A Model for Open, On-Demand, Collaborative Education for Service Science

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Abstract. This paper presents a proposal concerning the development of a sustainable support for modern education in services. It accounts for the development of a dedicated higher education study program on Service Science Management and Engineering (SSME) on different levels, i.e. master, undergraduate and compact modules dedicated to a lifelong education process (the SSME education model). The proposed approach addresses both research and curricula development on different service sectors, aiming to foster the new Science of Service at national level.

Key words: Service Science, education models, service innovation

1 Introduction

The main scope of the new Science of Service is to classify and explain how different types of service systems interact and evolve in order to co-create value through a continuous chain of interactions between service providers and consumers [1]. A new concept introduced in order to detail concepts related to Service Science is SSME - Service Science, Management and Engineering, describing a whole domain of study that allows engineers, economists and managers to interact and cooperate in order to analyse, develop and exploit complex dynamic systems, i.e. the service systems [2]. In a broader acceptance, SSME is a domain where scientific understanding, engineering practices and managerial tools meet in order to design, create and deliver complex service systems [3], [4]. From an academic point of view, Service Science closely relates to labour market qualifications and necessary competences for different service sectors that educational and research programs in services can provide [5]. There is an acknowledged demand today to develop a large number of higher education programs in SSME, emphasizing the need to create a format by itself, contrary to an implicit tendency to dissipate knowledge related to Service Science among already existing educational programs in specific domains [6]. Considering the multidisciplinary perspective on knowledge related to the new Science of Service, first attempts were made in order to closer relate service science and service innovation [7], to embed the new discipline of service science into a research agenda [8], or to make an initial proposal for a Service Science discipline classification system [9]. Other

approaches try to define guiding principles to develop service science disciplines [10] or to develop specific curricula in services [11], [12]. There have been also reported approaches to develop specific reference models [13] and Master programs in specific areas of study related to Service Science [14], [15]. At the same time, dedicated projects approached specific areas related to curricula and competencies development for service innovation. Among these, DELLIISS project [16] developed an European skill card in order to foster cooperation between higher education and enterprises. It is in the framework of the INSEED project [17] that the proposal of a reference model for a complex higher education program in SSME is formulated (section 2). The main artefact is the **SSME model** that proposes a modern vision on a complex educational model on three levels (undergraduate, masters and doctorate) to approach *service innovation* (section 3). It provides professional competencies in different service sectors (section 4) and support for specific lifelong learning education for service innovation (section 5).

2 Problem statement

This proposed approach to develop a higher education program to shape adaptive innovators for modern services in the SSME perspective takes into consideration different requirements and patently statements.

(**R1**.) There is an obvious trend that each of the developed countries is experiencing today showing that most of the labour force goes into different service businesses;

(**R2**.) There is an obvious necessity to increase both volume and quality in services for the economic benefit of society in a whole and for a better quality of life;

(**R3**.) Services in different service sectors can be grouped into three basic system categories, i.e. **Execute**, **Transform**, **Innovate** [1]. Inside each category there are common specificities that require both basic knowledge and different supplementary professional competences (see also Fig. 1 in section 3);

(**R4**.) We can apply the service innovation multilevel framework [7] on each of the three levels - *requirements*-, *competencies*- and *service resources* - in order to define curricular areas for the *new higher education in services model* that would provide professional competences in SSME for modern service development;

(**R5**.) In order to define the new higher education in services model we can use the transposition of: a) the service innovation multilevel framework [7], of the methodology and of the technological and organizational directions for innovation to support and provide requirements, competencies and resources for services; b) the partnership context in value co-creation through services [1]; c) the principles and the methodology for configuration, interconnecting, integration, exploitation and innovation of resources in sets of disciplines for the defined curricular areas.

(**R6**.) We can associate disciplines from the defined sets with profession (labour activity) categories in services. The discipline list is contained in the knowledge areas associated to the major dimensions of the service systems;

(**R7**.) There is a necessity for the continuous adaptation and improvement of provided knowledge and competences in the initial education cycles (undergraduate, master, doctorate) in SSME through dedicated lifelong learning programs;

(**R8**.) There is a need to sustain the migration ability of the graduated student of a service sector education program between occupation profiles in three different categories: a) *service performer*; b) *service transformer*; c) *service innovator*.

3 Higher Education Model for SSME - A Proposal

According to the above mentioned statements, the development of *a new higher education program* dedicated to train adaptive innovators for modern service systems implementation requires to define *an educational model in SSME* - the **SSME model**. The **SSME model** defines *different levels of higher education*. It takes as a starting point the service innovation multilevel framework [7], over which the curricular areas, professional competencies, sets of disciplines and types of occupations available to students are superimposed (Fig. 1). It has the following characteristics that answer to the above mentioned requirements.

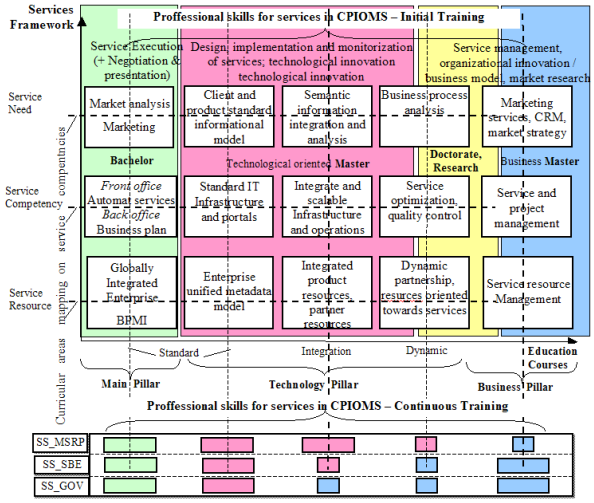

Fig. 1. SSME model and service innovation multilevel framework - correlation

(**C1**.) The SSME model addresses to higher education units (in Romania) in certain study profiles: engineering (technology oriented), economics (business oriented) and medical schools.

(**C2**.) The SSME model highlights: A) **LS**. An *undergraduate level* in service systems: (**LS**) - [Main Pillar]; B) **MS**. Two types of *master levels* in service systems: (**MS-T**) - a technology-oriented master program in services (engineering)

[Technology Pillar]; (**MS-E**) - a business-oriented master program in services (economics) [Business Pillar]; C) **DS**. A *doctorate level* for services, with the following aspects: (**DS-T**) - a technology-oriented doctoral program for complex service systems (engineering); (**DS-E**) - a business-oriented doctoral program for complex service systems (economics); D) **CS**. A *lifelong education program* in services, on both directions: technology-oriented and business-oriented. Grouping modules of disciplines that forms professional competencies in service systems requires the following classification [1]: d1) **SS_MSRP** (*major technology-orientation*) - systems that move, store, harvest, process; d2) **SS_SBE** (*moderate orientation towards technology and business*) - systems for health, welfare and wise education; and d3) **SS_GOV** (*major orientation towards business*) - systems that govern.

(**C3**.) In order to foster a major knowledge orientation of the new higher education program in SSME, the **SSME model** enforces the definition of a new fundamental study domain called *Service Science*.

(**C4**.) The SSME model includes the following types of Masters programs in Services: A) General programs [**MS-T** type or **MS-E** type]; B) IT-oriented programs [**MS-T** type]; C) Business-oriented programs [**MS-E** type]; D) Programs oriented towards different service sector in society [**MS-T** or **MS-E** type].

4 Professional competences in the SSME model

The **SSME model** provides professional competencies for service systems on each of the three education levels.

(**PC1**.) The undergraduate level provides competences for service realization, negotiation and presentation.

(**PC2**.) The Master level (IT oriented) provides competences in service design, implementation and monitoring, and technological innovation for services (resources and competencies for services).

(**PC3**.) The Master level (business oriented) provides competencies in service management, organizational innovation for services, new business and research models, provisioning and market strategy (competencies and requirements).

(**PC4**.) The Master level (service sectors oriented) provides competences in resources management fostering domain related service ecosystem development.

Curricular areas are associated to the mentioned levels as follows (Fig. 1):

(**CA1**.) *Resources for services*: resources / platforms to develop services; service content and resource performances; enterprise modelling; resource integration; channels / resources for service delivery; service resources management;

(**CA2**.) *Competencies for services*: processes for services; ERP; integration of processes and partners;

(**CA3**.) *Requirements for services*: market analysis and strategy, business process analysis, CRM, HCM;

(**CA4**.) The following curricular areas are defined in the business-oriented master programs: CRM, SCM, ERP, HCM, organizational innovation, business model innovation, demand innovation;

(**CA5**.) The following curricular areas are defined in the IT-oriented Master programs: new technologies for services; architectures for services; service analysis, design and optimization; technological innovation;

(**CA6**.) The curricular areas included in the undergraduate programs in *Service Engineering* and technology-oriented Master programs (including IT) are based on knowledge areas related to Services Computing [18];

(**CA7**.) The following curricular areas are defined in the general Master programs: ICT; operations, management and marketing (OMM); psychology, sociology and arts (PSA);

(**CA8**.) The curricular areas defined in the service sectors oriented Master programs: (1) generically substantiate the service, its modelling, architecture and flow of automated processes, development IT technologies, service analysis and optimization, and (2) associate and integrate resources, provide competences and manage operations and partners;

(**CA9**.) The following curricular areas are defined by the undergraduate program *Service Engineering*: basic concepts of services (service systems, value, resources, participants); basic concepts of IT and service computation (SOC); service design; service development and delivery; service integration and management; human resources management in services; service oriented enterprise architecture; business service consultancy.

5 Lifelong Learning Education Support in the SSME model

The continuous adaptation and improvement of knowledge and competencies provided on different levels of SSME initial education is sustained by including sub-programs for lifelong education in services. These modules are dedicated to staff training and knowledge upgrading in services in public institutions and private business. The share of training components in each of service sector is stated as follows (Fig. 2): a) **SS_MSRP**: 25% basic concepts for services; 62.5% technology; 12.5% management; b) **SS_SBE**: 25% basic concepts for services; 37.5% technology; 37.5% management; c) **SS_GOV**: 25% basic concepts for services; 25% technology; 50% management.

Transposition of the specific elements in sets of disciplines for the defined curricular areas is realized through the association between (Fig. 2): A) the *resources for services* level and *sets of disciplines* for technologies (platforms / resources for service development), shared information (service content, client data), and human staff (resources exploitation); B) the *competences for services* level and *sets of disciplines* for *organization*, *competitor* and *provider*; and C) the *requirements for services* level and *sets of disciplines* for stakeholder and governance authority. The way occupations / professions in different service sectors are positioned is determined by the transposition of the key factors associated to resources-, competencies- and requirements for services in curricular areas and sets of disciplines that generate competencies in the three specified categories.

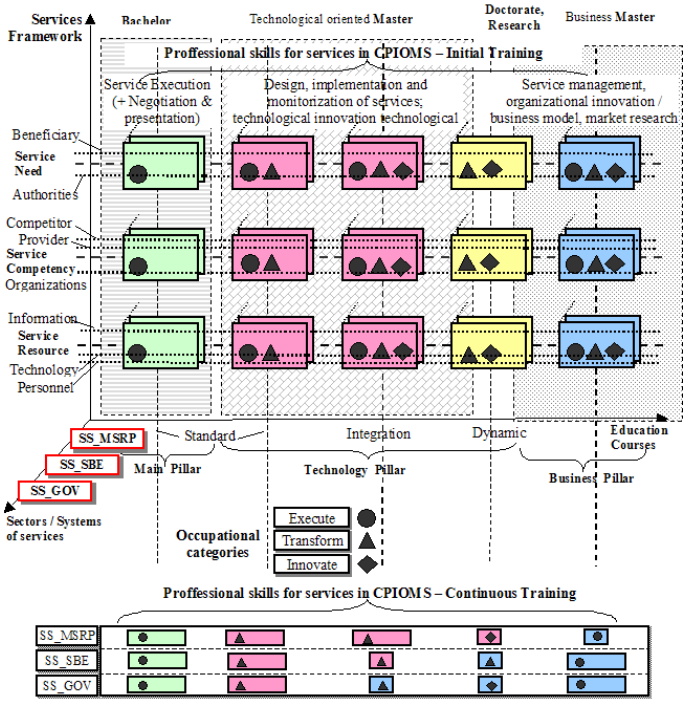

Fig. 2. Possible occupations in services in the SSME model

6 Conclusions

The whole education model proposed here strives to support the new *engineering perspective on service*: the *service* becomes a *commodity* that has to be conceptualized, designed, implemented and offered for consumption according to certain rules (the SLAs). The development of an educational program at the extent and vision of the **SSME model** should take into consideration that the components of a service are dynamic while including the human factor whose preferences are modelled and included in the outcome - the service. So, the **SSME model** proposed here should include a set of elements dedicated to the business organization, communication between service providers and consumers, formulation of preferences and value propositions and value co-creation. The SSME perspective on education for service innovation is undertaken in the **SSME model** and further developed in a novel perspective, with a global opening.

Acknowledgments. This work was supported by INSEED - Strategic Grant POSDRU/107/ 1.5/S/76903, Project ID 76903 (2011), co-financed by the European Social Fund – Investing in People, within the Sectoral Operational Programme Human Resource Development 2007 – 2013.

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