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Service Science in Academia

Pere Botella and Maria-Ribera Sancho

Although Service Science is a relatively new concept, that refers to what existing disciplines can bring to the skills required in the service industry, it has entered the academic world with some strength. This is a good vehicle for illustrating how, in the field of Computer Science, academia’s role has to continuously adapt to industry trends and needs. This article begins by with the recommendations that have been made to introduce such a multidisciplinary approach at this university, then presents an overview of what is being done in education and research in the world, to focus on the current situation in our country and to introduce some recommendations and personal opinions of the authors.

Keywords: Adaptation to Industry Trends, Service Science, Service Science Education, Service Science Research, SSME, University.

1 Introduction

Service Science is the short name that IBM introduced at the time as SSME (Service Science, Management and Engineering). This is the original definition given by IBM on its website (not yet active): "Services Sciences, Management and Engineering hopes to bring together ongoing work in computer science, operations research, industrial engineering, business strategy, management sciences, social and cognitive sciences, and legal sciences to develop the skills required in a services-led economy".

The multidisciplinary aspect of SSME is evident, and also that it is not the name of a new science, but rather that it refers to what existing disciplines can bring to the set of skills required in the service industry.

The Wikipedia definition is also interesting to read: "Service Science, Management, and Engineering (SSME) is a term introduced by IBM to describe Service Science, an interdisciplinary approach to the study, design, and implementation of services systems – complex systems in which specific arrangements of people and technologies take ac-

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Authors

Pere Botella is Full Professor at the Universitat Politècnica de Catalunya, UPC, Spain. He has been active in the Software Engineering field for more than 30 years. He has been Dean of the Barcelona School of Informatics (1992-1998) and Vicerector of the UPC (1982-1986, 1998-2002). Regular member of national and international conference program committees, including ESEC, ICSE, RE, ICCBSS or IESS, and being executive chair and proceedings co-editor for ESEC’95, and Financial Chair for RE’08. Member (past or present) of some steering committees (ESEC and JISBD among others). He has been coordinator in Spain for RENOIR (European Network of Excellence in Requirements Engineering). He co-leads the GESSI research group at the UPC, <http://www.essi.upc.edu/~gessi>. His research interests have included Requirements Engineering, Process Technology, COTS, Product Lines, MDD. Now his interests embraces Service Science (SSME). Member of the NESSI platform. Member of the INES platform (Spanish mirror group of Nessi). Member of ATIS, SISTEDES and IEEE Computer Society. Spanish representative at the IFIP TC8 (Information Systems), Dean Country Ambassador at Deans’ European Academy Network (DEAN). Pere is academic director for the UPC School of Professional & Executive Development, in which has been, from 1989, director of several executive programs in his fields of experience (at master’s level). Usual R+D evaluator for Spanish agencies (ANEPI, AIDIT, ANECA, AQU...), being responsible in AIDIT for the IT area. The Spanish scientific society on software engineering (SISTEDES) has given presented Dr. Botella the 2008 award for his lifelong contributions to software engineering. <pere.botella@upc.edu>

Maria-Ribera Sancho is Tenure Professor at the Universitat Politècnica de Catalunya – BarcelonaTech, UPC, Spain. She has been active in the Software Engineering field for more than 20 years. She has been Dean of the Barcelona School of Informatics (2004-2010) and vice-dean, head of studies, of the same school (1998-2004). Her main research areas are conceptual modeling, information systems and software engineering. Now her interests include Service Science (SSME). She’s author of different research articles and papers for International Congresses and Journals. She is member of PMI research group of the UPC (Modeling and Information Processing, <http://www.essi.upc.edu/~pmi>). She also collaborates with the LIAM (Information Analysis and Modeling Lab) research group of the UPC. She has participated in many projects at different companies and institutions. Member of the INES platform. Member of ATIS and SISTEDES. Spanish representative at the IFIP TC8 (Information Systems), Dean Country Ambassador at Deans’ European Academy Network (DEAN). She is a member of the committee for the Barcelona Strategic Plan. <maria.ribera.sancho@upc.edu>
tions that provide value for others. More precisely, SSME has been defined as the application of science, management, and engineering disciplines to tasks that one organization beneficiary performs for and with another. Today, SSME is a call for academia, industry, and governments to focus on becoming more systematic about innovation in the service sector, which is the largest sector of the economy in most industrialized nations, and is fast becoming the largest sector in developing nations as well. SSME is also a proposed academic discipline and research area that would complement—rather than replace—the many disciplines that contribute to knowledge about service.

This definition deals with the interdisciplinary (or more accurately: multidisciplinary) aspect as well. There is another important point: the "call" to academia, industry and governments to put a focus on a systematic way of innovating in the services sector.

A Services and Information Systems Engineering department, ESSI, was created at the Universitat Politècnica of Catalonia, UPC, Spain, in November 2009. It brought together the discipline of Service Science, Management and Engineering, SSME, and the computing disciplines of Information Systems and Information Technology. This article is based on the authors’ experience here and concentrates on how to include that call to action in the academic field with the aim of adapting to the emerging services-led economy.

Continuing with terminology, it should be noted that sometimes a D appears at the end, i.e. SSMED [1]. This new letter refers to "Design", an aspect that the authors want to highlight. We think that in the European context, in contrast to what is understood in the United States, "design" is an integral part of "engineering" and need not be mentioned explicitly.

For brevity, and also because academia prefers disciplines to be named with no more than two words (e.g. one = mathematics, biology, psychology or two = computer science, mechanical engineering), we use the term Service Science, understanding the term "science" as a discipline (as in "management science"), and as is also done in the "Cambridge whitepaper" [2] (also in [3], in Spanish).

This paper contains some recommendations for the academic world (Section 2), discusses current work in educational and research programmes (Sections 3 and 4), what is the current situation in Spain (Section 5) and concludes with some recommendations and conclusions from the authors (Section 6).

2 The Recommendations

The book "Service Science, Management and Engineering: Education for the 21st century" [4] includes contributions to a conference organized by IBM in 2006 on Service Science education and research. The book’s introduction mentions that three years earlier no-one had even heard of the concept, but the many contributions included remain current and relevant and give a comprehensive overview of the topic. We recommend this book to academics interested in implementing Services Science courses. Since then there have other publications in the same line (see [5] as an example) that we have often recommended.

Dr. Liba Svobodoba, from the IBM Zurich Research Laboratory, in a seminar given in Brno, November 2007, said:

- SSME is a multidisciplinary application of science, management, and engineering disciplines to services:
  - Science is a way to create knowledge through tools and methods studying Services
  - Engineering is a way to apply knowledge produced by science outputs and create new value
  - Management improves the process of creating and capturing value
- The promise of SSME is that the study of service systems, their design, evolution, processes and data, will increase our understanding of the services business—how to increase productivity, improve quality, control risk, innovate for growth and operate in dynamic environments
- SSME needs to be developed as an academic curriculum and research area

One of the elements appearing frequently in the recommendations for the university, is the need to educate students to be so-called "T-shaped" professionals, i.e. training graduates broadly and deeply at the same time to speak the "language" of various disciplines (broad) and be experts in at least one of them (deep). This recommendation is consistent with the views and opinions from service companies expressed to the authors of this article during their respective tenures as dean of the School of Informatics Engineering at UPC (Pere Botella 1992-1998, and Maria-Ribera Sancho 2004-2010). In essence, technical education given to the students is very good, but they require more ability to integrate themselves into multidisciplinary teams and work side by side with other engineers or in the field of management and administration (it is very common for our engineering graduates to complete their training with an MBA, or with some postgraduate training in IT management).

The well-known Cambridge whitepaper [2], one of the reference documents in Service Science, contains recommendations for education, research, business and government with the goal of success through service innovation. We strongly recommend strongly reading the original reference and the complete explanation of the recommendations. Due to limitations on space, we only list those related to the academic world here:

- For education:
  - Enable graduates from various individual disciplines to become T-shaped professionals, adaptive innovators with a service mindset who can make early contributions to the service-driven economy
  - Promote SSME education programmes and qualifications as a way of developing a service mindset, in conjunction with industry recognition and recruitment of SSME qualified graduates
  - Develop a modular, template-based SSME curriculum in higher education, add new materials and refinements as research develops over time and then extend this to all lev-
els of education
- Explore new teaching methods for SSME related education
  ■ For research:
- Develop an inclusive interdisciplinary and intercultural approach to service research
- Build bridges between disciplines through large research challenges
- Establish the service system and value proposition as foundational concepts
- Work with practitioners to create data sets to better understand the nature and behaviour of service systems
- Create modelling and simulations tools for service systems

We should perhaps, at this point, introduce the concept of "service system" in the SSME context. It is a configuration of people, technologies, and other resources that interact with other service systems to create mutual value [6]. It is important to pay attention to how this definition of service system relates to the classical concept of "information system" [7]. We will come back to this later on.

3 Educational Programs

Education is also a service, and perhaps the most important in the sector [8]. Therefore, the design of an education programme must be conducted in a systematic and rigorous way, as described in the development of a curriculum at the University of Berkeley in [9]. There is currently a proliferation of educational programs in service science, especially at the master’s level but also at the undergraduate level (bachelor), which we will examine in this section.

So who is introducing these programs in universities? [7] mentions an aspect that seems important to note. Despite the multidisciplinary attribute claimed for Service Science, and partly as a result of its early development (from 2004), there are just two disciplines that act as tractor driving force: Management or Business Administration within the service sector domain and Computing, in what is already known as SOC (Service Oriented Computing), referring to Web services, service-oriented architectures, etc. In business schools, Services has traditionally focused on human interaction, especially in relationships with customers, but in recent years they have incorporated IT as facilitator of the modern service industry. Moreover, in computer engineering, everything related with the SOC (Web Services, SOA), the new concept of "Software as a Service", SaaS, and technology that facilitates the "cloud computing" have appeared in strength. In both domains research networks or technological platforms appear, but have little contact between them, even today. On the business management side, we have networks like RESER, <http://www.reser.net/>, or interest groups like AMA – ServSig, <http://www.servsig.org/>, and Inform Services Science, <http://service-sci-section.informs.org/>. On the Computing side we find technological platforms like the European NESSI, <http://www.nessi-europe.com/>, or the Spanish INES, <http://www.ines.org.es/>, and research networks such as S-cube, <http://www.s-cube-network.eu/>.

These two academic worlds (management and information technology), both drivers of Service Science, work in parallel, but with little real contact but much goof intention. During a recent conference (IESS 1.0, International Conference on Exploring Services Sciences, Geneva, February 2010) in which an effort was made to attract both worlds, it was almost comical to see some puzzled faces during presentations, trying to understand the "other" sector. Despite all this, the interdisciplinary contact was necessary and stimulating.

Fortunately, there are already initiatives following the right direction, like the SRII, Service Research and Innovation Institute, <http://www.thesrii.org/>, an initiative of large companies (IBM, HP, Oracle, Microsoft ...) and professional associations (IEEE, ACM, INFORMS, Nessi ...) which was created as an "umbrella" entity of all member societies to harmonise efforts in research and innovation for the service sector. We find another example in the SSME network in the UK, <http://www.ssmenetuk.org/>, inspired by the SSME research center at Manchester University, coordinated by Linda Macaulay (Business School) and Liping Zao (Computer Science School). We should also mention, the master in Services Engineering and Management by the Porto University, coordinated by João Falcão (Computer engineering) and Lía Patricio (Industrial Organisation). Besides all these initiatives we can find many other cases of collaborative management and academic promotion of SSME.

The main purpose of this paper is far from providing a guide or a list of schools teaching degrees related to Service Science, but we will give some examples:
  ■ In terms of content, the article [7] gives a brief outline of what a course on Service Science could look like. In the book [4] you can find more contributions and examples. For an interesting guide, in more detail, we recommend the "SSME blueprint" that can be found in English on the web, <http://www.ssmenetuk.org/>, under "Downloads" in two documents: "Establishing SSME as a new academic discipline: A Blueprint for UK SSME Education" and a curriculum framework in "A Framework for Service Science Curricula".
  ■ For course offerings, any list included at the time of writing would immediately be obsolete, but again on the web <http://www.ssmenetuk.org/> (Key Reading and Glossary -> World Class Institution or Programme) there are plenty of up to date references on current courses.

And one last comment about education. In the context of the EHEA (European Higher Education Area) it is recommended to design degrees based on the desirable competencies of graduates, i.e., with rigour and discipline [9]. It is also recommended that these skills are determined, amongst other ways, through interviews with employers, as is discussed in Section 5.

4 Research

If a line of research is active, it can be detected in three ways: publications (journals), conferences and research centres. If this gives the right measure of interest in a sub-
ject in the scientific community, it must be said that the health of Service Science, given its youth, is enviable. As for the items above, two comments: 1) as already mentioned, the recommendations of the Cambridge white book [2], which need not be repeated here, and 2) the same division mentioned in education (computer science, management) is even more apparent in research, where it is more likely to work in silos or closed communities, and unfortunately, there is little tendency towards interdisciplinary adventures, so most of the referenced journals, conferences or centres tend either to the technical side or to the management side, while real integration rarely exists.

These are some reference journals and book series.

**Book series published by Springer**

**Journals**
- IBM Systems Journal, special issue on Service Science, Management and Engineering
- IEEE Transactions on Services Computing
  - [http://www.computer.org/portal/web/tsc](http://www.computer.org/portal/web/tsc)
- International Journal of Quality and Service Sciences:
  - [http://info.emeraldinsight.com/products/journals/journals.htm?PHPSESSID=kujbhv71v8kd3qmoatr2heqq7&PHPSESSID=kujbhv71v8kd3qmoatr2heqq7&id=IQSS](http://info.emeraldinsight.com/products/journals/journals.htm?PHPSESSID=kujbhv71v8kd3qmoatr2heqq7&PHPSESSID=kujbhv71v8kd3qmoatr2heqq7&id=IQSS)
- International Journal of Information Systems in the Service Sector:
  - [http://www.igi-global.com/journals/details.asp?id=6772](http://www.igi-global.com/journals/details.asp?id=6772).

**Conferences**
This is a more fluid area than journals, but there are a few:

**Research Centres**

(This is the centre from which the original proposal for SSME emerged).
- KSRI - Karlsruhe Service Research Institute (Karlsruhe Institute of Technology): [http://www.ksri.uni-karlsruhe.de/](http://www.ksri.uni-karlsruhe.de/).
- Swiss Institute of Service Science: [http://crag.hesge.ch/service-science/](http://crag.hesge.ch/service-science/).

### 5 Service Science in Spanish Universities

We must mention the Spanish SSME Forum, a joint initiative of the UIIMP (Universidad Internacional Menéndez Pelayo) and IBM, that has been (and hopefully still is) an area of debate between universities, industry and government, to academically set up Service Science in Spain. The Forum was established in February 2008 in Madrid, then met again in May, September, and November 2008. It involves 28 universities and 14 companies and institutions. Along with the fourth meeting of the forum in Barcelona, the UPC (Universitat Politècnica de Catalunya) and the UOC (Universitat Oberta de Catalunya) organised a course on SSME. We believe this was the first in Spain in this new discipline. A project born inside the Forum was to draft a book on SSME in Spanish Universities. In fact, as the promoters of the forum and the book were the same people, and in 2009 the book absorbed their time, this left the forum in a state of stand-by which we hope will not last much longer. The project was submitted to the Ministry of Education and their agreement was obtained (with the code EA2008-0307). The drafting team was made up of Pedro Lazaro (IBM), Luciano Galán (UAM, co-director of the project), Benjamin Suarez (UPC, co-director of the project) and Alfonso Dominguez (UAM, intern), and was also joined by many other people, from universities and companies (including the authors of this paper).

The book was called “The Science of Services: A challenge for the Spanish university system”. If you cannot find it in the references, it is because we have not been able to find it on the Ministry of Education’s web site, which is where it should be. We assume at some point it will be made public. After several interviews with companies in the services sector and a review of the documentation available, the book provides the competencies needed to define the objectives of a Service Science degree, together with the competencies to verify the degrees (60, European Credit Transfer and Accumulation System, ECTS, of basic training, 60 ECTS of common training, and 48 ECTS of specific technology training). The same was done for master’s studies, i.e. the competencies required to define the objectives for 60 ECTS of deep technological training.
Another experience was in May 2009, with the organisation of a first meeting on Services and ICT, geared towards companies and jointly organised by UOC and UPC. One of the objectives of the meeting was to conduct interviews with employers to obtain information on the skills required by potential services engineers. These interviews took place within the European project DELIiSS (Designing Lifelong Learning for Innovation in Information Sciences, <http://www.delliiss.eu/>), involving both universities. That has resulted in a professional oriented executive master course called EMISS (European Executive Master in Innovative Service Systems), with a joint diploma from all the participating universities that will begin in January 2011. The interviews mentioned above and other project activities have resulted in the drafting of "skill cards", or lists of competencies, which have been the basis for the design of the EMISS master course. And this is the process we recommend, like the EHEA does: to start based on these competencies (that already exist, and can be adopted and adapted), and then design the curriculum.

There are already some initiatives in Spain: Máster en Ciencia, Gestión e Ingeniería de los Servicios (University of Alcalá), Master in Services Management (Business Engineering School La Salle). And also a degree: Grado en Informática y Servicios (Escuelas Universitarias Gimbernat y Tomás Cerda, attached to the Universitat Autònoma de Barcelona, UAB). And there are several other projects, but we do not want to provide a list of what is in early stages. In the case of our university, the UPC, and as an example, current projects are: a) The UPC is one of the partner universities in the aforementioned project DELIiSS, <http://www.delliiss.eu/> . The main result is the European Executive Master in Innovative Service Systems, which is scheduled to start in January 2011 and will have meetings in all participating cities; being an executive master course it is intended for professionals with years of experience. It is managed by the UPC School (http://www.talent.upc.edu/). b) Also at the UPC School, starting in September 2010, two executive masters courses named “IT Project Management" and "IT Project Development" with a shared modular offering, will schedule one module (24 ECTS credits) on "Service Management & Engineering"; c) Not yet scheduled, a degree in Services Engineering at the School of Informatics (FIB) is planned. In terms of research, and returning to the Spanish white paper, one of its proposals was the creation of a joint research centre between IBM and the university, but so far there is no news on the item. The question is, is there services research in Spain? The answer is easy: of course there is. But the structure of research groups and departments (often isolated "silos" as reported by some authors, like Spohrer, Maglio and Glushko), does not promote or facilitate the necessary interdisciplinary working. There are very strong groups working in the technical field (web services, SOA, SaaS, cloud ...), as we have seen recently in the Spanish journal Novática, <http://www.ati.es/novatica/> , from the Spanish society ATI (Asociación de Técnicos de Informática). There are also very strong groups in the field of management, like the group Servilab, mentioned above, and others. But we need to go a little further to achieve a holistic global vision, which requires service science, and it is not easy to achieve this in the current research structures. The bridge is a group of computing and management experts to collaborate on a project.

An initiative in our university (UPC) and involving the authors, has been the creation of the new Department of Services and Information Systems Engineering, <http://www.essi.upc.edu/> . It has not been easy and many obstacles had to be overcome. It has been done with groups of information systems researchers, which in our opinion (and others, see [7]) makes sense. It is indeed the computer science area that, at least technically, has more contact with the organisational aspects. In information systems as well, a system of services includes human aspects. Many authors place information systems at the core of the SSME. But this is not enough, and it is appropriate to initiate a seed in interdisciplinary research. For that, we must have researchers from other groups or departments (business organisation, operations research, artificial intelligence ...) who are interested in the holistic vision that is raised by SSME. This kind of interdisciplinary collaboration should be facilitated by the university chancellor.

6 Concluding Remarks

To summarise, here again are our ideas for promoting service science in a university setting:

- Find a group or research institution that acts as a promoter and umbrella. Without it, groups working in services (whether web services, or marketing in the service sector) will continue without communication.
- Involve the university management team, if there is no involvement by the chancellor or members of his team, not much can be done to foster multidisciplinary.
- In education, it seems more prudent, under normal conditions, to begin with postgraduate (Masters) courses, and once experience is gained, move on to the undergraduate (bachelor) courses. But conditions in each university are not always the same, so in some situations it will be prudent to start with the bachelor.
- Do not just follow the trend. Believe in the issue and have hope: without faith and hope important things do not work.

References


