completely. Literature mentioned the challenge (e.g., [24]) and we encountered it in several of our interviews.

Amongst the top three challenges is *determination of business requirements*. This issue is directly connected to the fourth challenge – *translation of service requirements into service requests* – that 17% of the outsourcing clients seem to have major problems with. Literature addresses both the determination of services' impact on business operations and selection of cost-optimal service solutions (e.g., [25–26]).

With 14%, the fifth top challenge is *too high staff turnover*. In our interviews, the challenge was less prevalent. However, Beulen [27] described it in his work and our study confirms that it is amongst the top challenges for retained organizations in the delivery phase.

The two top ranked challenges arise at the interface with the provider. But, our findings also emphasize the importance of the interfaces of retained organizations with the own business units. The retained organization needs the capabilities to sufficiently understand and interpret business requirements and the technical ability to formulate adequate technical specifications. Hence, the demand side of a retained organization plays an important role in the outsourcing relationship and clients need to place more emphasis on this interface.

In conclusion, we denote the issues mentioned above as the five major challenges of retained organizations during the delivery phase of an outsourcing deal. The other challenges (see Table 1) are not seen that critical in comparison. Nevertheless, 19% to 40% of the participants at least tend towards considering them as major problems.

5 Evaluation of Statistical Hypotheses

In this section, we will test three hypotheses that we derive from the interviews of our qualitative study. First, we shortly outline the statistical methods we apply. Then, we introduce and test the three hypotheses. Finally, we discuss the results.

5.1 Evaluation Approach and Statistical Methods

We will now introduce the methods we apply to test the three hypotheses. To evaluate the impact of the success factors, we create an index of the challenges for each phase. The indices combine multiple items into one unweighted additive indicator [28]. That way, we obtain a measure for the severity of problems of a whole phase.

To ensure that the selected variables actually represent the aggregated index, we test each index for its reliability based on its discriminant coefficients (D) and Cronbach's alpha (C) [28]. The discriminant coefficient is a measure for the uni-dimensionality of the variables that we accept if $D > 0.3$ [29]. Cronbach's alpha evaluates the reliability of the index whereby $C > 0.7$ is considered good [30].

To evaluate the hypotheses, we test whether clients who performed well in a success factor have significantly fewer problems than those who did not. In order tTo not interpret the difference between the ordinal Likert items, we consider both affirming items in our tests. We create two partitions for each test grouping the responses according to the value of the respective index as depicted in Table 2. For example, group 1 in partition (a) only includes participants that clearly affirm whereas partition (b) also includes participants that tended towards the affirmative.

Table 2. Partitions for each test

	Group 1	Group 2
Partition (a)	"Yes"	"Tending towards yes", "Tending towards no" and "No"
Partition (b)	"Yes" and "Tending towards yes"	"Tending towards no" and "No"

For both groups, we will calculate its median and test for statistically significant differences between the underlying distributions at the .05 level applying the Mann-Whitney U-test. This non-parametric test is used to test whether the medians (M) of two samples are significantly different. It can be used if two samples are independent and at least ordinal – which is the case for Likert scales [31]. Hence, we test the following statistical hypothesis for each hypothesis and each partition:

$$H_0: M_{Group\_2} \leq M_{Group\_1} \; ; \; H_1: M_{Group\_2} > M_{Group\_1} \quad (1)$$

5.2 Findings of the Quantitative Study and Hypotheses Definition

In our ten expert interviews, three success factors were mentioned most frequently: (1) the retention of sufficient technical expertise, (2) the involvement of business units

in strategic decisions and (3) the client's awareness of the upcoming changes. To cover different aspects of factor (3), we evaluated it with three separate (see justification below). Hence, we assessed the level of the three success factors with a total of five questions in our questionnaire (see Fig. 7). The hypotheses introduced below relate these factors to the challenges of the transition and delivery phase to evaluate their impact.

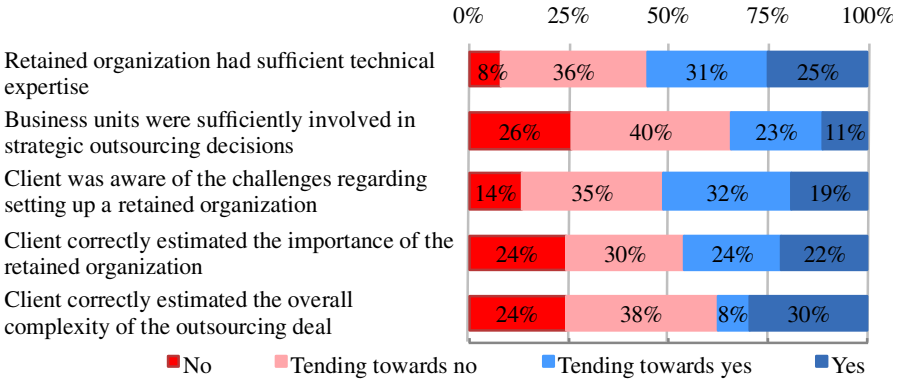

Fig. 7. Assessment of success factors

Hypothesis 1. *Clients who retain sufficient technical expertise in their retained organization have fewer major problems in the delivery phase.*

An important task of the retained organization is to translate business requirements into service requests and to technically evaluate proposals of the provider. In order to do so, it usually needs a sufficient amount of technical expertise. Our interviews and literature (e.g., [7]) frequently identified the lack of technical expertise as a cause for delivery problems of retained organizations. About half of our study participants at least tend towards assuming insufficient technical expertise of their client whereas 25% affirm it.

Hypothesis 2. *Clients who sufficiently involve their business units in strategic outsourcing decisions have fewer major problems in the delivery phase.*

One of the responsibilities of retained organizations is to manage the business demand and to ensure business and IT alignment (e.g., [14]). IT outsourcing often adversely impacts business and IT alignment [32]. Our interviewees mentioned the positive effect of the early involvement of the business units in strategic outsourcing decisions on alignment. Hence, it should reduce problems during service delivery. The insufficient involvement of the business units in strategic outsourcing decisions was observed very often in our quantitative study: 66% of respondents tend towards and 26% clearly observed it.

Hypothesis 3. *Clients who are aware of the upcoming changes have fewer major problems in the transition and the delivery phase.*

The hypothesis reflects the expectation that clients with a higher awareness of the upcoming changes should be able to better assess risks and prepare mitigating actions (e.g., [21][23]). This should reduce problems in the course of the outsourcing project. We captured the client's awareness of the upcoming changes with three questions. Our interviewees described three different facets that we assessed individually: (1) Clients underestimate the complexity of outsourcing, (2) they underestimate upcoming challenges and (3) they misjudge the retained organization's importance. Our findings suggest that the majority of the clients were not sufficiently aware of these changes. 49% of our participants at least tend towards an unawareness of the challenges associated with setting up a retained organization; likewise, 54% think that their client did not fully realize the importance of a retained organization. 62% observed that their client underestimated the complexity of the outsourcing deal.

5.3 Calculation of Indices

To have a unified measure that represents the problems of a whole phase, we create an index of the challenges for each phase. This allows us to evalute the impact of the three success factors on a phase as a whole. We do the same for the three questions that assess the client's awareness of the upcoming challenges.

The index of the transition phase and the index that combines the three questions regarding the client's awareness of the upcoming changes are both uni-dimensional and reliable. In the delivery phase, we had to exclude three challenges because of their low discriminant coefficient (*retained organization missed major shifts and new trends,* D = 0.1) and Cronbachs alpha (*provider lacked understanding of client's business* and *difficulties with performance measurement).* The index consisting of the remaining twelve challenges is also uni-dimensional and reliable (see Table 3).

Table 3. Indices for the evaluation of statistical hypotheses

Index	C	D
Transition challenges	0.88	$0.56 \leq D_x \leq 0.81$
Delivery phase challenges	0.80	$0.34 \leq D_x \leq 0.74$
Awareness of the upcoming challenges	0.72	$0.79 \leq D_x \leq 0.81$

5.4 Hypotheses Evaluation and Interpretation

We will now test the three hypotheses. For each hypothesis we will evaluate the medians of the chosen groups and partitions for significant differences in the underlying distributions.

Hypothesis 1 postulates that retained organizations with sufficient technical expertise have fewer major problems in their daily business. Accordingly, we test the technical expertise of the retained organizations against the index of the delivery phase both for partition (a) and (b) in the delivery phase. For both partitions, there is no statistically

significant difference between the underlying distributions (see Table 4). Clients with sufficient technical expertise in their retained organization did not have significantly fewer major problems. Thus, we cannot reject the two null hypotheses.

Consequently, based on our data, we are unable to state whether clients with sufficient technical expertise in their retained organization have fewer major problems. The hypothesis, however, has received strong support in past literature (e.g. [7][27]). We think that technical expertise is highly important, but in our cases other factors seemed to have more significant impacts.

Table 4. Results of the statistical tests for the three Hypotheses

	Partition	Phase	Mean rank	Significance
Hypothesis 1	Partition (a)	Delivery	14.5 < 19.2	.116 (-)
	Partition (b)	Delivery	15.7 < 21.1	.062 (-)
Hypothesis 2	Partition (a)	Transition	7.5 < 17.8	.020 (+)
		Delivery	6.0 < 19.6	.007 (++)
	Partition (b)	Transition	11.8 < 19.0	.011 (+)
		Delivery	9.9 < 22.2	.000 (++)
Hypothesis 3	Partition (a)	Transition	10.3 < 20.1	.006 (++)
		Delivery	11.1 < 21.0	.007 (++)
	Partition (b)	Transition	15.4 < 19.7	.104 (-)
		Delivery	14.6 < 22.8	.010 (++)

With *Hypothesis 2*, we evaluate whether clients that sufficiently involved their business units in the strategic outsourcing decisions had fewer major problems in the transition as well as the delivery phase (see Table 4). The Mann-Whitney U-test is significant at the .01 level for the delivery phase and at the .05 level for the transition phase for both partitions. Accordingly, there is a statistically significant difference between the underlying distributions and we reject the both null hypotheses.

The adverse impact of outsourcing on the level of business and IT alignment had already been observed in literature (e.g., [32]). Our results emphasize the importance of alignment measures during the implementation of retained organizations. In particular, clients should involve their business units in strategic outsourcing decisions. These findings are also supported by the work of Beulen [14].

For *Hypothesis 3*, we evaluate if clients with a higher awareness of the upcoming changes achieve better results both during the transition and the delivery. Hence, we test the index that describes the client's awareness of the upcoming changes against the two indices we calculated for the two phases. Our findings suggest that there is a statistically significant difference between the underlying distributions for partition (a): Clients who are aware of the upcoming changes have fewer major problems in the transition and delivery phase. Both Mann-Whitney U-tests are highly significant at the .01 level. Partition (b) includes clients that are somewhat aware of the upcoming changes. These clients still have significantly fewer major problems in the delivery phase at the .01 level. The Mann-Whitney U test is not significant for transition phase even at the .05 level, though (see Table 4).

We infer that the null hypotheses of these three of the four statistical tests are too unlikely to be correct and reject them, accordingly. For partitioning (b) of the transition phase, the median is also smaller for clients that had a higher awareness, but the difference is not statistically significant. Nevertheless, we conclude that clients who are aware of the changes ahead have fewer major problems in both phases.

6 Conclusion

In this paper, we presented the findings of our explorative study. A literature review, multiple initial interviews and an extensive quantitative study helped us to develop a clearer picture of the retained organization and its challenges. Based on the data collected, we identified and discussed the five major challenges of the transition and the delivery phase. Second, we tested three hypotheses derived from our interviews. Our findings provide further insights for researchers and practitioners.
Generally, our study outlines the high importance of mature retained organizations that are a crucial factor for outsourcing success. Outsourcing clients should not neglect the timely implementation of their retained organization.

We uncovered that the most critically ranked challenges during the delivery phase arise at the interface with the provider. Our analysis, however, revealed that the interfaces with the own business units were a source of major problems, too. Hence, clients should pay more attention on the establishment of these interfaces. For example, clients should take the necessary measures to ensure a high level of business and IT alignment from the outset of the outsourcing project. In this matter, we identified the early involvement of the own business units in strategic outsourcing decisions as a success factor.

During the transition phase, the challenges that are ranked highest in our study concern the human factor during the implementation. This indicates the need for appropriate organizational change activities. In particular, a thorough upfront assessment of the changes and challenges brought about by the implementation of retained organizations seems to be a key success factor. Outsourcing clients should recognize the importance of retained organizations and the complexity of setting it up. They should appropriately invest in their own organization.

In the following, we will critically discuss the limitations of our research. The first part of our explorative research consisted of two design interviews and a qualitative study with ten experts. In the interviews, we had a large consensus regarding the key challenges. Therefore, we think that the ten expert interviews in combination with the literature review are a good basis for the principal study. In the quantitative study, we were only able to acquire a sample size of 37 people. Nevertheless, the amount is sufficient for the descriptive analyses and the statistical evaluations of this paper [33].

Perhaps, a point of criticism might concern the decision to question representatives of only one outsourcing provider rather than client employees that are actually working in a retained organization. However, the participants of our interviews and questionnaire were outsourcing experts. They were selected based on a predefined profile (see section 3.2) to ensure their deep understanding of outsourcing relationships. They can, thus, draw on a long-standing experience with outsourcing and different retained organizations – whereas a client employee usually only has experience with one outsourcing project and the problems of this specific situation.

We think that the outsourcing experts were best qualified to state the most important and typical challenges based on their broad experience.

In our study, we identified several aspects that we could not cover in this work that further research should investigate. We saw that outsourcing clients often fail to appropriately implement their retained organizations in the transition phase. In this phase, the decisions and plans of the design phase are executed. In this paper, we did, however, not elaborate on challenges of the design phase. In future works we will discuss how this phase is interrelated with the transition and the delivery phase.

As discussed above, we carried out this work with a major outsourcing provider and key roles on the provider side of the outsourcing project. We are confident that the challenges identified are the typical challenges of retained organizations. However, to further evaluate and support the results of our research, we will discuss them in detail with client representatives.

Additionally, we found that particularly the interfaces of retained organizations with the own business units are an issue in many outsourcing engagements that can lead to severe problems impacting the whole outsourcing project. Future research should, therefore, lay more emphasis on internal governance and organizational structures of retained organizations with their own business units.

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Servitization – Its Raise through Information and Communication Technologies

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Abstract. The main challenge about dealing with servitization arises from the fact that one has to consider several diverging research disciplines, comprising of service science, manufacturing and operations management equally. Besides, contemporary economic environments are influenced by rapid development of information and communication technologies in different spheres. Thus, the servitizing companies are increasingly confronted with several substantial challenges on the implementation of novel ICT applications, which in turn may be a promising approach to exploit its capabilities to generate competitive advantage. Accordingly, first we discuss the fundamental impact of emergent ICTs on business models and customer behavior. Next, we examine the dedicated implications on the servitization sourced from ICT capabilities. Besides, a brief overview of current implementations is given, which in turn needs to be further broadened. Finally, potentially-valuable research directions, since the paper is a primary step in our research on the ICT and servitization inter-relationing, are proposed.

Keywords: Servitization, Service Science, ICT (Information Communication Technologies), e-Business, Product Service Systems (PSS).

1 Introduction

The emergence of fast and powerful information and communication technologies (ICT) like the Internet with its vast reach and multimedia capabilities constitutes a leading role in terms of improving existing business models and the enhancing the appearance of new ones [1]. In addition this development accounts likewise for considerable effects regarding the appreciation of manufactured goods and therefore enhances new forms of Product Service Systems (PSS). Consequently, the appropriate application of these technologies and the corresponding exploitation of their benefits constitutes an elementary competitive necessity [2 ÷ 4]. Since the approach and the inherent information capabilities of the Internet are accessible for everyone, especially customer, the initial subsequent subsection examines the implications on their resulting behaviour and supremacy. In fact, the novel information and communication capabilities equally affected business operations, which is examined in the 2nd subsection concerning e-Business.

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1.1 The Changing Role of Customers

Customers, who utilize the capabilities of novel ICT, are actually faced with a confusing paradox, since they are accompanied with increasing number of choices that finally yield less satisfaction yet. This circumstance originates from the fact that *"(…) the role of the consumer in the industrial system has changed from isolated to connected, from unaware to informed, from passive to active*" [4, p.1]. This statement actually reflects the situation about the increasing power and supremacy of customers which constitutes on their escalating information knowledge and business transparency [3, 5, 6]. Accordingly, [4] identified five different impacts, which are consolidated in Table 1 below and finally mirror this development perfectly.

Table 1. Impacts on Customer Behavior (own illustration according to [4])

Information Access	• Access to matchless vast amount of information and knowledge • Compiling more informed decisions
Global View	• Access to information on firms, products, prices, performance and customer reviews from all around the world • Therefore limiting possibilities for multinational firms in varying offerings and performances
Networking	• Thematic consumer communities sharing beliefs and experiences without geographic barriers • Changing traditional top-down patterns of marketing communications
Experimentation	• Possibility of experimenting with and developing on digital products • Enhances co-development
Activism	• Under the protection of anonymity people are embolden to speak out in digital communities • Enhances unsolicited feedback

Consequently, the Internet with its novel information and communication technologies provides the customer with more (1) *information access* to enormous amounts of information and knowledge to make more informed decisions. Next, the Internet allows finally a (2) *global view* about firm's products, prices and performance reviews, which therefore limits the freedom to vary the price or quality level in different regions. Another impact is constituted by the possibility of (3) *networking* among consumer to share beliefs, ideas and experiences. Finally, emerging ICTs allow (4) *experimentation* with new technologies and enhances as well as (5) *activism* among customer communities to embolden others to act and speak out, which may result in unsolicited feedback [4]. Since the novel opportunities, stemming from increasing performance levels in ICT, also affect other spheres, the subsequent section introduces the implications on business models.

1.2 e-Business

The emergence of ICT likewise affected priorities in businesses by shifting importance from products to information, which tempts several companies to transfer their business to the Internet and conduct business relationships via novel digital ICT channels. Consequently, the term e-Business arose, which embodies the initiation, agreement and execution of business processes via digital channels of ICT, in order to enhance mutual value creation [7]. In fact, this implicates that information finally replaces inventory constituting on the stepwise replacement of physical goods by digital products [1]. In order to provide a guideline towards the transition to an e-Business organization, [6] suggested a certain roadmap to approach this subject. Although, the detailed elaboration of this matter definitely would go beyond the scope of this paper, nevertheless the merely fundamental finding bears considerable knowledge. Thus, the successful transformation towards e-Business is based on the deliberate alignment of the constituted business with the appropriate technology [6]. Finally, there are nine generic business models that may occur in e-Business [8]. In order to provide a brief overview about this sphere within this paper, the subsequent Table 2 illustrates their main characteristics and approaches.

Table 2. Generic Business Models on the Web (own illustration according to [8])

Brokerage	• Bring buyers and sellers together and facilitate transactions • Charge fee or commission for each transaction enabled
Advertising	• Extension of the traditional media broadcast model • Website (=broadcaster) provides content and services mixed with advertising messages in the form of banner ads • Banner ads may be major or sole source of revenue
Infomediary	• Collecting valuable data about consumers and their consumption habits • Selling data in order provide information to target marketing campaigns
Merchant	• Wholesaler and retailer of goods and services • Sales based on list prices or auctions
Manufacturer	• Reach buyers directly and thereby compress the distribution channel • Based on efficiency, improved customer service and a better understanding of customer preferences
Affiliate	• Providing purchase opportunities wherever people may be surfing, by offering financial incentives to affiliated partner sites • Pay-for-performance model
Community	• Viability based on user loyalty • Revenue tied to contextual advertising and subscriptions for premium services • One of the more fertile areas of development
Subscription	• charged a periodic fee to subscribe to a service
Utility	• combinations of free content and “premium” with costs • “on-demand” model based on metering usage (“pay as you go”)

2 Impact on Servitization

Since the recent emergence of fast and powerful information and communication technologies (ICT) affected existing business models significantly, this also should be examined concerning the applications in servitization. Consequently, the subsequent section initially elaborates the role ICT within the servitization approach and proceeds with its novel enabled applications and capabilities. Finally, a brief framework which identifies possible opportunities regarding servitization will be elaborated.

2.1 The Role of ICT in Servitization

According to the section above e-Business deals with tangible products as well as digital ones and services for sure, as long as they are handled and sold via ICT channels [7]. Regarding this, the research work presented here identified two diverging possibilities on how ICT can be part of servitization and therefore enhance and support it. The first case considers the digital product itself as "lynchpin" of the offering, which constitutes value to the customer through its usage. In fact, this idea refers to the concept of S-D logic, since its value proposition stems from the intangible usage of a product and not its ownership [9]. Consequently, the paper suggests naming this assignment of ICT "Product Delivery". In contrast the integral part of the servitization offering also could be there, as well intangible service that is conducted on digital or tangible products. Accordingly, this idea would reflect the one of the typical servitization options consisting of an integration-oriented, product-oriented, service-oriented, use-oriented or result-oriented product-service-system [10, 11]. Since this idea focuses on the execution of the service, the paper suggests naming this assignment of ICT "Service Delivery". In order to enhance the understanding of these ideas the following section provides each with a certain application regarding the role of ICT either as "Product Deliverer" or "Service Deliverer".

Regarding ICT as "Product Deliverer" one can illustrate this by concerning current developments in the music industry. Consequently, this industry is faced with the transition from a tangible product (e.g. CD) to an intangible service, thereby applying a new business model corresponding to the latest purchasing behaviors of customers, which is offered and distributed over digital portals [12]. In fact, the traditional business model, which relied on physical distribution, remains useless since the advent of the Internet and the exploding popularity of downloading digital music [13]. Furthermore, the value proposition of digital music may be additionally enhanced by its wider availability and greater interactivity among social media. Consequently, new business models established where customers either pay-as-they-go, pay for each downloaded track (such as Apple's iTunes) or pay-monthly to gain access to an allotted music service portal (such as Spotify) [12]. Hence, the digital channels of novel ICT enable the delivery of the product, which in a row embodies the value proposition through its consumption.

The second role of ICT in servitization is manifested as "Service Deliverer", whereupon ICT enables the execution of the servitization offering. This can be illustrated by a common case considering the application in remote diagnostics, where

complex manufactured products are monitored via sensors that finally provide essential information to the supplier regarding necessary maintenance intervals [14]. Consequently, ICT enables and enhances possibilities in providing remote support or standardized operating processes in companies operating in geographically distributed networks [2]. In fact, companies have to establish therefore new business models like outcome-based contracting [15, 16], which most prominent case is that introduced by Rolls Royce in the aeroplane industry called "Power-by-the-hour®", where the customer doesn't buys an engine but guaranteed flying hours [17]. Hence, the digital channels of novel ICT even enable the possibility regarding the servitization offering and furthermore conduct the delivery of this service. Consequently, the next section examines the function of ICT as enabler concerning certain servitization offerings.

2.2 ICT as Enabler of Servitization

First, the attention should be drawn on the denomination of it, since ICT is designated as "Enabler" of servitization, which may cause considerable disagreement amongst other researchers. In fact, a lot of other authors declare ICT as "Driver" of servitization [2, 3, 5, 18, 19], which induces a more intensive examination with this matter. Regarding drivers of servitization, literature agrees that the most distinctive ambition driving servitization is reflected by the desire to handle decreasing margins of manufacturing and selling goods [10, 20, 21]. Since the service industry embodies higher margins than selling goods, the financial driver of servitization constitutes of applying corresponding services in order to exploit these ones [22 ÷ 24]. Furthermore, servitization establishes strategic advantages in terms of differentiation [10, 24, 25] and even serves marketing issues through locking customer in [10, 23, 26, 27], which finally also provides monetary benefits for the company. Finally, opposing this with the arising capabilities of emergent ICT perhaps provides clarification to this matter. One probably will agree that manufacturer rather apply a remote diagnostics system [14], in order to handle the installed-base argument and achieve therefore stable revenues [11], than being excited about the gathered information concerning necessary maintenance intervals. Consequently, this paper considers servitization rather as "Enabler" of advanced servitization offerings than as "Driver" of them.

According to [2] one can separate the impact of ICT amongst the service offering and the operating processes of a company, where ICT enables for both sound improvement possibilities. In fact, with regard to the service offerings, ICT can extend the scope and depth of these, which relies on the increased value added, based on higher customization levels and a broader variety of more sophisticated service offerings [18]. Furthermore, ICT likewise enhances the emergence of new revenue streams, since it enables opportunities to operate real-time data in remote diagnostics applications [14], which allows proficient and useful decision-making processes [2]. Customers therefore gain considerable benefits regarding operation of products with longer life-cycles [3]. Finally, ICT enables also improvements on operating processes, which becomes apparent on the standardization of processes and the resulting improvement in process responsiveness [2]. Consequently, common issues regarding supply chain management like the negative implications of the bullwhip effect may be mitigated by smart ICT applications [5].

2.3 Identifying ICT Opportunities for Servitization

Actually, the process of aligning a certain given business with an appropriate technology in order to establish an e-Business already constitutes a tremendous challenge [6]. In contrast, whilst trying to realize a smart and powerful application of ICT in terms of a novel servitization opportunity, one should either know the business application or the technological approach. Accordingly, [19] introduced the dynamics of "IT push" and "business pull", which in combination finally account for the emergence of new ICT applications in servitization. In fact, every business implicates a certain prospective of innovation which stems from generic business issues, competitive pressures or customer demand [6]. Consequently this approach is manifested by the term "business pull", since it roots from the desires and demands of actors within the business matter. In contrast, innovative potential also stems from emerging technologies, which therefore is called "IT push" [19]. These both dynamics can be consolidated into a 2 x 2 matrix, therefore constituting four different characteristics, which are illustrated in the Figure 1.

Accordingly, a new ICT application is successfully conducted when it appears to be classified in the upper-left quadrant, where both the "IT push" and the "business pull" are known and defined. In fact, the best potential for an emerging application is determined by the "technology search" or the "opportunities search", where either the business problem is defined or the technological approach is known. Finally, one cannot gain any advantages if no one of the two dynamics appears [19].

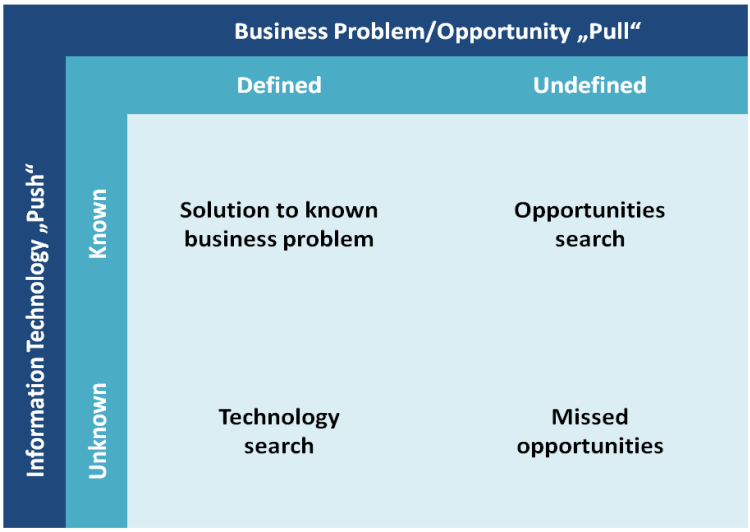

Fig. 1. Push and Pull of ICT Innovations (own illustration according to [19])

3 Applications in Servitization

The concluding section of this paper examines each with a certain case study correspondingly matching option of servitization, in order to visualize the countless possibilities of emergent ICT and therefore enhance its understanding. Consequently, all of these applications are characterized by the utilization and exploitation of emergent information and communication technologies:

- Integration-oriented PSS - Actually, the case of integration-oriented product-service systems is pretty strongly prevalent in e-Business, since it's manifested by simple online shops owned by manufacturing companies. In fact, the operation of an online shop constitutes a vertical integration, which is based on the moving into retail and therefore appears as integration-oriented approach [10]. Finally, two very popular examples can be displayed comprising of the computer manufacturer DELL and APPLE who actually operate online shops, in order to sell their products [28, 33].
- Product-oriented PSS - Considering a product-oriented product-service system one deals with the purchase and ownership of a product, which is enriched by a corresponding service [10]. Consequently, this description fits to the already discussed case of remote diagnostics of complex products [14]. Regarding a more up to date example one may consider the corresponding services offered from TV manufacturer. In fact, each Philips TV comes nowadays with an on-board application called "Smart TV" which consolidates video on demand functions, the Internet access and even social media apps directly on the TV device [29].
- Service-oriented PSS - The service-oriented option of servitization actually is characterized by the incorporation of the service offering into the product itself, which therefore results in a coupled product and service offering [21]. Hence, almost everyone is faced which such an offering in daily life, if owning a Smartphone with a corresponding telephone contract. Consequently, one purchases a Smartphone in order to make phone calls, which inherently implicates the need for a related telephone contract to execute the service [30].
- Use-oriented PSS - A very prominent example for a use-oriented product-service system is provided by the already mentioned business model introduced by Rolls Royce in the aeroplane industry called "Power-by-the-hour®", where the customer doesn't buys an engine but guaranteed flying hours [17]. This perfectly reflects that in this case the ownership of the tangible product retains by the service provider, whilst the customer solely gains value from its usage [10, 31]. Another recent example is provided by the well-known urban short-term car rental service "car2go" which operates in several cities around the world. Accordingly, the cars are diffused over a certain city, whilst registered users can obtain a car with their individual access cards and finally pay-by-use [32].
- Result-oriented PSS - The last occurrence of servitization is characterized by the total replacement of a product with a service instead. Consequently, this option

is called result-oriented product-service system, since the customer only demands for the result of a service [10]. Actually, this phenomenon is represented by the case of the music industry and the replacement of purchasing tangible records to purchasing intangible music entertainment [12, 13].

4 Conclusions and Further Topic Development Ideas

The most distinctive implication originating from the emergence of ICT is reflected by the fact that "(…) the role of the consumer in the industrial system has changed from isolated to connected, from unaware to informed, from passive to active" [4, p.1]. Accordingly, the term e-Business arose, which embodies the initiation, agreement and execution of business processes via digital channels of ICT, in order to enhance mutual value creation. Furthermore, literature identified that the successful transformation towards e-Business is based on the deliberate alignment of the constituted business with the appropriate technology.

Concerning the direct implications of ICT on servitization this paper actually suggests considering it rather as "Enabler" than as "Driver" of servitization, which represents a conflictive approach to other researchers. Finally, opposing this with the arising capabilities of emergent ICT might provide clarification to this matter. Accordingly, one probably will agree that manufacturer rather apply a remote diagnostics system, in order to handle the installed-base argument and achieve therefore stable revenues, than being excited about the gathered information concerning necessary maintenance intervals, which actually affirms the suggested approach.

In order to identify new opportunities of ICT in servitization, [19] introduced the dynamics of "IT push" and "business pull", which in combination finally account for the emergence of new ICT applications in servitization. Consequently, the term "business pull" implicates that every business constitutes a certain prospective of innovation which stems from generic business issues, competitive pressures or customer demand. The term "IT push" finally stems from innovative potential regarding emerging technologies.

As the work presented in this paper is research-in-progress, the purpose was to establish primary research framework on the specifying prospects of ICT in servitization, the following issues need to be studied further in order to build a comprehensive view of the field:

1. An impact of ICT on:
   a) the service offerings (e.g., added-value increase through the higher customization levels and a broader variety of services);
   b) the operating processes of an enterprise (e.g., improvement and standardization of processes, as well as processes responsiveness);
2. Opportunities of ICT to operate real-time data in remote diagnostic applications of complex e-Business services, in order to allow capable and advantageous decision-making processes;

3. Efficiency of supply chain management, particularly the reduction of negative consequences of the bullwhip effect that can be softened by smart ICT applications;
4. Opportunities and benefits of smart ICT applications usage for online shops' operation, e.g., e-Services delivery, particularly performance of extended studies as well as systematization of the cases multiplicity.

What is also important - examination each of above open issues with different case studies matching option of servitization. Consequently, capturing all essential topics and applications of servitization that are categorized by the utilization and exploitation of ICT technologies is our long-term research strategy.

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Introducing Service-oriented Organizational Structure for Capability Sourcing

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Abstract. At the strategic management level in an organization, participants in the decision making process need to share a common language to facilitate discussions and enhance related decision making. The context of this position paper is about strategic sourcing decision making and the goal is to facilitate it through a well-defined language. Companies need to acquire the right capabilities from the right source, and the right shore, at the right cost to improve their competitive position. In this position paper, capability sourcing is introduced as an organizing process to gain access to best-in-class capabilities for all activities in a company's value chain to ensure long-term competitive advantage. Furthermore, capability sourcing takes place in the service-oriented organizational structure that is introduced as a flexible structure to allocate the resources that shape the firm's competitive advantages. Therefore, the conceptualization of service system is proposed as a well-defined language for modeling, formalizing, representing and visualizing the concepts, constructs, and models in the capability sourcing process to facilitate strategic sourcing decision making.

Keywords: capability sourcing, strategic sourcing, service-oriented organizational structure, service orientation, componentization and service system.

1 Introduction

Organizing as a phase of organization management is defined as the process of arranging resources to work together to accomplish a goal. The organizing process formulates corporate strategies to achieve competitive advantages through arranging the firm's resources and configuring the firm's capabilities within a changing environment. In the organizing process, high-level (strategic) decisions are made about choosing the right sourcing alternatives like outsourcing, insourcing or co-sourcing. Sourcing decisions include the commitments, decisions and actions required for a firm to achieve strategic competitiveness on resources and organizational capabilities. In this paper we introduce two key requirements to facilitate sourcing decision making. There requirements need to be elaborated in further research.

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2 Strategic Sourcing

"*For years, sourcing has just been another word for procurement — a financial material, but strategically peripheral, corporate function. Now, globalization, aided by rapid technology innovation, is changing the basis of competition. [1] It's no longer a company's ownership of capabilities that matters but rather its ability to control and make the most of critical capabilities, whether or not they reside on the company's balance sheet*". [1]

Forward-thinking companies are making their value chains more elastic and their organization structures more flexible and adaptable. "*Sourcing is evolving into a strategic process for organizing and fine-tuning the value chain*". [1] Companies should be looking to alternative sourcing of business capabilities to seize new market opportunities. Yet few companies are taking full advantage of the cost and flexibility opportunities in the new global arena. [1]

Strategic sourcing is a systematic and fact based approach for optimizing an organization's supply base and improving the overall value proposition. "*Strategic sourcing allows companies to take full advantage of cost, flexibility and new capability opportunities; whether delivered by traditional suppliers and BPO suppliers, trading partners, distributors, agents and even customer self-service models*". [2]

Strategic sourcing is rooted in the idea that a business must have a set of explicitly defined capabilities in order to execute its strategy successfully. [2] *"Leaders often mistake the course of action and pursue a wrong path — diverting attention from the intended strategy. A root cause is often that strategic intent and objectives are not articulated in clear operating language for better execution. A written strategy does not ensure strategic action"*. [2]

3 Requirements for Right Sourcing

Companies need 1) to define for their own business how they create competitive advantage, and identify key capabilities they need to be world class; 2) to determine the optimal work location and delivery approach for in-house work; 3) to determine the right sourcing options to meet the sourcing strategic objectives and structure optimal sourcing decisions; 4) to determine optimal sourcing location: onshore, nearshore, offshore. Overall, companies need to leverage *the right capability at the right cost from the right source and the right shore* to improve their competitive position.

A right way of arranging resources and configuration capabilities is needed to *acquire the right capabilities from the right source, and the right shore, at the right price across the value chain and within a changing environment*.

There are two main requirements for arranging resources and configuration capabilities (organizing) to accomplish strategic sourcing goals effectively and efficiently: 1) a process as a course of action to execute strategic sourcing goals and 2) an organizational structure as a configuration or construction to pursue strategic sourcing goals.

The first requirement is an organizing process of gaining access to best-in-class capabilities for all activities in a company's value chain to ensure long-term competitive advantage. [1] It is needed to support companies to improve their competitive position by reducing costs, streamlining the organization, and improving quality. Also it is needed to support companies for finding more-qualified partners to provide critical functions that usually allow to enhance the core capabilities that drive competitive advantage in their industries. [1]

The second requirement is structure as a means that managers use to harness (control) resources and capabilities to achieve strategic goals. Also the organizing process take place within a structure reflected by the way in which the organization: 1) groups its work or activities, 2) establishes patterns of relationship among its various parts, 3) allocates its resources to achieve the specific strategic goals efficiently and effectively.

An organization structure needs to follow the organizational strategies. It is Chandler's Thesis – 1960's. Business environments are in a constant state of change. An organization's strategy must be adapted to changes in its competitive environment. Strategic change creates the need for restructuring the organization to acquire new and different knowledge, skills and abilities. [3]

It is critical to match organizational structure to the firm's strategy. "*Effective structures provide stability and flexibility. Structural stability provides the capacity required to consistently and predictably manage daily work routines*". "*Structural flexibility provides for the opportunity to explore competitive possibilities and the allocation of resources to activities that shape needed competitive advantages*". [3]

Therefore, strategy and structure have a reciprocal relationship. "*Structure flows from or follows the selection of the firm's strategy but once in place, structure can influence current strategic actions as well as choices about future strategies*". [3] Firms grow in predictable patterns by volume, by geography, by integration and finally through product or business diversification. A firm's growth patterns determine its structural form. [3]

A flexible structure refers to participative communication patterns of interactions that link a firm's components across its value chain within a changing environment. The flexible structure provides the opportunity to explore competitive positions and the allocation of resources that shape competitive advantages needed by the firm. [3] The Flexible structure decentralizes both tasks and decisions so that the company can adapt more quickly to changing circumstances. It works best in fluid and unpredictable business climates, in which a rigid structure might not respond quickly enough. Therefore it is needed to follow strategic sourcing goals.

Finally, the organized process needs to take place within a flexible structure to execute sourcing strategies through gaining access to best-in-class capabilities in the company's value net. This is because the flexible structure is successful in adapting to change in unstable and uncertain environments and allows firms to bring resources together in a boundary-less organization. (Fig.1)

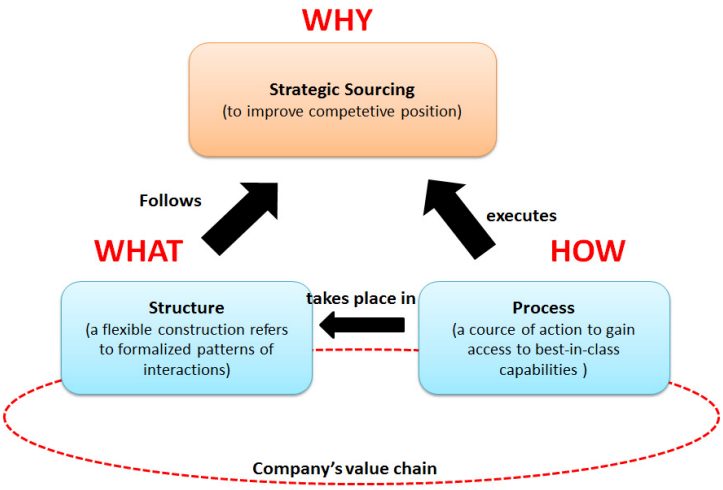

Fig. 1. Role of structure and process in right sourcing

4 Capability Sourcing as an Organizing Process

Capability sourcing began as a cost-cutting measure, but companies that create real sustained value routinely use it for far more strategic ends to gain capabilities that they don't have in-house, or to strengthen capabilities they do have, for everything from developing world-class talent to bringing new products to market faster and enabling business model innovation. [4] The capability sourcing process improves a company's competitive position by ensuring that processes and functions are obtained from the right source at the right cost. Greater focus on capability sourcing can improve a company's strategic position by reducing costs, streamlining the organization, and improving quality. [4] Also it can support companies for finding more-qualified partners to provide critical functions that usually allows to enhance their core capabilities that drive competitive advantage in their industries. [1]

Totally, capability sourcing is a process of gaining access to best-in-class capabilities for all activities in a company's value chain to ensure long-term competitive advantage. [1] [5] In this process, capabilities are the key to alignment and successful strategy execution and also capability sourcing model is a blueprint and a structured and aligned way to organize the capabilities required for strategy execution.

Role of Business Capability in Sourcing: Capabilities are WHAT the company needs to do to execute its business strategy, stated in measurable and actionable terms. [2] Resources are the assets that organizations have or can call upon (e.g. from partners or suppliers), that is, 'What a firm Has'. Capabilities are 'What the firm can Do'. Resources and capabilities are the key to alignment and successful execution. Furthermore, dynamic capabilities are the organization's abilities to renew and recreate its strategic capabilities to meet the needs of a changing environment. [6]

Capabilities exist across the value chain and in order to achieve high-performance a business must learn to manage capabilities that other parties in the value chain

perform. They must learn to govern a network of capabilities. Right sourcing allows sharper focus on differentiating capabilities. In other hand, incorrect sourcing decisions limit agility and increase costs. Capabilities where the company is not best in class can be, 1) built internally via process improvement and investment; 2) outsourced to a provider who is best in class; 3) moved offshore when cost and/or quality are superior. Clarifying the value contribution (or strategic relevance) of each capability helps a business allocate the right level of time and resources — whether to strengthen, minimize or outsource. Determining the value contribution helps focus resources and sourcing alternatives on capabilities that create value and distinctiveness, or identifies where to target efficiency work, either through rigorous process improvement or sourcing to a low cost provider. [2]

A complete picture of capabilities is the Enterprise Capability Model, sometimes also referred to as capability (heat) map. [7] It is a blueprint for the business expressed in terms of the capabilities necessary to execute the stated strategy. A capability model organizes in a structured and aligned way the capabilities required for strategy execution by determining capability value contribution. [2]

5 Service System as a Flexible Structure

Organizational structure refers to the grouping of activities and establishing patterns of relationships among the various parts of the organization. Structure provides a means of balancing two conflicting forces; 1) differentiation (Grouping): need for the division of tasks into meaningful groupings; 2) Integration (linking): need to integrate the groupings for efficiency and effectiveness. It creates a basis for measuring and comparing organizations. [8]

Organizational structure is an organization's framework as expressed by its degree of complexity, formalization, and centralization. Complexity refers to the degree of differentiation that exists within the organization. Formalization refers to the degree to which works (jobs) within an organization are standardized. Centralization refers to the degree to which decision making is concentrated at a single point in the organization. [8]

To execute sourcing strategies through the capability sourcing process, an organizational structure is needed that eliminates traditional barriers between departments as well as barriers between the organization and the external environment. In other words, an organizational structure is needed in which chains of command are eliminated, spans of control are unlimited, and rigid departments give way to empowered teams. Here, types of organizational boundaries and barriers are as below: [3]

- *Horizontal boundaries between different departments or functions in a firm.*
- *Vertical boundaries between operations and management, and levels of management, between "corporate" and "division".*
- *Geographic boundaries between different physical locations; between different countries or regions of the world and between cultures.*
- *External interface boundaries between a company and its customers, suppliers, partners, regulators, and competitors.*

We introduce Service System as a flexible structure to follow sourcing strategies. Service system has been defined as a dynamic configuration of resources (people, technologies, organizations and shared information) that is able to create and deliver value to other interested entities, through service. [9] In this research, this flexible structure has been called "Service-oriented Organizational Structure (SoOS)".

Service-oriented organizational structure introduces componentization and service orientation as two structural enablers for balancing two conflicting forces, differentiation and integration.

Componentization is a way to deconstruct an enterprise and then reconstruct it again into a value net, in which partnerships with customers and suppliers operate in a value network. The process of deconstruction-reconstruction is realized through business components (i.e. distinct business functions). A business component is a part of an enterprise that has the potential to operate independently. Business components represent a logical grouping of the work done within the enterprise and contain capabilities, activities, resources and performers. Therefore, service-oriented organizational structure introduce componentization as a way of differentiation by grouping tasks into meaningful and independent logical groupings. [10] [7]

Service orientation is a seamless integration and connection between business components within the firm, across external partners and throughout the world. Therefore, service-oriented organizational structure introduces service orientation as a way of integration through linking the groupings internally and across the boundaries of organization. [11]

Finally, Service-oriented Organizational Structure is a flexible structure to follow strategic sourcing goals and the capability sourcing process can take place within this structure to execute strategic sourcing goals through sharper focus on differentiating capabilities. (Fig.2)

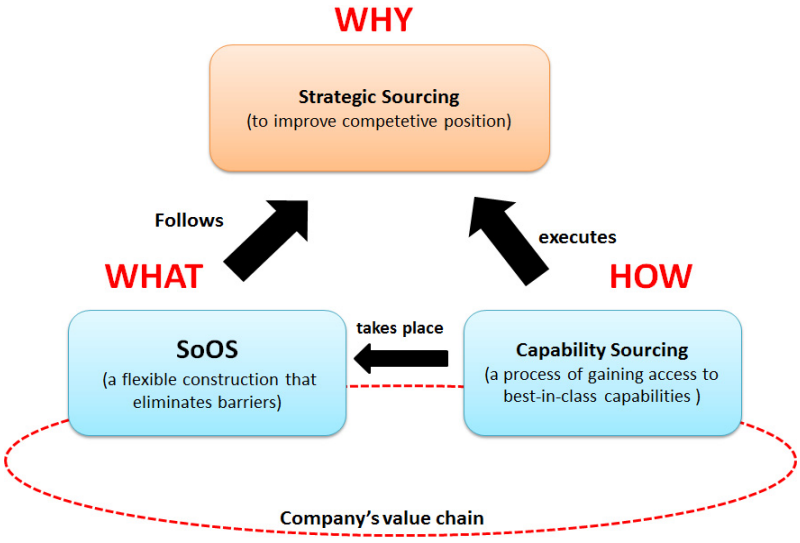

Fig. 2. Relation between SoOS and capability sourcing

6 Enterprise Capability Model Based on SoOS

In this paper, service-oriented organizational structure has been introduced as a flexible and adaptable structure that provides opportunities for dynamic allocation of resources and also dynamic configuration of capabilities to shape the needed competitive advantages. This structure is needed to follow strategic sourcing goals to achieve competitive advantages. Firms frequently alter their structure as they grow in size and complexity. Organizations require such form of organizational structure to implement and manage their sourcing strategies to improve their competitive position.

Furthermore, in this paper, we introduced capability sourcing as an organizing process which takes place in a service-oriented organizational structure to pursue strategic sourcing goals. This process includes modeling and decision making processes to perform the right sourcing. A modeling process is needed 1) to create artifacts like an Enterprise Capability Model as a blueprint to express the capabilities that are necessary to execute the stated strategy; 2) to formulate sourcing principles and measurements that inform and support the way in which an organization realizes its strategic sourcing goals.

At the strategic management level in an organization, decision makers need to share a common ground or a common language to facilitate their discussions. [12] A common language is needed to define and articulate concepts that facilitate the description of objects of strategic interest and that improve the strategic discussions and enhance related decision making. [13] Our research will focus upon the design of an articulated and clear modeling language based on a service-oriented organizational structure for capability sourcing. Service-oriented organizational structure is a well-defined basis for conceptual modeling in capability sourcing process. Our approach is introducing the service system abstraction as a well-defined conceptualization for capability modeling through mapping the concepts of service system [9] with the concepts of capability sourcing. The key concepts in service system are: (Fig. 4) [14]

Resource- in the context of service systems, resources are operand resources and operant resources. Operand resources (e.g., natural resources) are usually tangible and static resources that require some action to make them valuable. Operant resources (e.g., human skills and knowledge) are usually intangible and dynamic resources that are capable of acting on operand and other operant resources to create value. In other hand, in the sourcing context, the resources of the firm are seen as the main factors driving the firm's strategy and performance. When the external environment is subject to rapid change, resources and capabilities offer a more secure basis for strategy than market focus. This distinction between operand and operant resources is useful for capability modeling to describe dynamic capabilities through the dynamic configuration of resources. [14]

Value creation- in the context of a service system, value is an increase in the viability (survivability, well-being) of the system. [15] [16] In the context of service system, value is created collaboratively in interactive configurations of mutual exchange. [15] [16] This definition is similar to the definition of core competencies in a strategic sourcing context. Core competencies are the essence of what makes an organization unique in its ability to provide value to customers. Core competencies

are “What a firm Does” that is strategically valuable and also can lead to competitive advantage. [14]

Service system- it is a dynamic value co-creation configuration of resources, including people, organizations, shared information and technology, all connected internally and externally to other service systems by value propositions. [14] This definition is similar to the concept of business component in sourcing context. A business component is a discrete business areas comprised of people, processes and/or technologies that have a clear purpose and maintain financial viability. It is a part of enterprise that has potential to operate independently. Business component is key element to realize the deconstruction- reconstruction process of organization (componentization). [14]

Service exchange- in the context of service system, service is the application of resources (knowledge and skills) by one entity for the benefit of another. This definition provides a fresh perspective for understanding economic phenomena, by implying that value is created collaboratively in interactive configurations of mutual exchange. The definition of service exchange between service systems is similar to service orientation in sourcing as a seamless integration between business components. [14]

Resource Integrator- businesses, firms, and customers are all viewed as socio-economic actors who connect through value propositions within “complex service systems” and perform actions aimed at reaching desired outcomes such as mutual value creation. All social and economic actors are essentially doing the same thing; creating value for themselves and others through reciprocal resource integration and service provision. From the S-D Logic view, all economic and social actors are resource integrators and also the actor is always a co-creator of value. This definition is meaningful to describe best-in-class external partners and internal specialists who connect through value propositions within a value net. [14]

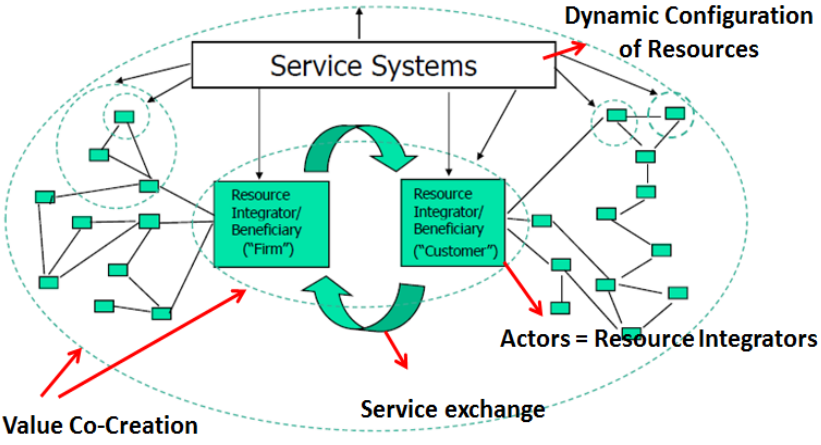

Fig. 3. Core concepts of service system

Current analytical methods for strategic planning such as strategy maps, SWOT analysis, PEST analysis, Porter's five forces analysis, and value chain analysis are not based on common languages, conceptual frameworks, and visual schemas that could be used to facilitate the strategic (sourcing) discussions and strategic (sourcing) decision making. [17] The advantage of the proposed approach "Service System Conceptualization" is its ability to apply for modeling, formalizing, representing, and visualizing the concepts, constructs, and models in strategic sourcing. Therefore, this conceptualization can improve the process of design thinking, prototyping, and exploring alternative solutions for strategic sourcing or capability sourcing decision making.

7 Research Method

Information systems (IS) research has the potential to contribute to improving strategic planning, particularly to improving decision making. [13] The current research focus in strategic management could be improved by some of the more conceptual and design-oriented research in IS. Three research areas of strategic management that could be improved by IS research are (1) the formalization and visualization of the core strategic concepts, (2) the exploration of design techniques for generating and assessing multiple models (to improve the process of designing answers and alternatives to strategic business questions), and (3) the support of computer-aided design for strategic management. Therefore, IS research offers a unique opportunity to contribute to corporate strategy research by helping in the design and exploration of multiple strategic options to better decision making. [13]

In our future research, our intended contribution is applying IS research in strategic management to improve strategic sourcing decision making. We apply IS research for identifying and formalizing strategic (sourcing) notions by (1) discovery of objects relevant to the design of (sourcing) strategy, (2) turning these objects into explicit specifications of a conceptualization, and (3) validating those subsequent objects. Our research is based on theories of two disciplines (1) service science with theories like service system theory and service dominant logic, and (2) organization science with theories like resource based view and dynamic capabilities.

Therefore, our research method is Design Science Research Methodology (DSRM) that is an accepted framework for IS research. [18] Our artifact is a conceptual construction in the scope of strategic decision making. Furthermore, we will use an observational design evaluation method for evaluation design artifact i.e. case studies. Consequently, the next step of our research is designing a sourcing conceptualization based on an ontology and modeling approach for service science like in [19].

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Why Is Aligning Economic- and IT Services So Difficult?

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Abstract. Since its inception, Service Orientation has promised to offer seamless alignment of the business and IT aspects of service-oriented systems. Practitioners, however, often report that such alignment is far from being solved. Specifically, current research in aligning services either remains at a too abstract, strategic level, or is too technology-oriented to be really useful in practice. In spite of being an "old" problem, business-IT alignment is still a dilemma. What makes alignment so difficult? In this work we address this fundamental question by questioning what should be aligned, and what are the concerns hindering alignment. This paper explores the conceptual gaps around the notion of service in the two economic- and IT perspectives. By framing the core constructs of Service Orientation and contrasting those constructs between the economic- and IT perspectives, this paper elicits five core alignment concerns. We illustrate the concerns using a real-life case study featuring an airport baggage handling system. The alignment concerns pinpoint promising solutions in which the alignment problem can be solved.

1 Introduction

Alignment has been a critical issue of service providers and consumers for years [1]. Empirical studies [2] show that alignment is a better predictor of organization's effectiveness than strategic orientation. More than twenty years ago, Henderson and Venkatraman proposed an influential model for business IT alignment [3]. Since then many approaches have proposed solutions for the old alignment problem, yet, how to actually realize it is no clearer today than it was decades ago.

Service Orientation is one of the paradigms that since its inception has promised to offer seamless alignment between multiple perspectives. Practitioners in the field, however, often report that such alignment is far from being solved. With so much hype surrounding Service Orientation, it is not surprising that academics and practitioners interpreted the concept differently and proposed different approaches for service alignment. Accordingly, soon there were abundance of unique methods that are hard to compare, leading to confusion on what alignment implies. Specifically, current research in aligning services either remains at a too abstract, or is too technology-oriented to be really useful in practice.

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As first step towards solving the "old" alignment problem, in this work we address the question of 'what makes alignment so difficult?'. To do so, we take a holistic view on which *perspectives* should be taken on the notion of service alignment, what are the *core elements* that need to be aligned, and what are the *concerns* hindering alignment.

Services, being one of the *core elements* of Service Orientation, are generally addressed from the business- and the IT *perspectives*. Term "business", however, is used in a very broad connotation, meaning anything that relates to the business objectives of a certain company. Eventually business includes IT, too, whenever IT is instrumental to realize, or support, the business. This confusion may conflict with the goal of aligning business and IT. To clarify the two perspectives, we scope down the business perspective (which encompasses organizations, markets and/or activities/services in the broad sense) to the economic perspective (which focuses on creating commercial value).

From the *economic perspective*, services are understood as deeds, processes, and performances [4]. Here a service typically corresponds to an activity (or series of activities) of more or less intangible nature [5]. In this perspective we may understand services as *economic* services, i.e. services for whose provisioning someone has to pay. From the *IT perspective* services refer to entirely different notion. For instance, in the realm of 'web services', a service is understood as "a software system designed to support interoperable machine-to-machine interaction over a network"[1]. In the field of service oriented architectures, a service means "a logical representation of a repeatable activity that has a specified outcome" (e.g. check customer data, deliver pizza, provide higher level education)[2]. A service is self-contained (state-less and adhering to a service contract); may be composed of other services (service composition); and is a black-box to its consumers [6]. Although the economic and IT perspectives on the notion of service are different, they are also related. Therefore they should be properly *aligned*; i.e., linked where relevant and kept consistent as a coherent whole.

To elicit the differing interpretations of the *core elements* per perspective, in this work we identify the shared terminology from both perspectives. To do so, we use a fragment of a real-life case study, featuring an airport baggage handling system, and model it using e^3value [7] and SoaML [8] modeling notations, which represent the economic- and IT perspectives, respectively. The discrepancies in interpretation of the *core elements* per perspective and, more importantly, the reason behind such discrepancies drive the identification of *alignment concerns*.

As a result, we elicit five fundamental concerns that are prevalent in service alignment endeavors. Those concerns suggest the following answer to 'what makes alignment so difficult?'; It is difficult because, in essence, the economic- and IT perspective pursue *incompatible objectives*. Without highlighting such incompatibilities, and specifically guiding how to balance such incompatibilities, alignment approaches are not able to sufficiently ease the alignment endeavors.

[1] `http://www.w3.org/TR/ws-arch/`, visited May 30th, 2013.

[2] `http://www.opengroup.org/soa/source-book/togaf/soadef.htm`, visited May 7th, 2013.

This paper is organized as follows. Sect. 2 presents an overview of service alignment as well as the core concepts *shared* between both perspectives. In Sect. 3 we present our running example. Sect. 4 presents a series of alignment concerns. Sect. 5 briefly reviews related work. Finally, Sect. 6 concludes the paper.

2 Aligning the Economic- and IT Perspectives on Services

This section presents our definition of alignment and introduces shared terminology between the economic and IT perspectives.

2.1 What Does Alignment Imply?

Alignment has been perceived very differently in the many existing approaches. For example, alignment in [3] means *balance*, in [9] *linking*, and in [10] it implies *harmony*. These interpretations each indicate a different, fundamental aspect of alignment: (i) the **alignment process** that entails *linking* equivalent elements, and/or *balancing* and eventually *compensating* the incompatible objectives and (ii) the **alignment outcome** i.e., state of harmony between different elements to achieve a coherent whole. Considering that both process and end-result perspectives are instrumental for ensuring a successful alignment, we define alignment as follows:

From process view, alignment is *a continual process* which includes (i) *linking* the elements that are equivalent or belong to a single overarching concept, and (ii) *balancing* and mutually compensating the incompatibilities. In addition, the alignment process should be carried out *across multiple organizations* as service orientation centers around the idea of offering services in networked organizations [11] rather than a single organization. From the outcome view, alignment is a state in which the core elements make a *coherent whole*, across perspectives, and across multiple organizations.

2.2 Terminology and Basic Concepts

In the following, we introduce the terminology constructs that are shared between the economic- and IT perspectives, but have a different, more specialized, interpretation in the two perspectives. It is our assumption that this multi-interpretable shared terminology motivates conceptual overlap between the perspectives and therefore is an important source of alignment challenges. The proposed terminology is notation-agnostic, although we use our knowledge on value modeling (e^3value) and service modeling (*SoaML*) to elicit the shared terminology. In our past service-oriented design projects we have observed that these terminology constructs are recurring and they are application-generic. However, to ensure that they are the bare essentials of Service Orientation, further research is needed. In the following the constructs of the shared terminology are in typewriter (e.g., `actor`).

- `Actors.` From an economic perspective, actors are *legal entities* [7]. A legal entity can be an enterprise, a profit-and-loss responsible unit within an enterprise, or a final customer. From an IT perspective, actors are *participants*, being *legal entities*, *people*, or *systems* [8].
- `Services.` Actors offer and request `services`. For the economic perspective, these services are *commercial* services, meaning that someone has to pay (give something of value in return) for the provisioning of a service. For the IT perspective, services are logically grouped operations that can be invoked.
- `Interaction.` Actors *interact* with each other. In [12], different kinds of interactions are proposed, depending on the perspective taken. In this paper, we restrict ourselves to the economic and IT perspectives. Taking the economic perspective, we consider *economic value transfers* as interactions. A value transfer can be a service outcome, but can also reflect a payment by transferring money (in [7] the notion of value transfer/exchange and value object is further explained). Assuming the IT perspective, interactions also happen between actors, but now imply *message exchanges* cf. service oriented architectures.
- `Contract.` Both the economic and IT perspective are governed by `contracts`, although these contracts differ per perspective. For instance, a service contract in the economic perspective may state its pricing and service quality in terms of properties valued by the customer. A service contract in the IT perspective may contain an interface specification cf. WSDL and technical quality attributes such as uptime, latency, etc.

3 The Running Example: Baggage Handling System

Our running example is extracted from a baggage handling system. A SOA solution provider company has designed a service inventory for a baggage handling system that is adoptable in different types of airports (e.g. hub, domestic, international, low-cost) and can be used by different types of airlines (e.g. legacy, domestic, international and intercontinental). From a bird's-eye view, baggage handling is quite simple. The traveller arrives at check-in desk, and her/his baggages are tagged by the Airline. Airport plans and governs the baggage handling process. Ground handlers do the real baggage management. They can optimize the routes taken by the carts to get the bags needed most urgently to their destinations fastest. They also track-and-trace the baggages. Finally, the security provider support the screening of the baggage. Consequently, baggage handling relies on five different actors: traveller, airline, airport, ground handers, and security provider.

3.1 Economic Perspective: Service Value Networks

We model the economic perspective using e^3value [7]. Fig. 1 presents an e^3value diagram representing the economic value aspects of the Baggage Handling System.

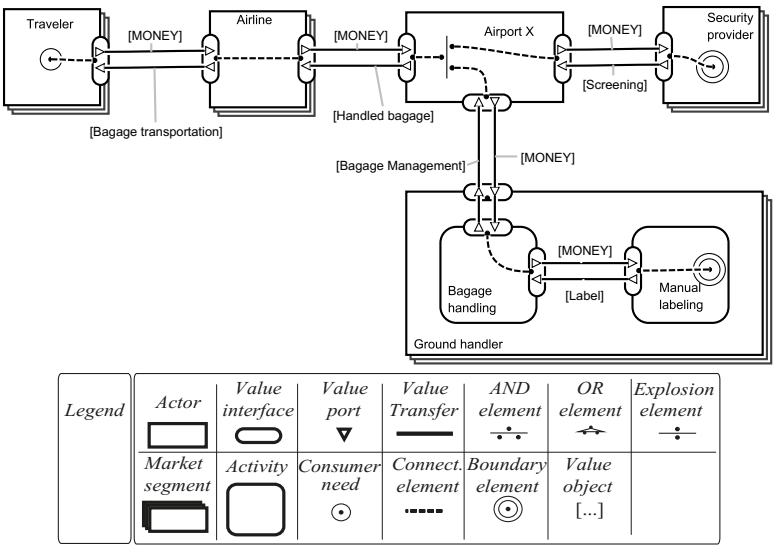

Fig. 1. The e^3*value* model for the baggage handling system

Basically, the e^3*value* model shows how `actors` create value in the context of the Baggage Handling System. First, there is a market segment called 'Traveler' who has the need to transport his baggage. A market segment indicates that are many `actors` that assign economic value in the same way. So in this case, there are multiple 'Travelers'. The notion of market segment is graphically depicted by stacked rectangles. In the economic perspective, the `actors` being part of a market segment are always legal entities or profit-and-loss responsible entities. The 'Airline' transports the baggage and uses services form the 'Airport' to do transportation. Equally to the 'Traveler', the 'Airline' is a market segment, indicating that many airlines are served by the same 'Airport'. The 'Airport', however is a single actor; in this e^3*value* model there is only one 'Airport', and refers therefore to a specific airport (e.g. 'Schiphol Amsterdam'). The actor construct is depicted as a single rectangle. The 'Airport' in turn uses two parties to the actual work. The 'Ground handler' offers 'baggage management' which includes operating the baggage handling system, and the 'Security provider' offers a 'screening' service'.

The `service` 'Manual Labeling' is modeled as a value activity that produces a service outcome named 'Labels' (in e^3*value* a value object). A value activity is an activity that, potentially, can be performed in a *profitable way* by some actor. Therefore, the *value* activity construct is not the same as the *operational* activity often found in process modeling approaches.The notion of profitability is important because actors should be interested in performing the activity.

The notion of `contract` is modeled using the e^3*value* construct 'value interface' (depicted as an oval rectangle including ports shown as arrow heads) that specifies the *interface* to the outside world. For instance, for the 'Airline', it represents that in order to obtain 'Handled baggage', the 'Airline' must provide

a payment. For instance the price (as a contractual element) can be modeled by the port requesting the 'money' value object. In this case the actor requesting the 'money' object determines the price.

The value transfers are a kind of `interactions` between actors or market segments and are depicted as lines between them, annotated with the value objects they exchange. The notion of value transfer assumes transactionality. For instance, the value interface of 'Airport' offering 'Handled baggage' and requesting 'money' in return assumes that *only* 'Handled baggage' is obtained if 'money' is returned, and vice versa.

3.2 IT Perspective: Service Network Architectures

We model the IT perspective of the Baggage Handling System using SoaML [8]. More precisely, we use three models of (i) Service Architecture (Fig. A.I in Appendix), (ii) Service Contract (Fig. A.II), and (iii) Service Choreography (Fig. A.III).

Service Architecture shows how different `actors`, called participants in SoaML, collaborate to provide `services`. For example, the 'Baggage Transportation' service architecture in Fig. A.I represents how 'Airline' interacts with 'Airport' to provide baggage transportation service to 'Traveler'. In doing so, the 'Airport' itself, through its 'Baggage Handling System', collaborates with third-party actors (shown in dashed-boxes in the Baggage Management service architecture in Fig. A.I).

`Contracts` are represented using the model shown in Fig. A.II. First this contract shows that it has two actor roles: (i) provider and (ii) consumer. In the context of 'Baggage Handling Service' (Fig. A.I) 'Ground Handler' is the provider of the 'SetRoute' contract and 'Baggage Handling Sys.' is the consumer. Second, it shows the interfaces and operations that actors use to enact the service. As an example, any actor who plays the role of 'RoutPlacer' or 'RoutTaker' needs to use the interfaces shown in the bottom of Fig. A.II.

The `interactions` between actors involved in a contract are modeled using choreography (see Fig. A.III). The choreography is a specification of what *messages* are exchanged between actors to provide a service.

4 Concerns for Aligning the Economic Perspective and the IT Perspective

We see alignment as a general problem aiming at relating the two economic- and IT perspectives. Such alignment entails addressing a set of general concerns that cross-cut the two perspectives. We observed that many of these concerns in fact originate from the semantic discrepancies between the shared elements in the two perspectives. By making such discrepancies explicit we should be able to make alignment less difficult. In this section we present the discrepancies between the shared constructs introduced in Sect.2. It should be noted that the shared constructs and the discrepancies are notation-agnostic and we use e^3value

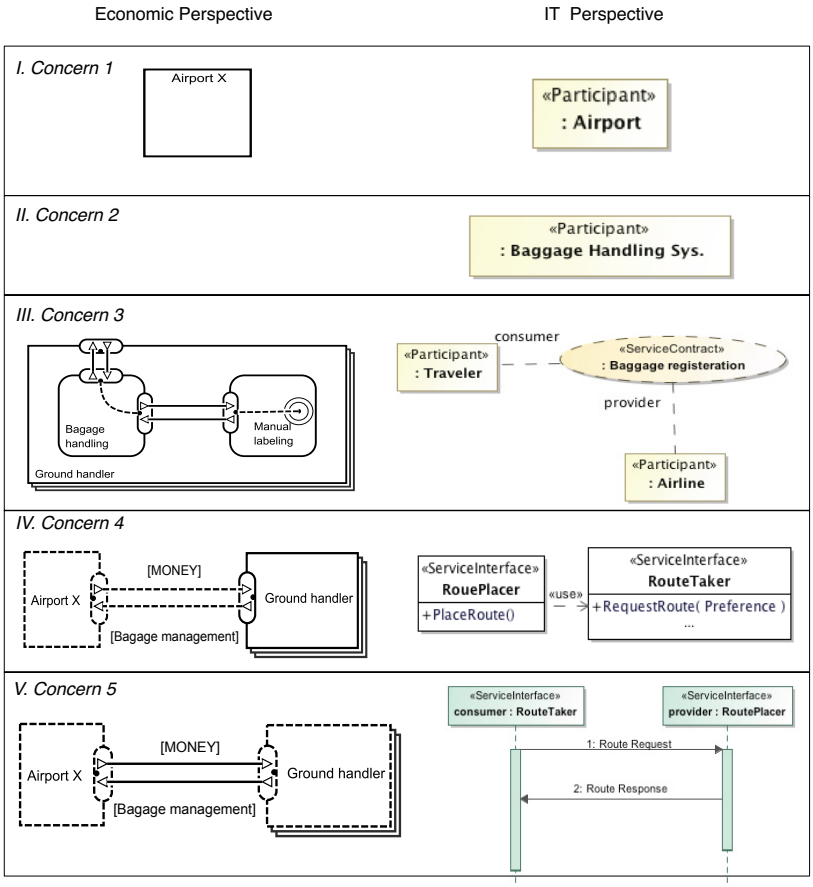

Fig. 2. Discrepancies between economic- and IT perspectives

and SoaML for illustration reasons only. By zooming into the origins of these discrepancies we identified 5 core architectural concerns for alignment. Related to each concern, possible alignment solutions are discussed. The concerns are categorized based on the shared constructs leading to the four areas of concern of `actor, service, contract` and `interaction`.

4.1 On Actors

The notion of actors is perceived differently in the two perspectives. In the economic perspective actors are *concrete instances*, usually *legal entities*, that are *profit-and-loss responsible*. In the IT perspective actors are *actor types*, and not necessarily a legal entity. This discrepancy leads to two alignment concerns described in the following.

Concern 1: Aligning Actor Instances and Actor Types

Description of the concern. In the economic perspective actors are *actor instances*, whereas in IT perspective actors are *actor types*. Fig. 2.I shows such a discrepancy; in the economic perspective 'Airport X' represents a certain instance of an airport, such as Schiphol airport. Its corresponding element in IT perspective is the 'Airport' participant, which is defined at the type level. This pinpoints a fundamental difference in the goals that each of the perspectives pursue. The economic perspective, on purpose, defines the actors at instance level because it represents a business model. A business model cares for how each specified actor would make *profit* or increases its *utility* [7]. The profit calculations are mainly actor-dependent; for instance, the profit of baggage handling for Schiphol airport would probably differ from the profit of another airport. Consequently, the economic perspective focuses on certain instances of actors. In contrast, the IT perspective deliberately aims for actor types to care for flexibility and openness (actors should be able to come and go on-the-fly). To this aim, by focusing on actor types the IT perspective expands the potential participants of 'Baggage Transportation' service network to any 'Airport' that is able to play the same role (i.e., provide/consume the same services). If not known and aligned properly, this discrepancy may have the following implications: it may (i) hinder profitability of the actors' collaborations -if the actor types do not constrain actors with certain value objects and expected profit- and/or (ii) hinder flexibility and openness -if the types are too specific such that they cannot support openness. Thus, the concern is *how to align actors in such a way that their profitability and openness are ensured simultaneously?*

Possible alignment solutions. One way to address this concern is to increase the level of abstraction of actors in the economic perspective to the *market segments*, instead of actor instances. A market segment is an enumeration of actors and as such is between an actor instance and an actor type. Thus, it helps bridging the gap between them. A market segment such as "Ground Handlers" indicates that there are a certain number of ground handlers that share common value transfers. Focusing on the common value objects the actors provide/consume, a market segment broadens the scope to a market, while ensuring the market's profitability.

Concern 2: Aligning Legal Entities and Non-legal Entities

Description of the concern. In the economic perspective the actors are both *legal entities* and *profit-and-loss responsible*. This constraint, however, does not necessarily apply to actors in the IT perspective. This discrepancy is evident in Fig. 2.II, where 'Baggage Handling System', belonging to the airport, appears in the IT perspective and not in the economic perspective. The economic perspective, on purpose, omits 'Baggage Handling System' because it is not the entity that exchanges value in the marketplace. The IT perspective, deliberately, illustrates this actor because it is the consumer of the services offered by 'Ground

Handler System' and 'Security Provider'. In order to support the business model of the economic perspective, the non-legal entities of IT perspective should eventually relate to a legal entity. Thus, the concern is *how to relate non-legal entities to legal entities?*

Possible alignment solutions. To align the non-legal entity actors with the economic perspective, we can use their owning actors, who is an *Expense Carrier*. An expense carrier is an actor or market segment in the economic perspective that create revenues to pay these expenses [13]. For instance, 'Airport' is the expense carrier of 'Baggage Handling System'. By representing the internal structure of 'Airport' in Fig. A and annotating 'Airport' as the expense carrier, we can link the constituent non-legal actors as well.

4.2 On Services

In the economic perspective services are commercial services, which produce outcomes of some value. In IT perspective, a service is a repeatable capability that might not directly produce economic value. Consequently, not all economic services can be mapped to IT services and vice versa. This leads to an alignment concern explained in the following.

Concern 3: Aligning Service as a Value Activity and Service as a Reusable Capability

Description of the concern. In the example of baggage handling system, 'Manual Labeling of Baggage' is a commercial service that is not realized using IT services. In contrast, 'Baggage Registration' is an IT service, which since it does not have a direct economic value, does not appear in the economic perspective (see Fig. 2.III) The economic perspective, on purpose, omits 'Baggage Registration' because it focuses on *value activities* that an actor is willing to pay for. In contrast, the IT perspective, deliberately includes 'Baggage Registration' because it is a *repeatable* and *reusable capability*, which serves *economies of scale*. Consequently, in the two perspectives services pursue two different, possibly contradicting purposes, i.e., profitability and reusability. If not known and if not cared for, this may have the following implications: it may (i) hinder creating value-adding services that are profitable, and/or (ii) hinder reusability and economy of scale. Thus the alignment concern is *how to design services in such a way that their profitability and reusability are ensured simultaneously?*

Possible Alignment Solution. What can possibly facilitate alignment of profitable- and reusable services, is the notion of *capability* in the economic perspective. A capability identifies the ability of actors (in terms of assets and processes) to perform a value activity [14]. Some of the capabilities will be required in multiple value activities. The capability model could support identification of *reusable* capabilities which realize *profitable* value activities.

4.3 On Contracts

In the economic perspective, contract information includes what determines the economic value of a service. Examples are pricing, services or quality attributes. In the IT perspective, however, contract information represents an agreement between the involved actors for how the service is to be provided and consumed. This agreement includes the interfaces, choreography and any other terms and conditions.

Concern 4: Aligning Value Interface and Service Interface

Description of the concern. Fig. 2.IV shows the contract between 'Ground Handler' and 'Airport' in the two perspectives. In the economic perspective, the contract (e.g., value interface in e^3value) indicates pricing for 'Baggage Management' and quality aspects such as 'Baggage Lost Ratio'. Usually, pricing is specified as a property of the port of the actor (in this case the 'Ground Handler') requesting the 'Money' object. The economic perspective restricts itself to such value objects because the goal is to determine the economic value co-creation of a service. The corresponding contracts in the IT perspective include 'SetRout', 'Track-Baggage', and 'Screen-the-Baggage' (see Fig.A.I). As shown in Fig. 2.IV, the information describing the contracts entail the operations and properties of the services realizing these contracts. The IT perspective deliberately focuses on this information because this is what actors need to agree on for communication. This indicates a discrepancy in the purpose of the contract in the two perspectives: economic perspectives seeks for *value determination or pricing* whereas IT perspective seeks for *interoperability.* At the end, the operations of the IT perspective contracts, although designed for interoperability, should realize the assigned value in the economic perspective. Hence, the alignment concern is *how to align the contract information in the IT perspectives with the value interfaces in the economic perspective such that the contact is value-determinable while it supports interoperability?*

Possible alignment solutions. To align contract information in the two perspectives, we envision to devise analysis models that guide one's reasoning in transforming value interfaces to operations and properties of contracts in the IT perspective.

4.4 On Interactions

In the economic perspective, interactions between actors occur in terms of *value transfers.* In the IT perspective, such interactions occur in terms of *message exchanges* in the context of choreographies.

Table 1. Overview of related work

		Alignment Process		Alignment Outcome
		Linking elements	**Balancing incompatible objectives**	
Business Science	[22,23,15]	Linking the elements of value models and coordination models	Homogenizing semantic and syntactic incompatibilities between value and coordination models	Consistent business case and coordination models
	[24]	Linking value models and services	–	–
	[25]	Mapping actors, communication channels, and services between the value model and the IT models.	–	–
	[26]	Link strategy, operational, execution and implementation models	–	–
	[27]	Mapping value proposition on business processes, data flow, and IT infrastructure.	–	Harmonization between the technical and business dimensions of the service-based system.
	[28]	Linking business, technical, and operational services (different types of relationships)	–	–
Computer Science	[29]	Mapping business artifacts and services	–	–
	[19,20]	Linking business process elements to services	–	–
	[30]	Linking business services to service compositions	–	–
	[11,18]	Linking service networks and business process models	–	–

Concern 5: Aligning Value Transfers and Message Exchanges

Description of the concern. Consider the Interaction between 'Ground Handler' and 'Airport' in the economic perspective. This interaction shown in Fig. 2.V is a value transfer that models the *principle of economic reciprocity*: Only if 'Airport' pays, it can obtain the 'Baggage Management' services and vice versa. This principle, inherently, embraces the notion of transactionality, i.e., the value transfers are guaranteed to perform completely or not at all. One of the corresponding interactions between 'Ground Handler' and 'Airport' is shown in Fig. 2.V. This interaction is message-based and illustrate the behavior of 'SetRout' contract. Instead of the detailed, internal interactions needed to enact 'Baggage Management' services, the IT perspective, on purpose, isolates the interactions in the scope of contracts. This is because it aims at *openness* (i.e., actors and their services can come and go on-the-fly as long as they comply with the contract behavior). At the end, interactions between actors should serve both goals of transactionalty and openness. The overall effect of message exchanges should enable transactionality, while the interactions support openness. Thus, the alignment concern is *how to align interactions in such a way that openness and transactionality are supported simultaneously?*

Possible alignment solution. A possible solution for supporting both transactionality and openness is to use a model that frames and highlights *how* using independent message transfers a transaction is realized. This model could add the business process perspective on the interactions in the economic perspective. The business processes lead moving from transactional value transfers to message exchanges in the context of contracts [14,15]. It should be noted that, such model differs from the approaches and technologies that address transactionality in the business process executions (e.g., WS-Transaction) [16,17]. The focus of these models should be on guiding service designers to design for transactionalty rather than how to implement it.

5 Related Work

Alignment has been researched in both Business- and Computer Sciences. Table 1 classifies a number of recent approaches from both *alignment process* and *alignment outcome* views. This table reveals the following two main findings. First, from alignment process view, existing approaches focus only on *linking different elements*, and *balancing incompatible objectives* is not supported. This implies that the current focus, common in both Business- and Computer Science field, consists of mapping the matching elements, rather than balancing incompatibilities. This work, to the best of our knowledge, is the first that externalizes the incompatible objectives and makes the concerns posed by such incompatibilities explicit. Second, from alignment outcome perspective, most existing approaches leave the outcome of alignment implicit, making governance of alignment difficult. We specify the alignment outcome as the state where the core elements (i.e., actors, services, contracts, and interactions) make a coherent whole across both perspective, while their incompatibilities are balanced.

Alignment Approaches in Business Science. An analysis of over 150 articles reveals that most approaches in this field focus on integration between business- and IT strategies and goals of a *single* enterprise [3]. In recent years, a number of approaches addressed alignment in networked organizations (see Table 1). Their IT perspective, however, is scoped down to high-level analysis models only (e.g., business and coordination process models [15]).

Alignment Approaches in Computer Science. Alignment in these approaches entails *linking* different service-oriented elements. Some link service network- and business process models [11,18]; while others link business- and software service models [19,20][3]. Although the aforementioned approaches appear to be quite different, they all converge to a common perception of "business", i.e., activities or services that are eventually supported by IT services. In this sense, business services are higher-level abstractions of software services, the

[3] In a systematic literature review on service identification methods, Gu and Lago [21] report that 40% of the methods use business processes to align business- and software services.

same as analysis models are higher level abstractions of design models. In practice, however, "business" does not entail higher level abstractions of IT services only. In turn, business might include elements that are in essence inconsistent with their corresponding IT elements. We argue that such simplistic perception of "business" is one of the main sources of confusion which make alignment especially challenging.

6 Conclusion

When Service Orientation was first introduced, many companies perceived it as providing *the solution* for the *old* alignment problem. After a decade, alignment still remains unsolved. This paper argues that the reason behind such difficulty lies in the semantic discrepancies between the economic- and IT perspectives. By framing the core elements of Service Orientation and contrasting those elements between the economic- and IT perspectives, this paper identifies five core alignment concerns. Although these concerns by no means are complete, they are representative as they cover alignment between the core elements.

We propose that these are fundamental issues that a service architect needs to address for achieving a coherent service-based enterprise. One way of addressing the alignment concerns is to guide the decision making of architects using *architectural viewpoints* [31]. With the goal of making alignment less difficult, future work will design viewpoints for aligning economic- and IT perspectives.

The concerns we identified go beyond mere design or modeling, and pose interesting challenges for other aspects of services. For instance, service adaptation is often triggered by changes in economic services. Solving the alignment challenges more formally would allow carrying out adaptation automatically and across both perspectives. In sum, alignment concerns more attention in various aspects of service science.

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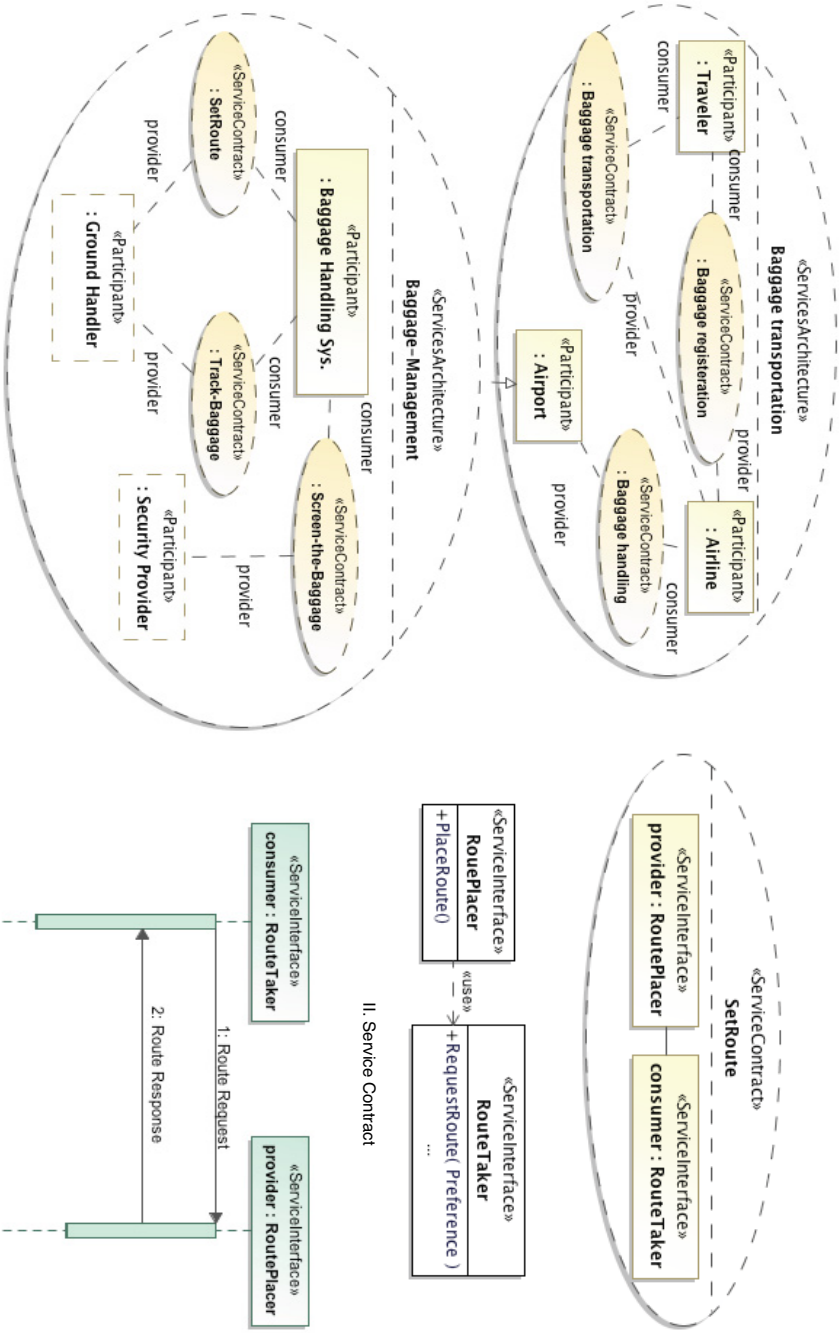

Fig. A. Appendix: The SoaML models for the baggage handling system

Towards the Consideration of Performance Risks for the Design of Service Offers

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Abstract. This work analyzes an outsourcing provider's challenge to design optimal service offers in a setting in which future service performance is uncertain and the provider is penalized or rewarded for deviating negatively or positively from performance guarantees. In particular, we address the question how outsourcing providers with different risk attitudes should mitigate service performance risks by incorporating uncertainty premiums into service prices. The problem is studied in the light of service incident related penalty and reward functions that tie payments to the adverse financial impact a service customer incurs from performance degradations.

Keywords: Performance Risk, Uncertainty Premiums, Service Offer Design, Decision Support.

1 Introduction

Over the last few years the importance of outsourcing has been growing continuously. Sales in IT outsourcing (ITO) and business process outsourcing (BPO) totaled $469 billion in 2012 and current forecasts estimate the outsourcing market to grow by 10% (ITO) or rather 25% (BPO) per year [10]. At the same time support of business processes by underlying (IT) services is often judged to be mission critical ([13], [22]), and service unavailability or major reductions in service performance may have a significant adverse impact on business ([7], [14], [16], [22]).

Providers are usually unable to make precise forecasts of the performance levels they will achieve in the delivery phase of a service. Thus, if service performance is uncertain (as opposed to certain or under risk)[1], providers need to consider and assess the risk of future penalty payments – i.e., the consequences of performance degradations - when designing service offers.

In this paper we aim to address an outsourcing provider's challenge to define optimal service offers in case of uncertain future service performance and incident related penalty and reward functions. The latter allow assessing the

[1] That is, the probability of occurrence of specific performance levels is unknown.

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business impact of single service incidents on customer business operations. Optimal service offers ensure that the profit of service providers is not cannibalized by penalty payments, which result from performance degradations.

The contribution of this work is twofold: first, we describe the offer design problem of a service provider by means of decision alternatives, states and outcomes, which are three fundamental concepts of decision theory. Second, based on this description, we suggest providers to apply decision rules to quantify the uncertain amount of penalty payments and rewards that may result from performance deviations. We recommend providers to incorporate this estimate, which we denote as *uncertainty premium*, into service prices to hedge against the uncertainty of future service performance.

The remainder of this paper is organized as follows: Chapter 2 introduces concepts to describe service performance through distributions of service incidents (incident indicators) and provides an introduction to corresponding incident related penalty and reward functions. Chapter 3 discusses literature related to this work. Afterwards, the business setting addressed is introduced in Chapter 4. In Chapter 5 we develop our approach to enable outsourcing providers to design optimal service offers in case of uncertain future service performance. Chapter 6 demonstrates the applicability of our approach by means of an example. Finally, Chapter 7 provides a conclusion, outlines limitations and topics for future research.

2 Towards the Application of Incident Indicators

Established (service level) indicators, which are applied to characterize service performance, quantitatively describe facts in an aggregated manner [9]. Such aggregating indicators are usually determined by translating the attribute values of individual service incidents into an aggregated single value. An indicator for "service availability", for instance, might describe the minimum availability of a service in a predefined monitoring period in percent. It is obtained in two steps: first, the outage durations of all outage incidents that occur during a predefined monitoring period are added up to a "total outage time". In a second step, this total outage time is set in reference to the duration of the monitoring period itself. For example, if outage durations add up to a total outage time of 400 minutes and the monitoring period is 10,000 minutes, the service availability is calculated as 96%. The information about the outage durations of single outage incidents (i.e., the incident distribution), however, is not reflected in this aggregated value any more. Consequently, if outsourcing partners stipulate performance levels on basis of aggregating indicators, they cannot infer on the distribution of attribute values of service incidents any longer.

This information, however, is needed for the application of incident related penalty and reward functions which allow outsourcing customers to determine the adverse impact of performance degradations on their business more precisely[2]. In this work, we therefore suggest using *incident indicators* [7] to define

[2] Incident related penalty and reward functions will be introduced in the end of this chapter.

service performance. Incident indicators have evolved with the development of service level engineering (cf. [6]). They are defined with regard to a specific *service incident class* $k_q \in K$ (e.g., "outage incidents", "response time incidents", etc.)[3]. In contrast to aggregating indicators, incident indicators describe the distribution of service incidents' attribute values (e.g., the distribution of outage durations). They characterize performance levels through two parameters: first, through an established aggregating indicator that we denote as *reference value* r_{k_q} (e.g., the total outage time), and, second, through a *probability density function* d_{k_q}, which characterizes the distribution of service incidents' attribute values (e.g., the distribution of outage durations). For reasons of simplicity we will limit ourselves to illustrate the applicability of incident indicators based on the example of "outage incidents" (and thus of "service availability"), only.

Building upon our previous example, we regard the total outage time of 400 minutes as a reference value to characterize service performance, whereas the monitoring period is again 10,000 minutes. By analyzing performance data of a past monitoring period the provider finds that the distribution of outage durations of outage incidents is best represented by a generalized beta density function $B(\alpha; \beta; x)$ for $d_{k_q}(x)$ with shaping parameters α, β and a support of $[0, 30]$, since the maximum outage duration of a single incident that he has observed amounts to 30 minutes.

Figure 1 illustrates the approach. The outage durations of all individual outage incidents are aggregated into a single value measuring the total outage time (i.e., the reference value). Afterwards, individual outage durations are analyzed to identify a probability density function that represents the distribution of outage durations best. A probability density function can, for instance, be determined by analyzing performance data of past monitoring periods (cf. [24]). Summarizing, incident indicators characterize service performance through a tuple of a probability density function and a reference value (d_{k_q}, r_{k_q}). If more than one indicator (i.e., more than one service incident class) is used to describe service

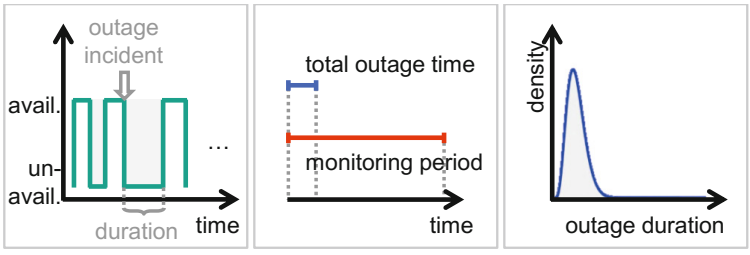

Fig. 1. Characterization of outage durations through a generalized beta density function and a corresponding reference value

[3] Service incident classes (e.g. "outage incidents") can usually be mapped to established performance indicators (e.g. "service availability").

performance, tuples of reference values and probability density functions have to be applied.[4]

A second fundamental concept are *incident related penalty and reward functions* (e.g. [8]). In outsourcing agreements, the negotiation of penalties and rewards ensures that agreed service levels are met and incentivizes providers to achieve or to exceed stipulated service performance [2, p. 82 ff]. Incident related penalty and reward functions tie penalties and rewards to the financial impact that single service incidents have on the customer's business. For example, let the customer's penalty and reward function for "outage incidents" be $f_{outages}(x) = x^2$, whereas the input variable x reflects the outage duration of a particular incident. If a service provider generates an additional outage of ten minutes (compared to guaranteed service performance) he is obliged to pay penalties of €100. If the provider manages to prevent an outage of eight minutes, however, he will receive a reward of €64.

If service performance is described through incident indicators we can generalize this concept: penalties and rewards are determined by comparing the financial impact – which we denote as *business impact (bi)* – of guaranteed versus achieved service performance. The business impact of service performance is calculated by combining a service provider's information about the distribution of attribute values of service incidents (i.e., the incident indicator) with the customer's penalty and reward function. If service performance is described through incidents of a one-dimensional service incident class only, business impact can be calculated as described in (1) below: we integrate over the support $[t_{k_q}, u_{k_q}]$ of the product of probability density function d_{k_q}, reference value r_{k_q} and penalty and reward function f_{k_q} and subsequently divide by attribute value x:

$$bi_{k_q} = \int_{t_{k_q}}^{u_{k_q}} \frac{d_{k_q}(x) \cdot r_{k_q}}{x} \cdot f_{k_q}(x) dx \ . \tag{1}$$

Simplified, the first factor of (1) (fraction $\frac{d_{k_q}(x) \cdot r_{k_q}}{x}$) represents the "number" of service incidents with specific attribute values to occur. The division by x in the first factor is needed because the penalty and reward function $f_{k_q}(x)$ assigns a financial impact to each service incident with specific attribute values. The result of (1) is a monetary value which quantifies the business impact an outsourcing customer incurs if a service provider delivers a service at a specific performance level. By comparing the business impact of stipulated and achieved service performance the amount of resulting penalties and rewards can be determined. If service performance is characterized through incidents which are described by multiple attributes, (1) needs to be generalized by considering all service incident classes accordingly.

[4] Depending on the dimensionality of service incidents considered, probability density functions might be univariate (e.g., generalized beta density functions) or multivariate (e.g., dirichlet distributions).

3 Related Work

To set our work in reference to contributions of other authors we have conducted a literature review on the definition of service offers from the perspective of service providers. The literature review follows the methodology proposed by Webster and Watson [25]: we performed an extensive forward and backward search without temporal restriction in "Google Scholar" with the following keywords (as well as combinations thereof): "service", "service provider", "service offer", "service performance", "service quality", "generation", "definition", "decision", "decision support", "risk" and "uncertainty". The remainder of this chapter is divided into three parts, each covering a specific field of research.

Decision Support. In [15], [16] and [17] the authors discuss portfolio optimization of service level agreements (SLAs) in service value networks. The objective of all articles is to determine an optimal portfolio of SLAs (provider view) which minimizes the risk of SLA violations caused by service failures (and incurred penalty payments). While Michalk et al. analyze the optimization problem from the perspective of a risk averse outsourcing provider [16], their approach is extended by Michalk and Blau to investigate this issue from the perspective of a risk averse service intermediary [15]. In [17], Michalk et al. study the portfolio optimization problem under consideration of different risk attitudes of a service provider. In contrast to those articles, Schulz discusses business related design of service level objectives (SLOs) for service level agreements [21]. His objective is to design service offers through the specification of thresholds for SLOs which ensure that expected penalty payments do not exceed a predefined upper limit.

SLA Design. The works [12], [13], [19], [20] and [26] discuss the derivation of optimal service level objectives for SLAs. Sauvé et al. derive optimal SLOs from a service provider's (internal) view by minimizing IT infrastructure cost and business financial loss (lost revenue) incurred through performance degradations and service failures [19]. In [20], Sauvé et al. apply this approach in an e-commerce setting. Marques et al. extend the approach suggested in [19] to study the derivation (negotiation) of optimal service level objectives from a joint perspective of a service provider and customer ([12], [13]). Optimal SLOs are derived by maximizing the profit margins of service provider and customer at the same time. Finally, Zhang et al. derive optimal SLOs for diverse usage windows in a software as a service domain from a provider's point of view [26].

Regarding the design of SLAs the articles [4], [5] and [11] further discuss the derivation of SLOs through the analysis of operational data. Breitgand et al. derive optimal response time SLOs for different service usage windows by maximizing a service provider's utility [4]. Utility considers gains through successful transactions and losses incurred by service failures. Ismail et al. design optimal service offers in a negotiation setting by evaluating constraints and objectives [5]. Constraints comprise resource capacity, temporal constraints and QoS requirements. Objective based evaluation then identifies the particular time slot that maximizes the provider's utility. Ludwig and Kowalkiewicz define service

level objectives by predicting future service behavior (and performance) on basis of an analysis of past operational data [11].

Insurance Theory. Mastroeni and Naldi discuss the calculation of risk premiums for insurances of service providers against SLA violations [14]. The approach aims to determine maximum insurance premiums that service providers with different risk attitudes should be willing to accept if they purchase an insurance against penalty payments for SLA violations.

Identified articles have in common that service performance is almost exclusively described through aggregating indicators: a characterization through incident indicators - in which the number of incidents and their respective attribute values matter - is not considered. Not surprisingly, incident related penalty and reward functions (see previous chapter) are not discussed either. None of the identified articles discusses the design of optimal service offers in a setting in which penalty payments are tied to the adverse financial impact of service performance. Either this impact is not considered at all or it is only tied to the number of incidents that occur, but not to their specific attribute values. Concluding, current literature - though diverse in topics - lacks methodologies to design optimal service offers if service performance is to be defined on basis of incident indicators.

4 Business Setting

This work addresses the design phase of a service that precedes the negotiation of an outsourcing contract between a service provider and its customer. We focus on a single outsourcing provider who is invited (among other external providers) to respond to a customer's request for proposal (RfP) and to submit a service offer. We analyze the provider's challenge to design an optimal service offer.

We assume that service offers need to be defined through tuples of service price and performance, the latter of which has to be described on the basis of incident indicators.[5] Remaining functional and non-functional requirements – except for service performance and price – are supposed to be fixed.

Due to the high significance of the service, the outsourcing provider has to accept the following specifications regarding penalty and reward functions: penalties and rewards are quantified on basis of predefined penalty and reward functions. The stipulated service performance level (reference values and corresponding probability density functions) constitutes the basis for the determination of penalty payments and rewards. If the business impact of achieved service performance exceeds the impact of stipulated performance (i.e., if the provider delivers an "inferior" distribution of service incidents) the outsourcing provider has to pay penalties in the amount of additional business impact caused. In

[5] Regarding the characterization of service performance we further assume that service incidents are independent of one another and that single service incidents do not overlap. This implies, for instance, that "outage incidents" and "response time incidents" do not occur at the same time.

return, the outsourcing customer is willing to grant financial rewards if the provider performs better than promised. To establish a shared understanding of achieved service performance during service delivery, outsourcing providers are asked to grant their client constant monitoring access.

5 Considering Service Performance Uncertainties in Service Offers

The outsourcing provider faces the challenge to design a service offer which allows realizing an expected profit even if service performance is uncertain and penalties and rewards have to be expected. The process of offer design requires two decisions: first, providers need to determine which level of service performance to bid. Second, they have to set a price for the delivery of the service at the specified performance level. Both problems are closely interlinked and cannot be addressed independently.

Decision theory allows translating these challenges into a formal model which may then serve as a basis for structured analyses. In the following, we first elaborate on the setup of such a decision model before we subsequently discuss how to design optimal service offers.

5.1 The Decision Model of the Service Provider

The objective of decision theory is to support decision makers in identifying optimal decision alternatives to pursue. To compare different decision alternatives, a decision problem can be transformed into a formal model of three components (cf. [1]): a set of decision alternatives to follow, a set of states that may be realized in the future[6] and a set of corresponding decision outcomes. Decision outcomes are assigned to each combination of decision alternative and state and are calculated on basis of a predefined result function. All three components are used to compile an outcome matrix that describes a decision problem in a systematic way.

As decisions have to be modeled with regard to the context they are made in, we define decision alternatives, states and outcomes with reference to our business setting. In the following, for reasons of simplicity, we describe service performance through incidents of the class "outage incidents" only. Results obtained may, however, be generalized to characterize settings in which service performance is described through different indicators and combinations of several indicators as well.

Decision Alternatives. Decision alternatives describe different strategies a decision maker can pursue in a particular situation [1]. With regard to our setting, decision alternatives correspond to the set of performance levels A a provider

[6] States describe environmental factors that have an influence on the outcome of a decision.

stipulates in the *design phase* of a service. As service performance is to be described through incident indicators, each decision alternative $a_i \in A$ is defined through a tuple of probability density function d_{a_i,k_q} and a corresponding reference value r_{a_i,k_q}, whereas k_q is a proxy for the service incident class considered. Thus, we can write $a_i = (d_{a_i,k_q}, r_{a_i,k_q})$.

States. States describe environmental factors that have an influence on the outcome of a decision [1]. In our setting, decision outcomes are influenced by the performance level that is achieved in the *delivery phase* of a service. Similar to decision alternatives, states $s_j = (d_{s_j,k_q}, r_{s_j,k_q})$ with $s_j \in S$ are described through a probability density function d_{s_j,k_q} and a corresponding reference value r_{s_j,k_q}. We assume the occurrence of states to be uncertain, i.e., the outsourcing provider has no information about the probability of a specific performance level to be realized in the delivery phase of the service.[7]

We assume that outsourcing providers evaluate performance data of past monitoring periods to generate decision alternatives and states. This assumption implies that the set of decision alternatives A and states S correspond to each other as both are compiled out of the same historic performance data.

Decision Outcomes. Decision outcomes are defined as the (monetary) difference between the business impact of stipulated service performance $bi(a_i)$ (i.e., the decision alternative selected) and actually achieved service performance $bi(s_j)$ (i.e., the state realized). Mathematically, decision outcomes $o(a_i, s_j)$ of an arbitrary decision alternative $a_i \in A$, state $s_j \in S$ and a result function g are calculated as

$$(a_i, s_j) \xrightarrow{g} o_{a_i,s_j} = g(a_i, s_j) = bi(a_i) - bi(s_j) \; . \tag{2}$$

Negative decision outcomes ($o_{a_i,s_j} < 0$) result in penalty payments and imply that a service provider performs worse than promised. If this is the case, business impact of achieved service performance is higher than the one of stipulated service performance. Due to the conditions stated in the request for proposal (see Chapter 4), the service provider is obliged to reimburse its customer in the amount of additional financial impact caused. Positive outcomes ($o_{a_i,s_j} > 0$), in contrast, result in financial rewards and imply that a service provider performs better than promised. In such cases the provider will be rewarded in the amount of business impact prevented on the customer's side. Outcomes of zero imply that neither rewards nor penalty payments will be paid.

Finally, decision alternatives, states and outcomes are used to compile an outcome matrix. We will illustrate the setup of such an outcome matrix based on the following example.

Example

An outsourcing provider has received a request for proposal from his potential customer that contains the following information: service performance is to be

[7] As outlined in Chapter 4 we consider the environment used to deliver a service (hardware, software, etc.) to be constant. The performance of this delivery environment is, however, assumed to be subject to fluctuations within reasonable limits.

measured through incident indicators with regard to "outage incidents" only. The penalty and reward function for outage incidents is defined as $f_{outages}(x) = x^2$ *whereas the input parameter* x *corresponds to the duration of an outage measured in minutes.*

As introduced above, the service provider assesses available performance data of four monitoring periods. A thorough analysis of the incident data collected allows for the derivation of a reference value $r_{outages}$ *("total outage time") and a probability density function* $d_{outages}(x)$ *for each monitoring period. Probability distributions are found to be representations of generalized beta density functions* $d_{outages}(x) = B(\alpha; \beta; x)$*, which characterize the distribution of service incidents outage durations for each monitoring period considered. Shapes of generalized beta density functions are described by two input variables* α *and* β *and by the function's support* $[t, u] = [0, 30]$*, since the RfP restricts the maximum duration of a single outage to thirty minutes.*

Figure 2 shows the resulting outcome matrix. Both, the set of decision alternatives and the set of states are derived on basis of past performance data and correspond to each other. As the outsourcing provider has no additional information about the probability of a specific state (s_1 *to* s_4) *to be realized (because the obtained data set is too small), the occurrence of future service performance (states) is uncertain. For each combination of action* a_i *and state* s_j *the corresponding decision outcome* o_{a_i,s_j} *is calculated according to (2). For example, decision outcome* $o_{a_1,s_2} = -1,360.71$ *may be obtained by subtracting the business impact of state* s_2 *(*$bi(s_2) = 3,075.00$*) from the business impact of decision alternative* a_1 *(*$bi(a_1) = 1,714.29$*). Alternatives* a_i *and states* s_j *are described through a tuple of generalized beta densitiy function* $B(\alpha; \beta; x)$ *and corresponding reference value (total outage time [minutes]) each. Negative entries constitute penalties, while positive ones are financial rewards.*

			States (uncertain			
			s_1	s_2	s_3	s_4
			(B(5;30;x);400)	(B(5;15;x);410)	(B(5;5;x);450)	(B(30;5;x);400)
Decision alternatives	a_1	(B(5;30;x);400)	0.00	-1,360.71	-5,035.71	-8,571.42
	a_2	(B(5;15;x);410)	1,360.71	0.00	-3,675.00	-7,210.71
	a_3	(B(5;5;x);450)	5,035.71	3,675.00	0.00	-3,535.71
	a_4	(B(30;5;x);400)	8,571.42	7,210.71	3,535.71	0.00

Fig. 2. Example of an outcome matrix stating potential penalty payments and rewards for four decision alternatives in dependence of realized states

5.2 Designing Service Offers through the Quantification of Uncertainty Premiums

Now, we want to turn towards the question at what price a provider should offer a service solution if he assures to deliver a specific service performance level. This problem is analyzed under the assumption that the environment used to deliver a service remains unchanged which implies that the delivery cost c is constant (see Chapter 4). In this work we further assume that providers aim to achieve a profit that satisfies their expectations when designing service offers.

Profits are implicitly represented in service prices. In its simplest form, a service price for an arbitrary service offer $a_i \in A$ is composed of a constant profit m which is added to the constant cost c (see Chapter 4) a provider incurs for the delivery of this service:

$$p_{a_i} = c + m \; . \tag{3}$$

What is not considered in (3) is the uncertainty of future service performance which in turn results in an uncertainty of potential penalty payments or rewards. Consequences with regard to the definition of service prices are twofold: underperformance will entail penalty payments, which will cannibalize the provider's profit. Performing better than promised, in contrast, will increase the profit due to financial rewards a provider will receive. Though the second effect seems quite attractive, it may lower an outsourcing provider's chance to win the customer's contract. This is especially the case if the considered market is a buyer's market, in which the price is the major source of differentiation. Thus, when expecting rewards providers should consider giving customers a price discount to stay competitive.

The severity and impact of performance uncertainty becomes evident if we take a look at our example (see Figure 2): we recognize that decision outcomes differ significantly. If an outsourcing provider stipulated alternative a_1 ("high" performance) and state s_4 ("low" performance) was realized, the provider would be obliged to pay penalties in the amount of $€|-8,571.42| = 8,571.42$. Depending on the variance of service performance and the customer's penalty and reward function, neglecting performance uncertainty may result in significant financial losses for service providers.

To ensure that outsourcing providers are able to satisfy their profit expectations in case of performance uncertainty, they need to assess and consider the risk of penalty payments and rewards when defining service prices. To do this, it is essential to gain an idea of the amounts of penalty payments and rewards which might occur. If both values were known, risk neutral providers would simply add expected penalty payments π_{a_i} to the service price and reduce it by expected rewards ρ_{a_i}:

$$p_{a_i} = c + m + (\pi_{a_i} - \rho_{a_i}) \; . \tag{4}$$

Penalty payments π_{a_i} and rewards ρ_{a_i} vary for different alternatives a_i, whereas delivery cost c and profit m are the same for all alternatives a_i (see (4)). Consequently, the price to be charged depends on the decision alternative selected

as well. However, for settings under uncertainty, which we focus on in this work, probabilities for the occurrence of states are unknown. Thus, providers cannot simply determine expected values for penalties and rewards. Moreover, providers with diverse attitudes towards risk may assess and consider the risk of penalty payments and rewards differently.

Decision theory has developed means to deal with problems of uncertainty, for instance, through the development of decision rules. Decision rules are applied if a dominant decision alternative does not exist [1, p.110 ff]. In such settings, decision rules assess and compare the set of decision alternatives (i.e., the rows of an outcome matrix) by assigning a valuation $v_{a_i,dec.rule}$ to each alternative $a_i \in A$ (i.e., a real value). This value is obtained through a valuation function $\Phi_{dec.rule}(a_i)$. The latter aggregates the perceived utility[8] that a decision maker associates with each decision outcome of an alternative to a real value [1, p.100 ff]. For instance, for a highly risk averse service provider the valuation of a particular decision alternative may correspond to the value of the worst decision outcome that might be achieved.

Decision rules, represented through valuation functions, implicitly characterize preference relations of decision makers. Thereby, it is possible to model the behavior of decision makers with different attitudes towards risk [1, p.112 ff].

If the mapping between risk attitude and valuation function is known[9], it is possible to determine the valuation that a decision maker with a specific risk attitude associates with a decision alternative. For example, the valuation function of a risk seeking provider is defined as $\Phi_{dec.rule}(a_i) = \max_j o_{a_i,s_j}$ [1, p.113]. If this valuation function is applied to decision alternative a_2 of Figure 2 the obtained valuation of the service provider equals $v_{a_2,dec.rule} = \max_j o_{a_2,s_j} = 1,360.71$.

We suggest using this kind of valuation functions as a proxy for the estimated penalties and rewards, which may result from the stipulation of specific decision alternatives. That is, in dependence of a decision maker's risk attitude we calculate an uncertainty premium for each decision alternative:

$$(\pi_{a_i,dec.rule} - \rho_{a_i,dec.rule}) = -v_{a_i,dec.rule} = -\Phi_{dec.rule}(a_i) \; . \tag{5}$$

The valuation $v_{a_i,dec.rule}$ is negated for the following reasons: negative valuations ($v_{a_i,dec.rule} < 0$) correspond to penalty payments that providers expect to incur, while positive valuations ($v_{a_i,dec.rule} > 0$) are associated with financial rewards. Thus, if valuations are negative, providers should increase service prices to ensure that profit is not cannibalized. Likewise, if valuations are positive, they should grant price discounts, as these will increase chances of winning service contracts.

[8] We assume the associated utility for a decision outcome to equate to the (financial) decision outcome as defined in the outcome matrix.

[9] Decision theory allows identifying decision rules for decision makers with diverse risk attitudes based on empirical analyses (see e.g. Hurwicz principle [1, p.113 ff]).

6 Considering Uncertainty Premiums in Service Offers - An Example

Given the risk attitude of outsourcing providers, decision rules allow the quantification of uncertainty premiums that providers should incorporate into their prices. In this section, we apply four different decision rules to illustrate the applicability of our approach: Maximin (risk averse), Hurwicz (risk averse with parameter value $\lambda = 0.2$[10]), Laplace (risk neutral), Hurwicz (risk seeking with parameter value $\lambda = 0.8$) and Maximax (risk seeking) [1, p.112 ff].

Table 1. Matrix stating obtained uncertainty premiums which result from the application of different decision rules

		Uncertainty premiums in dependence of applied decision rule				
		Maximin	Hurwicz(0.2)	Laplace	Hurwicz(0.8)	Maximax
		$-v_{a_i,Maximin}$	$-v_{a_i,Hurw.(0.2)}$	$-v_{a_i,Laplace}$	$-v_{a_i,Hurw.(0.8)}$	$-v_{a_i,Maximax}$
Decision Alternatives	a_1	8,571.42	6,857.14	3,741.96	1,714.28	0.00
	a_2	7,210.71	5,496.43	2,381.25	353.57	-1,360.71
	a_3	3,535.71	1,821.43	-1,293.75	-3,321.43	-5,5035.71
	a_4	0.00	-1,714.28	-4,829.46	-6,857.14	-8,571.42

Let us assume that an "optimistic" service provider aims to quantify uncertainty premiums for the set of decision alternatives $a_i \in A$ from our example. Based on an experiment, the provider has determined that his preferences are best represented by a Hurwicz decision rule with a parameter value of $\lambda = 0.8$ (risk seeking). The valuation function of the Hurwicz decision rule is defined as:

$$v_{a_i,Hurw.(\lambda)} = \Phi_{Hurw.(\lambda)}(a_i) = \lambda \cdot \max_j (o_{a_i,s_j}) + (1-\lambda) \cdot \min_j (o_{a_i,s_j}) \; , \lambda \in [0,1] \; . \tag{6}$$

If the outcome matrix of our initial example (see Figure 2) characterizes the set of decision alternatives that can be pursued, the outsourcing provider applies the valuation function (6) to calculate uncertainty premiums for all decision alternatives $a_i \in A$. Taking alternative a_1 as an example, the uncertainty premium is calculated as follows:

$$\begin{aligned} -v_{a_1,Hurw.(0.8)} &= -\Phi_{Hurw.(0.8)}(a_1) \\ &= 0.8 \cdot \max_j (o_{a_1,s_j}) + (1-0.8) \cdot \min_j (o_{a_1,s_j}) \\ &= -(0.8 \cdot 0 + 0.2 \cdot -8,571.42) = 1,714.28 \; . \end{aligned} \tag{7}$$

[10] The parameter value $\lambda \in [0,1]$ is a measure which indirectly characterizes a decision maker's attitude towards risk. In this paper we apply the Hurwicz decision rule with parameter values $\lambda = 0.2$ (risk averse) and $\lambda = 0.8$ (risk seeking).

If preferences of the outsourcing provider were represented by different decision rules, he would calculate uncertainty premiums according to the same underlying rationale. Table 1 provides an overview of the uncertainty premiums that a provider would incorporate into his service price in dependence of the decision rule applied. Positive entries signify that the provider will add a premium to his price, while negative entries constitute price discounts.

Figure 3 shows the calculated uncertainty premiums which result from the application of the considered decision rules. The horizontal axis of the figure lists the different decision alternatives whereas the vertical axis marks the amount of uncertainty premiums in dependence of the applied decision rule.

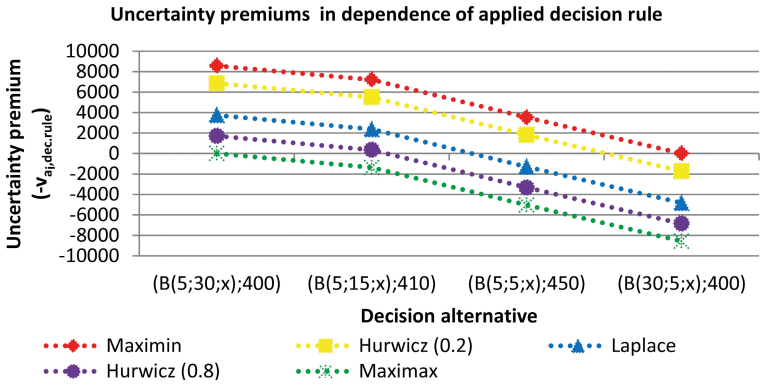

Fig. 3. Calculated uncertainty premiums in dependence of applied decision rules

We recognize that risk seeking providers will grant higher absolute price reductions than those who are risk averse. This effect becomes evident, for instance, through a comparison of the calculated uncertainty premiums of the Maximax-(risk seeking; green graph) and the Maximin-rule (risk averse; red graph). We recognize that the green graph always runs below the red one. The blue graph characterizes uncertainty premiums which are obtained through the Laplace-rule. As the latter is applied by risk neutral decision makers, the blue graph separates risk averse from risk seeking outsourcing providers. If a graph falls below the blue one outsourcing providers are considered to be risk seeking and vice versa. In general, risk seeking outsourcing providers will have better chances of winning service contracts, as they define lower uncertainty premiums and are thus able to offer lower prices. We recognize, for instance, that the curves of service offers of risk seeking providers which follow the Hurwicz(0.8) principle (purple graph) or the Maximax-rule (green graph) are much lower than those of a risk neutral (Laplace) or risk averse outsourcing providers (Hurwicz(0.2) or Maximin-rule). This is obvious from an economic point of view: the uncertainty premium that a risk averse provider demands has to be borne by the customer via the terms and conditions of the contract. In other words: the distribution of risk between the parties engaging in the outsourcing contract is a source of economic advantage in itself as, for instance, laid out in [18]. In this example, a

risk neutral customer and a risk seeking provider can benefit from the provider being able to bear the risk "cheaper", while a risk averse provider would charge more than the customer itself making an outsourcing contract less likely.

7 Conclusion and Outlook

Concluding, in this work we have analyzed an outsourcing provider's challenge to design optimal service offers in a setting in which (1) future service performance is uncertain and (2) the provider is penalized or rewarded for deviating negatively or positively from performance guarantees. In particular, we have addressed the question how outsourcing providers with different risk attitudes should mitigate the risks of cannibalizing their profits or losing service contracts by incorporating uncertainty premiums into service prices. The problem has been studied in the light of incident related penalty and reward functions. Though this work focuses on IT outsourcing, our findings may be generalized in many cases to address similar challenges in other application domains as well.

The contribution of this work is twofold: first, we apply concepts from decision theory to map the provider's offer design problem to a formal model of decision alternatives, states and outcomes. Second, based on this model, we suggest using valuation functions of decision rules to quantify uncertainty premiums that outsourcing providers should incorporate into their service prices. We find that providers with different risk attitudes will define uncertainty premiums of varying amounts. Risk seeking providers will grant higher absolute price reductions than risk neutral or risk averse providers. The latter will hence have lower chances of winning service contracts as prices of their service offers will be higher.

Having summarized the benefits of our approach we want to point to its limitations as well. First, we have simulated decision alternatives by means of randomized generalized beta density functions. In future works we will apply real world data of service delivery environments to set up our decision model. A second limitation is the limited number of decision rules applied. Further research is needed, to characterize the behavior of providers the risk-attitude of which can not be modeled through the introduced decision rules.

With regard to future research we plan to address the following issues: in cooperation with a large IT service provider, we will elaborate on how to influence the incident behavior of service delivery environments. Thus, we aim to support the realization of specific service incident distributions. First promising results with regard to the classification of server incident behavior, have, for instance, been presented by Bogojeska et al. [3]. Second, we have assumed the internal costs of operating service delivery environments to be known and stable. Future research is needed to enable service providers to quantify these costs. Third, we will complement the approach presented, and study the provider's problem of designing service offers in settings under risk. We plan to consider varying operating cost in that approach as well.

We are convinced that our approach towards the consideration of performance risks in service offers can serve as a basis for future research on the design of

optimal service offers. In practice, outsourcing providers will benefit from the recommendations on how to determine uncertainty premiums, which account for the uncertainty of future service performance.

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Developing Municipal e-Government in Italy: The City of Alfa Case

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Abstract. The paper aims to analyze the new trends in the public administration's way of doing government business. Specifically, it takes stock of the various actions developed to modernize the administrative and management structures of public companies (PA) and their outcomes. The modernization effort is the result of two macro actions: public administration reforms and the successive pervasion of Information and Communication Technologies (ICTs). The e-Government process is driven by ICTs and the search for a new way to govern. Given that many aspects of the reforms highlight the PA's multifaceted nature, the outcome of the phenomenon also needs to be defined and studied by taking into account how it straddles the technological, organizational, managerial, informatics, relational and cultural dimensions. The paper analyzes a case study of e-Government implementation in a mid-sized municipality in Northern Italy; the aim is to understand how Italy's new reforms and the advent of ICTs have shaped the City of Alfa's route to change.

Keywords: e-Goverment, case study, new public management.

1 Introduction

From the mid-1980s to the 1990s, the public administration systems of the developed countries were all objects of modernization reforms. Nevertheless, the process of change has taken place at different times and using different implementation methods, depending on the area or country involved. The word 'change' or 'process of change' signifies the process that involves an economic unit at a certain moment in time and in a certain economic, social and competitive context, and is the result of the joint decisions and actions implemented by said unit to address an "undetermined situation" [1]. In the past, the expression 'change' was flanked by an array of heterogeneous phenomena that could not, apparently, be attributed to the same object of analysis: the public company. In fact, in some cases this has affected the organizational dimension of the entire PA system or its individual units, while in others it has referred to new management logics and/or tools of the sector in question

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or has analyzed the process of change of the State legal system or the information system. In yet other cases, it has targeted also the innovation processes. The apparent diversity of the phenomenon object of study is debunked when one approaches the public sector as a complex organization with a three-tiered matrix [1].

The public enterprise theory has addressed the public organization mainly through three lenses that have pushed it in three different directions. The direction of managerial change, related to the corporatization processes, has progressively led the public company to adopt new principles and tools in the organizational, managerial and information technology processes of change. The direction of political change has reshaped the role of the public subject in the eyes of the external stakeholder. Then the direction of legal change through reform has led the public systems to acknowledge the transformation that is reshaping the socio-economic scenario, fuelling processes of innovation and simplification aimed at favoring adaptation [2].

The aim of the paper is to analyze the impact of Information and Communication Technologies (ICTs) on the public administration process of change.

As part of the entire "automation of the public administration" [3], the new information technologies have the capacity to transform data into 'knowledge', i.e., into information that can be of use in the decisional processes. The development of targeted information systems for management and decisional support systems has paved the way from a closed to an open public administration model [3]. That marks another milestone in the focus of the public action, which has moved from a model centered on documents and compliance to a model that centers on the results, on the identification and interpretation of needs, and on giving satisfying responses to its stakeholders [4]. Effective change is not driven by the reform process alone nor is it spurred by the mere implementation of information technologies; likewise, the modernization of the PA cannot be achieved purely by deploying ICTs [5, 6]. Hence, the process of change is the result of two combined macro actions [1]: the process of restructuring and rationalization through normative action and the process of computerization. In fact, reform becomes change only when the people employed at the diverse levels of the organizational structure contribute to transforming the opportunities offered by the legislative framework into vehicles of innovation. The outcome of these two forces is e-Government [7, 8].

2 e-Government and "Good Government"

e-Government can be defined as the: "…use of technology, particularly web-based Internet applications, to enhance the access to and delivery of government information and service to citizens, business partners, employees, other agencies, and government entities" or "…the continuous optimisation of service delivery, constituency participation, and governance by transforming internal and external relationships through technology, the Internet, and new media" [9, pp. 1011]. In other words, the term e-Government translates into the provision of information and services via the Internet or any other digital tool. However, many authors were quick to agree that it was highly reductive to consider the use of the internet and ICTs

generally as solely a "means to an end" and thus concluded that "the use of ICTs, and particularly the Internet, [is] a tool to achieve better government" [10; pp. 3]. Therefore, the consensus of both the academics and the institutions today is that e-Government is a tool that can bring the PA and the citizens closer through the building of a new relational model based on a more open administrative system, the engagement of the citizens in public affairs, and an increase in the level of accessibility to the public services, interaction and accountability.

According to that concept, ICT acquits the important task of restoring the trust of the citizens in the public action, "enhancing transparency, cost efficiency, effectiveness, and political participation" [10; pp. 4]. According to Mutz and Flemming, the degree of psychological and informative proximity between government and citizens reflects the degree of public trust in the institutions because "the perceived distance about the information gap between the public and government appears to be one of the major elements that have led to the decline of public trust in government" [11; pp. 80]. Indeed, the internet has turned the traditional hierarchical, linear and mono-directional structure of the PA into a "non-hierarchical, nonlinear, two-way, available 24 hours a day, seven days a week" system [12; pp. 16]. The origin of this global trend, which calls for not only new methods of providing services, but also giving the citizen the option of accessing the system when it is more convenient, reflects the offer of interactive initiatives pioneered by the private sector [13].

In this context, the ICTs are both a tool with which to build the infrastructure to enable the cast of actors to connect and communicate with each other and the means to enable the different public administrations to jointly agree the realization of public services. Hence, the outcome is a more horizontal, customer-oriented public administration system, called a 'network' or 'network organization' [3]. The ensuing increase in the number of actors on the stage multiplies the complexity of the services on at least two counts [14]: it makes it harder to access the information and has a negative impact on the quality of the service provided, given that the information exchange between the diverse public units is based on heterogeneous platforms.

Therefore, ICTs work in two ways: i) they provide the infrastructure needed to circulate the diverse information flows; and ii) generate improvements in both the delivery and the efficacy and efficiency of the services, thus enhancing the public services offer.

3 e-Governance Models

While the literature proposes a range of e-Governance models, defining the diverse evolutionary stages does not necessarily imply a transition in each, nor does it impose a strict chronological observation. An analysis of the models shows the most complete is that of West [12], which is split into four main development phases.

The first is called the 'Billdoard stage'. This is a phase in which the governments are still fairly inexperienced in the use of the technologies, in particular, the internet, leading them to minimize risk by supporting solely small projects [7]. The Billdoard stage consists of implementing static mechanisms to enable the user to visualize the information content of the websites and responds to the growing pressure of civil

society. It offers basic functionalities and minimal two-way interaction, giving the users access but not the ability to manipulate the information [12].

The second is the 'partial-service-delivery stage', in which, in tandem with the evolution of the websites, both the employees and the citizens add value to the internet as an additional channel for providing services [7]. The users can use some of the online services and also start to manipulate the database information. The websites let them to gather the information they need without having to rely on solely the information that the employees "intend" and "want" to give them. Nevertheless, the volume of services and information is sporadic and restricted to certain areas only, while the level of privacy and security are fairly low and access itself is far from universal [12].

The third is the 'portal stage', with fully executable and integrated service delivery. The focus in this phase is on the transformation of the services rather than on the automation and digitization of existing processes. Indeed, it is not enough to provide services online that were previously provided in other ways, a permanent change in processes is required to achieve e-Government. In other words, e-Government initiatives need to be accompanied by a contextual redesign of the service itself. Ultimately, "the full benefit of e-government will be realized only when organizational changes accompany technological changes" [7; pp. 130]. A peculiarity of this phase is the setting up of portals [15], the function of which is to render the online services fully operational and integrated. The portal stage gives the citizens indisputable benefits because a virtual area that integrates the different administration systems translates into easier and more efficacious access to the information [12]. Further, the growing attention to privacy and security is another stride forward in the development of e-Government, leading the websites themselves to publish the relative policies adopted [12].

The fourth, the 'interactive democracy with public outreach and accountability enhancing features stage' is unquestionably the most important. Only once this level has been reached are all the organizational boundaries surpassed. This is done through: the vertical integration of the diverse organizational levels of the administration system; the horizontal integration that determines the connection between this latter and the external environment; and, the building of connective infrastructure (interoperability issues) [15]. The fourth stage sees the websites transcend the simple delivery of services by giving the user the opportunity to customize the service itself and to push technology. This stage casts the citizen in a new role, elevating them from being a mere consumer of the public service to a proactive player in the provision of the service [12, 16].

In the wider scope of the public administration's mission, the above model enables the creation of public value. The expression 'public value' generally refers to the value created by governments through the delivery of services, legislation/regulation, and other actions. On the other hand, the concept investigated in this paper leads us to give the term 'public value' a wider meaning to that usually attributed by New Public Management (NPM), extending it to encompass the results, their publication, trust and legitimization [17]. Hence, by recognizing the creation of value as the ultimate goal of the public action and by adopting the broadest meaning of the concept of

public value as our analysis perspective, we can argue that "the use of ICTs to improve government and governance, as implied by e-Government, can be considered as a means to increase the public value produced by Public Administration" [18; pp. 67]. It therefore follows that the various actions undertaken by the PA in implementing the e-Government process can be evaluated based on how those actions increase the potential of the administrative system to generate public value.

Similarly, when the interaction between the citizen and the PA involves the former as both the user and the operator, it is possible to measure public value by adopting both an external (citizen-user) and an internal (citizen-operator) perspective [18]. Generating value through services depends on the quality of their delivery, which, in turn, depends on: the availability of the service; the level of satisfaction; its importance; integrity; and, ultimately, its cost [17]. The first outcomes of e-Government were obtained in the area of environmental policies, which, adopting the broadest definition of the term, includes the concept of the constituent environment, i.e., the local and global system of the public administration [17]. Thus it is clear that evaluating the outcomes of the diverse policies to support the creation of municipal aggregations needs to take account also of their capacity to increase [18] the level of integration of the policies in homogeneous local areas, the organizational and operational simplification of the diverse units that make up the network, and the capacity to maintain cooperative relations with the other actors.

4 Methodology

To confirm our research questions and to test the theoretical framework of reference, the paper uses the qualitative methodology and a field case study to analyze the data [19-21], which enables the phenomenon to be analyzed in its natural state [22]. According to Darke et al. [23; pp. 274] "…case study in research is useful in newer less well-developed research areas particularly where examination of the context and the dynamics of a situation are important".

In this specific case, the authors analyzed a mid-sized municipality in the North of Italy during the analysis and process reengineering of its new trade and business authorization/licensing service ('new business authorization') or "SCIA" (Segnalazione Certificata d'Inizio Attività).

The City of Alfa was chosen for two reasons. First, the municipality surveyed is a particularly relevant case of the analysis and reengineering of the new business authorization process through the introduction of e-Governance ICT tools [23]. Second, direct access to the data was obtained [24].

The case study was conducted according to the guidelines of Yin [22], hence, information was collected through semi-structured interviews, direct observation and documentation analysis, while the test sources consisted of interviews and internal documentation.

Privileged access to the information facilitated the gathering of data from several sources, thus increasing the quality of the information obtained [25].

The case analysis involved 12 semi-structured interviews of approximately 40 minutes each in the Alfa municipality with both researchers in attendance and used the protocol presented by Arksey and Knight [26; pp.74-75]. The interviews were conducted with one senior manager, one manager, four office staff, and an intern.

The information and the results were confirmed by transcribing the interviews and the interim results of the "data collection" phase and presenting these to the four main organizational actors of the Alfa study. In addition, the data analysis was performed using CAQDAS [Computer Assisted Qualitative Data Analysis Software], specifically Atlas.ti. This latter was deployed for the hermeneutic analysis of the documents and the transcription of the interviews [27], especially for the open coding, axial coding [28; pp. 61-69] and memoing [29; pp. 83-84] operations. Data collection started in April 2012 and ended roughly eight months later. The existing data was analyzed and integrated starting late December 2012.

5 Case Study: The City of Alfa

5.1 Scenario

The case study was conducted at the City of Alfa, a Northern Italian municipality, with the aim of analyzing the state-of-the-art of e-Government implementation in the administrative system, in particular, in the 'Settore Politiche dello Sviluppo - Commercio Fisso' (Development Policies Department – Office of Fixed Trade) in the wake of the recent legislative and regulatory measures and the modification of the new business authorization process.

Alfa is an important industrial and economic center, the beating heart of a province of small and medium enterprises. Data from ISTAT (Italian National Institute of Statistics) and Confindustria (the national business owner's association) highlight the province's leadership status, the sign of a dynamic production and commercial landscape, strong in numbers, with an eye to quality, and a player not only in the domestic, but also the world markets with a high level of exports.

In particular, this study will analyze the Development Policies Department (DPD) and, specifically, the Office of Fixed Trade (OFT). The Department is staffed by 12 people: a senior manager, two organizational staff, and nine employees, three of which part-time. The DPD is responsible for the planning, direction and control of commercial activities, while the number of administrative inspectors assigned to each OFT is confidential: the inspections are prerequisite to the issuing of licenses and control authorizations on the coordination SCIAs and the trading hours of the commercial activities and the serving of food and beverages. To recap, the DPD manages and regulates all the local area's shops and trading premises (e.g., store opening times, identification of spaces and the issuing of authorizations to trade, and the processing of applications to open new businesses, etc.).

Alfa is an interesting case study because this municipality has analyzed and introduced an e-Government system to the DPD-OFT processes. The distinctive aspect is that the DPD-OFT is going through a transitional phase, i.e., it is currently running two administrative systems in parallel; the former is being phased out (20%

operational at the time of our analysis), while the new e-Government process was 80% on stream with full implementation and operational launch slated for end-September 2013.

5.2 The "Pre" e-Government Situation

Prior to the implementation of e-Government, the Alfa new business application process, or SCIA, involved the external user (usually the shop owner and/or their business advisor) and the municipality's internal staff, split between the employees that managed the front office, i.e., the 'One-stop Trading Activities Desk' – in Italian, "SUAP" (Sportello Unico delle Attività Produttive – and the back office, i.e., the administrative inspectors of the OFT. The process analysis ("AS-IS" analysis) called for first interviewing the municipal staff directly involved and then studying the legislative/regulatory framework and the online application forms plus all the relative attachments currently used for opening a new business. The business advisor mandated to deal with the online SCIA application started by downloading and compiling the requisite form from the City of Alfa website; the client (the store/business owner) then went to the advisor's office to sign the form. After attaching the required documentation to the SCIA, the whole package was then converted into PDF format and the digital signature affixed in those cases where the client was without, attaching the relative power of attorney for the digital signature and/or online submission. The completed SCIA was then transmitted to SUAP using certified e-mail. When the system received the SCIA, it should have automatically checked the application form and its attachments to ensure these were prepared correctly. In practice, however, on receipt of the documentation, the information system merely generated a return receipt for the external user giving the user permission to immediately open the business activity object of the SCIA. Then the SUAP clerk registered the notified receipt and transmitted it electronically to the DPD Secretarial Office.

After verifying the digital signature and the object of the new business activity, the documentation was then printed out and filed in a paper folder. The next step was the inspection phase, which called for verifying the SCIA and its attachments for official compliance and correctness. After which, the whole bundle was archived manually due to the lack of an electronic archive in which to keep a record of the information.

Of the nine critical aspects of this process, the primary issues reported were:

- Problems with the incoming new business applications: instead of submitting the application forms provided on the City of Alfa website, the external user often transmits the application forms of the regional government or even the wrong SCIA form; (e.g., instead of submitting a SCIA for opening a store or business in a residential area, the user submitted a food & beverages licensing application);
- SUAP does not fully perform its assigned tasks. In fact, the system verifies the formal completion of the SCIA application and its attachments on receipt but, despite the fact that the software has the capability to check whether the digital

signature has been affixed, the front-office staff do not reject the applications from which it is missing. Hence, despite not being valid right from the outset of the process, the application continues its journey and eventually reaches the Office of Fixed Trade, which then finds itself having to reject it for reasons of inadmissibility;

- Sorting errors: each application is subject to two sorting processes, the first at SUAP and the second at the Secretarial Office. Aside from every plausible human error, a genuine problem of redundant information exists that makes it difficult to track down the file;
- Slow pace of document dematerialization: on receipt of the application, all the relative documentation is saved in an electronic folder and most of it printed out without first verifying whether it is even in a condition to continue down the administrative line;
- Delayed inspections: it takes at least 15-20 days from the date the application is registered before the inspection process gets underway and, in the event of a negative outcome requiring a conformation request, this same is preceded by telephone reminders (most times) that are hard to prove should a dispute with the external user arise;
- No schedule of completion dates for the in-house activities, which leads to application processing delays;
- Inefficient information system: hard to locate the information, duplications, information lost/misplaced, etc.

5.3 Launch of the New e-Government System

In response to the above criticalities and the need to re-establish the functions for which the SUAP itself had been created, the City of Alfa launched a major process reengineering project. The project was part of the broader strategy to advance the e-government process from a phase that we can call enhanced [15; pp. 215], i.e., the "AS-IS" process just analyzed, to an interactive phase [15; pp. 215] that would both enable the PA and the citizens to enjoy a two-way rapport and introduce the interactive portals needed to support it.

The new project was proposed by the City of Alfa's Economic Development councilor and Residential Construction councilor. The idea is to combine the management of both the functions carried out by the One-stop Trading Activities Desk (SUAP), i.e., the front office and the back office, assigning the task jointly to two national leaders, respectively: Infocamere, through the national "impresa in un giorno" ("business in a day") portal, and the Maggioli Group, through the J-IRIDE software.

Alfa's local government redesigned the process to achieve the following objectives:

- Procedures standardized with those of the regional government to ensure the interoperability of the diverse systems used by the process;
- A single operations management to ensure the transparency and uniformity of the processes;

- The progressive dematerialization of the paperwork in order to save costs;
- Reduction in the time required for the business application process to make its journey and ensure the completion of the application process in the shortest time possible;
- Cost-savings for both private businesses and citizens.

Without eclipsing the functions attributed to SUAP, the Italian Chamber of Commerce offers the municipality a shared organizational solution in the form of a web platform called 'SUAP camerale'. This tool enables the external user to communicate with the municipal SUAP via the portal and, starting with the City of Alfa website, use a single, standardized method to submit new business requests. Hence, the portal performs a linking function between the infrastructure and the networks already in operation for the exchange of information and online interaction between the administrations and agencies that play a role in both the new business processes (products and services) and the localization, development, transformation, restructuring or conversion, expansion or transfer of business premises, and the ceasing or resumption of trading of the business activities in question. The portal is a tool that can enable the concrete realization of the goal to transform the traditional hierarchical and centralist structure of the PA into a network organization. It ensures the municipal area a single point of access to all the procedures and processes, coordinating and managing all the relations with the internal offices and the agencies involved in the various phases of issuing the authorization or other measure. Further, it enables the integrated management of the information that, in turn, translates into the rationalization of a shared information asset that enables the Alfa municipality to save operating costs. The portal's front-office service provides accurate information on the legislative/regulatory requirements of the administrative procedures, third-party procedures, the application forms and the relative contacts.

The new SCIA process now crosses the administrative system's borders to directly involve the diverse actors that make up the environment system. Unlike the AS-IS process, the stakeholders of the process are both the external user and the internal staff, split between those responsible for the front office (SUAP camerale) and the back-office administrative inspectors (Ufficio Commercio Fisso) and any other external agency involved (e.g., ASL (national health service) and INPS (social security department), etc.). The external user launches the process by accessing the portal and, once authenticated, keys in three identifying coordinates to proceed to the compilation of the application:

- region: the area in which the trader plans to operate
- company business sector
- operations requested: what the applicant wants to do and the type of operation.

The user then compiles the application form in dynamic mode. The portal automatically generates a form split into several sections depending on the choices made; the sections are translated into declarations and attachments that the user is required to compile. After completing the forms, the request is digitally signed and

forwarded to the SUAP camerale. When the form is submitted by a delegated representative, this latter must attach the digitally signed special power of attorney (POA) supplied by the system and the identification documents of both signatories. The SUAP camerale bundles a PEC mail that contains the descriptive xml attachments and transmits it to the agencies and organizations in question, including, obviously, the Chamber of Commerce and the City of Alfa, which receive it via the J-IRIDE SUAP information system. The system then recognizes the presence of the xml application descriptor and automatically deduces the information needed to automate the registration of the application and launch the back-office procedure. In parallel to the transmission phase, SUAP camerale generates an electronic folder in which to gather the opinions and/or authorizations of all the diverse administrations involved. Unlike the previous software used to manage the procedures, the J-IRIDE system offers the administrative inspectors a timetable of due dates that enables them to program the workflow accordingly. The SCIAs are then dealt with in chronological order of receipt or, in the case of supplementary documentation, based on the need to complete procedures falling due. The platform also enables the dynamic modeling and management of the administrative procedures, ensuring security, authenticity, archiving, compliance with the record-keeping rules and information confidentiality pursuant to the relative law. Finally, it enables the control of all the creation, acquisition, management, distribution, sharing, exchange and archiving cycles relative to the structured information, and of the documents and the correlations inherent in the processes used by the municipality to expedite its activities.

6 Discussion

Automation or computerization can be implemented at different levels, from paper documents and the introduction of the electronic protocol through to the switchover from paper to electronic documents. The case study of the municipal Department (DPD) presented in the paper is an example of slow yet progressive dematerialization. Even though a good part of the incoming documentation is digital, to facilitate its citizens Alfa still allows a small percentage of applications to be submitted manually. Despite the fact that the incoming documentation is sent electronically, or is converted post-registration for the reasons illustrated earlier, most of the documents are printed out and a paper record of the application kept after the competent Secretarial Office has done the sorting. This has a negative impact on the municipality's objective of boosting productivity and saving the cost of keeping material records.

The most serious inefficiencies attributable to SUAP are the absence of an effective official check of the applications and the inefficacious connection between the diverse offices and third-parties involved in the process. In terms of the former, the AS-IS process underscores how 20% of SCIA applications, despite their initial inadmissibility (digital signature missing), are still forwarded to the OFT for rejection. Further, about 40% of the applications bypass the official controls of the One-Stop Desk because the user fails to enclose the required attachments and technical

information. These problems will be eliminated once the new process is fully on stream (end-September 2013). Indeed, the portal's dynamic compilation system will generate the appropriate application form complete with all the relative sections by asking the user to enter the three identification coordinates. The user then compiles the application form and attaches all the required information and presses 'send' to submit the documentation to SUAP. However, prior to sending, the system will check the form has been completed correctly and, if not, will block its transmission, prompting the user to make the relative corrections, give mandatory information that has been omitted or enclose any missing attachments. The same goes for the digital signature; the portal's system will block the external user from submitting the application if the digital signature and/or the relative POA is missing. The AS-IS process has underscored the inability of SUAP to integrate and share the management of the information received. On the other hand, the SUAP camerale is able to identify all the actors involved in the process and, once it has received the application, will be able to add new recipients where required. The new process has several benefits:

- Integrated management of service production/delivery and the creation of a shared file into which all the opinions and authorizations of the agencies and departments concerned will flow, thus, even though several different stakeholders are involved, the user will have the perception of a single service;
- The sharing of information between the network actors will enable both the user and the City of Alfa to reduce costs. Indeed, the municipality will be able to eliminate both duplications and redundant transactions, while the citizen will no longer be forced to learn the internal workings of the PA to obtain the service they need, nor will they have to furnish information that the administrative system can retrieve autonomously; moreover, the citizen will need to transmit any changes to information already submitted one time only, given that the network will be tasked to circulate the information thus received.

The SUAP inefficiencies can be attributed to both the lack of a technological infrastructure capable of providing a real connection between the different application process nodes, and the failure to give staff the relevant training. To ensure the process is implemented smoothly, the Alfa municipality can adopt an effective human resources program to remedy the personnel issue by upgrading their skills, redesigning their roles and responsibilities according to the new needs as these arise, and, last but not least, raising the level of motivation. From the back-office perspective, the new system has accelerated the registration and accreditation process; reduced the diverse inefficiencies, now reported in real time; increased the sense of responsibility of the persons involved in the application process; reduced process management and maintenance costs; and boosted system efficiency and efficacy.

7 Conclusions

Despite Italy's position of laggard in the e-Government global scenario, the UN Public Administration Programme ranks it Number 32 in the world classification of e-government implementation. In Europe, however, the situation is not so satisfactory, with Italy still placing 32nd but in a classification made up of solely 43 countries.

The case study has sought to illustrate the state of implementation of digital government and the major drivers of its innovation at the City of Alfa, an Italian municipality. The analysis of the AS-IS process has demonstrated how the e-Government process of Alfa is still in a primitive state, not only is its website content still visualized in static mode, but also the online services are still few in number. The SCIA application process object of our study has underscored how the use of ICTs is merely functional to the delivery of information and services. In particular, the online interaction between citizen and administration is limited to the option given to the former to fill in the forms published on the website and to receive confirmation of receipt or other indications ("pre e-Government scenario"). The analysis of the consolidated process ("post e-Government scenario") highlights how, from the organizational viewpoint, the e-Government evolution has prompted the reconfiguration of part of the organization's internal structures and, at the same time, shaped a new form of interaction between the municipality and the external environment. Nevertheless, from the managerial perspective, the integration of the processes to produce and deliver the services is neither complete nor efficacious. In fact, despite the significant changes to the organizational structure of the SUAP front office, full integration between the different organizations involved in the authorization process has not been achieved. The ineffectiveness of the reconfiguration is reflected also in the back office, where inefficiencies continue to persist at the level of both the connection and the interaction between the municipality's internal departments. Neither has the e-Government process generated the desired benefits from the information/IT standpoint. In fact, we cannot call it an integrated model of information management, either in-house or between the municipality and the other public network actors. Probably, it is not even correct to use the expression 'public network' to describe the organizational structure currently in place.

These considerations can be applied to a certain extent also when looking at the phenomenon through the relational lens. What is happening in the Alfa municipality is a progressive transition from a relational, face-to-face model to a Government to Government (G2G), Government to Citizen (G2C) and Government to Business (G2B) model. Then, if we examine the cultural angle, it is clear that it is a requisite condition for the success of the entire e-Government process. The under-use of some of the new ICT tools in routine internal operations is a clear sign that the implementation phase antecedent to that of the current system failed to give the staff involved in the process adequate training. Our approach to our research questions relies on a field case study analysis (City of Alfa) during the analysis and process reengineering of its new trade and business authorization/licensing service.

It is quite evident that this study needs further and deeper investigations in order to give a more incisive contribute in the understanding of the impact of ICT and new reforms on the organization context in the public companies. In the next studies, in order to reduce the limitation of relying on subjective performance data, we will create a questionnaire to distribute to the other Italian medium cities that develop/use e-Government processes/platforms.

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