A Service Science Knowledge Environment in the Cloud

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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

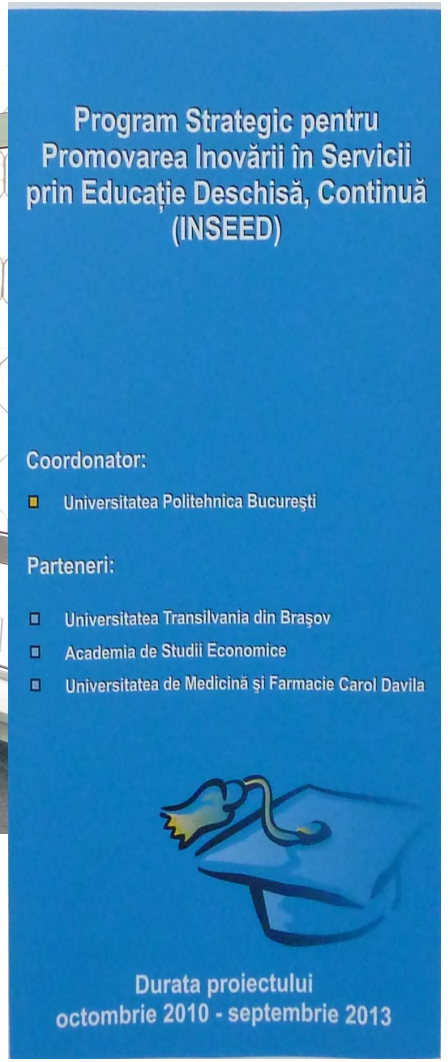
- advances in Information Technology are changing the way in which data is turned into insight – by automating time-consuming activities.
  - **Service-Oriented Computing**, i.e. *technology that allows powerful information tools to be made available over the network* – may contribute to that evolution
  - **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

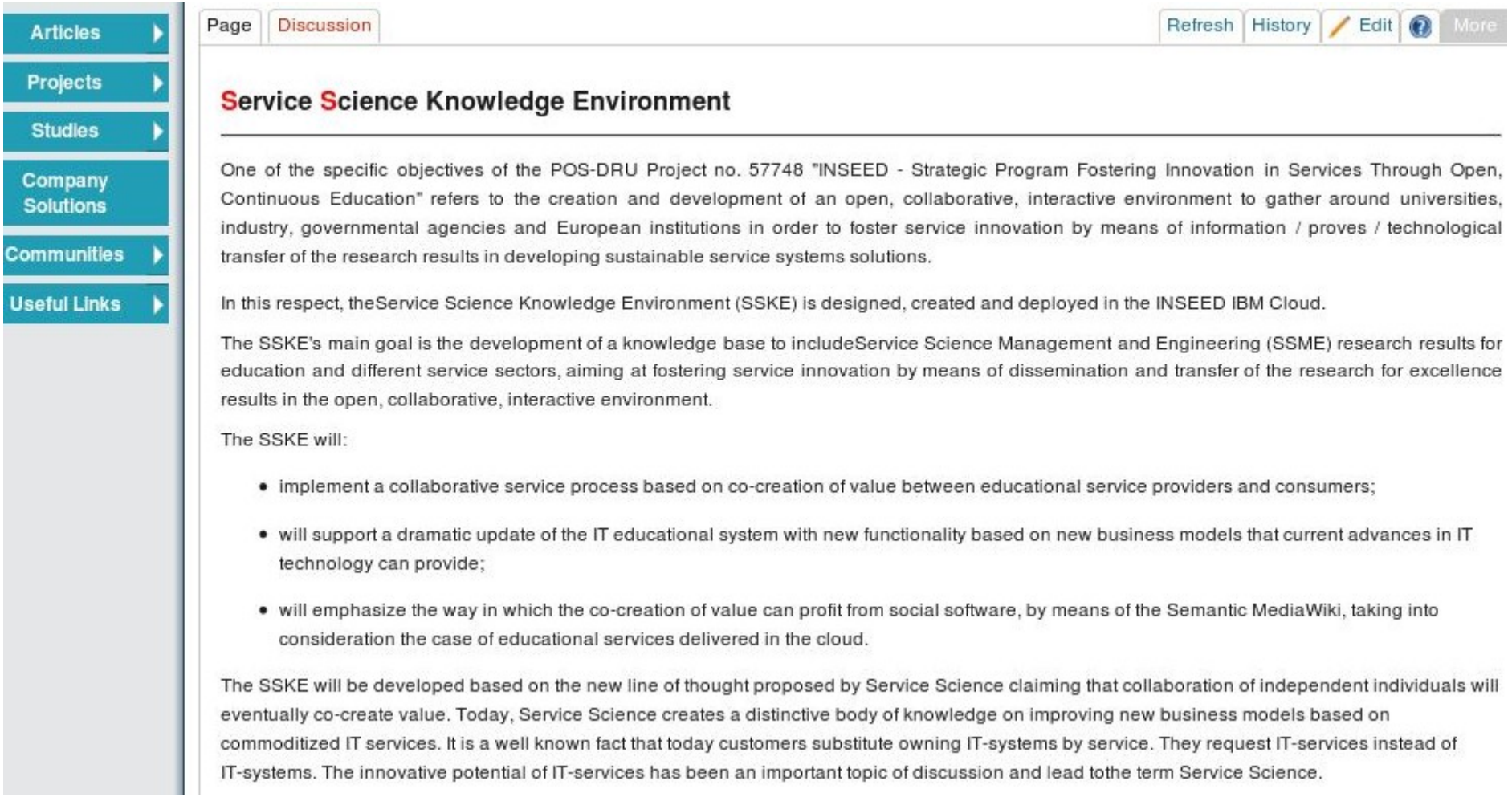
- new roles for campus information technology organizations
  - in addition to operating commodity services such as Internet and e-mail, these organizations can host functions and provide resources
  - various functions such as catalogs and ontologies, support a variety of collaborative research programs 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);



Service Science Knowledge Environment



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 (**)

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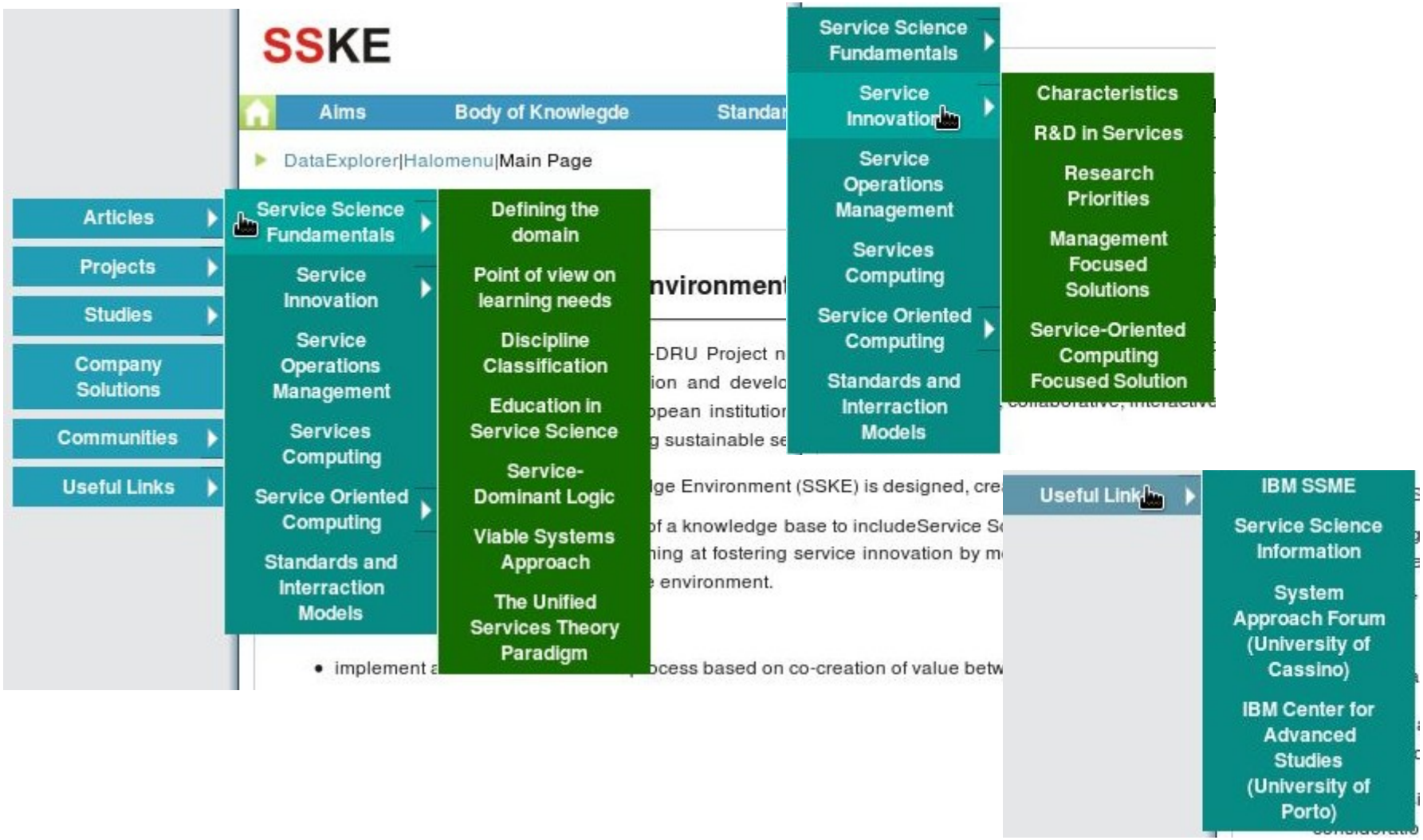
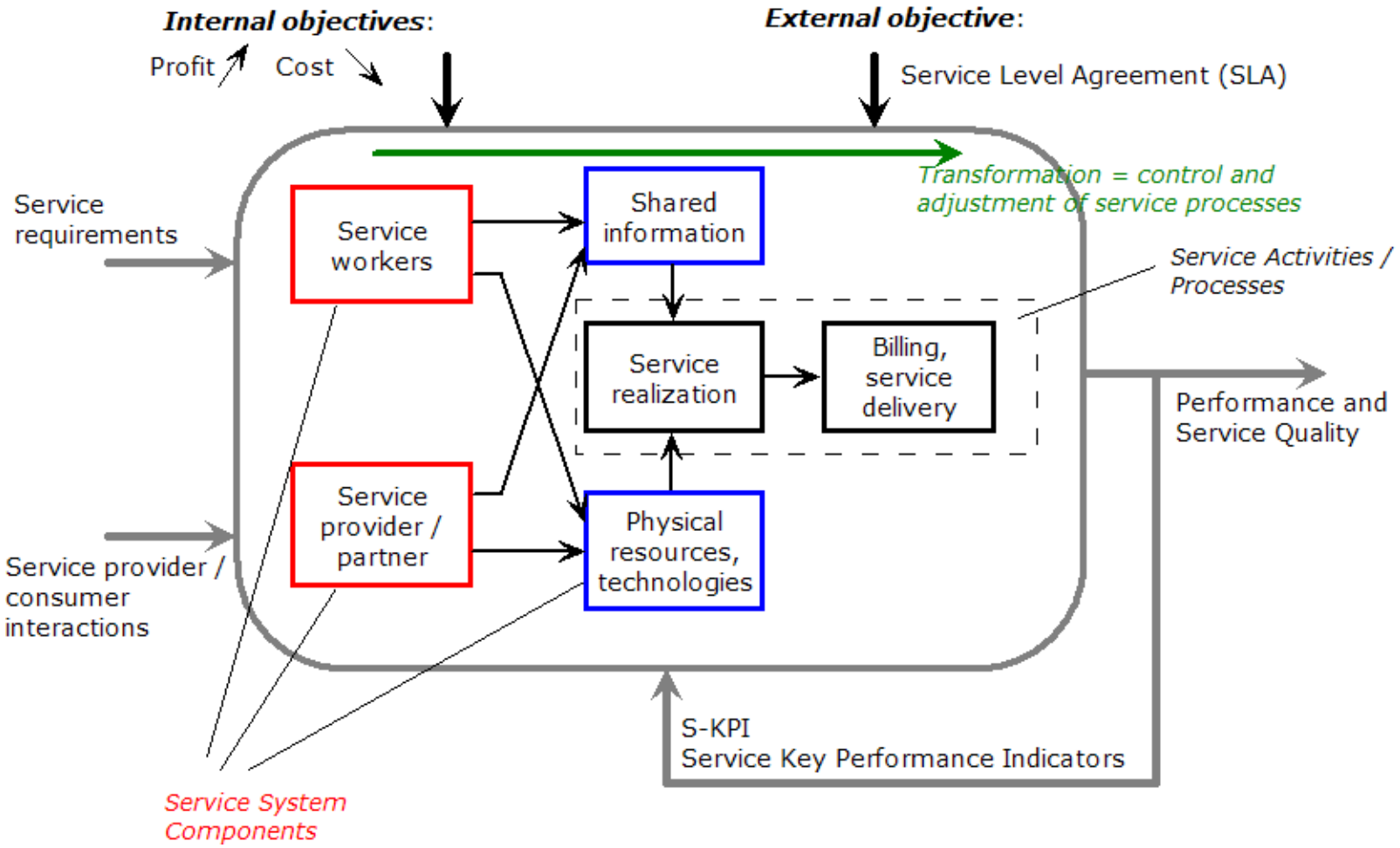
SS-KE – a conceptual view

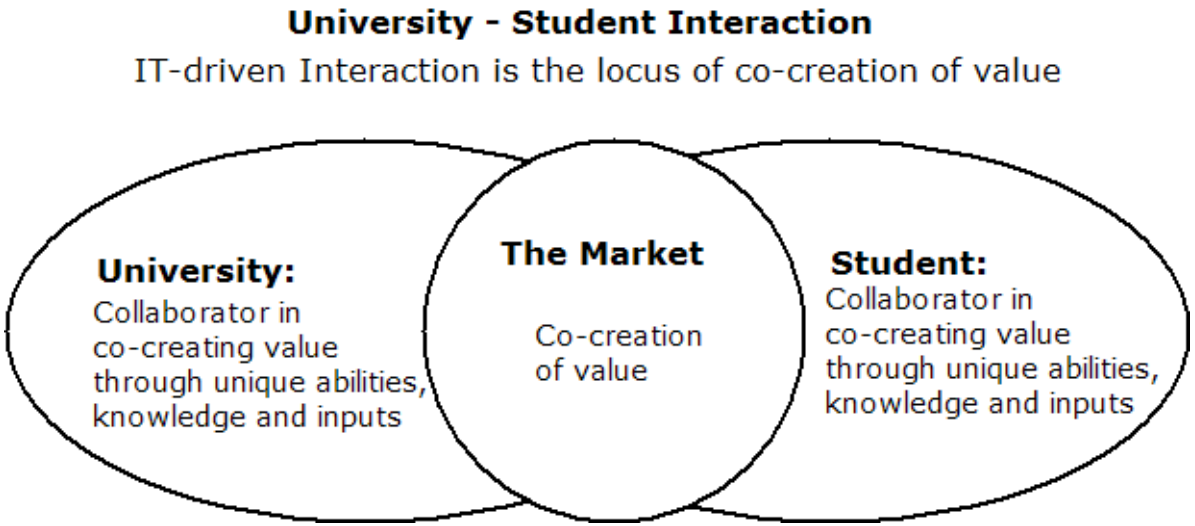


SS-KE – premises to co-create value



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

Service Science – approach of value



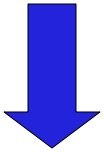
Adapted from C.K. Prahalad, V. Ramaswamy, "Co-creation experiences: The next practice in value creation ", Journal of Interactive Marketing, 18(3), 2004

- 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")

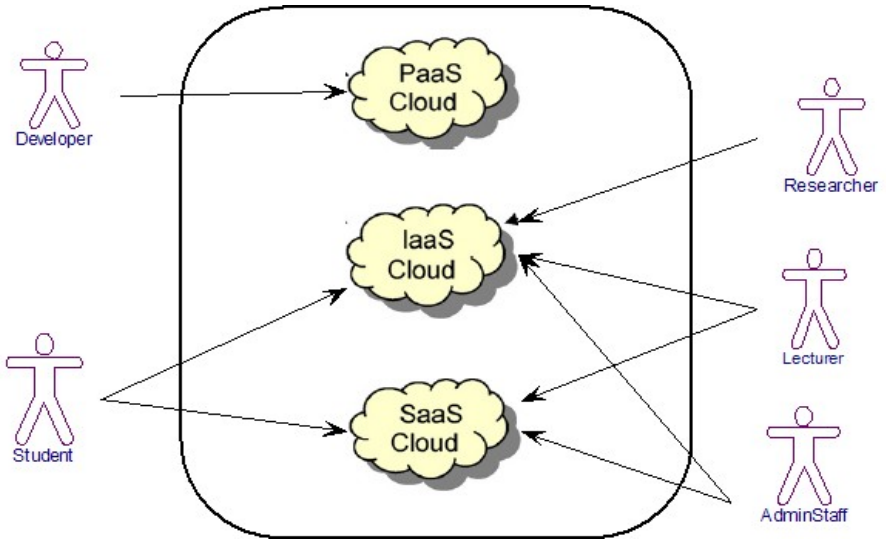
Cloud Computing – innovate education "service" systems

- 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

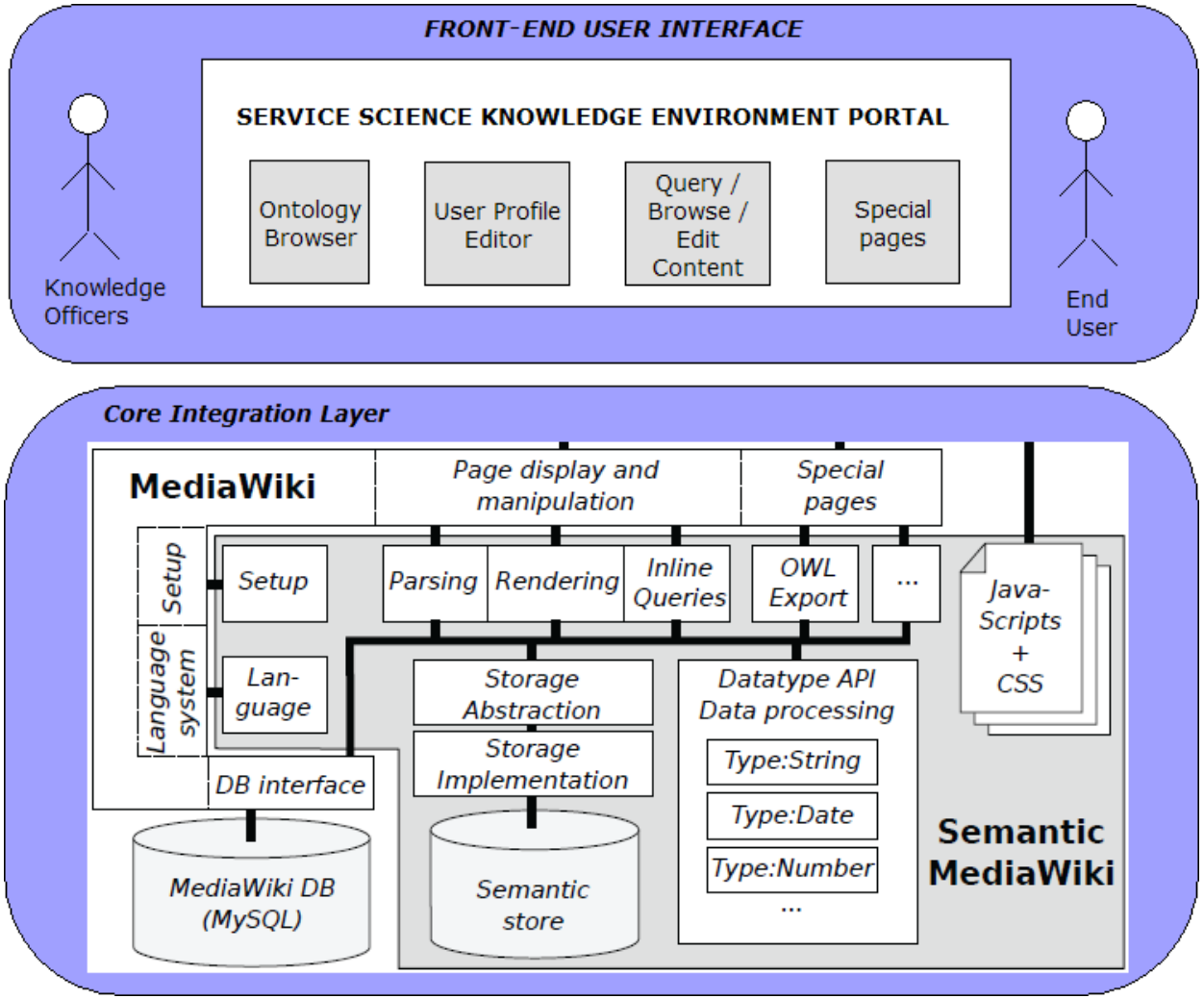
technologies: the Internet, virtualization, grid computing, Web services, etc.

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"



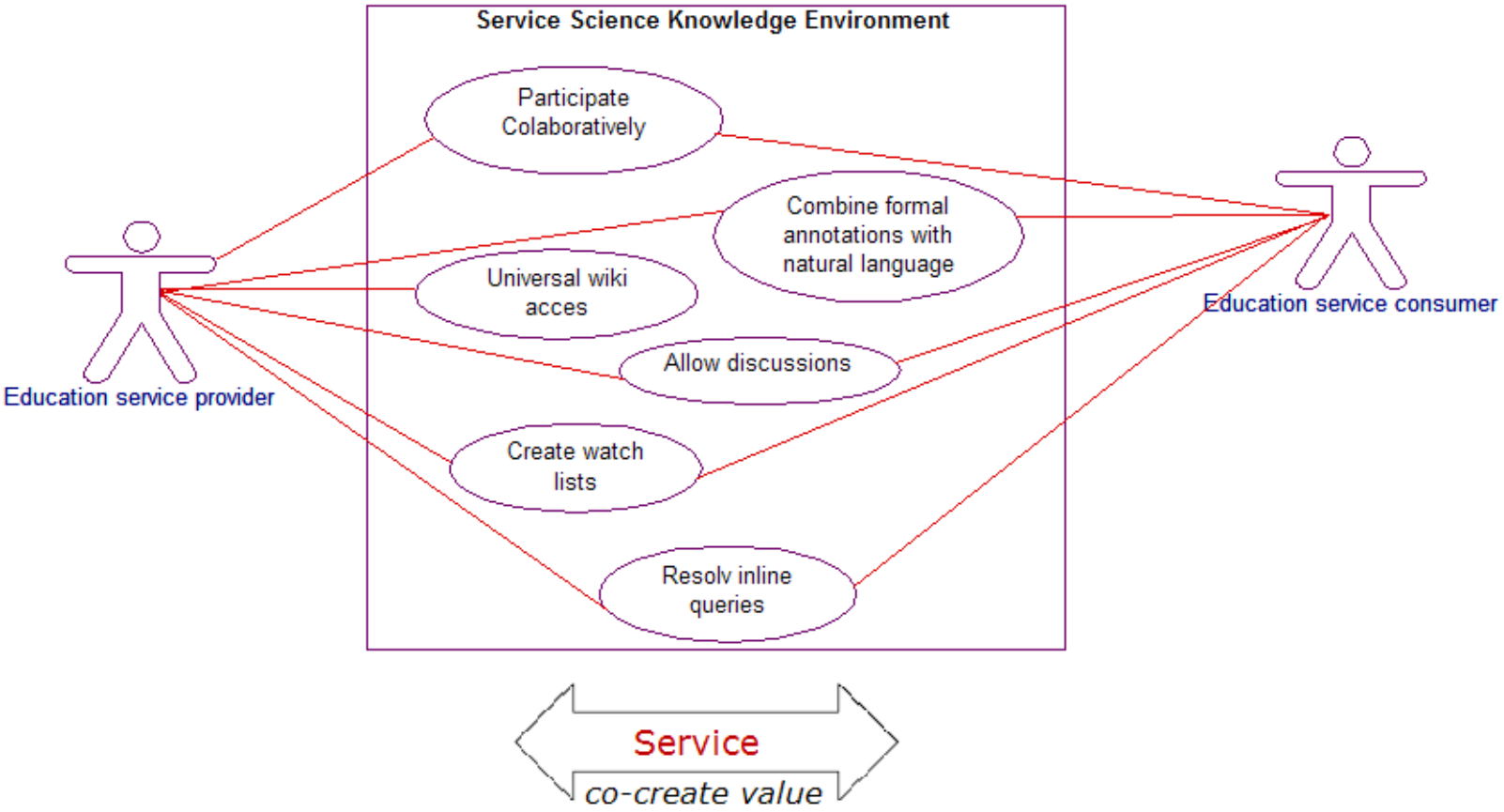
An Ontology-based SS-KE: architecture



M. Krötzsch, D. Vrandecic, 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

- create / edit content
- inline query
- organize (ontology-based)
- import and interconnect

- *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

- *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

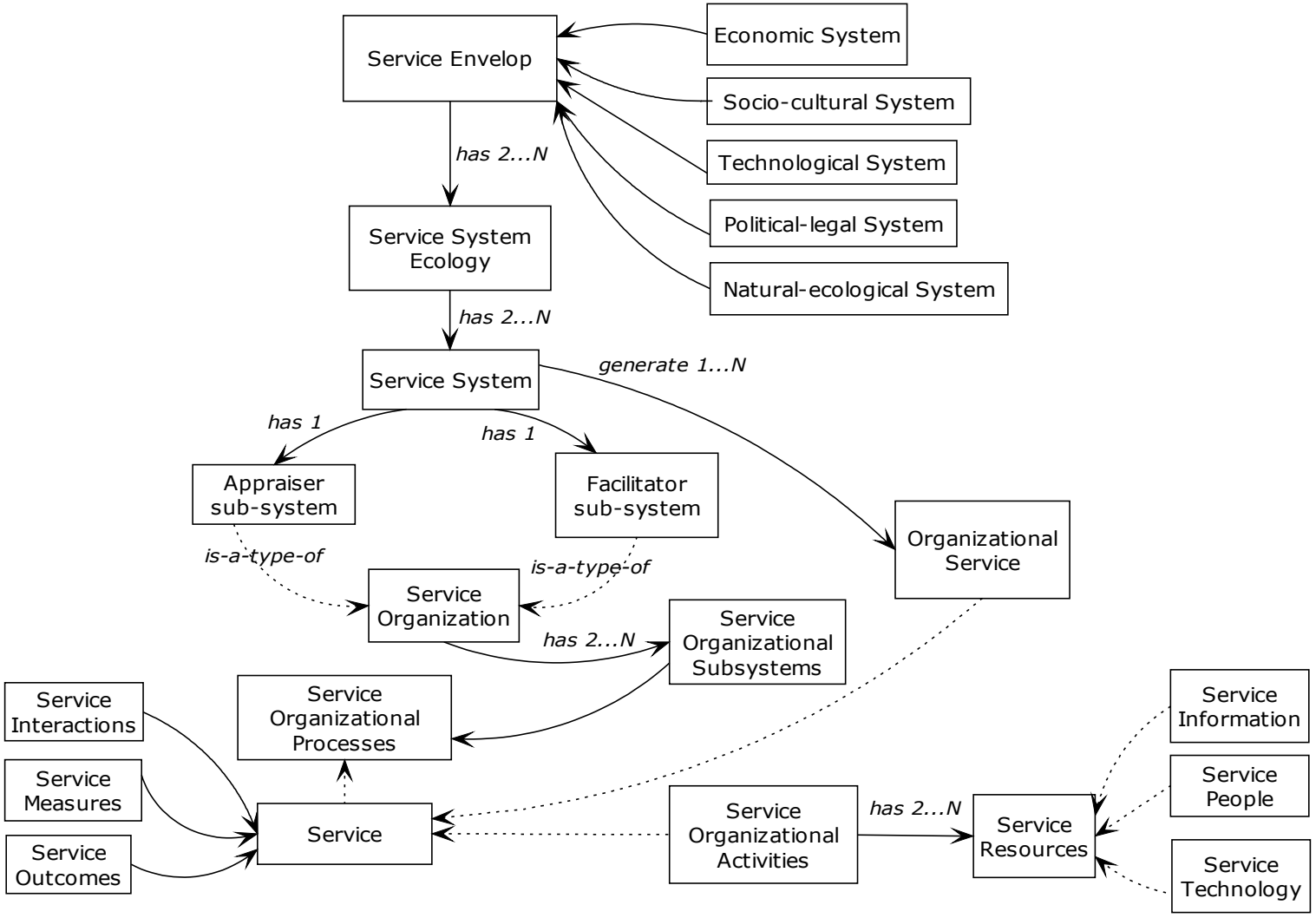
- Service Science body of knowledge - an *integrative view* is required (service frameworks, schemes, models, and constructs)
  - SS-KE conceptual artifact: *a formal and computerized specification of constructs for Service Science to be used for supporting automated reasoning in the intelligent knowledge 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

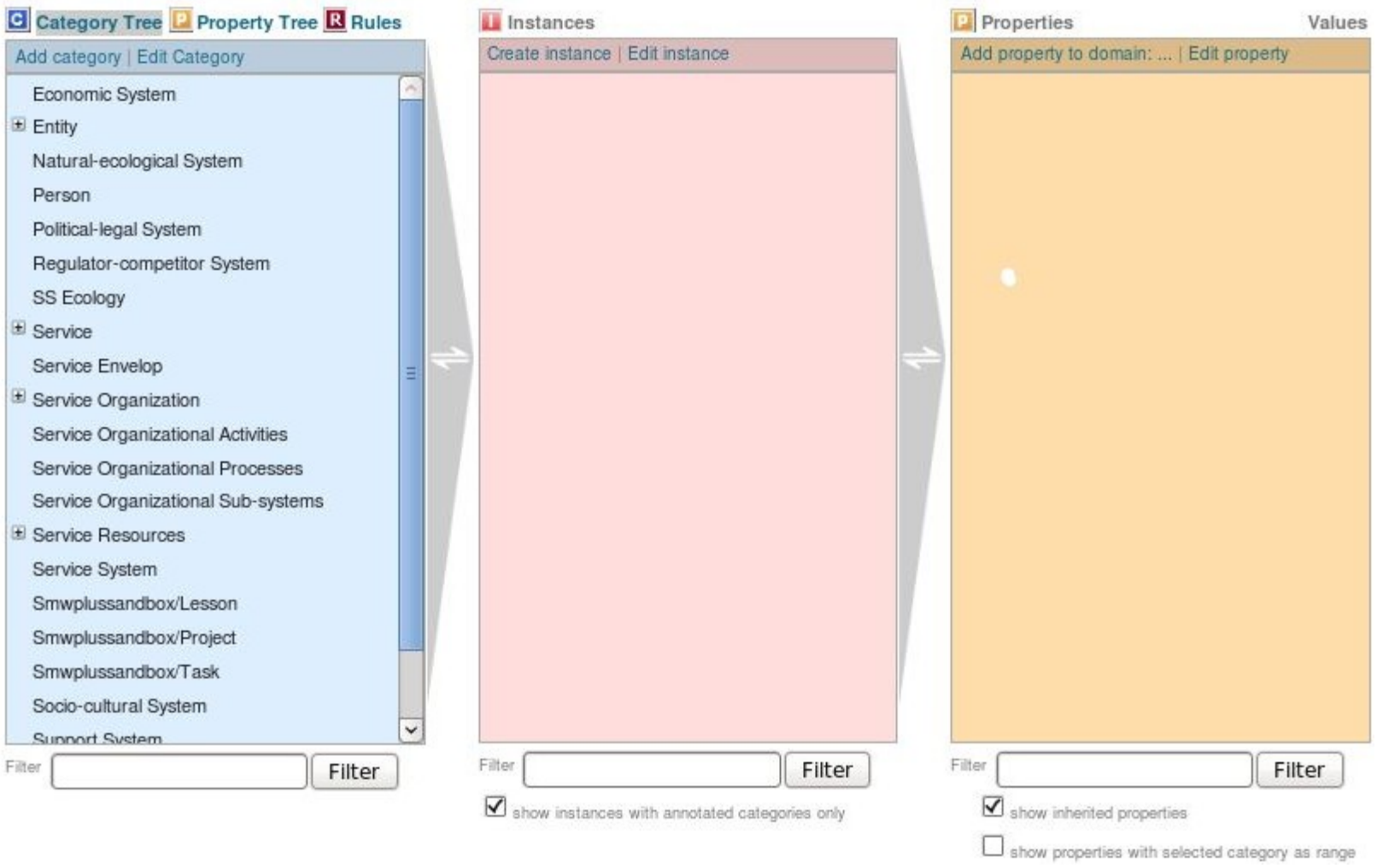
- essential tasks to design the ontology to be used in the SS-KE
  - definition of the domain, scope, competency and design goals of the ontology
  - identification of knowledge sources
  - initial identification and organization of ontological components (concepts, hierarchy of concepts, interrelationships
  - 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



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