

Human capital reengineering in Service Science

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Defining Service Science (skills, innovation, application)

Service Science Management and Engineering - SSME

“...curricula, training, and research programs that are designed to teach individuals to apply scientific, engineering, and management disciplines that integrate elements of computer science, operations research, industrial engineering, business strategy, management sciences, social and legal sciences, in order to encourage innovation in how organizations create value for customers and shareholders that could not be achieved through such disciplines working in isolation.”

America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science
(COMPETES) Act, Public Law 110-69—AUG. 9, 2007

Three important objectives

- Provide methods to scientifically analyze services, efficiently manage services, and maximize the productivity of services through engineering production processes
- Solve problems arising from service intangibility, simultaneity of production and consumption, and heterogeneity of the context services are delivered
- Explore a framework for systematically develop innovation

Education in Service Science

- Educate professionals having improved scientific & systemic understanding and being able to use a new set of models and tools to rend service innovation more systematic and sustainable
- Expand education at all three stages of higher education: undergraduate, master and PhD

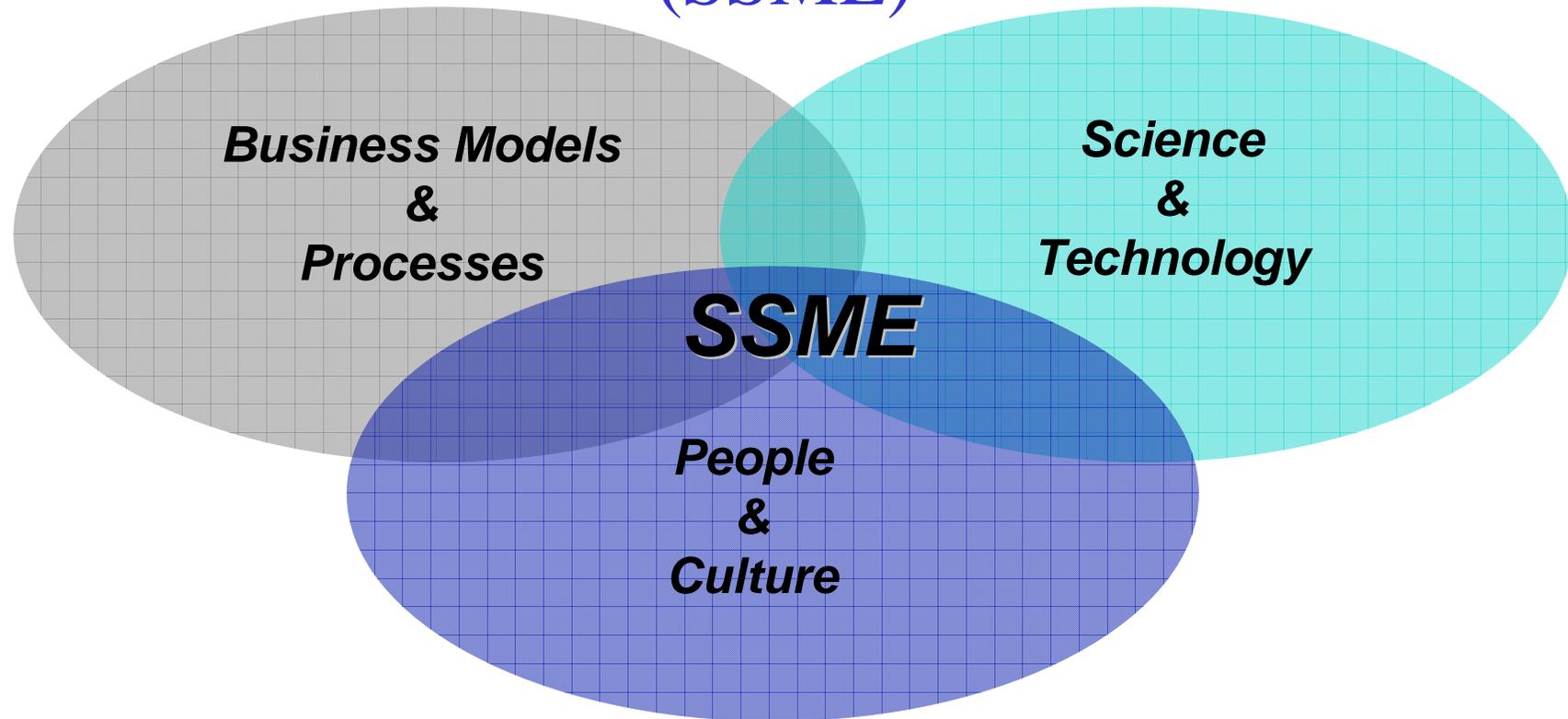
Education in Service Science

- Differentiate between three types of service science-related programs and curricula, keeping a minimal common core of disciplines:
 - Engineering (**Technology**)-focused: (T)
 - Economy (**Business**)-focused: (B)
 - Management (Organization)-focused: (O) – narrow set of skills
- Define main lines of skills for T-, B-, and O- service science programs: design, implement, operate (T); analyse, model, strategy (B); manage, communicate, leadership (M) of complex systems for services
- Relate respectively to Technology and Business profiles of schools

Skills for Service Systems

- Communications across disciplines
- Service design
- Service management
- Service system modelling
- Service strategy through understanding value co-creation
- Service lifecycles to ensure quality
- Service supply and demand management
- Business project management
- Creative and critical thinking, analysis and synthesis
- Business best practices
- Leadership, collaboration, and teaming
- Business case development and analysis
- New service offerings
- Organizational change management
- Knowledge of marketing and sales
- Case Studies in service sectors

Need for Academic Curricula Change: Service Science, Management & Engineering (SSME)



The marketplace requires innovation that combines
people, technology, value and clients

A new way to teach / learn / innovate / apply Service Science skills

1. Scope: fundament, teach, exemplify the logic of **complex service systems**; establish a common language and shared frameworks for *service innovation* in sectors of society (each one with its specificity).
2. Adopt an *interdisciplinary* approach for research and education on service systems.
3. Create, set up, promote new :
 - *curricula,*
 - *training, and*
 - *research programs*
4. Work together: Academia, Industry, Government
5. Create new knowledge; respond to needs of service industry; transfer results of applied research

A new way to teach / learn / innovate / apply Service Science skills

Education:

- Develop two types of modular Service Science curricula:
 - *Technology-oriented* (T-SS), in technical schools (CS&E, System Sciences, Electrical Engineering, Industrial Engineering profiles)
 - *Business-oriented* (B-SS), in business schools (Economic Informatics, Finance, Management, Public Administration profiles)
- Extend SS-Master programs in the national higher education network

A new way to teach / learn / innovate / apply Service Science skills

Education:

- Keep a *common core of disciplines* in T-SS and B-SS curricula: value cocreation; producer-consumer relationship; SS entities; Service dominant logic
- *Differentiate* inside T-SS and B-SS specific disciplines according to the institution's profile
 - Software technologies, Information architectures & systems for ICT-based service systems;
 - Supply chains; Transport & logistics; Energy distribution; Manufacturing
 - Retail & wholesale; e-commerce; banking and insurance
 - Health care

Common Core of SS disciplines: Physical Symbol Systems

1. Resources are the building blocks of service systems

**First foundational premise
of service science:**

**Service system entities
dynamically configure
four types of resources**

The named resource **is**
Physical or **Not-Physical**
(physicists resolve disputes)

The named resource **has**
Rights or **No-Rights**
*(judges resolve disputes
within their jurisdictions)*

Hierarchical complexity
(building blocks repeat / nest)

	Rights	No-Rights
Physical	1. People	2. Technology
Not-Physical	3. Organizations	4. Shared Information

Formal service systems can contract
Informal service systems can promise/commit
Trends & Countertrends (Evolve and Balance):

Informal <> Formal
Social <> Economic
Political <> Legal

Routine Cognitive Labor <> Computation
Routine Physical Labor <> Technology
Transportation (Atoms) <> Communication (Bits)
Qualitative (Tacit) <> Quantitative (Explicit)

Common Core of SS disciplines: Physical Symbol Systems

2. Value propositions are the building blocks of service system networks

Second foundational premise of service science:

Value propositions coordinate & motivate resource access

Service system entities calculate value from multiple stakeholder perspectives

A value propositions can be viewed as a request from one service system to another to run an algorithm (the value proposition) from the perspectives of multiple stakeholders according to culturally determined value principles.

The four primary stakeholder perspectives are: customer, provider, authority, and competitor

Stakeholder Perspective (the players)	Measure Impacted	Pricing Decision	Basic Questions	Value Proposition Reasoning
1. Customer	Quality (Revenue)	Value Based	Should we? (offer it)	Model of customer: Do customers want it? Is there a market? How large? Growth rate?
2. Provider	Productivity (Profit)	Cost Plus	Can we? (deliver it)	Model of self: Does it play to our strengths? Can we deliver it profitably to customers? Can we continue to improve?
3. Authority	Compliance (Taxes and Fines)	Regulated	May we? (offer and deliver it)	Model of authority: Is it legal? Does it compromise our integrity in any way? Does it create a moral hazard?
4. Competitor (Substitute)	Sustainable Innovation (Market share)	Strategic	Will we? (invest to make it so)	Model of competitor: Does it put us ahead? Can we stay ahead? Does it differentiate us from the competition?

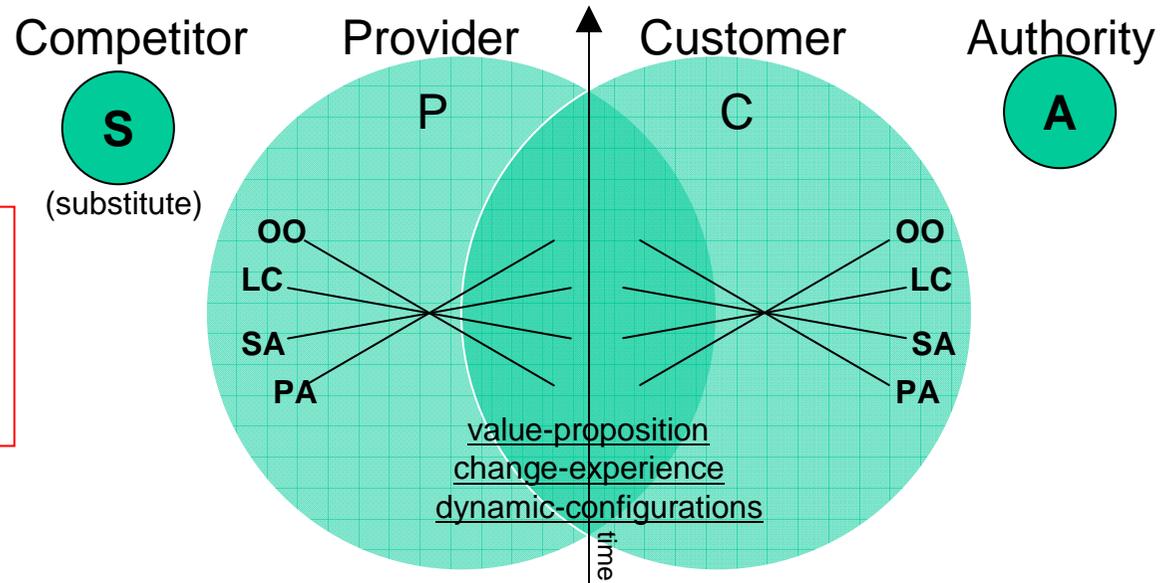
Common Core of SS disciplines: Physical Symbol Systems

3. Access rights are the building blocks of service system ecology

Third foundational premise of service science:

The access rights associated with customer and provider resources are reconfigured by mutually agreed value propositions relationships

- Access rights
 - Access to resources that are owned outright (i.e., property)
 - Access to resource that are leased/contracted for (i.e., rental car, home ownership via mortgage, insurance policies, etc.)
 - Shared access (i.e., roads, web information, air, etc.)
 - Privileged access (i.e., personal thoughts, inalienable kinship relationships, etc.)



service = value-cocreation

	B2B	
	B2C	
	B2G	
<u>provider resources</u>	G2C	<u>customer resources</u>
Owned Outright	G2B	Owned Outright
Leased/Contract	G2G	Leased/Contract
Shared Access	C2C	Shared Access
Privileged Access	C2B	Privileged Access
	C2G	

A new way to teach / learn / innovate / apply Service Science skills

Education (*define a new model of open, continuous education in SSME*)

- Establish a workgroup from higher education (members from engineering and business schools)
- Define the Service Science domain (SS), with SS_T and SS_B profiles
- Consult the service sector and ITC firms to establish the set of qualifications; validate them with the Ministry of Education, Research & Innovation
- Define core disciplines for SS_T and SS_B Master programs

A new way to teach / learn / innovate / apply

Service Science skills

Education (*define a new model of open, continuous education in SSME*)

- Address higher education institutions in the national academic network and stimulate them to launch differentiated SS Master programs according to:
 - Engineering / Economy specialties;
 - Service sectors addressed: manufacturing, energy, supply, transport, banking, business consulting, commerce, public administration, health care, ...
 - Regional specific: economy, tradition, trade, culture, ...
- Stimulate integration of information systems & technologies, web in SS solutions
- Develop open, collaborative e-learning platforms with virtualized resources accessed as services: SS campus cloud

Service Engineering and Management at PUB and AES (Bucharest)

- Created and designed as a T-oriented Service Science Master program
- New skills engineers should learn: ICT, OMM, PSO
- Teaching staff from two most representative academic institutions: POLITEHNICA University & Academy of Economic Sciences in Bucharest
- 4-Semester Master Program
- Teaching in English: facilitates student mobility, exchanges, joint degrees with EU universities
- Industry-supported; partner IBM SWG / IIC / LCC (internship; invited lecturers from SWG, GBS, GTS; execs from sales, operations, marketing)

Service Engineering and Management at PUB and AES (Bucharest)

- Provides components in education of service professionals:
 - *New technologies* (the ability to design, understand and evaluate innovative technologies and processes, IT-based service science systems)
 - *New interaction modes or services* (understand user and consumer needs and be able to meet requirements and quality expectations)
 - *New business models* (leadership and management capacity to meet stakeholder interests and the demand for organization flexibility, effectiveness and accountability)
- Three complementary modules (*interlaced courses*): (1) Information and Communication Technologies (ICT); (2) Operations, management and marketing (OMM); (3) Psychology and sociology (PSO)

SEM Program Structure

1st Year – 1st Semester

C11. Mathematical Modelling of Economic Processes (4 ECTS)

C12. Business Process Modelling, Strategies and Communication (4 ECTS)

C13. Information Management and Data Warehousing (3 ECTS)

C14. Information Systems Architecture (3 ECTS)

C15. Marketing and Financial Performance of Business (3 ECTS)

C16. Network and Systems Security (3 ECTS)

12 hours / week scientific Research/Development [in university lab / in company] (10 ECTS)

Total Semester 1 / Year 1 = 30 ECTS

SEM Program Structure

1st Year – 2nd Semester

C21. Service Operations Management and Logistics (4 ECTS)

C22. Business Process Management (4 ECTS)

C23. Multimedia and New Services (3 ECTS)

C24. Knowledge Engineering and Management for Services (3 ECTS)

C25. Communication Management and Cognitive Psychology (3 ECTS)

C26. Accounting and Financial Management (3 ECTS)

12 hours / week scientific Research/Development [in university lab / in company] (10 ECTS)

Total Semester 2 / Year 1 = 30 ECTS

SEM Program Structure

2nd Year – 1st Semester

C31. Supply Chain Management (4 ECTS)

C32. Data Workflow and Computer Networks (4 ECTS)

C33. Enterprise Management Architectures (4 ECTS)

C34. E-Business Technologies (3 ECTS)

18 hours / week scientific Research / Development [in university lab / in company] (15 ECTS)

TOTAL Semester 3 / Year 2 = 30 ECTS

SEM Program Structure

2nd Year – 2nd Semester

C41. Project Management (3 ECTS)

C42. Capital Budgeting (3 ECTS)

C43. Organizational Behaviour and Customer Relationship Management (3 ECTS)

C44. Intellectual Property and Entrepreneurship (3 ECTS)

6 hours / week scientific Research/Development (6 ECTS)

12 hours / week Master Project (12 ECTS)

Total Semester 4 / Year 2 = 30 ECTS

Service science - as a viable career path

- Universities should establish networks of service science graduates. Encourage [alumni networks of service science graduates](#) to explain their current work in industry to prospective students
- Representatives from industry, government and academia should participate in promotional activities to improve awareness among prospective students of [job profiles and employment prospects](#) available to service science graduates
- Universities should use leading edge research and industry collaboration to [promote the concept of service science](#) among existing students. This will serve to improve the awareness of service science among faculty members and students, motivating them to pursue relevant graduate programs

Service science - as a viable career path

- Human resource departments in larger companies should ensure that qualifications in service science become a pre-requisite for relevant roles within their companies. This is standard practice in more established areas of study and should be applied to service science in order that the company accesses the particular advantages of this academic qualification
- University liaison personnel from industry should ensure there is a clear line of sight from academic curricula to job opportunities. This is to be achieved by taking an active role in *promoting service science as a career path*, contributing to the definition of university curricula and ensuring that recruitment programs at explicitly seek out service science graduates for relevant roles in their companies

Research in Service Science

Research (*requirements for new academic research line*):

- Develop an interdisciplinary and intercultural approach to service research
- Fill gaps between disciplines through broad R&D lines
- Establish *service system* and *value proposition* as foundational concepts
- Work with practitioners to create data sets to understand the mechanisms of service systems
- Create modelling and simulation tools for service systems

Research in Service Science

Research (*requirements for new academic research line*):

- Service innovation should be carried out in a multidisciplinary business unit (Research Centre, Academic Consortium) that combines IT system integrators, managers, and market researchers
- There is a need to better understand the specific innovation patterns of services and their relevance for innovation policy strategies; develop new indicators that can better articulate and measure what service innovation is about
- Service-sector R&D is more difficult to measure, and customer-driven

The Strategy for R&D and Innovation 2007-2013. Service Science in National R&D Programs



Vision

The RDI system will be the engine for the development of the Romanian knowledge society, with the capacity to sustain performance through innovation in all areas contributing to the welfare of the citizens, while attaining reaching scientific excellence recognized at international level

The National Plan for R&D and Innovation 2007-2013

The objectives and priorities established by the *National Strategy* were taken into account as reference elements for the elaboration of the *National Plan for R&D and Innovation for 2007-2013 (PN II)*, the main implementation instrument.

Supportive measures promoted by National Plan II include:

- Increasing the number of young researchers, of PhDs and post-doctoral graduates, and also of Romanian researchers from abroad reintegrated in R&D activities in Romania
- Developing in R&D institutions and in universities a working environment comparable to similar EU institutions, with high performance research equipment and ICT facilities, integrated into complex research platforms, compatible with European ones
- Promoting the European dimension of research in Romania, by improving the level and quality of participation of researchers to R&D programs and activities in the European area

The National Plan for R&D and Innovation 2007-2013

Program 1. *Human Resources*

Increasing the number of researchers and improving their professional performances

Program 2. *Capacities*

Development of RDI infrastructures and their better connection and use at national and international level

Program 3. *Ideas*

Generation of high level S&T results, contributing to a higher international visibility and recognition for Romanian research

Program 4. *Partnerships in priority RDI fields*

Promotion of S&T partnerships leading to innovative technologies, products and services, for solving complex problems in key application areas

Program 5. *Innovation*

Promotion of industry-led research, technological development and innovation, based on the absorption of research results, for improving economic competitiveness and the quality of life

Program 6. *Promoting institutional performance*

Promoting the continuity and stability of R&D institutions, through the development of their own strategies, in accordance with the National RDI Strategy

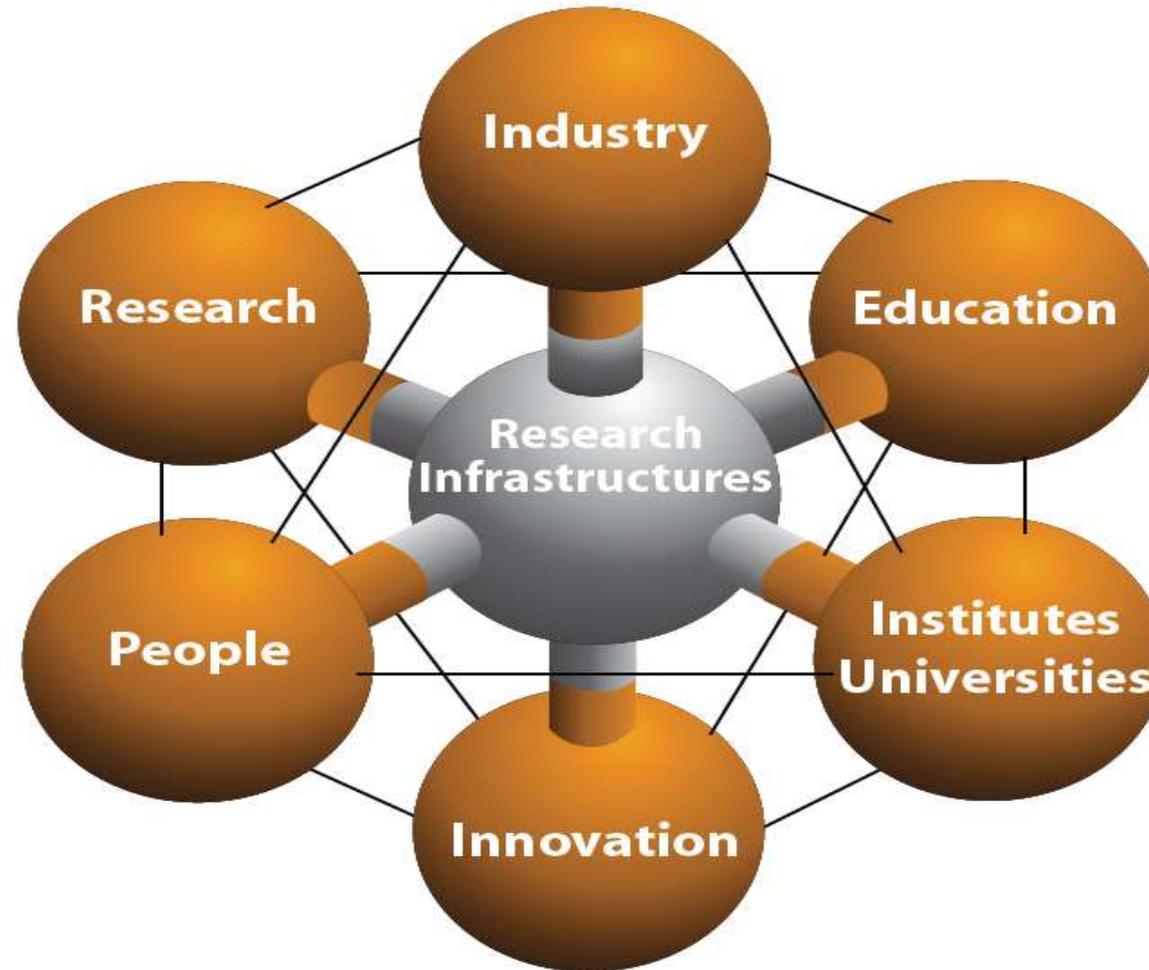
Type the service	Related R&D projects
<p><i>Finance, insurance and real estate industries</i> Commercial and investment banking, insurance, and commercial and residential real estate industries</p>	<p>Insurance and financial mathematics, IT systems development for the back office and delivery, service scripts development for the front desk personnel</p>
<p><i>Business services, legal services</i> Legal services, advertising, engineering and architecture, public relations, accounting, R&D and consulting</p>	<p>Creative design, socio-economic research (market research, technical science, consumer behaviour, management research, media research)</p>
<p><i>Transportation and communications</i> Electronic media, trucking, shipping, railroads, airlines and local transportation such as buses and taxis</p>	<p>ICT research and development, logistics simulation, technical science, systems management, planning and socio-economic research, management research, cabin service development, marketing and communications research</p>
<p><i>Wholesale and retail trade</i> Intermediaries between producers and consumers, restaurants, personal services, repair and maintenance services</p>	<p>Socio-economic research, economics, consumer behaviour, logistics, shop lay-out, logistics, purchasing management, management research, marketing research, systems management, simulation</p>
<p><i>Entertainment, hotel and motels</i> Comprise elements of tourism, the world's largest industry</p>	<p>Socio-economic research, economics, environmental research, consumer behaviour, management research, food science</p>
<p><i>Government services at the transnational, national, and local levels.</i> Public servants, armed forces, education, health care, police, fire departments.</p>	<p>Economics, politics-, and policy research. Socio-economic research, security research and development, planning, medical and health research, gerontology, demographics research, environmental and energy research</p>
<p><i>Not for profit agencies</i> charities, churches, museums, private not for profit health care agencies</p>	<p>Socio-economic research, nutritional research, demographics research, religion-oriented research, medical research</p>

Service research in national R&D projects

National Plan PNII	Existing activity directions in Service Science	Service Research Strategies Priorities
Human Resources	Stimulating the creation of Excellence Centres	<p>Fostering service infusion and growth Identifying business models for growth and expansion based on service; Evolving product-based organizations into service-oriented enterprises; Integrating and aligning goods, services, and solutions strategies, Developing and managing a services-goods portfolio</p> <p>Improving well-being through transformative service Improving consumer and societal welfare through service; Enhancing access, quality, and productivity in health care and education; Delivering service in a sustainable manner (i.e., one that preserves health, society, and the environment); Motivating the development and adoption of green technologies and related services; Planning, building, and managing service infrastructure for metropolitan areas, regions, and nations; Democratizing public services for the benefit of consumers and society; Driving service innovation at the base of the pyramid.</p> <p>Creating and maintaining a service culture Recruiting, training, and rewarding associates for a sustained service culture; Developing a service mind-set in product-focused organizations; Creating a learning service organization by harnessing employee and customer knowledge; Keeping a service focus as an organization grows, matures, and changes; Globalizing a service organization's culture across different countries.</p>
Capacities	.	
Ideas		
Partnerships in priority domains	<ul style="list-style-type: none"> • Advanced IT systems for e-services • Technologies, systems and communication infrastructures • Security and accessibility of IT systems • Distributed and embedded systems • Education Quality • Technology, organization and cultural change 	
Innovation	Support services for innovation	
Sustaining the institutions performance		

Service research in national R&D projects...

....with the support of.....



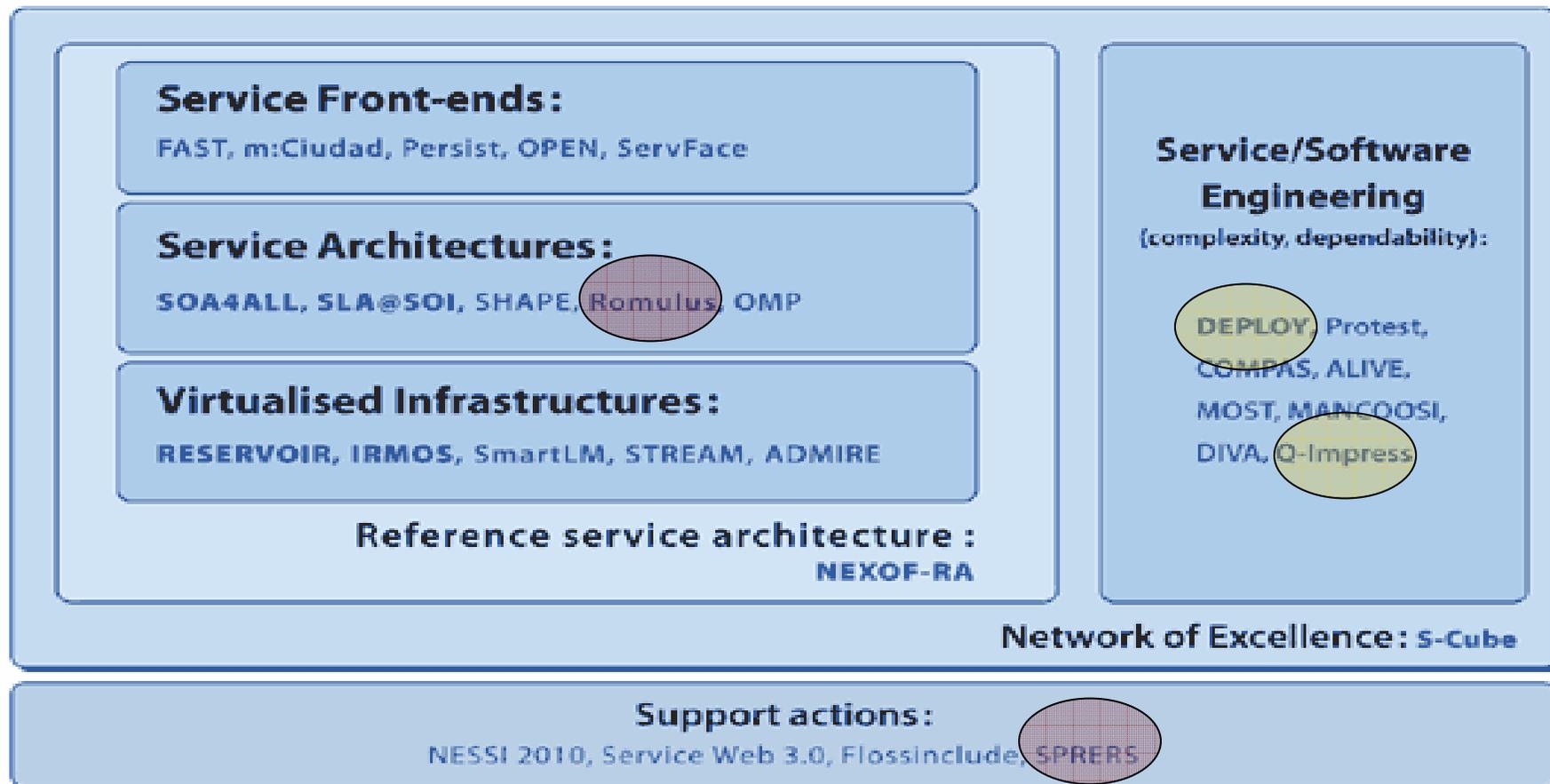
Software Service in FP7-ICT EU projects

Participation of Romanian workgroups

- WP 2009-2010 – Call 5, Oct 2009
 - Objective ICT-2009.1.2: Internet of Services, Software and Virtualisation (Call 5 – October 2009)
 - Service Architectures and Platforms for the Future Internet: *Service front ends; Open, scalable service platforms and architectures; Virtualized infrastructures*
 - Highly Innovative Service / Software Engineering: *Service / Software engineering methods and tools; Verification and validation; Open source software.*
- WP 2011-2011 – Call 8 (to be announced)
 - Objective ICT-2011.1.2: Cloud Computing, Internet of Services and Advanced Software Engineering

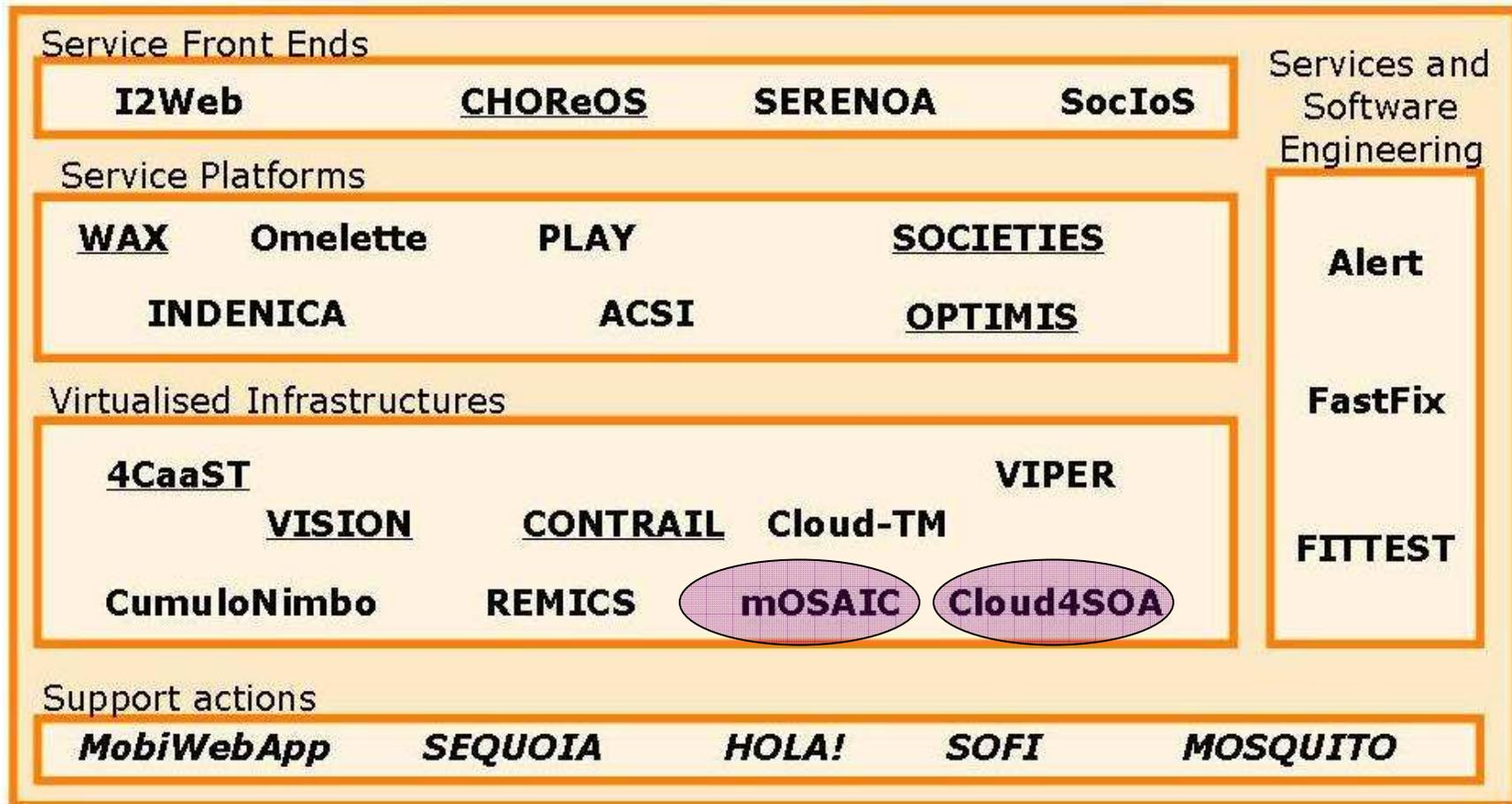
Funded Projects & Romanian Partnership

Objective 1.2 "Service and Software Architectures, Infrastructures and Engineering"



* IP/NoEs in bold

Projects in Negotiation & Romanian Partnership



Launching National R&D competitive calls

For prospectives studies under “**Capacities**” Program:

- Nanotechnologies
- Green Energy
- Cell/Cancer Therapy
- **SERVICES SCIENCE**

For human resources, for innovative projects, under “**Human resources**”, “**Ideas**” and “**Innovation**” Programs:

- Individuals
- Partnership (PPP included)

Collaboration in Service Science: University + Industry + Government

Industry (*partner in education & research, foster innovation*):

- Establish employment policies & career paths for T-shaped professionals
- Review existing approaches to service innovation
- Provide funding for service systems research
- Develop appropriate organizational arrangements to enhance industry-academic collaboration
- Work with stakeholders to include sustainability measures.

Government (*demonstrate need, cooperate in national education & research plans*):

- Promote service innovation
- Provide funding for SS education and research
- Demonstrate the value of Service Science to government agencies
- Make public service systems more comprehensive and citizen-responsive
- Encourage public briefings

Issues and challenges

- The need for higher education reengineering
- Differentiate between two Service Science – related higher education programs: T-oriented, B-oriented
- Awareness and absorptive capacities in service companies often missing
- Service innovation is not only technology based, but no funding unless it is centered around IT
- Need to “sell” the promise of service research and its innovative solutions
- Transdisciplinarity, user integration and co-creation are issues to be understood in the future
- R&D activities: fundamental, applied

Proposed solutions:

- Medium term activities to create awareness and absorptive capacity starting with open innovation workshops for co-creation including Innovation Labs/Centers/Factories/...
- Organizing a coherent, differentiated higher education Service Science domain, Technology-oriented & Business-oriented Master profiles
- *And then:* continuing this dialog and future exchanges of people between research, companies and funding agencies, driven by companies and facilitated by research as well as inter-sectorial mobility schemes
- Show the successes of service research to political actors via domain-specific case studies to make service innovation visible
- Make service research also encompass non-technological and hybrid services
- Ask funding agencies and ministries to share their experiences via a paneuropean ERA-NET project on innovation in services
- Promote a common agenda on service research and innovation on the Commission level

Thank you!

Questions?