Service Science and Scholarship: Experiences from a Pragmatist Perspective

Gianluigi Viscusi, Marco Cremaschi and Carlo Batini

Abstract This chapter discusses the case of ongoing experiences in the field of Service Science. The experiences refer to the Italian SMART project producing a homonymous methodology, briefly described together with a discussion of its application as an instrument for developing and structuring initiatives in Service Science education and in the design of services in funded industrial research projects. The discussion follows a pragmatist perspective, focusing on the enactment of a "funded experience" by scholars, practitioners, and Service Science students.

Keywords Service science · Pragmatism · Scholarship · Methodology

1 Introduction

In the last 5 years, Service Science [1] has evolved from a pioneering field to an emerging multidisciplinary research area, attaining a growing mainstream resonance and scientific recognition [2, 3]. Notwithstanding the progress, several issues are still open as for Service Science Education and Scholarship: in particular, the challenges still concern the development and recognition of (1) a common understanding of Service Science core skills, (2) career path, (3) the relevance of both pure and applied research [3].

G. Viscusi · M. Cremaschi · C. Batini (✉)
Department of Informatics, Systems and Communication (Disco),
University of Milano-Bicocca, Milan, Italy
e-mail: batini@disco.unimib.it

G. Viscusi
e-mail: viscusi@disco.unimib.it

M. Cremaschi
e-mail: marco.cremaschi@disco.unimib.it

G. Motta and B. Wu (eds.), *Software Engineering Education for a Global E-Service Economy*, Progress in IS, DOI: 10.1007/978-3-319-04217-6_19,

As for this last point, it is our believe that a pragmatist perspective [4], grounding and selecting theory on the basis of social conventions and their usefulness in the current service ecosystem, may provide a suitable alternative for both academic and practitioners. Indeed, a focus on what Dewey called "funded experience" [5], would be the appropriate underlying philosophy for an effective learning of what is and how to put in practice what is at the core of the Service Science, namely the service-dominant logic, S-D logic [6, 7]. To this end in the following we discuss the experience carried out in the SMART project (Services and Meta-services for SMART eGovernment) for the design, the application, and the teaching of a methodological framework. We point out the interest of the case because of the duality of the relationships between the different activities; on the one hand, the design influences the structuring of the learning modules and goals; on the other hand, learning and business applications of the framework contribute to enrich the very same structure and features of the methodology itself.

Thus, in the following we first briefly introduce state of the art methodologies and approaches to service design and planning, together with the current issues of Service Science scholarship and learning. Then, we provide an overview of the SMART methodology, subsequently described in its application in higher education courses and in design of value added services for agro food sector in Italy. Finally, a summary of the discussed experience concludes the chapter.

2 Background and Motivations

Service Science education faces the challenge of the development of both new skills and configuration of available skills in several areas, such as business models and processes, science and technology, people and culture, thus combining people, technology, value and clients [8]. The consolidation of the area is currently an ongoing challenge reflected by the number of frameworks and modelling efforts available in the contributing disciplines, such as information systems (IS), service marketing, service engineering and computing. Considering the IS literature, [9] discusses a four layer service domain framework to support the understanding, analysing, and researching service topics across different research areas. Furthermore, [10, 11] propose respectively a meta-model approach to service systems and an integrated view of service marketing, service operations, and service computing, arguing that Service Science should not privilege "servitizing" over "productizing", and that the concept of customer should be not simplified but better considered as made up of different groups and types of customers. Finally, [12] presents a framework for design research in the Service Science discipline, allowing for the systematisation of research regarding the design and evaluation of innovative IT artefacts in the Service Science discipline.

Other contributions from computer science focus on studying the very nature of service, on the one hand, to provide a general service model to unambiguously describe services towards a shared conceptualization [13]; on the other hand, to

make available a foundation for designing, producing, delivering, operating, maintaining, monitoring, and improving service systems under a market-oriented and economic growth perspective [14].

Notwithstanding these multidisciplinary efforts the design and planning of services in digital service ecosystems still sees a focus on the technological perspective as the prevailing one. Indeed, the Service Oriented Computing (SOC) paradigm and service oriented design and development methodologies support the realization of service-based ICT infrastructures [15–17], covering only one perspective among the many considered in initiatives aimed at designing and planning services in service ecosystems. As pointed out by [18], a service ecosystem is a marketplace for trading services in which services are developed, published, sold and used; accordingly, design and evaluation frameworks are required, considering all the different features of a service ecosystem: from technology to social and psychological issues implied by the service experience. As for these issues, an integration of the marketing focus in new engineering and technology oriented perspectives on services is necessary in order to provide service designers with insights into consumers' perception of service convenience and services consumption experience, see for example [19, 20].

Moving to service engineering, the need for software engineers to first understand a service, its ecosystem, and business models to build effective systems supporting it, contributes to promote a growing focus on strategy engineering and modelling the enterprise's goals and intentions that motivate the exchange of economically valuable things [21]. As a consequence, new models and frameworks have been proposed in literature based on the awareness of the difference between service systems and traditional software engineering (SE) approaches [22] and the need for a proper alignment between business and IT, a service perspective at the business level [23].

The above discussion provides a general idea of the challenge of having first a comprehensive understanding of all issues and factors impacting or else having an influence on the design, planning, and development of services supported and or delivered by information and communication technologies through environment, heavily characterised by digital constituents. Furthermore, education in Service Science faces the same challenges, requiring frameworks and instruments characterised by a certain kind of homology with the design, planning, and development activities. The first motivation is the continuity between education and professional skills and capabilities: briefly we argue here for an approach and perspective close on the one hand to methods as the Engaged Scholarship discovery, teaching, application, and integration [24–26]; on the other to design approaches inspired by action research [27].

A major challenge concerns again the consideration of service ecosystems under a holistic perspective, whereas silos oriented perspectives on the different subsystems prevail, still grounded in the above mentioned disciplinary boundaries [28]. Furthermore, moving between subsystems asks for filling conceptual and ontological gaps, e.g., between the technological system of Web services (WSs)

and the organizational system [28]. Nevertheless, as for these issues, at the state of the art different proposals have been discussed, focusing, for example, on the use of conceptual models to map and manage the complexity of service systems, both for learning [29] and design activities [28], where the aim is to map high-level goals to tasks addressed in technology oriented perspectives such as, e.g., the above mentioned service oriented computing.

In the following we discuss the case of the SMART methodology, aiming to connect scholarship in Service Science and professional activities by means of its exploitation in essays production, learning case studies, and service design activities in funded industrial projects. Thus, first we briefly introduce the conceptual model and the different phases of the SMART methodology; then we outline some of the applications of the methodology to scholarship and learning initiatives.

3 The SMART Methodology

The SMART methodology is the result of research efforts carried out in a homonymous Italian project of industrial research and development (Services and Meta-Services for smART eGovernment—SMART). The project aims at produce digital services for both private and public sector, developing at the same time a formalisation of the activities in term of a methodology. This latter is intended to define a procedural path for the life cycle of planning, design, production, sale, use, management and monitoring of services, from the point of view of three main actors: the *planner* (e.g., a Public Administration), the *service provider* (e.g., again a Public Administration or else a private broker), and the *user of the service*.

The focus of the methodology is the concept of value, in its various meanings, among others: public value (e.g., for a Public Administration), exchange value (for the provider) and value in use (for the end-user). The methodology is the evolution of the eG4M methodology, formerly designed for strategic planning of e-Government services [30–32], thus extending it to a broader domain of application and target adopters.

The methodology is further based on a conceptual model called iPAS, which extends the one proposed in [33, 34], mainly focused on government to business services. The resulting SMART methodology consists of five phases:

1. *Planning* in which the individual planner defines the strategic long-term activities in the production and delivery of services.
2. *Reconstruction* of the different components of the service system and of the relationships among them, with an evaluation of the level of service quality and value in use for the users.
3. *Design* in which the architectural choices and processes are taken.
4. *Production* in which the services are specified and service processes are realized.

Table 1 Steps of the planning phase

Steps	Description
1.1 Strategic planning	The step identifies and defines the principles and policies of the service initiative
1.2 Requirements analysis	The step identifies and models the goals of the end users

5. *Exercise* in which services are delivered, and the resources for the maintenance or renovation of service levels are provided; in this phase a monitoring of the quality and usefulness of services to end users is carried out.

The five phases are made up of different steps; in the Table 1 we provide as an example a high-level description of the steps that make up the *Planning* phase.

The step of strategic planning (1.1) defines the main priorities identified by the provider, for example, to promote the services within e-mail and backup through a cloud solution (technological goal), or to direct the production and supply of services to disabled users (social goal). The step of requirements analysis (1.2) then produces a set of goals or objectives of the users, and a first set of services that allow achieving these goals.

As a further example of the different perspectives considered in the SMART methodology, we now provide a brief discussion of the phase of *Reconstruction of the system of services*, which aims at providing an integrated view of all levels of the ecosystem services. Here the steps considered are eReadiness analysis, quality assessment, and value assessment of services.

eReadiness is usually measured in e-Government planning [35] to identify the initiatives to be taken to promote the adoption of the digital innovation by the different sectors of society involved in the delivery of services; the step also produces a user segmentation in homogeneous categories. The quality assessment of quality identifies the most important dimensions to consider in the service initiative, and then measure them by using objective and subjective metrics, possibly by comparing the values with national or international benchmarking. Finally, the step of assessment of the value of the services measures the value in use as perceived by the end users.

In the following section we first provide an account of the application of the methodology as both learning and working tool. Subsequently, we discuss a case study of its use in service design activities in funded industrial projects.

4 Applications

The SMART methodology is currently adopted under an action research approach in the design of e-Government services, involving academics, practitioners from both public and private companies, and public managers.

Table 2 Phases and related core disciplines

Phases	Core disciplines
Planning	• Management of information systems
	• Requirements engineering
	• Strategy and innovation management
	• Policy making and decision sciences
	• Service science (introduction)
Reconstruction of the system of services	• Business modelling
	• Quality management
	• Service management
	• Social studies of information systems
Design	• Human computer interaction
	• Information management
	• Systems analysis and design
Production	• Business process management
	• Data engineering
	• Service engineering
	• Software engineering
Exercise	• Business intelligence
	• Marketing
	• Operations research

The results of the design activities in terms of requirements, case studies, as well as the above mentioned stakeholders are used in a parallel set of education activities, consisting in:

- a Master on ICT management provided to students in a blended e-learning way (Length: 6 months).
- a Postgraduate Professional Course on Service Science (Length: 1 year).

The two initiatives have involved since March 2012 nearly 50 students, and have been structured following the phases of the methodology and the corresponding disciplines as shown in Table 2.

As also mentioned above, it is worth noting that the two courses involved managers from the organisations participating to the SMART project, discussing with students and scholars the issues at stake in the concurrent service design activities. Some of these issues have been the focus of class exercises and lectures, as well of the final examination essay, consisting in the instantiation of the methodology on a proposal for local and central administrations e-Government services.

The choice of this type of examination is inherited from previous experiences of application of the original eG4M methodology, whose SMART is an evolution and extension. As in the case of eG4M students, the resulting plans required an average of two man-weeks [36].

5 Case Study

This section will describe how the methodology has been adopted in the Mobile Services for Agrofood (MoSeForAgrofood) research project, leading to the design and implementation of "Smart Label" service. The project, partially funded by the Lombardy Region (Italy), involved four Italian Universities: University of Milano-Bicocca, University of Milano, Politecnico di Milano, University of Insubria. Moreover, MoSeForAgrofood aimed to address quality issues in planning, design and provision of value added mobile services. Thus, the project deployed a set of prototype services, among which we consider the "Smart Label" one, delivered through a *mobile app*, providing consumers more information than traditional food label. Accordingly, the app is suitable to support healthier and informed food choices. In the following we discuss how the SMART methodology has been applied for the elicitation of the requirements, the design, and the subsequent deployment of the SMART label.

Considering, the *Planning phase* of the SMART methodology, the focus on requirements engineering methods for goal and intentions modelling [37, 38] allows the elicitation of general properties and qualities characterizing consumers' buying behaviour. However, in the *Reconstruction of the system of service*, through an analysis of the agrofood economic literature, we have further identified some consumer clusters, characterized by similar needs. These led to the organization of focus groups in order to assess the perceived value [39] of "Smart Label" service, whose results provide evidence of consumers' interest in having more information about the products they buy and how this need is satisfied just in a small part by traditional labels. Furthermore, the analysis of the outputs of these early phases of the SMART methodology also manifests how the current food labels are actually characterized by a low level of clarity and transparency. The information gathered from the focus groups together with additional field work by supermarkets in Lombardy were used to identify the types of information considered interesting and relevant to the consumer. Finally, the identification of types of information allows having a support for the maximization of the value of the "Smart Label" service.

In conclusion, this application of the SMART methodology allows evidencing critical issues for service request and fruition, showing that users require further technologies that anticipate their needs, simplify the service interaction, improve accessibility of the effective use of information. Taking these issues into account, and considering the wide spread of mobile telephony (which offers an opportunity to develop electronic value-added-services [40]) in the *Design* phase the "Smart Label" service has been conceived for being provided through an app characterized by Near Field Communication technology (NFC) [41]. The main value of NFC is related to its capacity to enable mediation and activation of many services in a particularly user-friendly way, enhancing the accessibility of services for different types of potential users. As for the value optimization, simulations of "Smart Label" adoption and use actually point out that this service may offer

substantial benefits to consumers and businesses in the agrofood cluster; in particular, the chance for consumers to access additional contents (e.g., recipes, personalized information, etc.), and the capability for businesses to guarantee the accountability of both their production processes and the genuineness of products.

6 Conclusion

This chapter aims to discuss an ongoing experience in the field of Service Science. The experience refers to the Italian SMART project, producing a homonymous methodology, briefly described in the previous sections together with a discussion of its application as an instrument for developing and structuring initiatives in Service Science education.

It is our point that this kind of use of the methodology represents a way to enhance scholarship as "funded experience", because of the duality of the relationships of the different activities; on the one hand, the design influences the structuring of the learning modules and goals; on the other hand, learning and business applications of the framework as in the case of the MoSeForAgrofood project contribute to a more appropriate design of services, fitting with contextual requirements and needs, enriching at the same time both the structure and features of the methodology itself.

Acknowledgments The work presented in this chapter has been partially supported by the Italian PON project PON01_00861 SMART (Services and Meta-services for SMART eGovernment) and by Lombardy Region framework agreement 14629/RCC Mobile Services for AgroFood (MoSeForAgrofood).

References

1. Chesbrough, H., & Spohrer, J. (2006). A research manifesto for services science. *Communications of the ACM, 49*(7), 35–40.
2. Lusch, R., & Wu, C. (2012). A service science perspective on higher education—Linking service productivity theory and higher education reform.
3. Ovum, IBM, & Aalto University'. (2010). Making service science mainstream—A white paper based on the 2009 service science summit.
4. Rorty, R. (1982). *Consequences of pragmatism: Essays, 1972–1980* (p. 237). University of Minnesota Press.
5. Dewey, J. (1938). *Experience and education* (pp. xii, 2 l., 116 p.). Simon and Schuster.
6. Vargo, S. L., & Akaka, M. A. (2009). Service-dominant logic as a foundation for service science: Clarifications. *Science, 1*(1), 32–41.
7. Vargo, S. L., & Lusch, R. F. (2008). Service-dominant logic: Continuing the evolution. *Journal of the Academy of Marketing Science, 36*(1), 1–10.
8. Murphy, W., & Hefley, B. (2008). Service science, management and engineering education. In *World Computer Congress Industry Conference*.
9. Alter, S. (2009). Mapping the domain of service science. *Information Systems Journal*, 1–16.

10. Alter, S. (2011). Metamodel for service design and service innovation: Integrating service activities, service systems, and value constellations. In *ICIS 2011 Proceedings*.
11. Alter, S. (2012). Challenges for service science. *Journal of Information Technology Theory and Application, 13*(2), 22–37.
12. Becker, J., Beverungen, D., Knackstedt, R., Matzner, M., Mueller, O., & Poeppelbuss, J. (2009). A framework for design research in the service science discipline. In *AMCIS 2009 Proceedings*.
13. Ferrario, R., Guarino, N., Janiesch, C., Kiemes, T., Oberle, D., & Probst, F. (2011). Towards an ontological foundation of services science: The general service model. In *Wirtschaftinformatik Proceedings 2011*.
14. Kim, Y. J., & Nam, K. (2009). Service systems and service innovation: Toward the theory of service systems. In *AMCIS 2009 Proceedings*.
15. Papazoglou, M. P., & Van Den Heuvel, W.-J. (2006). Service-oriented design and development methodology. *International Journal of Web Engineering and Technology, 2*(4), 412.
16. Kohlmann, F., Börner, R., & Alt, R. (2010). A framework for the design of service maps. In *AMCIS 2010*.
17. Papazoglou, M. P., Traverso, P., Dustdar, S., & Leymann, F. (2008). Service oriented computing: A research road map. *International Journal of Cooperative Information Systems, 17*(02), 223–255.
18. Khadka, R., Saeidi, A., Jansen, S., Hage, J., & Helms, R. (2011). An evaluation of service frameworks for the management of service ecosystems. In *PACIS 2011 Proceedings*.
19. Dai, H., & Salam, A. F. (2010). An integrative framework of service convenience, service consumption experience, and relational exchange in electronic mediated environment (EME). In *ICIS 2010 Proceedings*.
20. Glushko, R. J., & Tabas, L. (2009). Designing service systems by bridging the '"front stage"' and '"back stage"'. *Information Systems and e-Business Management, 7*(4), 407–427.
21. Gordijn, J., Yu, E., & van der Raadt, B. (2006). e-Service design using i* and e3value modeling. *IEEE Software, 23*(3), 26–33.
22. Motta, G., Barroero, T., & Telese, I. (2011). Design of performance aware service systems—A conceptual framework and a case study. In *2011 International Joint Conference on Service Sciences*.
23. Weigand, H., Johannesson, P., Andersson, B., & Bergholtz, M. (2009). Value-based service modeling and design: Toward a unified view of services. In *CAiSE 2009, LNCS 5565* (pp. 410–424).
24. Medaglia, R. (2011). Engaged scholarship in research on information technology in government. *Information, Communication & Society*, 1–14.
25. de Ven, A. H. V. (2007). Engaged scholarship: A guide for organizational and social research. Oxford University Press.
26. Mathiassen, L., & Nielsen, P. A. (2008). Engaged scholarship in IS research. *Scandinavian Journal of Information Systems, 20*(2), 3–20.
27. Baskerville, R. L., & Wood-Harper, A. T. (1998). Diversity in information systems action research methods. *European Journal of Information Systems, 7*, 90–107.
28. Comerio, M., Grega, S., Palmonari, M., & Viscusi, G. (2012). Alignment of service science and service oriented computing: A unified interpretative approach to service design and planning. In M. De Marco, D. Te'eni, V. Albano & S. Za (Eds.), *Information systems: Crossroads for organization, management, accounting and engineering* (pp. 519–526). Heidelberg: Physica.
29. Kaner, M., & Karni, R. (2007). Design of service systems using a knowledge-based approach. *Knowledge and Process Management, 14*(4), 260–274.
30. Viscusi, G., & Batini, C. (2010) 'Policy: The GovQual Methodology, the Italian case. Overview' and 'Tools: The GovQual Methodology, the Case of the eGovernment for Mediterranean Countries (eG4M)'. In Workshop E-Government tools in practice: How to

develop a sound implementation road map organised by the MENA-OECD Governance Programme with the Palestinian National Authority, Ramallah, 5–7 July 2010.
31. Viscusi, G., Batini, C., & Mecella, M. (2010). *Information systems for eGovernment: A quality-of-service perspective*. New York: Springer.
32. Batini, C., Viscusi, G., & Cherubini, D. (2009). GovQual: A quality driven methodology for E-Government project planning. *Government Information Quarterly, 26*(1), 106–117.
33. Viscusi, G., & Palmonari, M. (2008). IPAS: An ontology based approach to government to business service selection. In 19th International Workshop on *Database and Expert Systems Application, 2008. DEXA'08* (pp. 749–753).
34. Palmonari, M., Viscusi, G., & Batini, C. (2008). A semantic repository approach to improve the government to business relationship. *Data & Knowledge Engineering, 65*(3), 485–511.
35. Choucri, N., Maugis, V., Madnick, S., & Siegel, M. (2003). Global e-Readiness: for What? MIT Sloan School of Management, Paper 177.
36. Batini, C., Viscusi, G., & Castelli, M. (2013). Design on a societal scale: The case of e-Government strategic planning. In R. Baskerville, M. De Marco, & P. Spagnoletti (Eds.), *Designing organizational systems* (Vol. 1, pp. 267–283). Berlin Heidelberg: Springer.
37. Mylopoulos, J., Chung, L., & Yu, E. S. K. (1999). From object-oriented to goal-oriented requirements analysis. *Communications of the ACM, 42*(1), 31–37.
38. Rolland, C. (2007). Capturing system intentionality with maps. In J. Krogstie, A. L. Opdahl & S. Brinkkemper (Eds.) *Conceptual modelling in information systems engineering* (pp. 141–158). New York: Springer.
39. Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2006). *Services marketing: Integrating customer focus across the firm*. New York: McGraw-Hill.
40. Aagesen, G., & Krogstie, J. (2011). Service delivery in transformational government: Model and scenarios. *Electronic Government, an International Journal, 8*(2/3), 242–258.
41. Kranz, M., Murmann, L., & Michahelles, F. (2013). Research in the large: Challenges for large-scale mobile application research—A case study about NFC adoption using gamification via an App Store. *IJMHCI*, *5*(1).