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# A Service Science Knowledge Environment in the Cloud

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Abstract. This paper presents the prototype of a knowledge sharing environment dedicated to Service Science development and dissemination. This proposed concept model of the Service Science Knowledge Environment (SS–KE) can be developed on three directions, i.e. research, education and business alliances. The paper emphasize the way in which value co-creation can profit from semantic-driven social software, taking into consideration the case of educational services delivered in the cloud. It approaches conception and development of an open, collaborative, interactive environment to gather around universities, industry, governmental agencies and European institutions in order to foster service innovation by means of a) information, b) proves and c) technological transfer of the research results aiming to develop sustainable service systems solutions. In this respect, a specification proposal for a collaborative service process based on co-creation of value between educational service providers and consumers is presented. As current ICT state-of-the-art allows to create new services and business services connected to the traditional manufacturing and business domains, the paper presents a perspective on manufacturing servitization processes. In the Internet of Services (IoS) perspective, the proposed approach delivers a vision on using cloud to help research and education to become global by improving front-end applications for educational services, such that technology would encourage individual learning, make learning global at the same time and enable global collaboration both in education and research.

Keywords: Service Science, service system, education, value co–creation, ontology, cloud computing

## 1 Introduction

The innovative potential of IT-services in different service industries has been definitely drawn in the new approach of Service Science [1] and its related procedural approaches like *Service Oriented Computing* [2], *Service-based Application*

*Engineering* [3], *Service Oriented Software Engineering* [4], or *Model Driven SOA* [5], that have been proposed lately.

On service innovation perspective, the emergence of the new Science of Service [6] creates in fact a distinctive body of knowledge on improving new business models based on commoditized IT services that may create cost benefits. Today customers strive for accessing services instead of owning their IT-systems. As IT is more and more seen as a commodity (for example, the software – a ”service” – is produced, packed and delivered like a commodity), new models of IT-based service production and delivery can be imagined and implemented.

Today, certain dimensions of our working life have been affected dramatically by information technology, in particular, by the Internet, that eventually imposed novel service conception based on grid and cloud technologies. Together with these two technological concepts a fundamental change of thinking regarding the transformation of vast amounts of disparate data into usable information arose. In fact, both grid and cloud technologies eventually refers to specific distributed networks of interoperability services that sustain new ways of gathering, processing, transforming, publishing and accessing information in a smarter world that becomes more interconnected, instrumented and intelligent [7].

Service-oriented approaches to science and education, like *e–Science* [8] and *e–Learning* [9], refer to information systems structured as networks of loosely coupled, communicating, autonomous, platform independent services (components) that communicate with each other using standard interfaces and message–exchanging protocols [10]. Their value on defining new or improved science and education IT-based functionalities relies on a clear evidence that delivering IT services in the cloud in a service-oriented manner based on standard interfaces and protocols that allow developers to encapsulate information tools and digital content allows for a large-scale automation of previously manual data-processing and analysis tasks. This will definitively increase the productivity of both educational and scientific endeavors at the educational service system level.

In this respect, this work approaches a conceptual perspective of an educational cloud in which a knowledge environment hosting both *e–Learning* and *e–Science* functionalities for Service Science should be conceptualized, designed, created and deployed in the cloud environment [34]. In such respect, the university IT educational system can be updated with new functionality based on new business models (on the cloud) that current advances in IT technology can provide.

This paper is organized as follows. Section 2 presents an overview of value co–creation mechanisms in an educational service system. It emphasizes the possibility to redefine interactions between the educational service consumers and providers in a cloud-enriched IT-infrastructure. Section 3 to section 5 presents the main functionality of the SS–KE in the framework of the *Service–Dominant Logic* with a main focus on service orientation in manufacturing. Section 6 concludes this paper.

## 2 SS-KE: Premises To Co-Create Value

The educational model in services in centered on the concept of system services (SS) supported by IT, scientifically founded by the systems theory [11]. In a larger perspective, Universities can be seen as systems that provide educational services. It is in the framework of Service Science and the Service Dominant Logic [12] that the Educational Service System is defined (see Fig. 1 for an example).

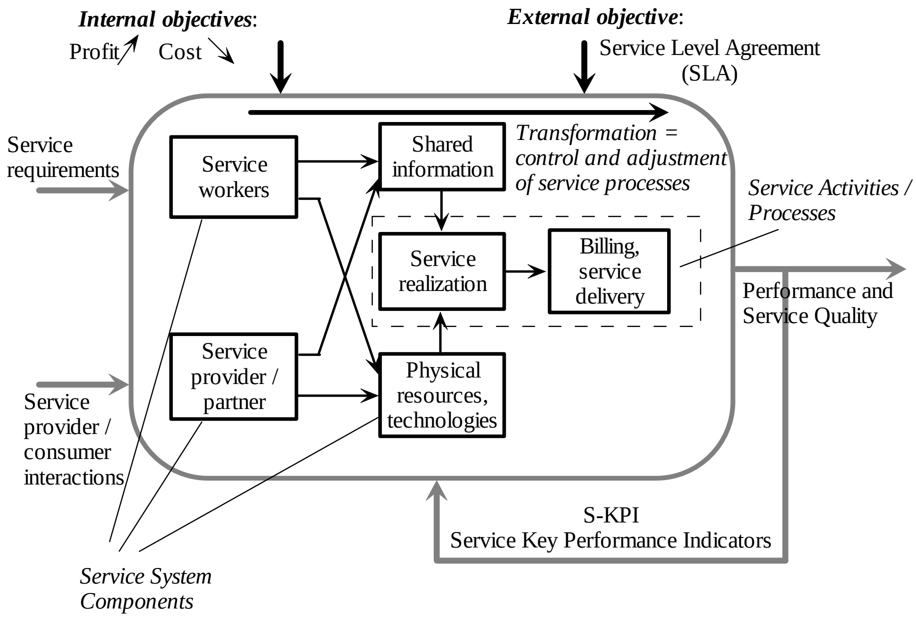


**Fig.1.** Service Dominant Logic: Educational Service System (I–O representation, components, control, feedback, performances)

Therefore, the educational service system can be modeled as a process that can be controlled (a system's theory perspective). It is a service system that relies on IT technology that allows service procedure automation and innovation. Performance is supervised by means of **S-KPI** (*Service Key Performance Indicators*), while value is provided by the service provider (university staff and infrastructure) and the service consumer (student, researcher) close interactions. These two parts meet somewhere in between, they "market with" one another to offer value propositions to be accepted and to define value to be co-created [13].

In the above mentioned perspective, acting on individual educational service system components provides a mean of managing educational outcome performances. The proposed prototype of the Service Science Knowledge Environment (SS–KE) would specifically address Shared Information and Physical Resources and Technologies blocks in Fig. 1.

While Cloud Computing refers to services, applications, and data storage delivered on-line through powerful file servers, this new paradigm allows to clearly redefine interactions between the service consumer and the cloud-enriched IT infrastructure (see Fig. 2).

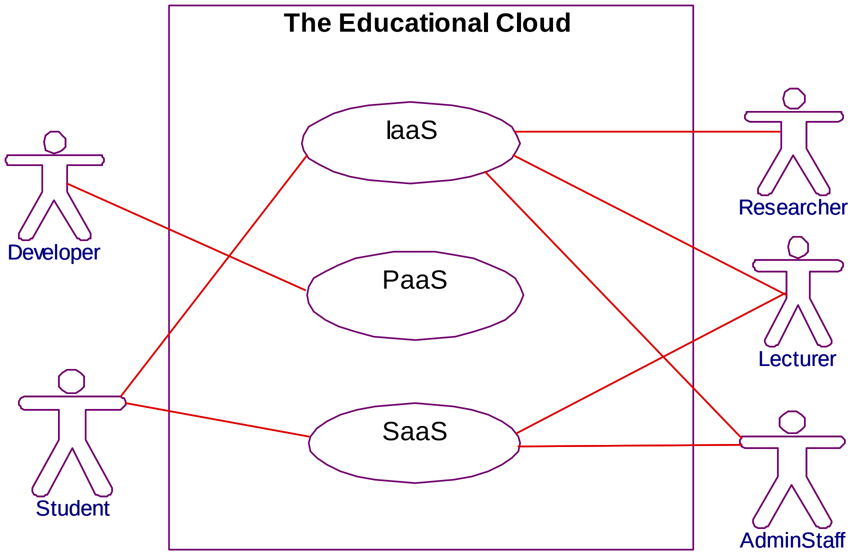


**Fig. 2.** Redefining user interactions in the educational cloud

Being the cloud computing pay-as-you-go cost structure that relies on a number of existing technologies, like the Internet, virtualization, grid computing, Web services, two main benefits of deploying an application like the prototype of a Service Science Knowledge Environment as service in the cloud could be clearly specified, defining its value for education:

- the ”cloud” can be seen today as a way to rationalize educational technology resources (see, for example, interactions of the **Actor → IaaS** or **Actor → PaaS** type in Fig. 2);
- the ”cloud” can be seen as a new way of doing ”business”, a mean to provide on-line ”education in the cloud” (see, for example, interactions of the **Student / Lecturer → IaaS** or **Student / Lecturer → SaaS** type in Fig. 2).

## 3 Problem statement

The emergence of Service Science Management and Engineering (SSME) accounted for a gradual identification of numerous areas of study, see for example [14], [15]. All these service systems are using their own experience and views for implementing services. Due to the variety in service research and implementation, there is no consensus about the theoretical foundation of Service Science. As we all know, Service Science has emerged as a new interdisciplinary approach to study the design, implementation and innovation of service systems. This lack of agreement may become an obstacle for the further development of the Service Science research field.

What it is needed is an enabler for fostering common understanding on Service Science, which would in turn support the innovation in services. In this respect a prototype specification of a Service Science Knowledge Environment is proposed to be delivered as a service in the cloud.

It approaches conception and development of an open, collaborative, interactive environment to gather around universities, industry, governmental agencies and European institutions in order to foster service innovation by means of information / proves / technological transfer of the research results aiming to develop sustainable service systems innovation solutions.

Mainly, it accounts for creation of a digital library that will include specific knowledge on Service Science. The main beneficiary of this knowledge engineering environment is the student, and at the same time, the Higher Education Service System, as previously mentioned.

Specifically, the digital content to be created in order to be collaboratively available might be used in three different perspectives, defining this three main functionalities:

1. Development of a data base to highlight an educational knowledge path on Service Science;
2. Growth of the service companies visibility;
3. Report on new methods, tools and software applications.

### 3.1 Database Development

The development of the digital content database should highlight an educational knowledge path on Service Science as well as related areas like Services Computing, Service Oriented Computing and related architectural concepts (SOA – Service Oriented Architecture, Grid and Cloud Computing) and technologies (Web Services technologies and standards, Internet standards, database, Service Oriented Software Engineering, etc).

Considering that in the last 2 – 3 decades a huge amount of literature on Service Science was delivered on paper as well as digital content, it is useful to start a detailed classification of the main concepts related to this interdisciplinary domain. In this respect, the role of the semantic – driven data processing by using domain – specific ontologies which is proposed to be used is to capture and describe relations between Service Science concepts. Obviously, this endeavor requires a long process to be fulfilled. as well as procedure reiteration.

In time, different ontologies for different Service Science related sub-domains would be developed, for example on *service systems*, *service oriented computing*, *service oriented architecture in automation* related concepts, etc.

### 3.2 Improve visibility of service companies

In this respect, the proposed prototype of the Service Science Knowledge Environment delivered as a service in the cloud would allow companies to publish company case studies in service innovation. In this approach, a data base on service innovation in different service sectors would be gradually built. The main service sectors that firstly come into perspective are (according to [16] and [17]): a) manufacturing and supply chains; b) electronic services for citizen (e–gov); c) electrical engineering; d) power systems and Smart Grid; e) electronics and telecommunications; f) e-Health.

This list is not exhaustively defined and it would grow up in time as more companies are willing to collaboratively share their experience through the SS-KE application. At the same time, partners should strive to identify specific case studies to be published and to be available on-line.

### 3.3 Report on new methods, tools and software applications

The new methods, tools and software applications will be used to develop IT services and to accomplish service automation. All of these will eventually support service and service system innovation.

### 3.4 Perspectives on education

Specifically, two perspectives can be highlighted for education. They intend to innovate on educational services, aiming to update the IT educational system with new functionalities based on new business models that current advances in IT technology can provide. In this respect, cloud technology can be used to allow offering virtualized educational support services in the cloud for e-learning and practical work.

**E-learning in the cloud**. A digital database can be created to deliver content for post-graduated programs dedicated to Service Science. Lectures content can be accessed based on granted access rights on the cloud platform for all the partners.

**Laboratories in the cloud**. Software applications that are to be used to support lectures would be delivered in the IaaS platform as virtual machines enabled by available specific access rights.

## 4 Design strategy and research method

The Service Science Knowledge Environment (SS-KE) conceptual artifact is a formal and computerized specification of constructs for Service Science to be used for supporting automated reasoning in the intelligent knowledge management system deployed in the cloud infrastructure.

Recently, some research directions towards the development of an ontological foundation for Service Science have been put into action (see for example [18], [19],

[20] and [21]). Each of them draw a clear conclusion to establish an unifying framework of service representation in different perspectives, based on the Service-Dominant Logic view that considers services as value co–production complex systems consisting on people, technology, other internal and external service systems, and shared information (such as language, processes, metrics, prices, policies, and laws, [1]).

In [21] the design of the Onto-ServSys ontology on service systems is reported, this integration being realized through a System Approach, that mainly consists of an organizational system view and a service system view.

Preferably, ontologies are constructed in a collaborative effort of domain experts, representatives of end users and IT experts, thus it is a difficult task to impose a single ontology in a large community. Because the different types of stakeholders must devise multiple ontologies, the proposed prototype of the knowledge environment intends to use a basic ontology that can provide a framework for integrating possible future ontologies. Thus, there has been made an attempt to identify the main basic concepts underpinning the notion of a knowledge environment on Service Science along with the relations between these concepts.

### 4.1 The ontology-based shared conceptual model

Fig. 3 presents an overview of the main classes of the ontology that support the knowledge resources classified along with the basic ontology.

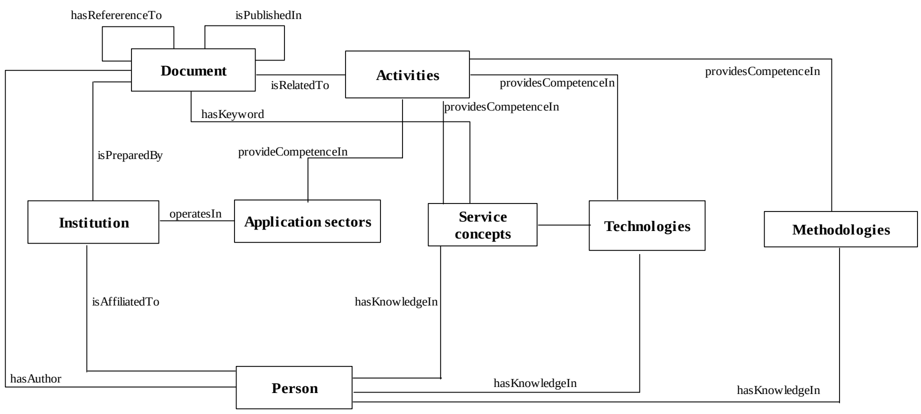


**Fig. 3.** General ontology with main classes and relations

In the framework of the SS–KE development we propose an enlargement of the above mentioned research context on Service Science. The proposed methodology approaches three different perspectives:

- *definition of the research domains* on service systems to be approached. The following domains will be initially taken into consideration: (a) Foundations of Service Science; (b) Information Technology; (c) Service Oriented Computing;

(d) Marketing and Management; (e) Industrial and Operation Management; (f) Service Oriented Architecture in Automation;

- *definition of the essential tasks* to design the ontology to be used in the SSKE. This includes (a) the domain and scope definition, the competency and design goals of the ontology; (b) the identification of knowledge sources (see also the above mentioned components); (c) the initial identification of the ontological components, i.e. the main concepts, hierarchy of concepts, interrelationships between concepts; (d) the intermediate evaluation and continuous refinement of the SS–KE ontology shared conceptual model;
- *insights* are to be collected from (a) Education; (b) Service sectors, and (c) Company solutions.

**Service Concepts – Service Science Fundamentals**. This knowledge resource category sets up a formal basis for Service Science, presenting it in the form of an ontology that defines the fundamental terms used in Service Science, the meaning of these terms and the relations that they have with each other (see Fig. 4).

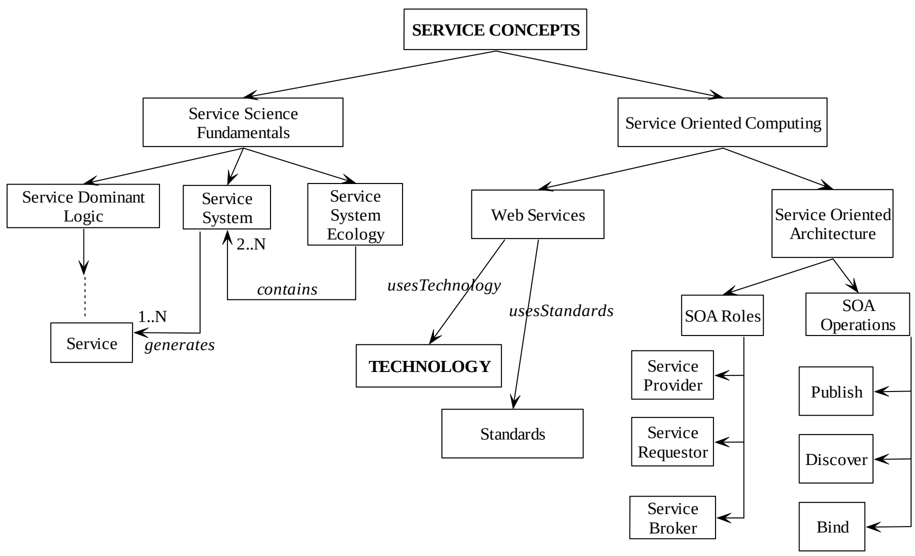


**Fig. 4.** SS–KE ontology: Service concepts

**Activities**. The knowledge environment stores various initiatives, holding a subclass for each under a main class called *Activities*. The subclasses are the following: *Project*, *Educational Program*, *Event* and *Support Activities for Services* (see Fig. 5).
**Application sectors**. A special class has been dedicated to the areas where Service Science can be applied. Knowledge resources on Application Sectors refer to different service sectors such as manufacturing and supply chains, e-Health, transportation, e-gov, education, telecom, smart grids, business management, IT service, to name only a few.

**Institution**. Institutions, whether they are evolving in the academic or business area, are important players in the environment of service science. Universities are the main centers of research that sustain innovation in services, while companies are the ones that put into practice different methodologies or fund research for innovative solutions in response to various needs identified on the market.

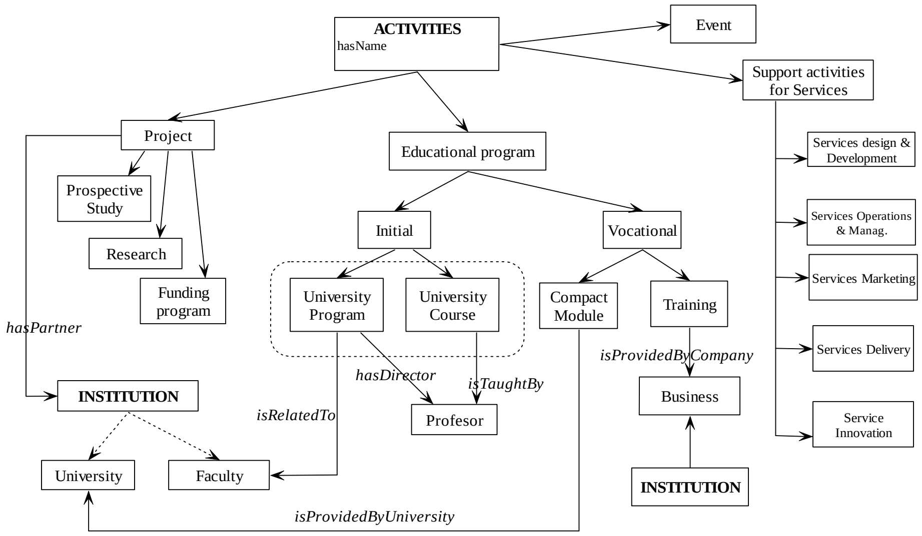


**Fig. 5.** SS–KE ontology: Activities

**Person**. The Person class is sub classed in four categories, which represent the main individual actors of the system. These are: *Professor*, *Professional*, *Researcher* and *Student* (see Fig. 6).

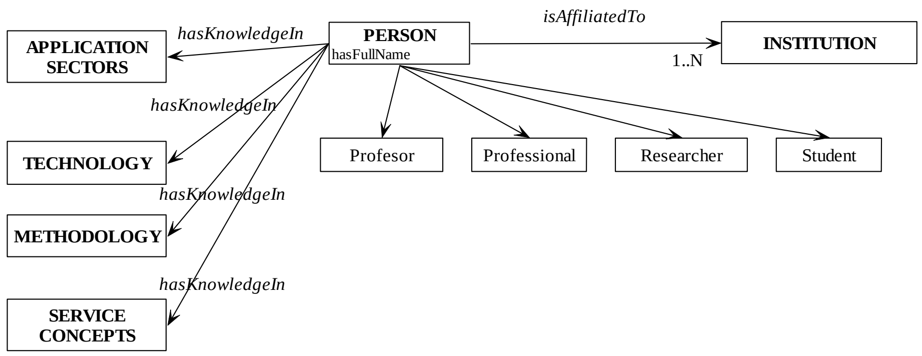


**Fig. 6.** SS–KE ontology: Person

**Document**. The documentation envisioned to be stored on the knowledge environment consists 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*.

**Technology**. Technology plays an important role in service innovation, for which it was considered to be a stand-alone topic in Service Science Knowledge Environment that requires a dedicated class in the ontology. It is considered that a certain technology can be of either of software or 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. Currently, the proposed subclasses are *Cloud* and *Grid* for the *Hardware* category, and *Language* and *Protocol* for the *Software* category.

**Methodology**. Methodology is an ontology class created as a category for different instances of methodologies that apply in the Service Science, be they theoretical or practical (for example business process modeling, services blueprinting, etc.). For now the category doesn't contain any subclasses, but it can be extended in the future if there are identified any other possible sub-classes of methodologies.

**Tools**. The Tools class has been created as a category for instruments (usually technological) that support methodologies and processes in the service lifecycle or in various service science related activities, such as research studies or business processes.

### 4.2 Service Orientation in Manufacturing - related concepts

This section presents main concepts related to service orientation in manufacturing that a special extension of the above mentioned ontology should include for later developments. Today it is recognized the fact that the Service Oriented Architecture (SOA) has been looked upon as a suitable and effective approach for industrial automation and manufacturing which ultimately uses SOA to control and manage different manufacturing parts, like robotics cells responsible for various functions in the automation process [22], [23]. These efforts made towards applying SOA in the field of robotics and automation clearly show the growing importance of SOA in robotics and manufacturing [24]. At the same time, different other research proposals use a service-oriented architectural framework for the exploitation of Service–Oriented Computing (SOC) in the development process of embedded systems monitoring and control [25], [26], [27].

The Service Oriented Architecture (SOA) represents a technical architecture, a business modeling concept, a type of infrastructure, an integration source and a new way of viewing units of automation within the enterprise. The product, seen as good by manufacturing resources and as service consumer by information systems, provides consistency between the material and informational flows in manufacturing enterprises. Thus, service orientation in the manufacturing domain is not limited to just Web services, or technology and technical infrastructure either; instead, it reflects a new way of thinking about processes, resources and their information counterparts -

the service-oriented agents reinforcing the value of commoditization, reuse, semantics and information, and create business value.

In this context, the service value creation model at enterprise level consists into using a Service Component Architecture (SCA) for business process applications, based on entities which handle (provide, ask for, monitor) services. In this componentization view, a service is a piece of software encapsulating the business / control logic or resource functionality of an entity that exhibits an individual competence and responds to a specific request to fulfill a local (product operation, verification) or global objective (batch production).

The service-oriented methodology is implemented through MAS, by defining and using service-oriented information entities:

- **Agents** that represent resources at enterprise or shop-floor level: *Manufacturing Resource Agents* (MRA) - agentified manufacturing components in a cluster extended with agent-like skills such as negotiation, contracting and services; *Coordinating Agent* (CA) - the agent whose task is to coordinate the activities of a coalition of MRA having together the necessary skills to perform a collective task / objective; *Cluster Manager Agent* (CMgA) – the agent supporting the activities associated to the cluster it represents; *Broker Agent* (BA) - the agent responsible for creation of coalitions from clusters;
- **Holons** that are autonomous and cooperative building blocks of a manufacturing system for transforming, transporting, storing and / or validating information and / or physical objects. They contain an information processing part and optionally a material processing part [28], [29]. In a heterarchical product scheduling and resource allocation mode, *order holons* built as active entities (e.g. by aggregating a product carrier and a on-board embedded device) *request specific services* from resources, according to the product's recipe embedded in a product holon; in response, *resource holons* within a coalition of MRAs bid and negotiate to *offer their services* for product execution.

Hence, the **value creation model VCM** at shop-floor level is based on a 3-stage approach [30], [31], [32], [33]:

- *Componentization*, in which complex processes (i.e. the manufacturing or quality control or supply tasks) are split in services to be further dynamically discovered, accessed and performed;
- *Agentification*, in which agents are initially configured in coalitions which offer all the necessary services for batch production. This step provides agility to the enterprise, by possibly reconfiguring in time coalitions of resources rather than by reprogramming them at the occurrence of disturbances of technical (e.g. resource breakdowns) or economic (e.g. rush orders, market changes) nature. By creating Resource Service Models (RSM), the context in which services are provided and their quality (execution time, processing / assembling accuracy, power consumption, etc) can be monitored and the societal relationship inter-resource agents updated even in real time (Fig. 7). This leads also to sustainable manufacturing;

- *Holarchy* creation, in which holons bridge the physical manufacturing components (resources, processes, materials) with their information counterpart (control modes, sequence of services realized) to reach the global objective of batch execution in fault-tolerant mode.

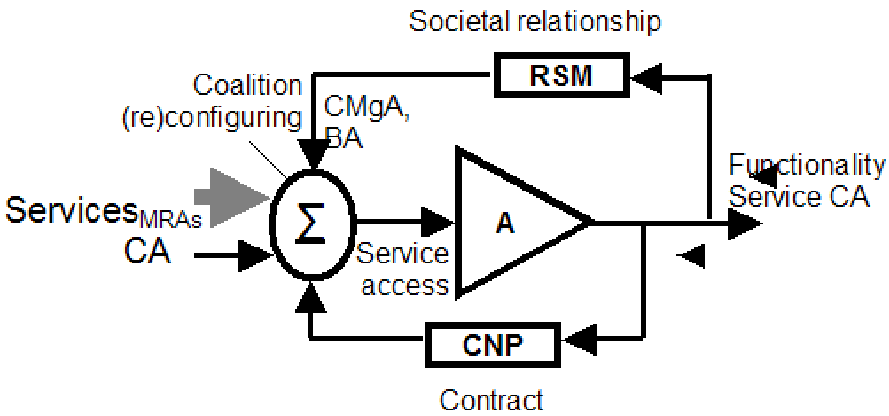


**Fig. 7.** VCM for the manufacturing process in Service-Dominant Logic

The following are levels of Service Component Architectures in the domain of manufacturing: Holon, Active Holon Entity / Intelligent Product, Scheduling System, Manufacturing Execution System (MES), Enterprise Service Architecture (ESB), Manufacturing Service Bus (MSB), Service Oriented Enterprise Architecture (SOEA) and Manufacturing Integration Framework (MIF). The Service-Dominant Logic (S-DL) value creation model is recurrent at enterprise level, and this provides agility from reusability, flexibility and standardization of services and their providers [23], [28].

**SOEA and Connectivity**. Service-oriented architecture offers a practical and viable approach to explore services in relation to business needs [28]. In the IT context, it provides a framework for the:

- *Commoditization of hardware* (on-demand computing, resource virtualization, shared infrastructure service providers);
- *Commoditization of software* (SOA, SaaS - software as a service, shared application service providers);
- *Commoditization of business processes* (Offer Request Management, SRM, IT Infrastructure Library, ITIL).

The way how service orientation is used in manufacturing is shown in Fig. 8, which gives an architectural view of the building blocks usually existing in an enterprise. The basic idea consists in using software components to create atomic and composite software services that can be used to perform business processes with business service choreographies.

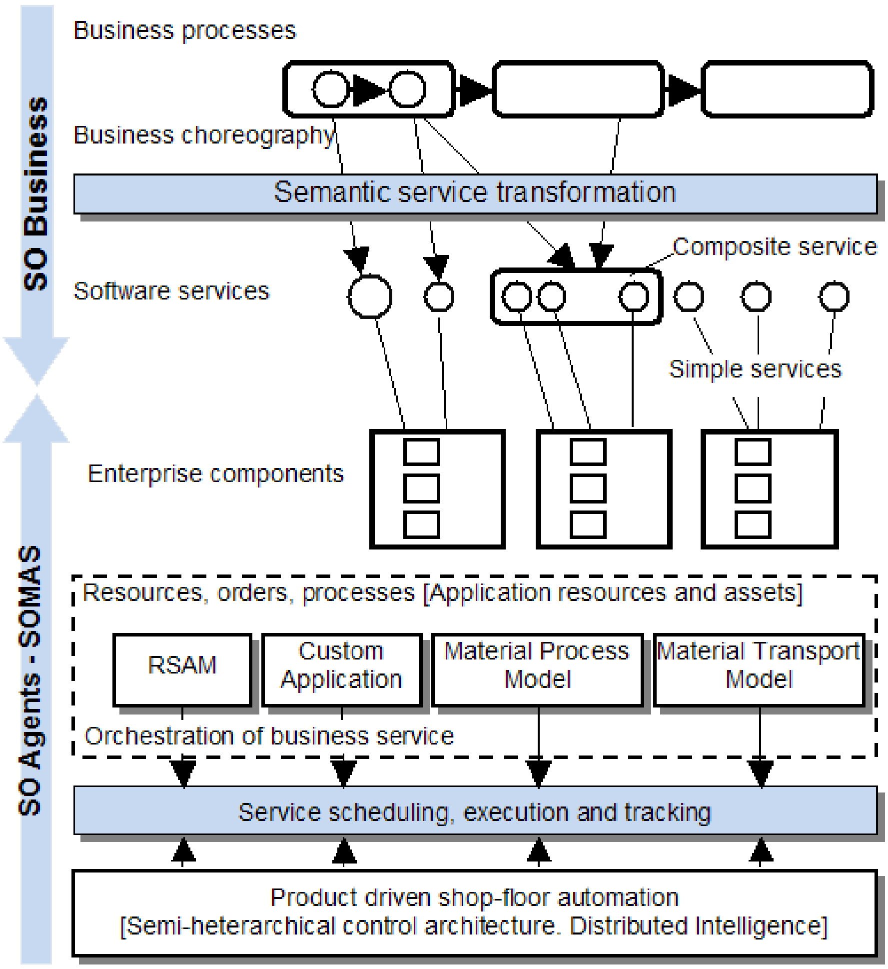


**Fig. 8.** The Service Oriented Enterprise Architecture for manufacturing

The building blocks range from top-layer business (offer request management, customer requirements management - CRM and customer order management, supply requirements manager - SRM) to mid-layer services (engineering, batch production planning), up to bottom-layer components: SO agents in MAS (SOMAS) for resource allocation, product routing, process automation, quality control, and traceability.

The global business objectives of the manufacturing firm, subject of the constraints induced by its resources, IT assets and existing IT infrastructure are also considered: agility, top line growth, technology innovation, operational excellence, cost reduction and gaining market share. The challenges to be faced for the above business objectives are: complex processes and systems; complex applications and interfaces; difficult to adapt quickly; large portion of IT budget spent on maintenance, not on new value added investments.

It must be emphasized that the enterprise's business is only as flexible as its IT is. This requires thinking about business in terms of components, optimizing business processes, and ensuring that IT resources exist to support the needed agility and flexibility. Service Oriented Architecture allows using the existing IT investments to achieve flexible, distributed business processes. SOA, which includes Web services, is a process-centric architecture rather a program-centric IT one. This allows manufacturing enterprises to achieve the agility and the degree of flexibility they are looking for. Today, the most important technology developments and organizational changes taking place in the transformation of manufacturing enterprises to service-dominant logic (S-DL) and SOA involve semantics, reuse and information.

Connectivity is central to the SOA environment: the next services, derived from business process componentization and supported by IT, are interconnected through Enterprise Service Bus (ESB) [29].

**Top-layer services**: *Business Services*, support enterprise business processes and goals.

**Core Services**:

- *Process Services*: orchestrate and automate business processes;
- *Interaction Services*: enable the collaboration between people, processes and information;
- *Information Services*: manage diverse data and content in a unified manner;
- *Business Application Services*: build on a scalable, robust, and secure services environment;
- *Access Services*: facilitate the interactions with existing information and application resources and assets;
- *Partner Services*: Connect with supply chain partners.

**Bottom-layer services**: *Infrastructure Services*, optimize throughput, availability and utilization.

**Horizontal services**:

- *Management Services*: manage and secure services, applications and resources;
- *Development Services*: integrated environment for the design and creation of solution assets.

Agile connectivity in an enterprise begins with integration. The *Enterprise Service Bus* (ESB) enables flexible SOA connectivity for integrating business applications, services and processes, by: connecting everything to everything; transforming between different data formats; distributing business events, converting between different transport protocols, and also matching and routing communications between services.

## 5 Value Co–Creation with Semantic Technology

The prototype of the Service Science Knowledge Environment uses a MediaWiki front user interface enriched with semantic-driven data processing (Semantic Media Wiki) as the SS–KE's digital library content access method. The SS–KE's front end is organized into several different applications that use extensively the collaborative features of media wiki type software. Each is targeted at different user groups. The use cases related with the proposed knowledge environment implementation takes into consideration the activities involved by the platform, and four types of actors can be identified (see also Fig. 9):

**Knowledge Consumer**. A general user that uses the platform to read publicly available content or dedicated content that is restricted to a private group to which the person belongs. Content an be retrieved in one of two ways: faceted search (multiple filters according to user's needs, resulting a list of relevant links) and semantic queries (a filtered based content retrieval on certain criteria, with query results on multiple formats such as a table, a file, an alphabetical index etc.).

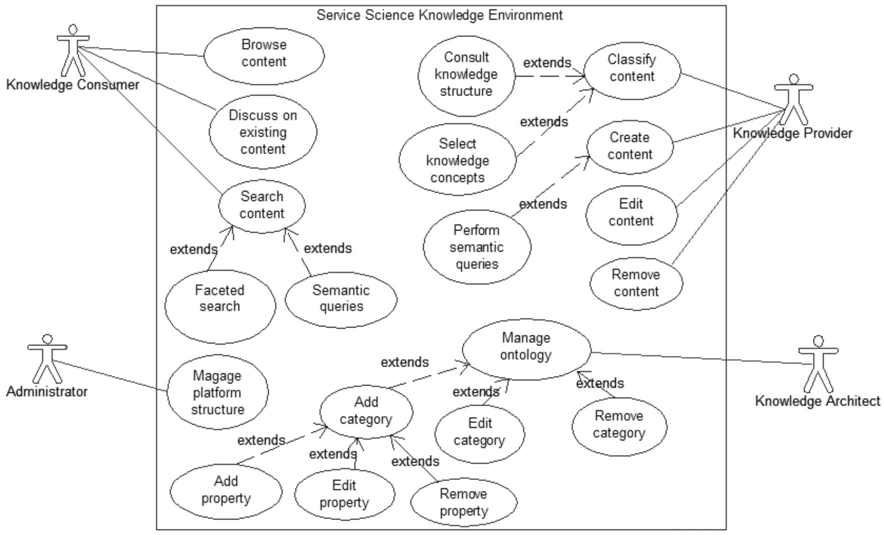


**Fig. 9.** Service Science Knowledge Environment: Knowledge Management use cases

**Knowledge Provider**. A person that can add and edit content to the platform. This actor can can create relevant Service Science content and classify it based on the existing ontology through the possibility of annotating selected knowledge components (Data Explorer special page). Content generated by this type of user can contain the result of semantic queries. Moreover, a knowledge provider can edit or even remove the content he generated based on special access grants.

**Knowledge Architect**. Usually an expert in a certain domain knowledge area of the platform, responsible for managing the domain ontology used for the information classification. This actor is a user responsible for managing the ontology by adding, editing or removing existing categories and instances. Event though instances can be also managed by knowledge providers, categories can only be managed by knowledge architects. When adding a category, a knowledge architect can add also properties that correspond to that category. The properties can be further edited or removed.

**Administrator**. A person that manages the platform structure and functionalities, including wiki engine installation and maintenance or user access rights.

## 6 Conclusions

Cloud Computing is an emerging paradigm for delivering and consuming IT–based services. It is a new ”business” model that help approaching one of the most important challenges that the actual education systems have to face – managing the ”business” of education in order to co-create value for both the provider and the consumer of the educational services. This paper defines the prototype of a Knowledge Environment in the cloud dedicated to the Service Science domain that will grant access to universities, industry partners and governmental agencies, aiming to create a network of skills in Service Science. It draws a vision of cloud computing for education and research – education and research for a smarter planet. A Service Science education pilot is designed, containing course content, virtualized laboratories, case studies and semantic driven knowledge – processed with the help of an ontology – based automated reasoning functionality in the intelligent knowledge management system deployed in the Cloud. This will eventually lead to a rich shared conceptual model for the Service Science communities. At the same time, the IT educational service system can be updated with new functionalities based on new business models that current advances in IT technology can provide

In this respect, the prototype of the Service Science Knowledge Environment is supposed: a) to implement a collaborative service process based on co-creation of value between educational service providers and consumers; b) to support a variety of collaborative research programs in interdisciplinary areas to serve Service Science; c) to support a dramatic update of the IT educational system with new functionalities based on new business models that current advances in IT technology can provide; d) to foster service innovation by means of dissemination and transfer of the research for excellence results in the open, collaborative, interactive environment, in order to e) develop a knowledge base to include Service Science Management and Engineering (SSME) research results for education and different service sectors; and f) to emphasize the way in which the co-creation of value can profit from social software, by means of the Semantic MediaWiki, taking into consideration the case of educational services delivered in the cloud.

In the age of the Internet of Services (IoS), improving front-end access to new educational and research services using the latest ICT technologies like cloud computing eventually leads to the possibility to access huge amount of resources and information. In this respect, the proposed prototype of the knowledge sharing environment for Service Science can help education and research become global.

With the further support of domain stakeholders it might become a good approach to lifelong learning, fostering flexibility and openness to learning new skills.

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