
A Service Science Knowledge Environment in the Cloud

Monica Drăgoicea, Ph.D

Automation and Systems Engineering Dept.
University "Politehnica" of Bucharest

IBM Academic Days for Universities in Romania 2012
March 15-16, 2012, University "Transilvania" of Brasov

Agenda

- e-Science in a Smarter Planet
- new approaches to value in education
- a Knowledge Environment for Service Science – rationale
 - learning
 - use-cases and solutions (open source and proprietary)
 - research
- premises to co-create value in SS-KE
- a novel approach to deliver educational services in the cloud - SS-KE
- conclusions

Education for Economic Development in a Smarter Planet

- ... cities, industries and organizations get smarter



On a smarter planet,
education systems on all levels
can turn vast amounts of **disparate**
data into **usable information**.

Towards Service-Oriented Science

- advances in Information Technology are changing the way in which data is turned into insight – by automating time-consuming activities.
 - **Service-Oriented Computing**, i.e. *technology that allows powerful information tools to be made available over the network* – may contribute to that evolution
 - **Service-Oriented Science** (“e-Science”) refers to scientific research enabled by distributed networks of interoperability services
 - ➔ new information architectures
 - ➔ new approaches to publishing and accessing valuable data and programs
 - ➔ automated access by software programs, data integration from many sources and relationships identification

Education – new approaches to value

- new roles for campus information technology organizations
 - in addition to operating commodity services such as Internet and e-mail, these organizations can host **functions** and provide **resources**
 - various functions such as catalogs and ontologies, support a variety of **collaborative research programs** in different areas
 - ➔ all participants can obtain access to large quantities of distributed storage and computational power when they need it
 - ➔ **e-Science**:
 - ➔ increase individual and collective scientific productivity by making powerful information tools available to all
 - ➔ shared information documented in various databases and programs that represent - and automatically maintain and evolve - a collective knowledge base
 - ➔ **scientific enterprise**: new skills to build / use / host services
 - ➔ policies to govern access to services required

Service Science Knowledge Environment

- The SS-KE will allow to foster service innovation - dissemination and transfer of the “research for excellence in service innovation” results in the open, collaborative, interactive environment – IBM Cloud;
- a 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);



Program Strategic pentru
Promovarea Inovării în Servicii
prin Educație Deschisă, Continuă
(INSEED)

Coordonator:

- Universitatea Politehnica București

Parteneri:

- Universitatea Transilvania din Brașov
- Academia de Studii Economice
- Universitatea de Medicină și Farmacie Carol Davila



Durata proiectului
octombrie 2010 - septembrie 2013

Service Science Knowledge Environment

Articles ▶

Projects ▶

Studies ▶

Company
Solutions

Communities ▶

Useful Links ▶

Page

Discussion

Refresh

History

Edit



More

Service Science Knowledge Environment

One of the specific objectives of the POS-DRU Project no. 57748 "INSEED - Strategic Program Fostering Innovation in Services Through Open, Continuous Education" refers to the creation 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 in developing sustainable service systems solutions.

In this respect, the Service Science Knowledge Environment (SSKE) is designed, created and deployed in the INSEED IBM Cloud.

The SSKE's main goal is the development of a knowledge base to include Service Science Management and Engineering (SSME) research results for education and different service sectors, aiming at fostering service innovation by means of dissemination and transfer of the research for excellence results in the open, collaborative, interactive environment.

The SSKE will:

- implement a collaborative service process based on co-creation of value between educational service providers and consumers;
- will support a dramatic update of the IT educational system with new functionality based on new business models that current advances in IT technology can provide;
- will 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.

The SSKE will be developed based on the new line of thought proposed by Service Science claiming that collaboration of independent individuals will eventually co-create value. Today, Service Science creates a distinctive body of knowledge on improving new business models based on commoditized IT services. It is a well known fact that today customers substitute owning IT-systems by service. They request IT-services instead of IT-systems. The innovative potential of IT-services has been an important topic of discussion and lead to the term Service Science.

SS-KE – Service Science Concept Library

- **Knowledge Path on Service Science**

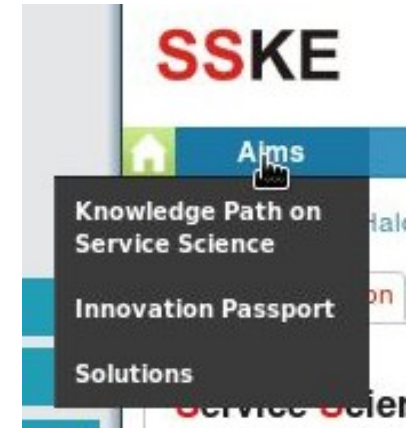
- Service Science – defining the domain (ontology-based)
- Point of view on learning needs (*)
- Service Science Discipline Classification
- Service Science – a global perspective (*)

- **Innovation Passport**

- Characteristics of Service Innovation (**)
- Measuring Innovation (**): Innovation and productivity; Intellectual Property and services; Productivity and growth in services;
- R&D in Services – roadmap for service innovation (**)
- European and World wide support to foster innovation
- Research priorities for the Science of Service (**)

- **Solutions to improve service innovation**

- Management focused (*)
- SOC focused (*)



* POS-DRU Project no. 57748 "INSEED - Strategic Program - Fostering Innovation in Services through Open, Continuous Education"

** 207/CPII/2010 Project - Prospective Study in Service Science- "CRIS – Research Strategic Program for Growth and Innovation in Services"

SS-KE - Service Science Concept Library



- **Foundations of Service Science**
 - Service Operation Management
 - Services Computing
 - Service Oriented Computing and enabling technologies
- **Research projects on services and service innovation**
 - Industry research
 - Education (*)
 - Service Sectors
 - Prospective studies (**)

* POS-DRU Project no. 57748 "INSEED - Strategic Program - Fostering Innovation in Services through Open, Continuous Education"

** 207/CPII/2010 Project - Prospective Study in Service Science- "CRIS – Research Strategic Program for Growth and Innovation in Services"

SS-KE – a conceptual view

SSKE

Home Aims Body of Knowledge Standards

DataExplorer|Halomenu|Main Page

Articles ▶ Projects ▶ Studies ▶ Company Solutions ▶ Communities ▶ Useful Links ▶

Service Science Fundamentals

- Defining the domain
- Point of view on learning needs
- Discipline Classification
- Education in Service Science
- Service-Dominant Logic
- Viable Systems Approach
- The Unified Services Theory Paradigm

Service Innovation

- Characteristics
- R&D In Services
- Research Priorities
- Management Focused Solutions
- Service-Oriented Computing Focused Solution

Service Operations Management

Services Computing

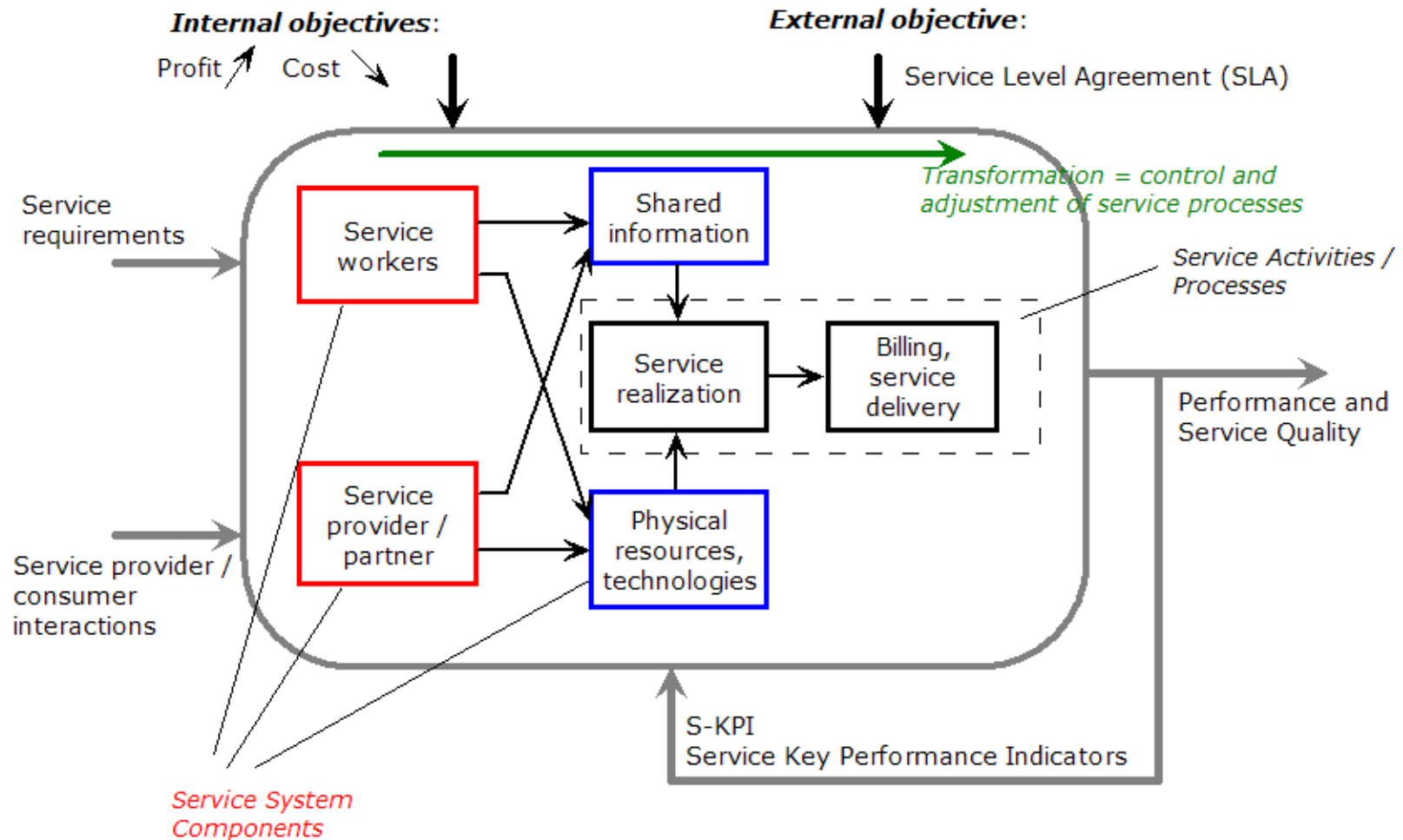
Service Oriented Computing

Standards and Interaction Models

Useful Links

- IBM SSME
- Service Science Information
- System Approach Forum (University of Cassino)
- IBM Center for Advanced Studies (University of Porto)

SS-KE – premises to co-create value

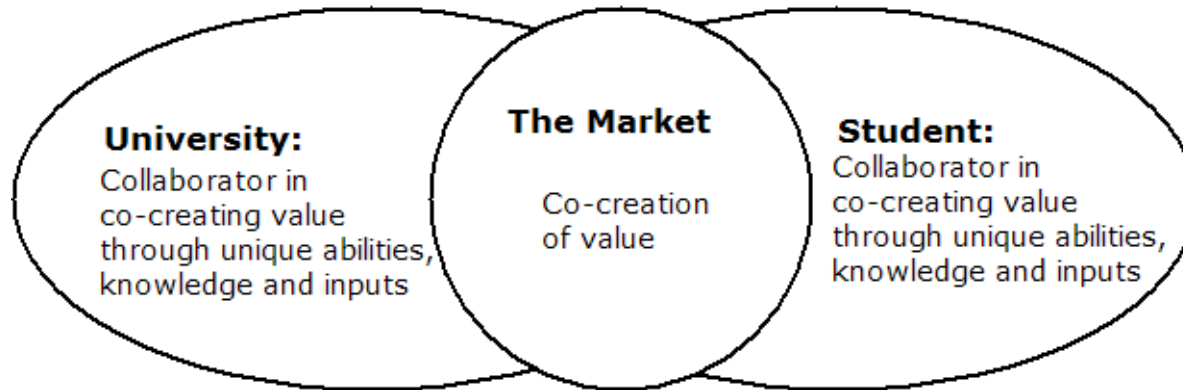


Education Service System = {Inputs, Outputs, Goals, Transformation, Components, Feedback}

Service Science – approach of value

University - Student Interaction

IT-driven Interaction is the locus of co-creation of value



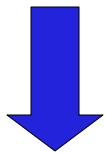
Adapted from C.K. Prahalad, V. Ramaswamy, "Co-creation experiences: The next practice in value creation", *Journal of Interactive Marketing*, 18(3), 2004

- Service dominant logic (SDL):
 - service is the application of specialized competences (knowledge and skills) for the benefit of another entity, rather than the production of units of output
 - the customer or client is always a co-creator of value, not a target of that value, because
 - the customer/client mobilizes knowledge and other resources, and these customer/client efforts affects the success of a value proposition.

Cloud Computing – A Service Science Perspective

- Education is a complex service system whose underlying principles and value propositions must be discovered and improved in the service dominant logic perspective in order to create investment roadmaps for continuously improvement of T-shaped people (adaptive innovators)

Service science –
a systematic approach for service innovation



- Cloud computing offers *new business models in the service world*

From: G-D Logic	To: S-D Logic
Operand resources	Operant resources
Resource acquisition	Resourcing (creating and integrating resources and removing resistances)
Goods and services	Servicing and experiencing
Price	Value proposing
Promotion	Dialog
Supply chain	Value-creation network
Maximizing behavior	Learning via exchange
“Marketing to”	Collaborative marketing (“marketing with”)

Cloud Computing – innovate education “service” systems

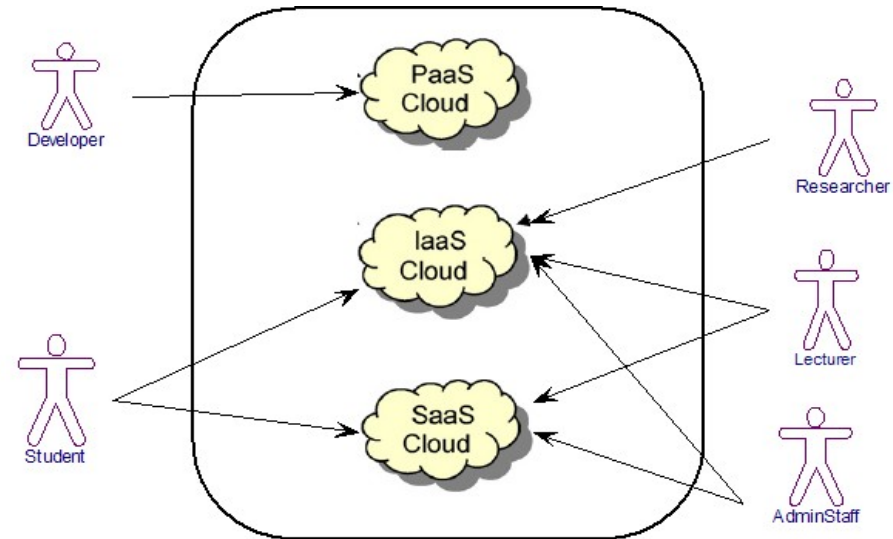
- Cloud computing - services, applications, and data storage delivered online through powerful file servers
 - *characteristics*: on-demand self-service, ubiquitous network access, location-independent resource pooling, rapid elasticity, and measured service
 - *delivery model*: SaaS (running specific applications through a cloud), PaaS (using a suite of applications, programming languages, and user tools), or IaaS (relying on remote data storage networks)
 - *deployment model*: a) private clouds operated for a specific organization, b) public clouds available to the general public or large groups of agencies, c) hybrid clouds combine public and private elements in the same data center

technologies: the Internet, virtualization, grid computing, Web services, etc.

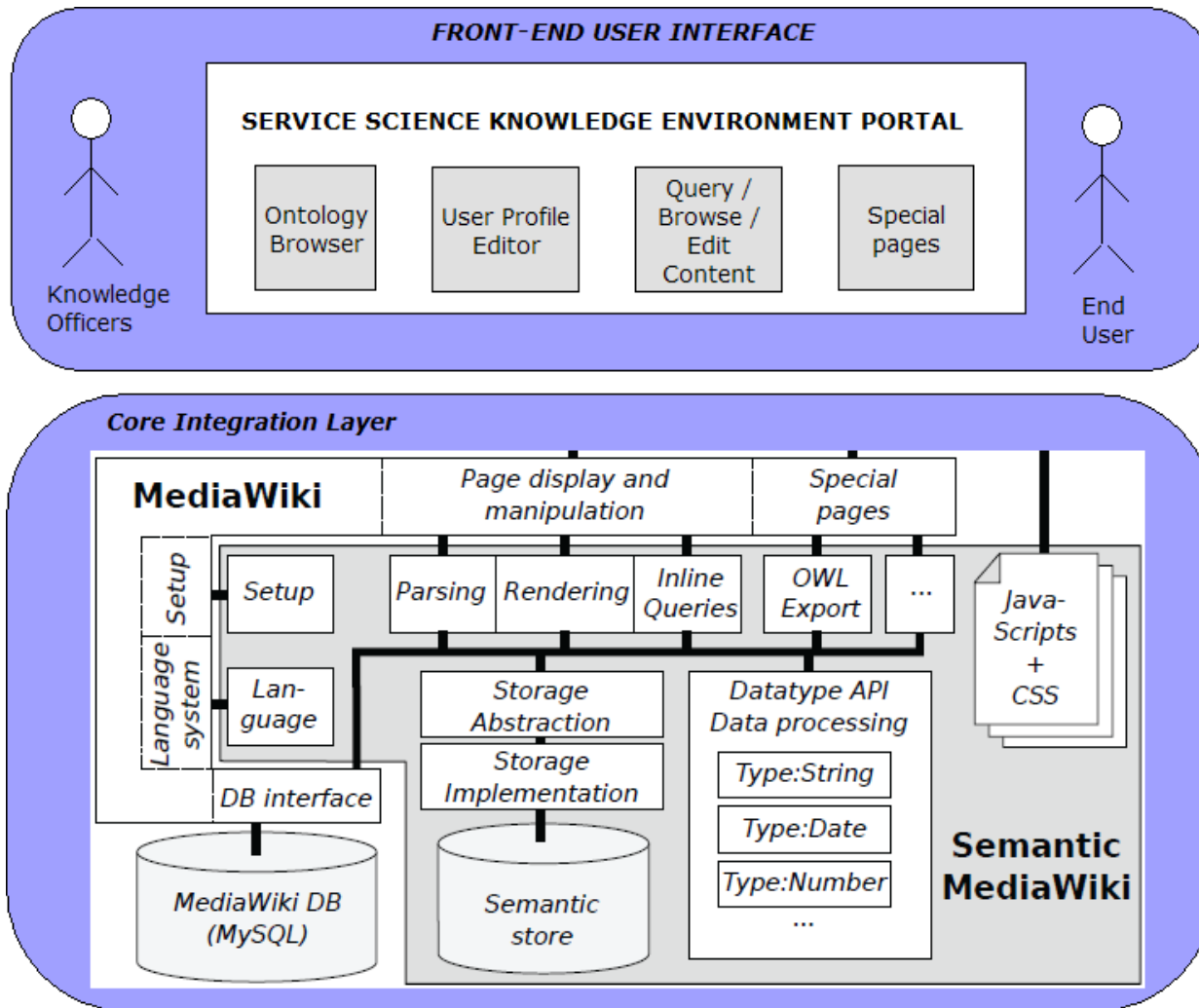


pay-as-you-go way through the Internet

- its value for education
 - a way to rationalize resources
 - a new way of going “business”, i.e. on-line “education in the cloud”



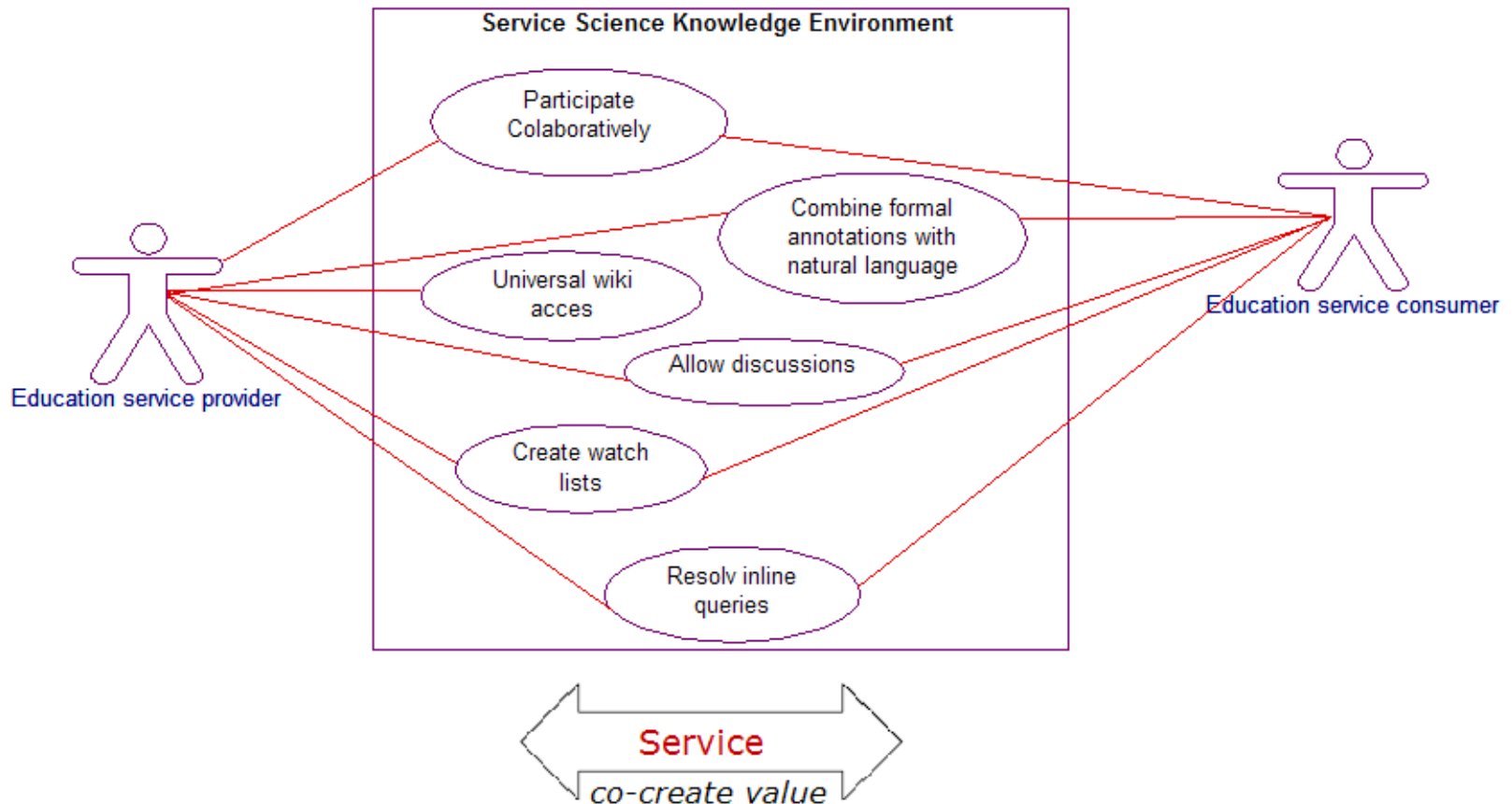
An Ontology-based SS-KE: architecture



M. Krötzsch, D. Vrandečić, M. Völkel, H. Haller, R. Studer. "Semantic Wikipedia". In Journal of Web Semantics 5 (4), pp. 251–261. Elsevier 2007

Value Co-Creation - semantic technology

- approach knowledge-intensive processes and exploit the knowledge that is locked in the content



Value Co-Creation - semantic technology

- *collaboration*
 - users are able to not only read published content but are also able to add new information as well as to change existing information
- *management of knowledge representation* - extends a classical wiki by integrating it with the management capabilities for the formal knowledge representations
 - text-centered semantic wikis enrich classical wiki environments with semantic annotations relating the textual content to a formal ontology
- *create / edit content*
- *inline query*
- *organize (ontology-based)*
- *import and interconnect*
- *use of wiki page content* - contents can be browsed, searched, and reused in novel ways
 - SMW organizes content within wiki pages
 - ontology browser for visualizing categories, instances and properties
 - combines the query and data management power of a database with the ease of use and collaboration features of a wiki

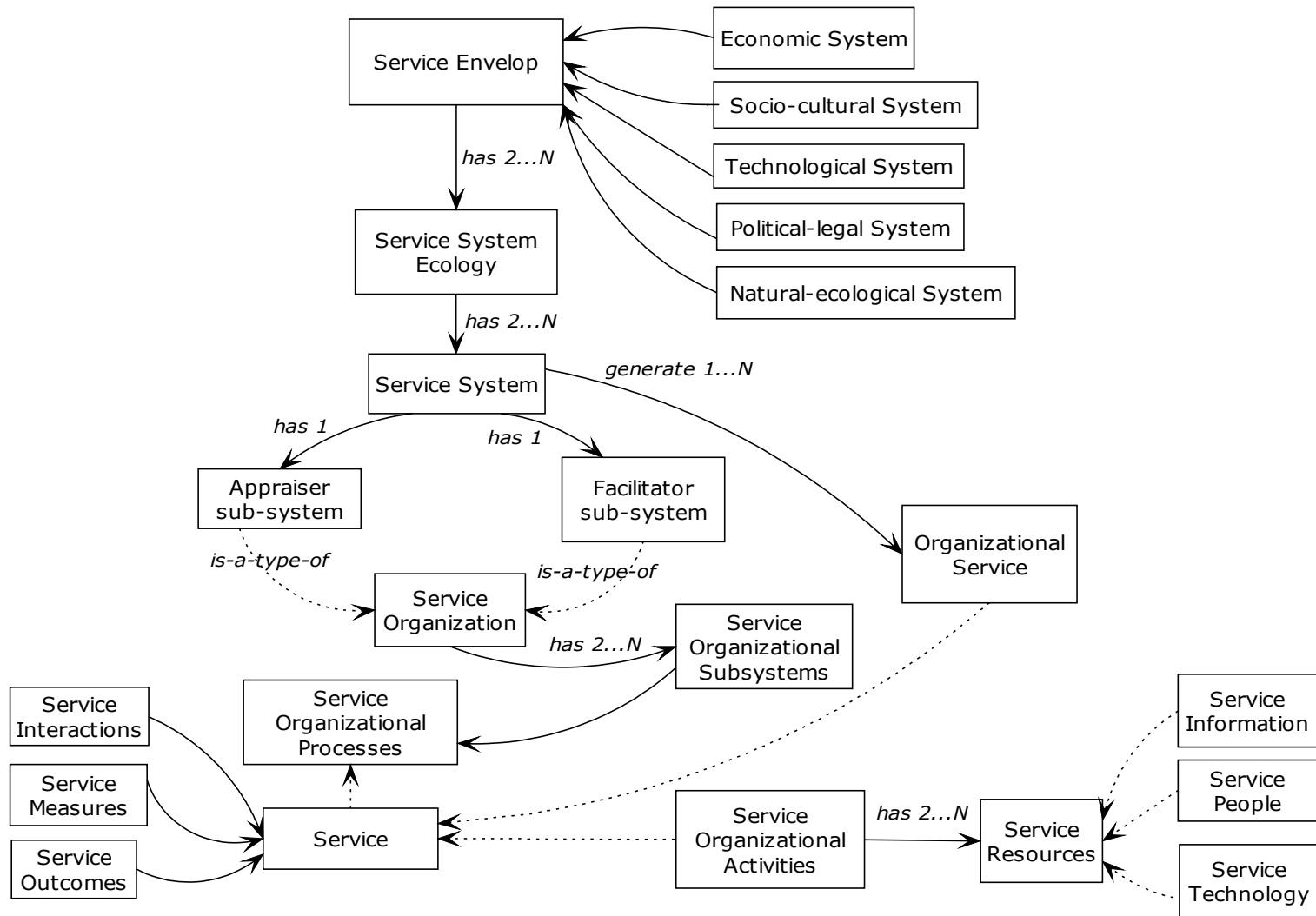
Service Science Ontology-based Data Integration

- Service Science body of knowledge - an *integrative view* is required (service frameworks, schemes, models, and constructs)
 - SS-KE conceptual artifact: *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 INSEED IBM Cloud*
 - SS-KE: we use the ontology to effectively combine data or information from multiple heterogeneous sources
 - specifically, the Service Science ontology is intended to play the following roles:
 - *content explication*: it will enable accurate interpretation of data from multiple sources through the explicit definition of terms and relationships in the ontology
 - *query model*: the query is formulated using the ontology as a global query schema
 - *verification*: the ontology verifies the mappings used to integrate data from multiple sources

Service Science Ontology – methodology

- essential tasks to design the ontology to be used in the SS-KE
 - definition of the domain, scope, competency and design goals of the ontology
 - identification of knowledge sources
 - initial identification and organization of ontological components (concepts, hierarchy of concepts, interrelationships)
 - evaluation and refinement of ontology
- research domains on service systems:
 - Marketing / Management
 - Industrial and Operation Management
 - Information Technology
- insights:
 - Education
 - Service sectors
 - Company solutions

Service Systems Ontology – concepts



Service Systems Ontology – concepts

The screenshot displays the Service Systems Ontology interface, which is divided into three main panels: **Category Tree**, **Instances**, and **Properties**.

- Category Tree (C):** This panel shows a hierarchical list of categories. The top bar includes "Add category | Edit Category". The categories listed are: Economic System, Entity, Natural-ecological System, Person, Political-legal System, Regulator-competitor System, SS Ecology, Service, Service Envelop, Service Organization, Service Organizational Activities, Service Organizational Processes, Service Organizational Sub-systems, Service Resources, Service System, Smwplussandbox/Lesson, Smwplussandbox/Project, Smwplussandbox/Task, Socio-cultural System, and Support System. A "Filter" input field and a "Filter" button are located at the bottom.
- Instances (I):** This panel is currently empty. The top bar includes "Create instance | Edit instance". A "Filter" input field and a "Filter" button are at the bottom. A checkbox labeled "show instances with annotated categories only" is checked.
- Properties (P):** This panel is also empty. The top bar includes "Add property to domain: ... | Edit property". A "Filter" input field and a "Filter" button are at the bottom. Two checkboxes are present: "show inherited properties" (checked) and "show properties with selected category as range" (unchecked).

Double-headed arrows indicate the relationships between the panels: Category Tree ↔ Instances ↔ Properties.

Conclusions

- The SS-KE - Service Science Knowledge Environment - will be designed, created and deployed in the INSEED IBM Cloud
- In such respect, the IT educational system can be updated with new functionalities based on new business models that current advances in IT technology can provide
- The SS-KE is supposed to:
 - support a variety of collaborative research programs in interdisciplinary areas to serve Service Science
 - allow 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
 - develop a knowledge base to include SSME research results for education and research aiming at different service sectors