Marja Toivonen   *Editor*

Service Innovation

Novel Ways of Creating Value in Actor Systems

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In 1956, Kenneth Boulding explained the concept of General Systems Theory as a skeleton of science. He describes that it hopes to develop something like a "spectrum" of theories—a system of systems which may perform the function of a "gestalt" in theoretical construction. Such "gestalts" in special fields have been of great value in directing research towards the gaps which they reveal.

There were, at that time, other important conceptual frameworks and theories, such as cybernetics. Additional theories and applications developed later, including synergetics, cognitive science, complex adaptive systems, and many others. Some focused on principles within specific domains of knowledge and others crossed areas of knowledge and practice, along the spectrum described by Boulding.

Also in 1956, the Society for General Systems Research (now the International Society for the Systems Sciences) was founded. One of the concerns of the founders, even then, was the state of the human condition, and what science could do about it.

The present Translational Systems Sciences book series aims at cultivating a new frontier of systems sciences for contributing to the need for practical applications that benefit people.

The concept of translational research originally comes from medical science for enhancing human health and well-being. Translational medical research is often labeled as "Bench to Bedside." It places emphasis on translating the findings in basic research (at bench) more quickly and efficiently into medical practice (at bedside). At the same time, needs and demands from practice drive the development of new and innovative ideas and concepts. In this tightly coupled process it is essential to remove barriers to multi-disciplinary collaboration.

The present series attempts to bridge and integrate basic research founded in systems concepts, logic, theories and models with systems practices and methodologies, into a process of systems research. Since both bench and bedside involve diverse stakeholder groups, including researchers, practitioners and users, translational systems science works to create common platforms for language to activate the "bench to bedside" cycle.

In order to create a resilient and sustainable society in the twenty-first century, we unquestionably need open social innovation through which we create new social values, and realize them in society by connecting diverse ideas and developing new solutions. We assume three types of social values, namely: (1) values relevant to social infrastructure such as safety, security, and amenity; (2) values created by innovation in business, economics, and management practices; and, (3) values necessary for community sustainability brought about by conflict resolution and consensus building.

The series will first approach these social values from a systems science perspective by drawing on a range of disciplines in trans-disciplinary and cross-cultural ways. They may include social systems theory, sociology, business administration, management information science, organization science, computational mathematical organization theory, economics, evolutionary economics, international political science, jurisprudence, policy science, socio-information studies, cognitive science, artificial intelligence, complex adaptive systems theory, philosophy of science, and other related disciplines. In addition, this series will promote translational systems science as a means of scientific research that facilitates the translation of findings from basic science to practical applications, and vice versa.

We believe that this book series should advance a new frontier in systems sciences by presenting theoretical and conceptual frameworks, as well as theories for design and application, for twenty-first-century socioeconomic systems in a translational and trans-disciplinary context.

More information about this series at http://www.springer.com/series/11213

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Preface

Background for the Topics of the Book

Services started to dominate the economic landscape of developed countries in the 1970s. Early research into services, which soon emerged, focused both on the macro-level issues of sectorial development and on the managerial issues of service business. The former approach produced broad and systematic analyses about the growth and prospects of different service sectors (Gershuny and Miles 1983). The latter approach was the basis for the formation of the first actual school of thinking in the area of services: service marketing and management (Grönroos 1982; Lovelock 1982). After the mid-1980s, the linkages between manufacturing and services started to arouse interest, too: researchers found out that external service inputs are essential for production and also manufacturers themselves provide services in addition to material products. Consequently, studies on "producer services" (Wood 1986) and "servitization of manufacturing" (Vandermerwe and Rada 1988) gained ground rapidly.

The development of information and communication technologies (ICT) had a strong influence on services in several sectors. This was reflected in service research, particularly in the early research into service innovation. Barras' model of the "reverse innovation cycle" has often been mentioned as the first service innovation theory (Barras 1986). According to it, the innovation cycle in service sectors is the converse of the traditional industrial cycle: process innovation precedes product innovation. Service firms adopt new technologies in order to increase the efficiency of their processes and later the quality of service. At the final stage, wholly new service products are developed. Barras' model is important due to its pioneering nature; however, it ignores those service innovations whose core is not the utilization of technology. It does not analyze service innovations for their own sake but examines the impacts of technological innovations on services (cf. Gallouj and Weinstein 1997).

A prerequisite for the emergence of genuine service innovation theories was a change in the general innovation paradigm. In the 1980s, the mainstream of innovation theories focused on radical inventions in material products and suggested that these inventions can be most efficiently promoted via intraorganizational R&D (Kline and Rosenberg 1986). As novelties in services are usually incremental and created in practical business operations – often in the customer interface – they were not compatible with these views. However, in the end of the decade, there strengthened a new perspective which questioned the separate R&D process as a norm and the nature of innovations as exceptional "events." A number of researchers argued that the majority of innovations emerge in the developmental work that takes place in the everyday practice of enterprises and are essentially affected by market demands. A new use of preexisting possibilities is characteristic of innovations and is often discovered in production and sales activities (Dosi 1988). Interaction capabilities and coping with uncertainty are important because innovation processes are increasingly collaborative and complex in nature (Lundvall 2002; Lundvall and Johnson 1994).

These views relied on the broad perspective that Schumpeter (1934, 1942), the classic in the field of innovation research, had suggested several decades ago but which had given way to a narrow, science-based, and linear innovation paradigm. The "rediscovery" of Schumpeter was an important driver for the studies on innovative outputs that are not tangible. More specifically, it was crucial for the emergence of research into service innovation (Howells 2004). On the other hand, research into service innovation contributed to the further development of the broad neo-Schumpeterian view. During the 1990s, both approaches developed to some extent hand in hand. Many characteristics that were first identified among service providers were later perceived to characterize industrial companies, too. An example is the intermingling of innovation activities with other organizational functions, e.g., marketing and training (Preissl 2000). The central role of incremental innovations, which earlier was regarded as a specificity of services, turned out to be essential in many high-technology companies that create innovations by recombining existing pieces of knowledge (Kim and Mauborgne 1999). Service researchers have also pointed out that behind a minor visible change there may be widely applicable cognitive inputs (Gallouj and Weinstein 1997).

After the emergence, the contribution of service innovation research has been twofold. On the one hand, it has provided new insights about the nature of innovation as an economic and societal phenomenon. On the other hand, it has analyzed organizational strategies from the innovation viewpoint and examined the management of innovation processes. Often the studies have aimed to understand both the phenomenon and its managerial implications.

In the early stages, many service innovation studies focused on modeling a service and the outcome of innovation. The most well-known model is the characteristics-based approach by Gallouj and Weinstein (1997), which describes a service as a combination of technical, competence, and final characteristics and identifies different types of innovations (incremental, additive, recombinative, etc.) as changes in these characteristics. In addition to researchers whose background was in (neo-Schumpeterian) innovation theories, modeling was carried out by service

marketing scholars. These scholars did not use innovation terminology but applied the concept of new service development (NSD) to analyze the prerequisites of success in the creation of novel services. Thus, the management of the service innovation process was in the spotlight in these studies. However, due to its immaterial nature, the target of development – an individual service – needed modeling, too. An extensively applied model is that of Edvardsson and Olsson (1996), which regards the creation of prerequisites for a well-functioning customer process and attractive customer outcome as the core task of NSD. The prerequisites are crystallized in the description of a service in terms of the concept, the process, and the system (resources).

Starting from their managerial focus, NSD studies produced several models for the implementation of a successful innovation process. The majority of these models followed the footsteps of the new product development (NPD) studies, which relied on the linear innovation paradigm and had developed a more specific "stage-gate approach" based on it (Cooper and de Brentani 1991). A strong emphasis on the intraorganizational work before the launch was typical in both NPD and NSD models throughout the 1990s. In the beginning of the next decade, Alam and Perry (2002) presented the first model which included customer collaboration as an essential part of NSD. Thereafter, NSD studies have increasingly emphasized customer orientation and interpreted it, not only as a practice of listening to the customer's voice but also as a practice of engaging customers in concrete developmental activities.

Scholars with an innovation theoretical background have put less emphasis on the detailed modeling of service innovation processes. Instead of that, an important contribution has been the analysis of the integration of various innovation activities at the organizational level. The concepts of "balanced empowerment" (Sundbo 1996) and "strategic reflexivity" (Sundbo and Fuglsang 2002) highlight the ways in which service organizations typically manage (and should manage) their innovation efforts as a whole. Balanced empowerment aims to explain how innovation activities can be fostered in a context which does not include a separate R&D function. The role of strategy and management are crucial here: they should both stimulate and channel innovativeness among the individual actors and answer the questions "why, when, and how to innovate." Strategic reflexivity highlights the reflections on the purpose of the organization and the goals of actors, as well as the interpretations of the interplay with the environment. It also points out the importance of reconciling top-down and bottom-up processes in innovation.

In 2004, Vargo and Lusch challenged the basic problem formulation in service research by suggesting a new approach: service-dominant logic (S-D logic). According to it, service (singular) should be separated from services (plural). The former refers to the process of using one's competences for the benefit of another party, while the latter are conveyors of competences and in this sense comparable with goods. In the S-D logic, the concept of service is equally important in the case of both goods and services and includes value cocreation between the provider and the customer as its core phenomenon. Value is not inherent in goods or services but becomes realized only when the customer uses them. Before value can be realized,

the input from a single provider has to be linked to other inputs, some of which are obtained from the market, others based on public sources or provided privately. Thus, the role of the customer as a value creator manifests itself in the integration of contextual resources. Relating customers to their contexts broadens the perspective from the provider-customer dyad to multiple actors and to actor networks in which value is created mutually and reciprocally (Vargo and Lusch 2011).

The approach of S-D logic is not totally new. The conceptual difference between services as offerings and service(s) as their outcome (benefit provided to the customer) was already made by Hill (1976). More recently, the characteristics-based model of Gallouj and Weinstein included the idea that services provide service: the authors use the concepts of "final characteristics" (benefits) and "service characteristics" as synonyms. In service marketing, the central role of the customer has been a core claim for several decades (Grönroos 1990; Edvardsson and Olsson 1996). There are, however, important contributions and novelties in S-D logic. They are included partially in the managerial implications that follow from viewing the customer as resource integrator. Even more important is the view that manifests itself when we move from the consideration of individual service relationships to the level of markets and the economy. S-D logic is not primarily a service theory but a theory about the emergence of use value. Even though its "intellectual home" is in service marketing, it has adopted many of its basic arguments from social sciences. In this way, it has built bridges between different scientific discourses in service research.

From the viewpoint of innovation, S-D logic is interesting and important in many respects. First, its basic premises are compatible with the neo-Schumpeterian thinking about innovation. Common points are the embeddedness of innovation in everyday business activities, emphasis on the institutional arrangements surrounding the efforts of value creation/innovation, multi-actor perspective, and interest in knowledge and skills behind concrete outputs. Second, S-D logic has boosted the search for alternative process models in innovation. The approach of effectuation in particular has gained ground as a more flexible innovation practice compared to the linear stage-gate models. It suggests replacing predetermined goals with an approach that begins from available means and via expanding cycles of resources allows the goals to emerge in the course of action (Read et al. 2009). Third, S-D logic has paid particular attention to the institutionalization of innovations (Vargo et al. 2015), which is a much less understood area compared to the creation and diffusion of innovations.

An important aspect in S-D logic is the adoption of a system view in value creation and innovation (Vargo and Lusch 2011). In recent years, a holistic stance has gained ground in service research also generally: it has been understood that the dynamic interactions between individual technological and service innovations are essential. A system view and system methods are needed in order to analyze the complex phenomena that result from these interactions. Systems include several characteristics that make their behavior counterintuitive and result in failures of seemingly obvious solutions (Sterman 2000). Feedback is a central characteristic: decisions of the actors trigger others to act, which alters the next decisions of the

original actors. It is also common that small, random perturbations are amplified by feedback. Another characteristic concerns the difficulty of identifying cause-effect relationships as causes and effects are often distant in space and time. Finally, systems are constantly adapting and self-organizing: actors change their behavior as a result of learning. These complexities remain unnoticed if different outputs, outcomes, and related performances are analyzed separately.

A transfer of focus from individual goods and services toward the analysis of systems is taking place at several levels. In businesses and organizations, the development of integrated solutions includes a system perspective. Integrated solutions are a bundle of physical products, services, and information, seamlessly combined to provide more value than the parts alone. A network of actors is usually required to provide these kinds of solutions (Brax and Jonsson 2009). More macro-level systems have also attracted increasing attention (Ahrweiler 2010). They are essential because the current social, economic, and environmental challenges are too big to be solved via individual product and service innovations created in individual organizations. The concept of system innovation refers to the simultaneous development of organizations, technologies, services, and network relationships. The novelty created is not restricted to a new outcome, but also the knowledge sources and the ways to interact during the innovation process are new. A crucial question is how to combine various innovations effectively and disseminate them rapidly based on the collaboration between different organizations (Harrison et al. 2010).

The broad topics of innovation in individual services, in the context of value cocreation, and in systemic constellations have fostered the emergence of multiple specific research areas. In the mid-1990s, studies on producer services led to the "discovery" of KIBS (knowledge-intensive business services), which were found to be important facilitators of innovations in other companies and organizations (Miles et al. 1995). Since then, KIBS research has continued as one of the most active subareas in service innovation research. Sector-based innovation studies have broadened and deepened. For instance, studies on industrial services have helped to reduce the distinction between goods and services. Studies on public innovation have provided insights on the role of grassroots employees as transmitters of user input into organizations (Sørensen et al. 2013). In the newest literature, the grand societal challenges are clearly visible. The role of services in sustainable development has aroused growing interest and is linked to the new opportunities that digitalization provides for citizen empowerment.

Simultaneously with the multiplying topics in service innovation, the theoretical frameworks have become more versatile. Examples of the approaches that are actively studied are practice theories and experience-based theories. A typical trend is also the growth of interdisciplinary linkages: concepts are transferred to new contexts. An illustrative example is the concept of "bricolage" which was originally applied in anthropology but is now used as a process model in service innovation (and besides effectuation is a promising alternative to the linear model). Its core is in the co-shaping of an emerging path – blurring the boundaries between design and implementation (Fuglsang 2011).

This book discusses in more detail the topics described above. The book is divided into three sections. The first section provides an overview on service innovation as a research topic, including both the perspective of services as offerings and the approach of S-D logic: service as value cocreation. Further, this section connects the analysis of service innovation to the analyses of social and system innovations. The second section focuses on the management of service innovation, which is examined from the viewpoints of business models, innovation practices, service experience, and customer interface. The third section illustrates specific themes that have been topical in service innovation research during the recent years. It studies first the role of services in the sustainability efforts. Thereafter, it brings to the fore new insights concerning innovation in various service sectors: public services, industrial services, and KIBS. The book ends up with a chapter that tackles the relationship between internationalization and innovation – a topic whose significance is continuously growing.

Structure of the Book

The first section of the book includes four chapters. Ian Miles opens the book by depicting in Chap. 1 broad trends and major themes in the service innovation literature during the last 20 years. Using a bibliometric analysis, he reviews the development from the neglect of service innovation to the prominence and recognition of this phenomenon. He also specifies further the broadly used categorization into assimilation, demarcation, and synthesis views on services and manufacturing through a separation of techno- and servo-focused approaches. Techno-assimilation considers services to be fundamentally similar to manufacturing, while the servo-assimilation (actually S-D logic) regards service as a pervasive economic phenomenon – the end result of all economic activity. Techno-demarcation focuses on the role of technology in service innovation, while servo-demarcation highlights the peculiarities of service innovation as compared to manufacturing innovation.

In Chap. 2, Heiko Wieland, Stephen Vargo, and Melissa Akaka apply the S-D logic to examine the role institutions and institutional arrangements in innovation – tackling the question of how and why particular innovations succeed and others do not. They highlight the significance of market innovation which does not automatically occur when new value propositions in the form of new technologies or products are introduced. Essential for market innovation is the "stabilization" of new practices through institutional work. The authors suggest a service ecosystems perspective as a way to zoom out from the firm level to the broader level of actor networks. On the other hand, they also emphasize the significance of zooming in: analyzing deeper resource integration and value creation practices in microlevel contexts of nested interactions. Finally, examining the interplay of micro-, meso-, and macro-level phenomena often reveals intra-institutional inconsistencies and contradictions that slow down or prevent the emergence of common interpretations necessary for the acceptance of new value propositions.

Also Chap. 3 applies a systems perspective. The aim of this chapter by Kyoichi Kijima, Marja Toivonen, and Sampsa Ruutu is to provide starting points for the development of a dynamic innovation model of service ecosystems, on the basis of the views included in the neo-Schumpeterian framework and the S-D logic. In order to do this, the chapter combines the panarchy concept of the general systems theory and the approach of transition management. Panarchy explains the occurrence of both stability and change in complex systems. Variability and novelty are periodically generated in these systems due to internally accumulated resources or due to external conditions that change the dynamics of the system. Panarchy illustrates how service ecosystems develop via adaptive transition and how they also experience phase transitions which move them into a qualitatively different state. The approach of transition management is used for the analysis of contents issues. The specific issue examined in Chap. 3 concerns paradigmatic shifts in the European public sector: the transition from public administration to new public management (NPM) and further to the emerging network governance.

Chapter 4 authored by Luis Rubalcaba studies the relationships between service innovation, social innovation, and system innovation. The focus is on social innovation which – after the general characterization and definition – is analyzed from the service perspective. On the other hand, the chapter suggests that the approach of social innovation can enrich the study on service innovation as it is not restricted to the context of markets but takes into account the public and third sectors, too. In addition, social innovation highlights solving the urgent social problems of today. Several common points between the concepts are identified in the chapter. First, the outcomes of social innovation are often new services. Second, a great part of social innovations take place in service sectors. Third, the participatory processes characterizing social innovation require service coproduction and co-innovation. Fourth, service innovation can be considered a dimension behind the processes of social innovation. Based on the analyses, three features are identified as characteristic of social innovations: prevalence of social goals, social means (complex systemic coproduction), and service and non-technological innovations (besides possible technological outcomes).

The second section of the book moves the discussion toward the management and practice of service innovation. In Chap. 5, Matthijs Janssen and Pim den Hertog combine the frameworks of service innovation and business model. The starting point is the six-dimensional service innovation framework developed earlier by the second author. According to the authors, this framework actually corresponds to the well-known business model canvas by Osterwalder and Pigneur (2010) – both also reflect the evolutionary theory. The main research question in the chapter is: which innovation capabilities are needed when developing a service-based business model? Five core capabilities (also evolutionarily inspired) are suggested, and hypotheses on their relationships to innovation dimensions are tested using a large-scale survey. As most hypotheses are confirmed, the authors conclude that the approach provides guidance to innovate service-based business models.

Chapter 6 includes a practice-based approach to innovation. Tiziana Russo-Spena and Cristina Mele highlight that innovation is not only an outcome or a

result of deliberate activities but first and foremost a collective doing of actors, produced in working activities on a daily basis. Concepts like "bricolage" are near to this practice lens. The authors use the term "innovating" to emphasize the dynamic and emergent character of the phenomenon. This term is conceptualized as a texture of practices that seamlessly interweave relationships and actions. Networking and knowing are essential practices that emerge in actor-to-actor interactions during innovating. A case study in the area of healthcare is included in the chapter and shows concretely how innovating occurs as changes in practices and in their related elements (actors, resources, activities).

In Chap. 7, Antonella Carù, Laura Colm, and Bernard Cova argue that innovation in services can emerge through the creation of memorable experiences for customers. More specifically, the chapter analyzes the role of an innovative servicescape: the physical, social, and virtual environment in which a service process takes place. Servicescape is examined as a platform able to support activities in different cases of presence and involvement of the customer and the employee: self-service, interpersonal service, and remote service. Based on case vignettes representing these differing circumstances, the authors suggest three main findings. First, servicescapes have to be continuously improved due to the evolving customer needs. Second, the importance of servicescapes themselves should be highlighted: they are more than a setting for service processes. Third, technology is central regarding both the providers and customers; firms should realize that also customers hold considerable technological potential which can be explored and capitalized.

Silvia Gliem and Christiane Hipp continue the discussion on customer encounter in Chap. 8 by focusing on the impacts of ICT. They state that many studies have mapped the customers' attitudes toward technology, while the actual usage of technology has been examined much less. ICT in particular has influenced strongly, not only on "trimming" the back office service activities but also on facilitating the front office service encounters: services can be delivered faster, more accurately, and at a higher quality. However, the know-how required in ICT usage among the frontline employees and customers has been analyzed rarely. The authors propose ICT literacy as a useful concept for further research to shed light on ICT as a means of value creation in services.

The third section of the book discusses topical themes in service innovation research. In Chap. 9, Faridah Djellal and Faïz Gallouj analyze the role of services and service innovation in the promotion of environmental sustainability. The authors argue that the supposed immateriality of services, which seems to favor their natural sustainability, is a myth. In order to justify this argument, the chapter provides a profound theoretical analysis of the materiality of services. Materiality may be included in the service medium or target, in the physical spaces of production or consumption, in the production factors, or in coproduction relationship which often requires mobility (transport facilities) and infrastructure. On the other hand, the authors emphasize that materiality is not an intrinsic characteristic of services but a social construction whose degree depends on the output conventions adopted (the same holds true in the case of goods, too). Consequently, even though "naturally green services" is a myth, the greening of the economy is possible

via services and service innovation. This can occur through greening strategies within service sectors and/or through the dematerialization of goods by adding service components in them.

The next three chapters analyze innovation in different service sectors: the public sector, manufacturing, and KIBS. In Chap. 10, Lars Fuglsang and Jon Sundbo examine service innovation in the public sector. They outline the characteristics and conditions that in the public sector differ from market-based service sectors. The concept of innovation capabilities is used as the core concept for comparing private and public service innovations. Partially, the capabilities needed are the same in both sectors. However, public service systems also require some specific capabilities due to their linkages to political systems. Innovative coproduction with users and the involvement of employees and their bricolage are important capabilities in both private and public services. A specific feature in the public sector is the importance of public value and the obligatory aspects included in the role of employees: they have to deliver services even in wicked or complex situations.

In Chap. 11, Christian Kowalkowski studies innovation in industrial services from the viewpoints of offerings, processes, and business models. As a starting point, the author identifies the basic difference between new product development and new service development. While product development is generally "back heavy," service development is "front heavy." The former emphasis means that abundant resources are needed for prototyping and technology development. The latter approach focuses on market introduction, pilot testing, and securing the skills, systems, and infrastructures for sales and delivery. In terms of service offering innovation, the chapter presents a taxonomy based on service focus and revenue model. The service process design is analyzed using a typology with two dimensions: diversity of demand and customer disposition to participate. Finally, three business model archetypes – equipment supplier, availability provider, and performance provider – are discussed in the context of service innovation.

Chapter 12 by Jiang Wei and Dan Zhou examines the important topic of KIBS and innovation. An interesting additional aspect is the empirical context of the study: the emerging KIBS sector in China. Previous research has highlighted the role of KIBS in innovation systems, suggesting that KIBS act as sources, carriers, and facilitators of innovation. This study aims to provide a more specific understanding about these roles in relation to manufacturing. It also explicitly links the analysis to the viewpoint of innovation system. In China, the influence of KIBS on manufacturing is a key question when their role in the innovation system is evaluated. The authors use an input-output framework and curve estimation to explore the relationship between KIBS input and manufacturing innovation in China. The results indicate that there is a positive relationship between these variables. KIBS mainly play a role of knowledge coproducer and knowledge disseminator in the Chinese innovation system.

The final chapter (Chap. 13) in the book is authored by Patrik Ström and Robert Wentrup. It discusses the interaction between internationalization and innovation – two mutually enforcing processes. More specifically, the chapter examines how firms within new sectors, such as Internet service providers, make use of their

internationalization as a way to compete for innovation. The chapter opens up the spatial aspects of how internationalization is conducted and what firms are looking for at specific locations to facilitate their innovation process and obtain a sustainable competitive advantage. Two mini-cases of Internet service providers reveal the importance of connections between the firm level and the macroeconomic structures within regions and knowledge clusters. Regional development policy helps to promote the firm-level development by creating an environment that supports innovation. It also improves attractiveness for foreign firms wanting to expand abroad and take advantage of knowledge clusters or centers of excellence.

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Contents

Part I
Services, Service Systems, and Value Co-creation

Chapter 1
Twenty Years of Service Innovation Research

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Abstract During the twenty-first century, the topic of service innovation has gained increasing attention and moved from the margins of innovation studies to a position of some significance. There has been an explosion of studies of one or other aspects of related topics – innovation in services, new service development and the like. It is impossible to review every single paper, report or even every book, and this chapter attempts instead to depict the broader trends and major themes in this literature. It suggests that we can conveniently differentiate between approaches that focus mainly on innovation in terms of new technology, as opposed to innovation in terms of new service features, and also between approaches that focus mainly on similarities between the major sectors of the economy and those that stress, especially, points that make service innovation distinctive. While service innovation is now far more integrated into the mainstream of innovation studies, this process is far from complete, and a wide variety of ideas as to how to move this forward are presented and debated. Current economic and technological trends, together with the need to confront grand challenges, such as demographic change and environmental sustainability, make it likely that this field of study will continue to attract growing attention and quite possibly feature an even wider variety of approaches.

Keywords Service innovation • New service development • Innovation studies

1   Introduction

Service Innovation: This phrase juxtaposes two words whose meaning is highly ambiguous. *Service* has many different senses, even just as a noun.[1] Familiar uses in housework, livestock, military and religious contexts have been recently joined by

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[1] "Service" can be a verb, a noun, or a noun as adjective (in English, a noun can usually be used as an adjective – usually this is the singular version of the noun; there will be different implications if the plural of the noun is used).

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the idea of the ecosystem providing us with services. "Services" (plural) can refer to specific industries or to the main products of these industries (which products can also be provided by other industries and, indeed, by private individuals). Likewise, *innovation* can be the product of an innovation process or the process itself (when people speak of "a service", "an innovation", "service" and "innovations" as nouns, they tend to refer to the products, while "innovation" tends to refer to the processes, and "services" is used in both senses – giving rise to no little misunderstanding). "Innovation" is often seen as solely a matter of new technology, although as all sorts of organisations have tried to brand themselves as "innovative", this assumption is less prevalent than it used to be.

The "product-process" distinction made above is challenging in two ways. Firstly, when we discuss innovations, there is a standard distinction between product innovations (new or improved goods or services) and process innovations (new or improved ways of producing goods or services). Because "services" refers to both industries and their products, it is unclear whether "innovation in services" means new or improved service (products) or new or improved ways of creating these services (processes). "Service innovation", in contrast, might be expected to focus more centrally on new or improved services (products), though there is some inconsistency in the literature here. The bigger challenge, though, is that the "innovation process" (the way in which innovations are created and the various elements of this are managed) is distinct from "process innovation" (new or improved processes).

Secondly, while the "product-process" distinction can be a useful point of reference, its origins lie in the analysis of manufacturing industry. In the manufacturing industry, the products (goods) are typically produced through production processes in factories that are remote from consumers and consumption activities. The goods are typically transported (using transport services, sometimes belonging to the manufacturer, sometimes supplied by specialised transport service firms) to trade services (wholesale and retail trades), from where they are acquired by consumers. In contrast, services (products) often appear to be produced and consumed at the same time and place, with consumers not only being present but also, in at least some cases, actively co-producing the service. Thus, some commentators resist the distinction ("the product is the process") or reject the term "product" ("services are about relationships"). Since service consumption (or - co-production) can be a protracted affair, we may hear about the "service journey" or "pathway", where the consumer and the service supplier encounter each other across a number of "touchpoints".

This chapter will seek to retain clarity as concerns the precise meanings being discussed. It will consider both "service innovation" and "innovation in services" (SI-IS for short) and both "innovations" and "innovation processes". It will review the literature that has burgeoned on these topics in the last 20 years, consider its achievements and limitations and suggest directions for future work.

2 From Neglect to Prominence

The last 20 years form a great period in which to study the emergence of literature on SI-IS. Until the 1990s, SI-IS hardly registered as a topic of interest to researchers or concern for policymakers. Though Schumpeter had early discussed innovations in marketing and organisation, the surge of interest in innovation studies and policies from the 1960s onwards[2] was largely fuelled by a growing sense that advanced technology was not just important for winning world wars – it also was a major factor underpinning the growth of nations (and the relative decline of some nations). Technological innovations, furthermore, were mainly seen as flowing from the application of new knowledge in manufacturing industries.[3] New knowledge, furthermore, was typically seen as being generated by research and development (R&D) and diffused through technology adoption and technology transfer (which was often the terminology employed to describe the flow of such innovations to developing countries). The focus of much innovation research, as with much innovation policy, was on advanced and R&D-intensive manufacturing firms and sectors such as aerospace, automotive, electronics and pharmaceutical industries. So-called low-tech manufacturing was often neglected.[4]

Service industries were initially examined very rarely by the growing band of innovation scholars in the last quarter of the twentieth century. It is important to note the existence of different academic tribes, however. "Innovation studies" has largely been a phenomenon dominated by economists and, to a lesser extent, geographers and policy researchers. They often focused on the "upstream" elements of the innovation process, such as R&D, probably reflecting in large part the fact that governments usually find it easier to fund R&D programmes (where a precompetitive, "market failure" rationale can be brought to bear) than to fund market development (except where they are procuring technology, as in the case of public services). The topics of technology adoption and diffusion are included in innovation studies, and economists have been interested in modelling diffusion curves, for example. But a large number of contributions to the study of technology adoption and diffusion have been made by social psychologists,[5] development economists and marketing researchers. Notably, marketing research has tended to prefer the terminology of "new product development (NPD)", and latterly "new service development (NSD)", and opposed to goods and service innovation. The parts of the innovation process studied here would often be the latter stages of commercialisation and market development, though some attention was given to building market knowledge into design and earlier stages of the process. "Science and technology studies", in contrast, have been more of a matter of sociologists and

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[2] (Fagerberg 2004, documents this effectively).

[3] (Pickstone (2000) presents a strong case for the often-neglected role of hospitals and medical research in innovation).

[4] (for a corrective, see the PILOT study, reported by Hirsch-Kreinsen and Bender 2007).

[5] Rogers (1984) is overwhelmingly the main reference point in this literature.

historians, who have often criticised innovation studies as being dominated by technological determinism; they have stressed the social construction of technologies (sometimes to the extent of making it appear that the materiality of technologies has an insignificant role as compared to the exercise of social power).

Bibliometric approaches can be used to explore the development of the literature on SI-IS. Here we use the tool *Publish or Perish* (*PoP*) which, despite producing a share of false "hits" and duplications, allows us to explore all sorts of publications – including books and official reports as well as scholarly publications in well-cited journals (Harzing 2007).[6] This differentiates the method applied in this chapter from the interesting study by Carlborg et al. (2014), which traced the evolution of SI-IS research through (and thus in) journal articles only.

Examining the co-occurrence of the terms "service" and "innovation" in the titles of publications PoP locates via Google Scholar, we see an explosive development: considering successive decades, the 1950s (1950–1959) notch up a single publication; the 1960s have 21; the 1970s, 70; the 1980s, 99; the 1990s, 287; and the first decade of the 2000s, 2302. This rate of growth in part reflects the increasing volume of academic publication and the greater availability of online documents in recent decades, but we shall see that it is rather fast compared to some other combinations of terms. It would be unwise to take these numbers as fully representative of interest in the field. Errors of omission are most likely – many studies which have an innovation focus do not actually feature the term "innovation" in their title. Indeed, since the focus of many innovation studies was directed to technological innovation, the discussion of technology and services was often the way in which SI-IS was tackled. There is a growing number of articles in the 1980s and 1990s dealing with new technology (mainly new information technology – IT) and service activities in journals such as *Progress in Planning* and *Technovation*.[7] A whole body of literature discusses "new service development", too, and does not always invoke the term "innovation".

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[6] Data reported in this chapter were extracted from *PoP* over the period May 15–June 4, 2015. The data are derived from Google Scholar, ultimately, and feature various inaccuracies and mainly refer to English-language publications. The problems are not likely to be more or less prevalent in the different topics we consider. We know of many relevant studies that do not appear in the lists; some because they did not use the precise terms discussed in their titles or even their text. Earlier periods are probably underrepresented, not least because many publications are not available in electronic form and are only known through citations. But the trends that can be documented are highly indicative, especially when it comes to comparison of different topics.

[7] Meanwhile, many publications featured neither "innovation" nor "technology" in their titles; while studies such as Gershuny and Miles (1983) and Petit (1986) were addressing innovation issues, their titles – respectively, *The New Service Economy* and *Slow Growth and the Service Economy* – alluded to this indirectly. Classic studies on service activities, such as Bell's (1973) *The Coming of Post-Industrial Society* and Fuchs' (1968) *The Service Economy*, tended to stress service industries' supposed resistance to technological change. Finally, many studies of specific firms and sectors will not have used the term "service" in their title – we know of relevant early studies of, for example, insurance and local government.

Nevertheless, inspection of the titles recorded in *PoP* as bringing together the terms "service" and "innovation" reveals some interesting features. Perhaps the most striking of these features demonstrates that mainstream innovation studies were slow to catch on to SI-IS. It is not until 1983 that one of these publications is attributed to a journal that is recognisably in this mainstream tradition – the *Journal of Technology Transfer* – which contains an article on *Fostering and Managing Innovation in the Forest Service*. Another article appears in *Urban Geography* in 1988, before one in *Research Policy* in 1990, another in *Journal of Creativity and Innovation* in 1992 – and then a substantial number of papers in these journals, and others such as *R&D Management*, the *European* and *International Journal*(*s*) *of Innovation Management*, *Technovation* and so on, from the turn of the century on.

Meanwhile, the journals where the earliest SI-IS articles had appeared span such topic areas as human relations, management and marketing. Many of the publications listed in the earlier decades are not linked to journals at all – PoP picks up reports, chapters and conference papers. The topics are often dealing with individual and psychological factors, with several pieces touching on public services like education and health (dealing with the effectiveness of innovation and organisational issues, as well as attitudes and acceptance of change). These pieces of research and documentation often contributed insights as to SI-IS, but were largely unrecognised by the emerging field of innovation (and innovation policy) studies.

For a long time, the innovation studies field was focused on technological innovations, undertaken by private firms, in manufacturing industries. Much of the analysis was motivated by efforts to inform managers and policymakers about how they might best act so as to render their firms, industries or countries more innovative. US work tended to be more addressed to managers, and European work to policymakers, but there were many significant exceptions to this rule and much interchange between leading researchers across the Atlantic. Distinctions were drawn between different types of innovation – not just product and process but also incremental, radical and revolutionary innovation and subsequently concepts such as architectural and disruptive innovation (Henderson and Clark 1990; Christensen 1997), but goods and services innovation was rarely proposed as a demarcation framework.

Distinctions were drawn between types of innovator, too, but these were largely based on varieties of manufacturing firm and sector. Thus, the first and most influential version of Pavitt's (1984) classification, derived from studies that excluded service industries, classified innovators into supplier-dominated firms, specialised suppliers, scale-intensive firms and science-based firms. All service industries were assumed to fall into the supplier-driven category in his original formulation – though he later added the category of information-intensive firms, which included technologically advanced services. The contribution of most services to innovation was to adopt the new technologies emerging from manufacturing. Even those service industries that were exceptionally heavy users of technologies, such as large telecommunications and transport organisations, were seen as typically adopting products flowing from innovative manufacturers.

Innovation studies thus mainly ignored SI-IS, though there was plenty of documentation of the role of, for example, public telecommunications firms in pushing forward innovations such as digital switches and computer communication systems like videotex (cf. Maddox (1972) and Mayntz and Schneider (1988)) and growing interest in new online services.[8]

Such technological innovations were associated with the application of new IT, involving new technological knowledge about (or about how to use) hardware such as microprocessors, digital memory storage, lasers and optical communication systems and software of all kinds. From the early 1980s on, innovation studies were heavily influenced by the emergence of these revolutionary new technologies, not least because policymakers in many countries were concerned about catching up with the technology leaders (in the USA and, increasingly, Japan) but also because a "swarm" of new products and processes was sweeping through practically all sectors of the economy. Manufacturing industries still attracted the lion's share of attention. But, early on, it was evident that some service industries were substantial investors in, and users of, new IT. Back-office automation of financial services may have been largely invisible to customers, but counter staff began working with terminals, cash machines offered 24 hour services, and telephone banking took off in some countries. New service products and platforms were emerging, and their use became widespread in the 1990s – online databases, the Internet, the Web, e-commerce and services associated with digital broadcasting, mobile communications and much else. Software and new media industries were growing in size and significance, too. Even without these developments, the growing share of service industries and employment in national economies, and the increasing visibility of international service companies and the brands associated with them, would have forced SI-IS into the attention of innovation studies community. But now we were seeing services not only as quantitatively dominant parts of the economy but also, as Richard Barras remarked (1990), as undergoing their own industrial revolution, with much in common with the one that had transformed manufacturing industry in the nineteenth century.

PoP provides some evidence concerning the growth in researcher's attention to the phenomena here. Publications featuring the two words "technology" and "service(s)" proliferate over the 1980s and, especially, the 1990s (less than 5 a year feature in the 1960s, just over 20 a year in the 1970s, 47 in the 1980s, 128 in the 1990s, 477 in the 2000s and 636 per year for 2010–2014). Many of the articles concern how to fit technologies to service applications and forecast of the likely application areas, with education, information services (e.g. librarianship) and computer services featuring strongly. In the more recent periods, innovation issues also feature, with articles in the *European Journal of Innovation Management* and the *Journal of Product Innovation Management*, for example. Particularly noteworthy are a pair of books produced for the US National Academy of Engineering –

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[8] (in at least one instance – Thomas and Miles (1989) – there was an effort to apply insights from innovation theory to the topic).

Guile and Quinn's (1988a, b) *Managing Innovation*: *Cases from the Services Industries* and *Technology in Services*. Since much of the early burst of attention to services and technology came from Europe, these American collections are of some interest. But while they do describe trends and trajectories, their focus is much more on economics (issues of productivity and trade) and management (applying technology in various sectors) than on innovation dynamics.

3 Recognition

Innovation researchers began to acknowledge the significance of SI-IS, and over the past 20 years, studies proliferated on the phenomena. Data from *PoP* demonstrate this growth of attention, and Table 1.1 and Fig. 1.1 present information on the numbers of publications that are recorded over successive 5-year periods, whose titles refer to "service innovation", "innovation in services" and, for comparison, a number of other key terms. Some of these provide insight into ongoing and emerging themes in service research more generally that throw light in SI-IS interests.

Since the 1990s, Table 1.1 and Fig. 1.1 show that the term "service management" has been most commonly used in titles of publications recorded, displacing "service operations". This suggests the prominence of the view that the management of service activities has distinctive features that require addressing and signalling. Publications on this topic were briefly overhauled by "service trade", during the intensive trade negotiations round the turn of the century, but grew steadily from almost 80 per year in the early 1990s, to 47 per year in the early 2000s, to well over 100 per year in the early 2010s.

The rate of growth of "service innovation" really takes off in the present century, becoming much more rapid than that of "service management": from 3 in the early 1990s to 37 per year in the early 1900s and 75 in the early 2010s. "Innovation in services" grows from 6 per year in the early 1990s to over 20 per year in the early 1900s and over 40 per year in the early 2010s. Thus, these two SI-IS terms together come to be featured in more titles than "service management" in the most recent period, with "service innovation" in particular booming in popularity. SI-IS research has thus gained a substantial foothold as a topic of much interest. Concerning other innovation-related terms, "new service development" (NSD) features much less often, while "service design" has attracted a great deal of use in recent periods, outpacing "innovation in services".

However, the NSD and design terminologies seem to engage their own specific research communities. The SI-IS field features rather different national traditions and also differences related to disciplinary frameworks. NSD is a terminology particularly used by scholars of service marketing and management backgrounds – despite its title, the *Journal of Product Innovation Management*, where many of

Table 1.1 Publications with key phrases in their titles

1a. Over 300 publications in the period 2010–2014

	Service management	Service innovation	Service trade
1960–1964	4	0	0
1965–1969	2	0	2
1970–1974	7	0	2
1975–1979	18	0	2
1980–1984	26	2	6
1985–1989	36	1	11
1990–1994	79	3	27
1995–1999	133	9	35
2000–2004	234	37	135
2005–2009	410	189	417
2010–2014	546	375	488

1b. 200–300 publications in the period 2010–2014

	Service economy	Innovation in services	Service operations	Service design	Service-dominant logic
1960–1964	0	0	4	1	0
1965–1969	20	0	10	1	0
1970–1974	10	0	18	1	0
1975–1979	23	0	43	3	0
1980–1984	61	0	43	4	0
1985–1989	125	4	66	3	0
1990–1994	74	6	94	15	0
1995–1999	94	62	126	19	0
2000–2004	150	108	131	36	0
2005–2009	183	153	262	143	137
2010–2014	201	210	271	281	283

1c. 100–200 publications in the period 2010–2014

	Service science	Knowledge-intensive business services	Servicescape
1960–1964	1	0	0
1965–1969	2	0	0
1970–1974	3	0	0
1975–1979	3	0	0
1980–1984	3	0	0
1985–1989	2	0	0
1990–1994	6	2	0
1995–1999	6	38	18
2000–2004	13	66	35
2005–2009	68	109	78
2010–2014	154	186	175

1d. Less than 100 publications in the period 2010–2014

	Service engineering	Service marketing	New service development	Servuction
1960–1964	0	0	0	0
1965–1969	1	0	0	0
1970–1974	1	1	0	0
1975–1979	1	4	0	1
1980–1984	1	10	1	1
1985–1989	1	16	2	14
1990–1994	5	18	2	6
1995–1999	13	26	4	13
2000–2004	35	40	16	11
2005–2009	66	63	25	6
2010–2014	72	81	37	2

Fig. 1.1 Publications with key phrases in their titles. (**a**) Over 300 publications in the period 2010–2014. (**b**) 200–300 publications in the period 2010–2014. Publications with key phrases in their titles. (**c**) 100–200 publications in the period 2010–2014. (**d**) Less than 100 publications in the period 2010–2014

these publications feature, is more linked to those communities than to innovation studies (which derive more from economic or related backgrounds).[9] Other sites of publication here include general business and management journals and specialised service research journals. The terminology of "service design" features in a wide range of journals, including not just a variety of specialised design journals but also

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[9] We do note the occasional use of "new service development" in titles of studies in the *International Journal of Innovation Management* (features the term three times), *R&D Management* (2), *Research Policy* (1) and *Technovation* (2). In contrast, the *Journal of Product Innovation Management* and *Service Industries Journal* both feature the term 8 times, and publications whose name begins with *The Journal of Service*(*s*) or *The International Journal of Service*(*s*) feature 24 titles and the *Service Industries Journal* 5.

several that focus on services in one way or another. Perhaps surprisingly, it very rarely appears in titles in the main innovation studies journals.[10] Part of the explanation is that while calls for design to be taken seriously are quite common-place in the innovation studies literature, along with suggestions to extend the concept of R&D to encompass design, the publications in question rarely stem from detailed analyses of design processes or industries.

One further reason for the surge in interest in SI-IS should also be considered. It is reflected in the use of the terms "service science" and "service engineering".

In the first years of the present century, the major computer service firm IBM (that had transitioned from being a mainly manufacturing company to a mainly service company) determined to put analysis of service activities on a firmer footing. Setting up a research group at Almaden laboratories, and funding academic conferences and research groups, IBM announced the need to develop a new discipline of "service science", or SSME (service science, management and engineering). Table 1.1c and Fig. 1.1c include data on the emergence and rapid growth of "service science" in publication titles over the last 15 (and especially the last 10) years; we can also see the emergence of "service engineering" (Table 1.1d and Fig. 1.1d). One of the leading researchers supported by and supporting the IBM initiative was Henry Chesbrough, who announced in articles in the *Financial Times* and *Harvard Business Review* that academics had grievously neglected the topic of SI-IS:

> . . .most analyses of innovation tend to focus on products, not services. . . academic research about innovation in services is not well defined. . . Any useful understanding of the opportunities and risks that are unique to services innovation will invariably involve business process modelling, business models, systems integration and design. More deeply, questions of complexity in systems design, cognitive processing of information, and the role of codified and tacit knowledge will also be involved. The design of choice sets and experience points in facilitating interaction with customers will also be a rich vein of inquiry. (Chesbrough 2004)

This intervention overlooked the considerable amount of work that had already been undertaken, and the numerous publications already in existence, on the topic. This may reflect in part the difference between typical American and European approaches to SI-IS and to a great many other innovation-related topics. Much of the European work is constructed around the mission of providing intelligence for policymakers; much American work serves the objective of informing managers.[11] These different orientations lead to substantially distinctive ways of presenting arguments and results, so that even contributions that nominally address the same topic may have little in common.

But even if neglecting the existence of a body of work, which had not attained anything like the number of publications focusing on "service management" at this stage, the intervention almost certainly succeeded in bringing SI-IS to the attention

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[10] A solitary appearance is made in *Technovation* in 2002.

[11] "Service engineering" has been an approach that is particularly popular in Germany, attempting to bring formalised analysis and management approaches to bear on service design.

of funding agencies that had paid little heed to it before – not least in developing economies who had previously understood catch-up to involve manufacturing industrialisation.[12]

By the turn of the century, *PoP* suggests that around 200 publications featured "service innovation" or "innovation in services" in their titles, divided practically equally between the two (96 and 97 titles, respectively, by the year 2000). This was far less than the number of "service management" publications (featured in over 1700 titles), but still represents a substantial body of literature. A number of books appeared that contained appraisals of SI-IS from contributors from several countries, often in conjunction with European projects in the area.[13] And there were over 2200 titles including the words "technology" and "service"; while many of these were not focused on innovation, a great many were. By the end of this period, in the last few years, several substantial collections setting out to overview the field of SI-IS were published. These included two handbooks devoted to the topic – Gallouj and Djellal (2010) and Agarwal et al. (2015) – and one specifically focused on public service innovation, Osborne and Brown (2013). The neglect of attention to SI-IS was a thing of the past. Let us examine how it was being overcome.

4 Three (or Four?) Perspectives

Already in 1994, the present author had prepared a review of work on "Innovation in Services" in a handbook of innovation studies (Miles 1994), and Gallouj (1994) had devoted a whole book to the topic. These two authors, each engaged with the innovation studies tradition, were engaging with Anglophone and Francophone communities especially (this point is made because there may still be some ignorance of the French literature on the part of English speakers).[14] Subsequently, each author elaborated their accounts of the growing attention to SI-IS, in Gallouj and Weinstein (1997) and then Coombs and Miles (2000). The two accounts are tellingly similar, but also feature some sharp differences.

In Gallouj's work, the bulk of the literature to date was portrayed as falling into one of two lines: (1) a *technologist* approach, seeing SI-IS only in terms of the adoption and use of technology – especially new IT – and as something that can be

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[12] There were conferences held, course launched, and study teams sent abroad, especially from Asian countries, in efforts to master SI-IS.

[13] Andersen et al. (2000), Boden and Miles (2000), Metcalfe and Miles (2000), Windrum and Koch (2008) and Gallouj et al. (2013) are among these EU studies. Earlier, one of those involved in such studies, Sundbo (1998) had published his own *The Organisation of Innovation in Services*; and earlier still the EU's FAST programme had funded the studies presented in Gershuny and Miles (1983) and Howells (1988).

[14] On this point, we would suggest that the concept of "servuction" (Eiglier and Langeard 1987) would have received more and earlier attention in Anglophone communities were the key texts have been readily available in English.

largely understood in terms of the frameworks and concepts used when discussing innovation in manufacturing and in goods and (2) a *service-oriented* approach that stresses differences between service and manufacturing activities, arguing for the need for frameworks and concepts that take into account the specificities of service products and processes.

Coombs and Miles also considered most previous studies as to fall into one of two main approaches (after the approach of simply dismissing SI-IS had grown untenable). They identified (1) an *assimilationist* approach, seeing SI-IS, whether involving technology or other forms of innovation, as something that can be largely understood and measured in terms of the frameworks and concepts used when discussing innovation in manufacturing and in goods (often this perspective was advanced by economists and statisticians) and (2) a *demarcationist* approach that stresses the peculiar features of service activities – especially as revealed in marketing and management case studies – again arguing for the need for frameworks and concepts that take into account the specificities of service products and processes.

Carlborg et al. (2014) interpret journal articles on SI-IS using this framework. They argue that SI-IS research has gone through three stages: (1) *the formation phase*, 1986–2000 (with 27 articles), mainly presenting a demarcationist perspective; (2) *the maturity phase*, 2001–2005 (with 26 articles), beginning to shift towards a synthesis approach; and (3) *the multidimensional phase*, 2006–2010, with 76 articles, featuring the synthesis approach much more as well as highlighting the interactions of the innovation process between different sectors and discussing varieties of dynamics within and across sectors.

The Gallouj and the Coombs/Miles approaches – and their proposals for further research – are strikingly similar. But they also are significantly different in emphasis, as noted by Droege et al. (2009). When they compared these two accounts, Droege et al. considered them useful for classifying much of the extant literature, but argued that while the two classification systems agreed on their second approaches (demarcation or service orientation), technologist and assimilationist
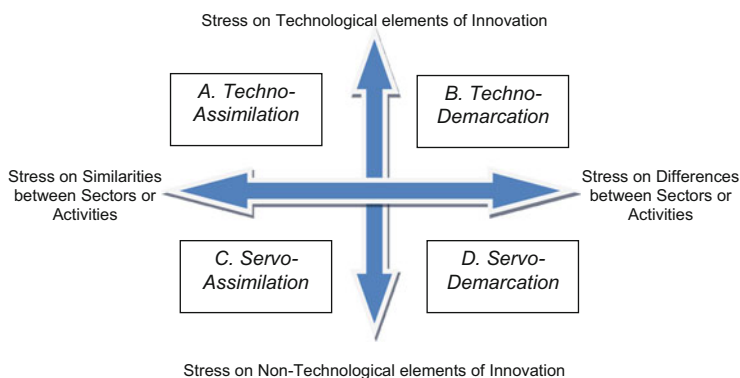

Fig. 1.2 Two dimensions of debate

approaches were sufficiently distinct to be worth separating. We suggest now that it is probably more helpful to frame the discussion in terms of two more or less orthogonal dimensions: one reflects the stress on technological versus other forms of innovation and innovation process; the other reflects the extent to which stress is placed on similarities or on differences between service and manufacturing activities and industries. If we cross-cut these two dimensions, four distinct orientations emerge, as in Fig. 1.2.

The horizontal dimension refers to the relative stress on similarity across all sectors (typically, but not always, assimilating service studies within manufacturing paradigms) versus stress on the distinctiveness of services as compared to others (especially manufacturing). There is scope for any particular publication to be further or closer to either pole – it is unrealistic to expect all authors to be strictly assimilationist or demarcationist. Similarly, there will be different shades of opinion and emphasis on the second, vertical, axis.

This vertical dimension relates to the stress on innovation as involving new technology (ways of doing things – of producing goods or services) and innovation as involving new service elements (things that are done or supplied). Innovation studies had largely emerged from examination of technological innovation. An inescapable phenomenon from the early 1980s on was the remarkably swift adoption of new IT across the economies of Western nations (this gave rise to work deploying and deepening notions such as technological revolutions and techno-economic paradigms). New IT applications were highly visible in large swathes of service industry. We have already noted the two American collections edited by Guile and Quinn (1988a, b) that examined this phenomenon in the US context. This technology emphasis was by no means confined to Americans. It is apparent in such studies as Gershuny and Miles (1983), where there is much discussion of the scope for transforming services through the application of new IT – but relatively little discussion of the organisational dimensions of such change. Interest in the topics

Table 1.2 Publications featuring the words "technology and service" and "technology and services" in their titles

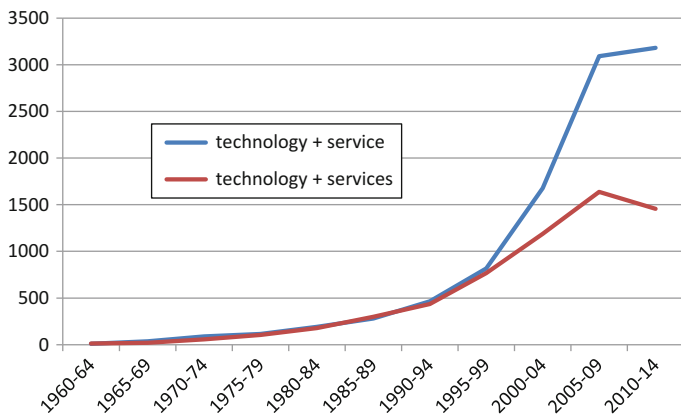|	Technology + service	Technology + services
1960–1964	11	12
1965–1969	36	21
1970–1974	89	57
1975–1979	114	104
1980–1984	190	177
1985–1989	281	298
1990–1994	465	435
1995–1999	816	766
2000–2004	1676	1189
2005–2009	3092	1637
2010–2014	3180	1455

Fig. 1.3 Publications featuring the words "technology and service" and "technology and services" in their titles

continued to mount, and Table 1.2 and Fig. 1.3 report on publications featuring the word "technology" and the word "service" or "services" in their titles. The number of publications is much greater, and growth in publications is much less abrupt than that for the phrase "service innovation" as noted in Table 1.1 and Fig. 1.1. This in part reflects that large number of publications addressing very specific services and technology applications – but we consider that it is also telling us about the early interests in, and continuing dominance of, ideas about technological innovation in service activities.

4.1 Techno-assimilation

Gallouj and Savona (2010) see the technologistic and the assimilation approaches as being effectively identical. In contrast, Droege et al. (2009) treat the two approaches to be distinctive; as Fig. 1.2 implies, we concur that it is misleading to regard all technology-focused approaches as essentially similar.

Coombs and Miles' (2000) idea of assimilation reflects the point of view that considers most economic attributes of services to be fundamentally similar to those of manufacturing sectors. This is reflected in the discussion of services as merely "intangible goods" (e.g. see Hill 1999; Gadrey 2000, for a cogent discussion) and the claim that service trade can mainly be thought of in terms similar to those of manufacturing trade (and investment, since this is a major form of service internationalisation).

Of course, it is conceded that there are differences between the classical grand sectors. But to the assimilationist, these are more a matter of (often relatively minor) quantitative variations rather than qualitative distinctiveness. For example, average capital intensity and firm size may vary across sectors, but they also vary

considerably within sectors. The problem with properly addressing service industries is less a matter of their having specific characteristics than one of neglect, especially when it comes to adequate statistical coverage. In terms of innovation – and many other topics, such as productivity, trade and so on – the assimilationist will suggest that both services and manufacturing can be effectively studied and statistically documented using the same, familiar, theories, concepts, methods and tools – typically ones that have been developed in the context of manufacturing. In innovation studies, the implication is that indicators can be applied across sectors with, at most, minor modifications. If most service industries emerge as featuring relatively low levels of R&D, then this simply means that they share a great deal in common with low-tech manufacturing. Thus, Pavitt (1984) grouped service industries together with supplier-driven manufacturing sectors. Problems with service innovation may then be seen as mainly to do with low rates of adoption of new technology in services, which in turn accounts for many service industries displaying lower productivity growth as compared to manufacturing.

While Pavitt was later to concede that some services were highly innovative, two authors argued that his original classification, with some modification, could readily describe variations across service industries, in a useful way. Innovative practices in services varied as widely as, and this diversity could be captured in terms similar to, those in manufacturing. In work published as a report in the 1980s, and a journal article around the turn of the century, Soete and Miozzo (1989; see also Miozzo and Soete 2001) accepted that many service organisations were largely *supplier dominated* (they pointed especially to public and personal services and retail firms). But they established other categories that were fairly parallel to Pavitt's. Two groups shared the characteristics of large-scale operations – *production-intensive/scale-intensive sectors* (especially characterised by large-scale administrative back-office activity) and *network sectors* (these could be physical transport or distribution networks or information and communication networks). They often dictate technological development paths to their suppliers. Finally, there are service organisations that are active in generating new knowledge and its applications, which the authors described as *specialised technology suppliers* and *science-based sectors* (including, e.g. software and engineering services). This influential study has found some reflection in more empirical survey-based analysis of different innovation patterns among service industries.

Given the rapid adoption of new IT across service industries, however, it appeared to be the case that many of these industries would be subject to higher levels of innovation – and quite possibly to increasing-scale economies and centralisation as previously sheltered local service firms found large corporations – often transnational service firms, intruding into their markets. Some service industries began to be routinely incorporated into Community Innovation Surveys in EU countries, and a stream of studies suggested that service innovation could indeed be measured through such instruments, that individual service firms and sectors varied markedly and that much the same dynamics occurred in services as in the manufacturing sectors. There are many examples of such survey-based studies, including Sirilli and Evangelista (1998), Tether et al. (2002) and Hipp and Grupp

(2005). Two features of the latter study are rather interesting in the context of this review. First is that the authors assert the need for specific study of service industries – which comes close to a demarcationist argument – but then statistically generate a set of distinctive innovation modes across service firms that come remarkably close to the Miozzo/Soete classification (they distinguish supplier-dominated, knowledge-intensive, scale-intensive and network-based innovation modes). Second is that they demonstrate intrasectoral heterogeneity, as well as broad tendencies across service sectors. Each sector may stress one or other modes, but features firms characterised by several other modes. This is completely congruent with survey-based accounts of the manufacturing industry – it is rare to find all firms nominally within the same manufacturing sector displaying the same logic, and cross-national variations can mean that a sector classified as, for example, high tech based on its features in one region may actually be quite low tech in another.[15]

We see this sort of perspective as widely adopted by economists and innovation researchers.

4.2 Techno-demarcation

Though techno-assimilationists stress familiar types of technological innovation, one of the earliest and most influential accounts of SI-IS argued that the trajectory of service industries' technological innovation is distinctive in important ways. Barras (1986, 1990) argues that new IT can be seen as service industries' twentieth-century analogue to manufacturing industries' nineteenth-century technological revolutions. Physical production was transformed through the use of new power systems: service production was now being transformed through the use of new information systems. Barras accumulated evidence for service organisations becoming technology intensive, but proposed that service organisations follow a "reverse product cycle".

The proposal is that service applications of new technology typically begin with (back-office) use of IT to render production of services more efficient. Only after a more or less lengthy period of assimilating the new systems do we see the creation of new services (at the front office or other points of customer contact). This reverses the standard account of the product cycle in manufacturing. In the standard account, we begin with product innovation, and then, as designs are stabilised and quality improved, innovation effort shifts to process innovation aiming at more efficiency and cheaper production. Service industries are seen as starting with process innovation and then (perhaps after product-quality improvements) moving

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[15] For example, automobile manufacturing in one region may be R&D intensive, while in other regions, it may constitute mainly assembly activities. It is possible that similar variations may apply to classification of service industries as knowledge intensive or otherwise (not least because of variations over time and space in the extent to which the labour force possesses higher education qualifications).
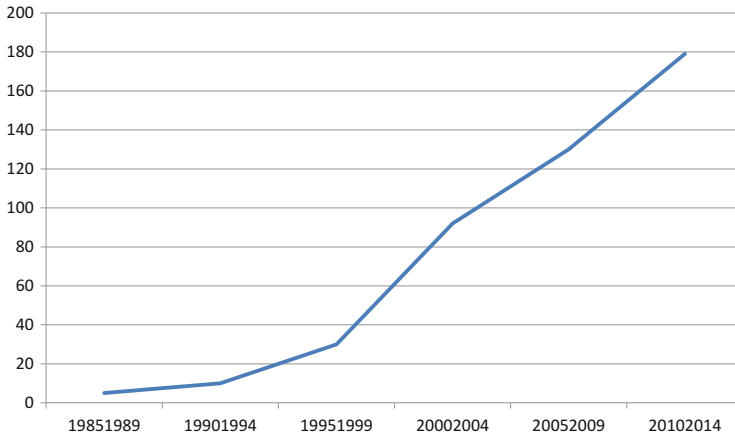
Fig. 1.4 Publications making reference to the "reverse product cycle" (RPC) in their text

on to product innovation. For Carlborg et al. (2014), this is a demarcationist approach, but for Gallouj and Savona (2010), it is technologistic: thus, the usefulness of further expanding the classification system is demonstrated.

Barras' approach has been highly influential. Admittedly, the phrase "reverse product cycle" (RPC) has hardly been ever featured in the titles of publications – Barras himself never included it (he employs such terms as "technical change" and "interactive innovation"). However, when we search for publications containing the phrase in their text, we see a steadily mounting level of citation (Fig. 1.4). A substantial share of SI-IS publications are making reference to this approach: it must be the single most influential theoretical approach to SI-IS.

While Gallouj's terminology sees this as just a "technologistic" account, the "techno-demarcationist" label is apt, because Barras' theory stresses the supposed specificity of SI-IS, reversing the standard account of technical change in industry. Whether this pattern is really so unique is open to doubt. Most obviously, it can be seen to apply to back-office functions across the economy: new IT has been introduced to support administrative functions across all sectors. Over time, this has helped to provide the tools for moving towards e-commerce and associated activities, just as service firms have been able to use online communications for informational elements of their own activities (Barras' industry studies are all informational services, and he sees their offering online services as a matter of new services, contrasted with the efficiency-improving process innovations happening as back-office processes were automated).

Of course, these back-office activities can be seen as service activities, just happening to be taking place within manufacturing and other (non-service) sectors. But new IT is also introduced to support industrial production processes in manufacturing sectors. Thus, computer-controlled machine tools, robotics and material processing may well be introduced for efficiency reasons; one could argue that some at least of these process innovations became the underpinning for

later developments such as mass customisation and the product innovations that could be associated with this. Product innovations involving new IT – from smartphones and CD and DVD players to microprocessor-controlled cars and washing machines – will probably often have germinated largely independently from the use of IT in process innovations, however. In this respect, the service-specific reverse product cycle argument has some force. Whether it actually is an accurate account of a historical moment is open to question (see especially Uchupalanan 2000). Equally important is the suspicion that the account, which depicts phenomena happening at the point in time where services first began to "industrialise" and adopt new IT on a large scale, is less useful for describing SI-IS after this period. Barras' approach does not tell us what will happen once service organisations have become technology-intensive and have learned to use new technology as manufacturing firms have done – will they conform to the standard product cycle model?

Other techno-demarcation approaches are conceivable. One line of work developed in the 1980s by the present author suggested that depending upon the type of service activity in question, different service industries could be expected to uptake quite different types of technology (for succinct statements, see Miles 1993, 1994). Sectors like transport, repairs and storage are engaged in physical and chemical transformations and thus may well use process technologies similar to those in manufacturing processes (while still interacting directly with consumers more than what is typical for manufacturing). But the picture is different for other sets of services, which may then be demarcated in the types of knowledge and technology they employ. Informational services (processing or communicating data, as in telecommunications, broadcasting and computer services – and financial services) will tend to use new IT earlier and more intensively than others and throughout their operations, not just in back offices. New services and firms may arise rapidly, too; these are the sorts of activities that Barras actually focused on. Human services, dealing with individuals (personal and health services, for instance), will make use of new IT as it becomes cheap and flexible enough to employ in interactions with customers but otherwise will vary in their use of, for example, cosmetic and medical products, according to their specific functions. Some would be highly supplier driven, but others – e.g. large medical systems – might well develop their own innovations and be particularly reliant on public sector research.

The focus on technological innovation in the techno-assimilationist and -demarcationist approaches was challenged from several directions. Studies of manufacturing industries had highlighted the importance of organisational innovations – the factory system in the nineteenth century and approaches such as quality control and quality circles and just-in-time systems, in the last half of the twentieth century. Discussion of post-Fordism, and of similar ways of describing what was seen as a shift from mass production to flexible specialisation and mass customisation, did not only stress the role of new IT in enabling these developments. It also put a great deal of weight on developments in markets and marketing, on global competition and production chains.

   The assimilation of new technologies into service sectors can be seen as an industrialisation of services (Levitt 1976, whose work was influential on many SI-IS researchers). But, just as the manufacturing industry was by the 1980s being described as entering a "post-Fordist" phase, so the form taken by industrialisation might also depart from conventional Fordism. In this respect, the nature of the service function itself, and its differences from the tangible goods produced by manufacturing, was reflected in attention, especially from SI-IS researchers more embedded in management and marketing traditions, on the nature of service innovation as distinct from goods innovation. Aspects of innovation that go beyond novelty in tangible technological products thus came to the fore: what we label the "servo-" approach, as compared to the "techno-" one. This was initially most apparent from a demarcation perspective, and thus, Coombs and Miles' "demarcation" was identified with Gallouj's "service-oriented" perspective: but we explore two varieties of demarcation below.

4.3   Servo-demarcation[16]

Many scholars have portrayed (most) service activities and industries as being highly distinctive ones, who require tools different from those used for manufacturing to examine, for example, their marketing (e.g. Lovelock and Wright 2002), productivity (e.g. Gadrey 2002; Grönroos and Ojasalo 2004) and trade (e.g. Vandermerwe and Chadwick 1989). Indeed, many of those who have examined SI-IS and new service development from these perspectives have come from a background in management and marketing studies. Often, their research is informed more by detailed case studies than by broad-brush survey studies. They argue that services (and by extension, SI-IS) require novel theories and instruments. One illustration of this relates to the overall relatively low levels of R&D in the service sector as compared to manufacturing. R&D intensity is used to differentiate between "high-tech" and "low-tech" manufacturing, but almost all service sectors would appear to be "low tech" (with a few exceptions such as computer, engineering and telecommunications services). Thus, Eurostat and the OECD – cf. Gottfried (2004a, b), Strack (2004) and the commentary in Miles (2011) – decided that a different basis is required for differentiating among services; "knowledge-intensive" sectors are identified on the basis of workforce educational attainment levels.[17]

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[16] While "servo-"is rather a clumsy prefix, alternatives like "humo-" (Delyagin 2003) or "touch-" (Naisbitt 1982, contrasted "high tech" and "high touch") are equally unsatisfying.

[17] The OECD also directed some attention to knowledge-intensive service activities that are carried out across almost all industrial sectors – see OECD (2006) and Martinez-Fernandez et al. (2011).

While innovation survey studies often use instruments originally designed to examine manufacturing innovation, those that have examined wider dimensions of innovation do tend to point to relatively more emphasis from service firms on organisational innovation as compared to technological innovation. Thus, Howells and Tether (2004) reported that a substantial share of service firms considered solely organisational innovations to be their main innovative activities; this was much rarer among manufacturing firms. In line with this, Kanerva et al. (2006) found service firms to be more prone to initiate organisational change; less striking differences (but in the same direction) were noted by Schmidt and Rammer (2006) and Miles (2008). The two latter survey-based analyses found firms in manufacturing and IT service sectors to report more technology-based innovations, with most other service sectors reporting more organisational innovation (but the differences are less striking than a demarcationist approach might expect; indeed, technologically innovative firms also tend to be organisationally innovative and vice versa).

What might lead to services (and SI-IS) being demarcated from other sectors? One factor often stressed in marketing and management studies centres on the relationship between service supplier and consumer. Manufacturing typically takes place at several removes from the consumers, who actually acquire goods through trade services. Customers are, in contrast, often present during the service production process (or at least its final stages), their contact with the supplier extends over a period of time (which may be extensive enough for researchers to talk of the "service journey" or "pathway"), and they may visit the service organisation and interact with the "servicescape" (Bitner 1992) of buildings, equipment, staff members and other customers. Customers may be actively engaged in co-production of the service, and the user input can determine the quality of the final service.

The service itself can have many elements of a relationship between supplier and user. It is intangible in the sense that there is rarely a new physical product created, though many services produce changes in the physical state or ownership status of tangible goods. Intangibility affects management and marketing through problems in demonstrating the service prior to purchase, through difficulties in storing and transporting the service (production and consumption are often coterminous) and through the important roles played by the behaviour of service workers and consumers alike.

Alongside studies of service management and marketing, then, the literature whose titles feature new service development (NSD) has emerged and grown. As Fig. 1.1 displays, this remains a much smaller body of work than the extensive literatures featuring service marketing (by far the largest), service innovation and (after having been overtaken in recent years by service innovation) service management. Nevertheless, it has gained sufficient breadth to be the subject of several literature reviews.

Johne and Storey (1998) presented one of the first reviews of NSD studies, stressing that new services face marketing challenges associated with issues of co-production and intangibility. Often, studies have focused on the factors facilitating successful introduction of new services (e.g. Martin and Horne 1993, 1995). The NSD process is typically seen as requiring more attention to customer features and roles and to their expectations and experiences. The cooperation of users is

critical in shaping the quality of the service outcome and the effectiveness of service innovation. Similarly, employees are often vital, since their interaction with customers is central: they are co-producers of the service and may require skills and knowledge to support innovation. Again, their knowledge and insight (of customers and of service processes) may be vital. Successful NSD was rarely achieved by a few experts. It is fairly common for service innovation to be organised through transitory project management structures – and much innovation emerges from ad hoc, on-the-job experimentation.

These NSD studies are making points not dissimilar from those in much of the rest of the SI-IS literature. They tend to focus more on matters of consumer appeal and acceptance, the role of intelligence from service employees and issues such as leadership. Studies of success cases – and sometimes of failures – are more prevalent. In these respects, while often stemming from Europe (especially Northern Europe, it seems), the NSD literature has much in common with the North American SI-IS literature.

Other lines of SI-IS work may also stress the distinctiveness of service activities and products as compared to the manufacturing/goods paradigm. For example, the role of the service relationship and co-production may draw attention to innovations and efforts at innovation involving new roles, self-service systems, the application of automated equipment, online interaction and delivery of services and so on. Intangibility is often related to difficulties in protecting service innovations with the IPR arrangements (patents) deployed for innovation in material goods. For practitioners, this means other approaches to protecting their innovations; for researchers, it means looking for other measures of innovation outputs (see FhG-ISI 2003). Innovative service organisations may also seek to provide consumers with evidence as to service quality (demonstrators, trial periods, membership of trade associations or accreditation to quality standards, etc.) or to add tangible elements to their services (e.g. loyalty cards).

The features of service activities – such as the role of co-production and servicescapes – can make service design issues a complicated affair. Some established industrial design firms have turned from industrial product design to service design, and some new firms have become well-known as contributing to this activity (Tether 2008; Stigliani and Tether 2011). Service blueprinting methods are well established (Bitner et al. 2008 provide one account), but other tools, techniques and philosophies have been introduced recently, including storyboarding (borrowed from cinema and other creative industries), interface and interaction design (from informatics), ethnographic research and virtual reality applications (reviews of service design include Moritz (2005) and Saco and Goncalves (2008); see also the journal *Touchpoint*).

Nontechnological innovations, then, including those in the service relationship, are emphasised by many demarcationists. But a relatively recent line of literature has been influential in arguing that service characteristics are central to all sectors.

4.4 Servo-assimilation

Service marketing scholars and practitioners had found that service marketing could not rely on the methods used for marketing goods, as noted above. However, in seeking to articulate the new thinking that was required here, the highly influential "service-dominant logic" (SDL) approach was spelled out (see, e.g. Lusch et al. 2008; Vargo and Lusch 2006). And this approach, it was argued, encompassed all economic activity – for the whole economy could be seen as a matter of the exchange of services. The new framework should apply to all sectors. Service is a pervasive economic phenomenon, a relational process, rather than just as an "intangible good" (as in techno-assimilationism). The service process is seen as one of co-production, with both supplier and customer contributing resources to create value for each other. Service is the end result of all economic activity, whether this involves a service firm supplying a service to a consumer or a manufacturing firm supplying a good which the consumer uses to produce their own service. The emphasis is on *service* (the co-production relationship) rather than on *services* (which we might consider to be the benefits that are supplied to the
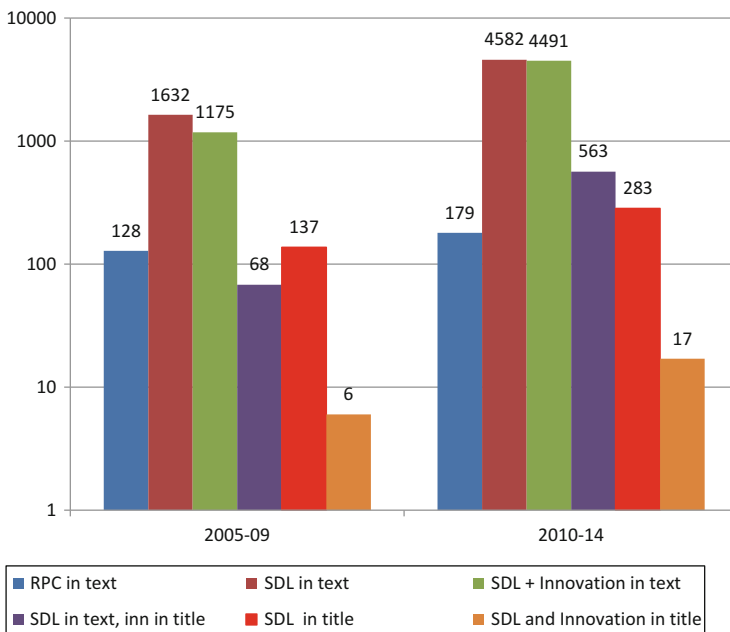

Fig. 1.5 The service-dominant logic approach. (Note: *vertical axis* is on a log [base 10] scale, because of acute differences in size of bars. The absolute numbers are provided *above* the bars)

users).[18] Seeing all economic activities as oriented to service provides reorientation of thinking about management and marketing across the economy, and much SDL literature involves applying this perspective to industries other than those belonging to service sectors.

The approach was only articulated fairly recently, but has proved extremely influential, as illustrated in Fig. 1.5. Since the seminal paper on the topic was only published in 2004 (and its title uses the phrase "dominant logic", but not SDL), we consider only the two most recent time periods. For purposes of comparison, papers dealing with RPC are also included.

Several striking features are immediately apparent from Fig. 1.5. First, SDL is referred to much more often within publications than is RPC, despite the later introduction of the SDL terminology. Of course, the RPC account is specifically focused on innovation, while the SDL approach is deployed in various ways. Indeed, while numerous publications refer to SDL in their titles, only a trickle refer to both SDL and innovation in their titles. Many more publications feature reference to SDL in their text, of course, but not their titles; a substantial number (and a growing share) of these are publications that refer to innovation in their titles. A very large (and also growing) share refers to innovation at some point in their text.

Some of the publications that relate SDL to innovation are basically reiterating the point made in much innovation and new product development work that successful innovation generally requires good knowledge of users and their potential requirements. In the SDL literature, this translates into designing offerings that generate value to producers and consumers alike, with each side bringing resources of their own to the co-production of service. Authors have explored what this implies for the ecosystems of actors involved here, for thinking about innovation networks and disruptive innovation and such topics as service platforms and the role of new IT as a resource for actors of all types (e.g. Lusch and Nambisan 2015). Though this approach may be seen as an assimilationist one, around the service construct, it by no means necessitates ignoring the importance of technological change.

The SDL approach to SI-IS is likely to evolve further and may serve as a bridge between NSD and other lines of SI-IS analysis and between marketing-oriented, management-oriented and more economistic and system-oriented researchers (the originators of the SDL approach have shown themselves to be very open to some major themes in the innovation literature – especially, perhaps, to those of the more managerial blockbusters on open and disruptive innovation). Its stress on the continuities across all economic sectors is challenged by some researchers and practitioners, who point to the very different managerial and physical complexities of, for example, large manufacturing systems and large service systems. It may be criticised as featuring more of a reframing, that is, as knitting together existing perspectives in new ways, than as providing much new insight; though with the

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[18] The very term "services" is often rejected in SDL literature, rendering the use of the term "goods" rather incongruous.

explosive growth of research, new intellectual tools, facilitating integration of discrete lines of work, are probably necessary for getting a grasp on the field. Issues like co-production and the alignment of value capture across partners and wider actors in business ecosystems are ones that apply across sectors. It is not only in SI-IS that innovations can be viewed in terms of the resources brought by the partners (and the role of new partners), the value created for different partners and the roles and interactions of these actors.

The "service science" (SSME) literature is rather challenging to locate in terms of the four quadrants of Fig. 1.2, in part because of its diversity. Publications and conferences originating under the service science banner have featured both demarcationist essays, but also contributions from leading SDL researchers.[19] There are also numerous efforts to examine service systems (or product-service systems) as combining goods and service production and use in order to deliver final service portfolios. It is possible that such efforts will eventually contribute to a fifth perspective, and we now turn to the emerging contours of such an approach.

5 Beyond Assimilation and Demarcation: Towards Synthesis

Gallouj and Weinstein (1997) and Coombs and Miles (2000) both argued that it was possible to transcend assimilationist and demarcationist approaches, to develop an *integrative* or *synthesising* approach. This would draw on insights from studies of both manufacturing and service industries, and both techno- and servo-approaches, to build a common conceptual framework, articulating an enlarged view of different types of innovation in different types of social and economic activity and organisation. This would be a more comprehensive analysis of innovation right across the economy – accounting for variations within and across goods and service innovation. It would probably require new indicators, able to address the service activities of manufacturing firms and the goods-producing activities of service organisations. It should thus better reflect important contemporary economic developments which the assimilationist and demarcationist approaches might overlook.

Several authors following in the wake of these original authors also specified this as the way forward (e.g. Drejer 2004), and Carlborg et al. (2014) actually suggest that such an approach is now widely embodied in SI-IS studies. It may, however, be more accurate to say that there is much research that aims to contribute to the

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[19] Leading advocates of service science, such as Maglio and Spohrer (2008), seem to agree with SDL researchers (e.g. Lusch et al. 2008; Vargo and Akaka 2009) who argue the centrality of their approach; the service science proponents, however, do introduce additional tools for thinking about service systems as articulating people, organisations, technology and information together in specific ways.

elaboration of an integrative approach but that a consolidated view is yet to be established (or at least to be widely agreed upon).

The case for a synthesis finds various rationales in the literature. One rationale relates to the increasing similarity of the grand sectors, which goes beyond the "industrialisation" and increasing technology intensity of services. Even without the SDL argument, there has been much discussion of the tertiarisation of manufacturing (greater shares of the workforce being engaged in service activities, especially white-collar ones) – and more recently of the "servicisation" (or servitisation) of manufacturing (e.g. Avadikyan and Lhuillery 2007; Howells 2001; Neely 2008; Susman et al. 2006). This can take various forms – post-Fordist "mass customisation", "product services" (supporting or complementary to the goods that firms produce), selling on surplus capacity from in-house service activities and, strikingly, the shift to selling service products rather than selling the goods that customers can use to create the outcomes they require. The various forms of servicisation are liable to impact manufacturers' innovation strategies, both in terms of goods and manufacturing and of new service development and customer relationships. The grand services remain distinctive, in many ways, but many of the features that appeared to differentiate between them do so less clearly now.[20] Indeed, the intertwining between sectors has been such that some service activities – notably those stemming from KIBS (e.g. R&D services, design services, consultancies, etc.) as well as activities like training – mean that these services are involved in innovation processes across the whole economy. Increasingly, a simple distinction between manufacturing and services is unsustainable – a more integrated perspective is required.

Janssen (2015) stresses the role of evolutionary economics as a potentially integrative framework. In fact, he suggests that it is fruitful to think of two steps in the development of such an approach – *pre-synthesis* and *post-synthesis*. Post-synthesis is what we have referred to as synthesis above – Janssen argues that there is liable to be an intermediate step, somewhat between demarcation and full synthesis. This step would elaborate on service-specific insights by examining commonalities across various SI-IS activities and interpreting these in terms of evolutionary frameworks.[21] As different disciplinary perspectives are integrated, the SI-IS material should be brought into the heart of innovation studies more generally, so that this literature becomes "service aware".

Evolutionary and related systemic frameworks are major features of innovation studies. Gallouj and Weinstein (1997) already proposed a Lancastrian model of service product characteristics as one way of taking this forward, and among those extending this are Windrum and Garçia-Goñi (2008), who consider how some public service may fit into the picture. Such analyses point to the scope for further

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[20] As already argued in Miles (1993) and a few earlier studies

[21] Howells (2010) in contrast argued for a "segmentalist" approach to SI-IS. He suggests that the great variety among service activities suggests that quite distinctive accounts of SI-IS need to be developed.

integration with other lines of work that may inform synthesis. We can anticipate contributions from studies of "business model innovation". In this context, den Hertog's approach – examining six different features of SI-IS and the managerial capabilities required to master these – may be particularly helpful (a detailed account of this approach is supplied by den Hertog et al. 2010; the six dimensions where novelty may be introduced are the service concept, customer interaction, value systems, revenue models, personnel/organisation/culture and technology). The six dimensions are not so much distinct types of innovation, as ways of describing variations across different service innovations, though some may focus more on one or other dimensions and thus tend to be identified with it. Successful innovation will usually require the alignment of change or stability in the six dimensions; successful innovators will have capabilities to manage each type of change. Though this account is generated in the context of SI-IS, it is no great stretch to see it as an account that has a great deal in common with business model analyses of any economic activities – and the view of business model innovation as involving change on multiple dimensions.[22]

Den Hertog et al. (2006), Rubalcaba (2011), Janssen (2015) and Janssen et al. (2012) have found the assimilationist, demarcationist and synthesis approaches to be a useful framework for examining service innovation policies, with Janssen even differentiating between pre- and post-synthesis policy orientations. The distinctions we have drawn earlier concerning techno- and servo-approaches could further be developed in terms of policy frameworks that embed elements of traditional approaches to SI-IS policy within a recognition of the importance of service and services to all sectors of twenty-first-century economies.

6 Conclusions

The story of SI-IS may well be exemplary of how new fields of research develop. After the issues they address become recognised as salient ones, there is a tension between those seeking to assimilate them within the received wisdom and those stressing the novel elements that mean accommodation of that wisdom to new understandings. Whether and how SI-IS will be mainstreamed in innovation studies and related fields remains an open question, but it is unlikely that the issues raised will become any less salient. Indeed, we could anticipate that new waves of technological innovation applied to service activities – exploiting, for example, new functions (such as locational capabilities) of devices such as smartphones, developments in personal health systems (involving new monitoring and treatment devices, together with new roles and functions in public health service systems) and

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[22] A rather more elaborate that also shares a great deal in common with business model perspectives is provided in the context of analysis of innovation in creative industries by Miles and Green (2008).

the rapidly developing knowledge of neuropsychology – will intensify interests in SI-IS (wide uptake of new technologies might even lead to a new burst of RPC theorising, in some of these cases).

As is suggested by the cases of SDL and SSME approaches, it is quite possible for distinctive new rallying points and ideas to come to the fore in a field like SI-IS. A rapid development and rise of new approaches might well be associated with the consolidation of new practices such as service design thinking, the application of artificial intelligence and virtual reality in service settings or the analysis of service systems oriented to tackling major social challenges. Topics such as two-sided markets in the platforms on which social media and other service "apps" are running, the variety of types of knowledge and knowledge use by KIBS in their interactions with clients and in the creation of experience within servicescapes are examples of themes that could well be linked more closely to the SI-IS problematique.

The role of service and services in practically all facets of social and economic life – including in the efforts that societies make to meet the grand challenges that they confront (climate change, demographic change, insecurities of many kinds and the like) – is liable to become increasingly prominent. Furthermore, service activities of many kinds are being transformed, by the application of new technological opportunities, by organisational change and innovation in a globalising world and by changing attitudes and expectations on the part of citizens, consumers and employees. There will be much need to deepen understanding of particular service activities, their evolution and the ways in which they can be practised more effectively and sustainably.

SI-IS is not only important for the industrial competitiveness of the advanced industrial countries. These countries have found many of their traditional manufacturing strengths eroded by competition from emergent economies, and service and services are seen as possibly enduring comparative advantages. Actually, though, the rise of the service economy is significant in practically all world regions (and this is one reason for the growing number of contributions from beyond North America and Northern Europe). But sustainability is important as well as competitiveness – arguably more so. As mentioned above, the grand challenges we face in the twenty-first century are wicked problems involving complex service systems; adequate responses to these (it may be hubristic to think of "solutions") are bound to involve mixtures of technological and service innovation. Service innovation is not, then, just about sophisticated experience: it remains intrinsic to continued social and economic wellbeing. The growth of the SI-IS literature suggests that this is increasingly recognised.

With this growth, however, there are dangers of fragmentation of burgeoning scholarly and managerial literatures into numerous specialisms lacking in adequate interchange and overview. Hopefully, these can be at least in part offset by the wider and more thorough development and application of "synthesis" perspectives. Another challenge and opportunity will be associated by the ongoing appearance of new intellectual entrants to the SI-IS field. We can expect researchers from a range of associated disciplines to contribute – and, equally if not more important, continued growth of contributions from previously marginalised continents such as

Asia and South America. The future development of SI-IS studies promises to be rich and to make significant contributions to social and economic analysis — and hopefully to action as well.

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Chapter 2
Zooming Out and Zooming In: Service Ecosystems as Venues for Collaborative Innovation

Heiko Wieland, Stephen L. Vargo, and Melissa Archpru Akaka

Abstract In this chapter, we provide a perspective that extends the process of innovation beyond firm activities and new product development. We apply an S-D logic, service ecosystems framework to reframe the context of innovation to include collaboration and social structures (i.e., institutions and institutional arrangements) that guide and are guided by the actions and interactions among multiple actors. Using this framework, we show that market innovation does not automatically occur when actors (e.g., firms) or groups of actors (e.g., innovation networks) introduce new ideas or products, but instead when new practices become institutionalized as solutions. Institutionalization, in this context, is a nonlinear process in which systemic actors engage in institutional work and cocreate institutions through multiple iterations of institutional developments until common templates emerge that reflect imperfectly shared conceptions of problems and solutions. More specifically, we argue that technological innovation can be viewed as the cocreation of new value propositions. Market innovation, on the other hand, is driven by and drives the development of new technologies but also requires the acceptance of value propositions as well as the continued exchange, interpretation, integration, and application of a particular technology among multiple actors, over time (i.e., institutionalization).

Keywords Market innovation • Technological innovation • Institutions • Ecosystems • Service-dominant logic

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1 Introduction

Traditionally, innovation has been largely viewed as driven by firm and entrepreneurial activities that result in the development of new products, services, and processes. Similarly, traditional innovation models have depicted value as flowing linearly and sequentially from innovation-creating firms to innovation-adopting customers. However, recent research questions these linear and sequential value flow models since it is becoming increasingly evident that they are ineffective in capturing the interconnected and interdependent nature of the networked economy (Nelson and Nelson 2002; Vargo et al. 2015). Consequently, more contemporary work on innovation focuses on the development of systemic views of markets (e.g., Callon 1998), the exploration of intangible and dynamic aspects of resources (e.g., Constantin and Lusch 1994; Pinch 2008; Vargo and Lusch 2004), and the broadening of innovation processes beyond the activities of individual firms to the interactions and efforts of multiple actors in innovation networks, including users, universities, and other research partners (Möller and Rajala 2007; Nelson and Nelson 2002; von Hippel 2007). However, while this movement toward more dynamic approaches of innovation raises issues with innovation models that are centered on unidirectional processes, it often remains focused on the firm-centric development of new products and services.

Using a service ecosystems perspective, we advance a systemic view on innovation and show that innovation is central to ongoing value creation and resource integration processes. More specifically, we employ service-dominant (S-D) logic (Vargo and Lusch 2004, 2008) as a conceptual foundation for the study of service in general and innovation in particular. S-D logic is an emerging framework that has been recognized as an alternative lens for studying the creation of value in a variety of business-related fields. This framework is grounded in the premise that service – the application of one actor's resources (e.g., knowledge and skills) for the benefit of another party – is the basis of economic and social exchange. Viewed through an S-D logic lens, value is created through the collaborative processes of doing something for and with other actors.

We show that this S-D logic framework can provide a deeper and broader perspective of innovation than traditional ones because it enables and compels researchers and practitioners to zoom out beyond dyadic exchange encounters and to view value as being created in (eco)systems of service-for-service exchange. This systemic approach not only helps to (re)conceptualize the processes and practices that are foundational to value creation and innovation, as well as market formation and reformation, but also points toward the importance of dynamic resources and the institutional arrangements that govern these processes and practices (Vargo and Lusch 2011).

In this chapter, we extend the context of innovation beyond firms' product development activities to highlight that the interactions and institutions of multiple actors guide, and are guided by, their cocreative, innovative efforts. We first discuss how S-D logic provides a foundation for a systemic understanding of value creation

and innovation and elaborate how, in this view, innovation processes are driven by the actions and interactions of multiple actors integrating, exchanging, and applying resources. In this context, we highlight the role of institutions in value creation processes in general and in innovation processes in particular. More specifically, we explicate the process of institutionalization as an underlying process and driver in the reformation of both technologies and markets. Finally, we close the chapter with a few thoughts on how the service ecosystems approach to innovation can guide future research and provide insight for academicians and practitioners who struggle with innovation in dynamic and continually changing environments.

2 The Role of Institutions in Value Cocreation: A Service Ecosystems View

One of the main contributions of the S-D logic framework is that it provides a broader perspective on value cocreation that moves away from a dyadic orientation between producers and "consumers" toward a network perspective (e.g., Lusch and Vargo 2006). More specifically, this framework explores the relational, reciprocal, and interconnected nature of exchange. A foundational step in this development is the distinction between "service" (a process) and "services" (units of output) and the realization that service is the "basis" rather than the "unit" of exchange. In other words, service (singular) is the application of competences (e.g., knowledge and skills) for the benefit of another party, and value cocreation is the collaborative process of doing something for and with other actors.

Thus, S-D logic mandates zooming out to a more holistic, dynamic perspective of value creation, through exchange, among wider, more comprehensive (than producers and consumers) configurations of actors. Stated alternatively, S-D logic views all economic and social actors as resource integrators. Thus, this view requires a move away from a single-minded concern with restricted, predesignated roles of "producers"/"consumers," "firms"/"customers," and "innovators"/ "adopters" to more generic actors – that is, to an *actor-to-actor* (A2A) orientation. This move away from parties with predesignated roles to generic actors has wide-ranging implications because it signals that all social and economic actors (e.g. individuals, households, firms, etc.) engage in exchange and value creation by fundamentally doing the same thing, that is, they share, integrate, and apply resources in service-for-service exchange, all in the process of *cocreating value*.

A "generic actor" designation, however, does not imply that all actors are identical but instead is intended to do the opposite: disassociate actors from predesignated roles such as producers, consumers, or innovators. Instead, this view highlights dynamic systems of actors who relationally cocreate value and, at the same time, jointly provide the context through which value gains its collective and individual assessment (Giddens 1984; Slater 2002; Vargo and Lusch 2011). Thus, the A2A orientation not only highlights that value creation takes place in

networks, since it implies that the resources used in service provision typically, at least in part, come from other actors, but also points to a dynamic component to these networks, since each integration or application of resources (i.e., service) changes the nature of the network in some way.

S-D logic captures this dynamic approach in its definition of service ecosystems: "relatively self-contained, self-adjusting system[s] of resource integrating actors connected by shared institutional arrangements and mutual value creation through service exchange" (Lusch and Vargo 2014). Thus, an S-D logic, service ecosystems view not only centers on the collaborative creation of value and the integration of dynamic resources but also highlights the existence of mechanisms (i.e., institutions) to facilitate all of this resource integration and service exchange through the coordination of actors. In other words, the service ecosystems perspective points to the fact that value cocreation needs to be viewed as a process in which resource-integrating, reciprocal-service-providing actors create value through holistic, meaning-laden experiences in nested and overlapping systems and subsystems, governed and evaluated with the help of institutional arrangements. In this context, it is important to note that we, consistent with most institutional theorists in various disciplines, do not refer to organizations when we describe institutions and institutional change.

In summary, a service ecosystems perspective broadens the scope of value creation to include the actions and interactions of generic actors that are always relational, reciprocal, and contextual. In this view, all actors are resource integrators and, thus, cocreate their own service-providing resources through their resource-integrating activities. In the following sections, we show that in the same way that S-D logic removes the divide between "producers" as "creators" and "consumers" as "destroyers" of value, an A2A approach also blurs the divide between "innovators" and "adopters" (Vargo et al. 2015). In particular, it broadens the scope of innovation to not only include the actions and perspectives of those that develop and offer new value propositions but also those who use, refine, and/or redevelop emerging value propositions and, even more broadly, to all actors who shape institutional arrangements.

3   Institutionalization as an Underlying Process of Innovation

As stated, one of the main goals of this chapter is to propose a service ecosystems approach to innovation that extends the context of innovation to dynamic ecosystems of interaction and institutions, which are continually reconstituted as multiple actors integrate resources, exchange service, and cocreate value. Stated alternatively, we point to the importance of institutions (i.e., rules, norms, meanings, symbols, and similar aides to collaboration) and, more generally, institutional arrangements (i.e., interdependent sets of institutions). With few exceptions (e.g., Alderson

1965; Araujo and Spring 2006; Arndt 1981; Carson et al. 1999; Humphreys 2010; Nelson and Nelson 2002; Pinch 2008), institutions and institutional arrangements have received little attention in the marketing and innovation literature, despite their prevalence in the related sociology, economics, and organizational literatures. Work on S-D logic (e.g., Lusch and Vargo 2014; Vargo et al. 2015; Venkatesh et al. 2006), on the other hand, has begun to recognize the importance of institutions and institutional arrangements not only as the key to understanding human systems and social activities such as value creation but also as an underlying mechanism for innovation.

In this section, we describe how institutions (re)form – i.e., how *institutionalization* occurs. Institutions enable and constrain how actors integrate resources, conceptualize markets, and perceive value (Edvardsson et al. 2014; Lusch and Vargo 2014; Vargo et al. 2015). Exploring the genealogy of the study of institutions, Scott (2001) identifies such influential scholars as Spence, Durkheim, Marx, and Weber as the forerunners of institutional research streams. Their early work was centered on the tension that lies between materialist, agency-driven views and those focused on "ideational, normative forces that serve as constraints on individuals' behavior" (Hinings and Tolbert 2008, p. 476). The same tension is also addressed by structuration theory (Giddens 1984), a sociological approach for studying social systems that is based on the idea that these systems are formed and reformed through the enactment of practices – routine actions or "doings and sayings" (Schatzki 1996).

Barley and Tolbert (1997) draw on structuration theory (Giddens 1984) to propose a framework for institutionalization that helps to understand "the processes by which existing institutions are maintained and modified." In Barley and Tolbert's view, institutions are continually reproduced through the ongoing enactment of practices and redevelopment of relationships. Thus, understanding institutionalization processes requires "a conceptual framework that specifies the relations between interactional episodes and institutional principles" (Barley and Tolbert 1997, p. 100). In this way, a structuration approach to institutionalization provides critical insights into how practices contribute to the ongoing formation and reformation of social structures (i.e., institutions) and systems. However, others (e.g., Sewell 1992) have argued that a structuration-based approach lacks the consideration of the dynamics of institutions, or social structures, which is needed to fully understand institutional change.

More recent work has focused on the processes through which actors affect the institutional arrangements in which they operate to try to overcome "over-socialized" or overly structural views of neo-institutional approaches (e.g., Battilana et al. 2009; DiMaggio 1988; Greenwood and Suddaby 2006). One of these views of institutional change, called "institutional work," proposes that institutional change, disruption, and maintenance are driven by the activities of diverse, spatially dispersed actors and their involvement in the political struggles and the interactions among them (Hardy and Maguire 2008; Lawrence and Suddaby 2006).

This approach expands the analysis beyond the creation of new institutions (i.e., institutional entrepreneurship) by highlighting the important influence of a

broad range of actors on purposefully, maintaining, and disrupting existing institutions (Lawrence and Suddaby 2006). Arguably, this view connects, bridges, and extends work on institutional entrepreneurship, institutional change, innovation, and deinstitutionalization by emphasizing the idea that institutional work involves transformative action as well as the repairing and concealing of tensions and conflicts within and across institutions (Lawrence et al. 2009). This approach is imperative for the study of innovation because it highlights the importance of institutional *maintenance*, as well as *change*.

The consideration of institutional maintenance is often overlooked as an important aspect of innovation as increasing attention is being paid to radical or "disruptive" innovations (Bower and Christensen 1995) and "blue ocean" strategies (Kim and Mauborgne 2005). However, even innovations that represent major institutional shifts (e.g., blue ocean vs. red ocean market opportunities) and offer drastically different value propositions are built upon existing institutions that enable potential customers to evaluate offerings in positive (or negative) ways. For example, the growing popularity of *Tesla* cars is only made possible because of the underlying institutions that enable people to legitimize this new technology (electric sports cars). While the emergence and growth of *Tesla* has led to some substantial changes in the wider automobile market (e.g., reframing electric- and battery-driven vehicles from low-performance to high-end luxury), the expectations for all vehicles have largely remained the same.

The *Tesla* cars developed in Silicon Valley differ drastically from traditional automobiles, and their model of distribution departs from the norm. However, there are a number of features of this car that align with current understandings of automobiles. Customers still want a car to get them from one place to another in an efficient, safe, and effective manner. Additionally, the introduction of *Tesla* cars has shown that even electric cars continue to be important symbols for the lifestyle and financial success of their owners. Similarly, *Tesla* success, at least partly, has been based on the company's ability to build a large number of "charging stations" around the world. These charging stations, viewed from an institutional perspective, are, at least partly, consistent with established rules and norms that are in place for the distribution of gas for traditional and hybrid cars.

Zooming out even further, it can be easily argued that the emerging institutions associated with carbon footprints and the scarcity of fossil fuels play an important part of the *Tesla* service ecosystem. These broader institutions, due to the increasing awareness and belief that natural resources are not boundless and that climate change is based on carbon emissions, undoubtedly shape the perceptions of both the traditional and the electric car markets.

In this example, it is clear that the innovation of *Tesla* cars as a new market offering requires the cooperation of multiple actors, including drivers, third-party organizations, and customers. Thus, the iterative and dynamic process for innovation becomes clear, and the collaboration among firms, customers, and other actors underscore the value cocreation that drives the institutionalization (i.e., maintenance, disruption, and change) of technology and markets. This provides evidence of how the actions and interactions of multiple actors collaboratively contribute to

value creation, including those that help to both change and maintain institutions. Furthermore, this example emphasizes how the social forces within service ecosystems influence, and are influenced by, the actions of multiple actors and the integration and use of new technologies and ultimately shape the formation of new markets. The way in which institutionalization drives the innovation of technologies and markets is elaborated below.

4 Technological Innovation and Value Propositions

As stated, prior research regarding innovation has traditionally focused on new product development or the design and production of goods, and, in this context, the term technology is often used. However, as Pinch (2008) argues, this term is elusive and immediately problematic since it has taken on various disparate and often limiting meanings (e.g., in regard to material constrains). In an effort to address these limitations, more recent work conceptualizes technology in light of a more dynamic and social perspective, which has important implications for product-centered approaches to innovation. For example, Arthur (2009, p. 28) describes "technology as an assemblage of practices and components that are means to fulfill human purposes" and suggests that products and processes do not need to be classified as disparate categories. Instead, he suggests that the term "technology" can refer to a wide class of phenomena, both "software" (i.e., processes or methods) and "hardware" (i.e., physical devices).

Echoing this view, Nelson and Nelson (2002) distinguish between "physical" and "social" technologies for which the latter are defined as "institutions." Similarly, Orlikowski (1992) also recognizes the role of institutions in socio-technical innovation processes by pointing out that, "[w]hile technologies appear to have objective forms and functions at one point, these can and do vary by different users, by different contexts of use, and by the same users over time." Her work builds on the social construction of technology (SCOT) approach (Pinch and Bijker 1984), which highlights that social groups play an important role in the construction of technology. The SCOT approach, building on a concept that has become known as "interpretive flexibility," suggests that different actors can "construct radically different meanings of a technology" (Oudshoorn and Pinch 2003, p. 3).

Thus, recent research conceptualizes technology as neither exclusively physical nor social, but as potentially useful knowledge that may provide solutions for new or existing problems. This notion of *technology as knowledge* aligns with a service ecosystems emphasis on the centrality of operant resources (i.e., resources that are capable of acting on other resources to create value) and highlights the idea that competences, and not physical things, lie at the heart of technology. This view, however, does not diminish the importance of physical artifacts in technological innovation, since these artifacts are often the vehicles that convey embedded knowledge and skills (Orlikowski 1992) as well as mechanisms of institutionalization.

The *Tesla* example discussed above provides clear evidence of technology as knowledge, because most of the material components of this innovation are not new. Both traditional automobiles and new electric cars rely on similar operand resources, such as sheet metal, rubber, and an increasing number of electronic components. In fact, *Tesla* was not the first company to introduce a purely electric vehicle. However, what makes the *Tesla* case distinct from those of traditional automobiles and even other electric cars is the development of an electric vehicle that people see as a luxury offering and the enactment of the practices and the acceptance of the infrastructure that enabled the growth of this type of transportation. In this way, the innovation of this technology is not based on the development of new "hardware" or tangible products. Rather, innovation emerges as the systemic adoption of new solutions (i.e., the institutionalization of new integrative and market practices).

In the case of *Tesla*, differences between how customers perceive the offered solution are partially reflected in differences in price – e.g., the price of a *Tesla* versus the price of other fully electric vehicles. *Tesla* has been able to charge higher prices because customers feel that its cars offer increased levels of status through *Tesla*'s aesthetic as well as its functional design. Although *Tesla* has reached a notable level of market success with the launch of its first car model, the goal of the company, and Elon Musk, is to make *Tesla* cars more accessible. Moreover, the vision of *Tesla* is to do more than make cars, it is to be a technology and design company centered on energy innovation (www.teslamotors.com). As part of this strategy, *Tesla* is aiming to increase its share of the transportation market by launching a lower-priced car and hoping to meet the needs of customers wanting to drive energy-efficient cars who may be less interested in, and less able to engage with, *Tesla* as a luxury brand. The success of this attempt to reach more customers will not only rely on technological advances but, maybe more importantly, on the systemic construction of new meanings of technologies (e.g., people driving *Tesla* cars because of their energy-efficient properties versus those driving them as status symbols). Thus, innovation is not only centered on technological advances (i.e., new knowledge for design processes) but also is influenced by the institutions (e.g., social rules, norms, values, meanings, and beliefs) that guide both the "design" and "use" phases associated with new, emerging, and evolving technologies (i.e., potentially useful knowledge) (Orlikowski 1992).

In this socio-technical approach to technology, innovation has to be viewed as a cocreational and ongoing process. Value propositions or technologies are always the cocreated outcomes of systemic human action and interactions among systemic actors. Value-proposing actors use their institutional arrangements and their competences (i.e., operant resources) and engage in institutional work (maintenance, disruption, and change) by recombining or proposing not only new value propositions but also new integrative practices. Stated differently, value propositions are never just evidence of institutional change but also reflect the institutional work of overlapping maintenance and disruption components (Creed et al. 2010).

Thus, arguably, a service ecosystems approach suggests that technological advancement is always embedded within dynamic social systems and provides

insight into how the integration of resources and cocreation of value drive the institutionalization (i.e., maintenance, disruption, and change) of new value propositions in dynamic socio-technical systems. In line with this socio-technical view of innovation, Coombs and Miles (2000, p. 100) argue that "we are moving away from a model of innovation that puts all the emphasis on artifacts and technological innovation; and toward a model which sees innovation in terms of changes in market relationships but with major artifact and technological dimensions."

Going one step further, we argue that technological advancement, viewed from a service ecosystems perspective, can be conceptualized without reference to material constraints, as potentially useful knowledge that may offer solutions for new or existing problems. Furthermore, technological advancement can be considered as a "combinatorial evolution" since "new elements are constructed from ones that already exist, and these offer themselves as possible building-block elements for the construction of still further elements" (Arthur 2009, p. 167). In other words, all technologies (i.e., potentially useful knowledge) are birthed from previous technologies through resource integration.

However, this discussion of technological advancements does not fully explain how the innovation of technologies can (potentially) lead to the adoption of new solutions (i.e., the institutionalization of new integrative and market practices). The following section explores the relationship between technological and market innovation and sheds light on how institutionalization not only drives the advancement of technologies, or value propositions, but also the innovation of markets or the institutionalization of new solutions.

5 Institutionalization as the Driver of Market Innovation

Not surprisingly, technological innovations do not necessarily lead to market success, and many value propositions never lead to changes in integrative practices, much less drive the formation of new markets. In fact, previous research has shown that 40–90 % of all new products do not gain acceptance among customers (Gourville 2005; Griffin 1997). Thus, market innovation does not automatically occur when actors (e.g., firms) or groups of actors (e.g. innovation networks) introduce new ideas or products but instead when new practices (i.e., solutions) become institutionalized. For example, the only way that *Tesla* could make the transition from a technological innovation (new value proposition) to a viable market was because customers adapted new practices – e.g., charged their cars instead of going to a gas station. In this way, the institutionalization of a new solution (e.g., type of transportation) occurred through the changing of norms and practices.

However, before we can explore the interplay of institutionalization processes and market formation, it is necessary to define markets from a service ecosystem perspective in more detail. Viewed from this perspective, markets are not seen as static or preexisting, but as being "performed" through the actions and interactions

of market actors (Harrison and Kjellberg 2010; Kjellberg and Helgesson 2007; Mele et al. 2014). More specifically, Kjellberg and Helgesson (2006, 2007) view markets as the ongoing enactment of three types of practices: (1) exchange practices, (2) normative practices, and (3) representational practices. E*xchange* practices are routinized activities involved in the exchange of market offerings, *normative* practices are routinized activities involved in forming normative expectations, and *representational* practices are routinized activities that shape images of markets.

More recently, Vargo and Akaka (2012) and Lusch and Vargo (2014) have extended Kjellberg and Helgesson's (2006, 2007) markets-as-practice framework to a value cocreation framework by broadening the classification of exchange practices to include all *resource integration* practices, which are all practices that enable actors to draw on a variety of resources to create value for themselves and for others (e.g., specialization) and are not restricted to economic exchanges.

A practice approach to markets, in which practices are conceptualized as routine actions or "doings and sayings" (Schatzki 1996), points to the fact that market interactions often become reconciled and stabilized, resulting in relatively durable resource integration and value cocreation practices. Consequently, Vargo and Lusch (2013) have conceptualized markets, in the context of service ecosystems, as "*institutionalized solutions*." Thus, a service ecosystem view, in line with other contemporary innovation research (Geels 2004; Nelson and Nelson 2002; Pinch 2008), points to the fact that institutions and institutional change are always foundational to innovation and market formation processes.

Market (re)formation involves the ongoing and systemic maintenance, change, and disruptions of the institutions that enable and constrain integrative, normative, and representational practices. In this context, service ecosystems need to be viewed as, at least partly, loosely coupled, interconnected, and nested. "Any particular social structure is viewed not as an isolated, abstract phenomenon but, rather, as part of a larger whole composed of multiple, interpenetrating social structures operating at multiple levels and in multiple sectors" (Seo and Creed 2002, p. 225). Thus, due to their loosely coupled nature, social structures are susceptible to incompatibilities both within and among institutional arrangements (Benson 1977), and the institutionalization of new solutions always involves the integration of multiple institutions. In other words, the institutionalization of markets occurs through the enactment of new integrative, normative, and representational practices that, together, reproduce a broader social structure. This is an ongoing process, since the social order produced in the process of social construction always creates new institutional contradictions, ruptures, inconsistencies, and incompatibilities (Benson 1977).

In this way, value propositions can never be viewed as the sole creation of a value-proposing actor but are always the cocreated outcomes of systemic human action. Value-proposing actors, based on their institutional arrangements and their competences (i.e., operant resources), engage in institutional work by recombining or proposing not only new integrative practices but also new normative and representational practices. Thus, even value propositions, viewed from and

institutional perspective, are cocreated. Consequently, value propositions are never just aimed at institutional change but also reflect the institutional work of overlapping maintenance and disruption components (Creed et al. 2010). Without maintaining elements, for example, institutional innovations could not achieve "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman 1995, p. 574).

In the case of *Tesla*, existing institutions that surround traditional automobiles continue to shape customer expectations and norms for transportation problems and solutions. However, new knowledge and ideas for how to solve existing problems have contributed to the development of new value propositions. The continual integration of new practices surrounding this value proposition have led to the institutionalization of electric vehicles as a viable solution for both transportation and social status and thereby formed a new market. However, there are still numerous market tensions associated with the introduction and use of electric vehicles (e.g., the inconvenience of charging a car versus filling up with gas, the limitations in range, or the influence of the petroleum industry on government regulations), exemplifying that markets are never completely stabilized. Rather, the institutionalization of new solutions (i.e., markets) is ongoing, and markets are continually formed and reformed.

Thus, this example shows that the distinction between "innovators" and "adopters" becomes blurred as all actors similarly cocreate value by enacting integrative, normative, and representational practices. Using their interpretive flexibility, integrators of value propositions contribute to the ongoing development of new value propositions by proposing modified value cocreation practices based, similarly, on their own knowledge and institutional arrangements. However, the formation of markets only occurs when new practices (i.e., solutions) become institutionalized in a somewhat cohesive manner. Consistent with the need to view markets as highly relational, Zietsma and McKnight (2009) describe institutionalization processes as nonlinear processes in which systemic actors engage in institutional work and cocreate institutions through multiple iterations of institutional developments until common templates emerge that reflect imperfectly shared conceptions of problems and solutions. More specifically, they describe institutionalization as a systemic process in which all actors engage in "ongoing negotiations, experimentation, competition, and learning" (Zietsma and McKNight 2009, p. 145). For example, the only way that *Tesla* could make the transition from a technological innovation (new value proposition) to a viable market was because customers adapted new practices – e.g., charging their vehicles instead of filling up with gas. In this way, a new solution (e.g., type of transportation) became institutionalized through the changing of norms and practices.

This proposed view of innovation builds upon Vargo and Lusch's (2011) normalized actor-to-actor (A2A) view and sheds light on how markets form and reform, through technological advancements and changes in institutions that are embedded within service ecosystems. In this view, market innovation involves the ongoing and systemic maintenance, change, and disruptions of the institutions that

enable and constrain integrative, normative, and representational practices. At the same time, these institutional arrangements also lead to problems and conflicts, through their intra-institutional inconsistencies and contradictions. Thus, the nested and loosely coupled nature of institutions propels the ongoing emergence of new value propositions (i.e., technologies) and continually drives the institutionalization of new solutions (i.e., markets).

6   Zooming In: A Closer Look at Innovation to Understand Market Formation

This consideration of institutionalization as an underlying process of innovation provides insight into the dynamic nature of technology and markets and, arguably, provides a more comprehensive framework that focuses on the integration and application of operant resources for co-innovating both. An S-D logic, service ecosystems perspective not only highlights the relational, reciprocal, and interconnected nature of value creation but also points toward institutions as central elements in the development of new forms of value (i.e., innovation). More specifically, this extended context and emphasis on institutions in innovation suggest that institutionalization (the change, disruption, and maintenance of institutions) is a central process of the innovation of both technologies and markets. However, zooming out to a broad service ecosystems view often makes it difficult to pinpoint specific drivers of value cocreation and innovation. Thus, once a broader perspective of innovation is understood, it is helpful to take a closer look at the phenomena that drive particular innovation processes and, perhaps, lead to specific innovative outcomes (e.g., disruptive innovation).

One of the main benefits of using an A2A perspective and zooming out to a systems level is that it enables researchers and managers to overcome false divides between "producers" and "consumers" as well as "innovators" and "adopters." Based on this systemic, A2A perspective, innovation needs to be conceptualized as the cocreation of useful knowledge (i.e., technology) that becomes institutionalized into the fabric of a particular socio-technical system composed of rules, norms, values, meanings, and practices (i.e., institutional arrangements) (Vargo et al. 2015). Thus, innovation processes are always driven by the actions and interactions among multiple actors who continually strive to create new forms of value (i.e., innovate) for themselves and for others. Arguably, reframing innovation with the help of a service ecosystems lens can guide future research regarding innovation in general and help to develop related research under the umbrella of viable systems perspectives (Wieland et al. 2012).

The challenge with maintaining such a high level of abstraction is that it is difficult to identify particular practices and processes that lead to diverse outcomes, and assess the differences between and among diverse exchange systems. Thus, to better understand why some markets are dynamic and others are not or why some

innovations succeed and others fail, it is helpful to take a closer look at more microlevel contexts of nested interactions within these particular service ecosystems. Chandler and Vargo's (2011) discussion about how context frames exchange offers a meta-layer of analysis that emphasizes the need to oscillate between micro-, meso-, and macrolevels of service ecosystems to more fully understand how value is created and evaluated. This suggests that in order to understand how dynamic systems operate, it is important to investigate the particular actions and interactions that underlie and drive both the maintenance and change of the wider service ecosystem.

For innovation, it might be particularly helpful to take a close look at how and why particular innovations succeed and why others do not. This can be done using empirical studies to explore phenomena such as practices, resources, and symbols that influence value cocreation and innovation. Ethnographic and historical methods, as well as case studies, are helpful methodological tools for investigating particular social phenomena at a microlevel. A closer look at the electric car industry, for example, might provide important insights to how innovation occurs and markets form. It is no secret that *Tesla* is not the first electric car to be offered to customers. However, in terms of shaping and extending the market for electric cars, it appears that this particular company and car have had a greater impact than other electric car companies. In this case, it appears that *Tesla* has moved the market for electric cars beyond its original niche group of environmentally conscious customers, to engage with customers wanting high status, high-tech vehicles. An in-depth investigation into the history of the electric car industry can provide a macrolevel backdrop. However, a closer look at the value cocreation practices that guided *Tesla's* emergence and influence on this industry could also shed light on the institutions upon which these particular technologies are built and may provide insights into the future of the industry as well. Importantly, microlevel investigations must be done with a broader understanding of the service ecosystem as a whole. It is by zooming out and then zooming back in that more comprehensive understandings about market dynamics can be discovered.

7 Conclusion

In this chapter, we use an S-D logic, service ecosystems framework to extend the context of innovation to include collaboration and social structures (i.e., institutions and institutional arrangements) that guide and are guided by the actions and interactions among multiple actors. Thus, we extend the focus beyond firm activities and new product development to emphasize how value is cocreated, and innovation occurs, through dynamic systems of service exchange.

We provide evidence for the fact that *technological innovation* can be viewed as the cocreation of new value propositions or as a collective, combinatorial evolution that leads to the generation of new, potentially useful knowledge (i.e., operant resources) (Vargo et al. 2015). *Market innovation*, on the other hand, is driven by and drives the development of new technologies but also requires the acceptance of

value propositions as well as the continued exchange, interpretation, integration, and application of a particular technology among multiple actors, over time (i.e., institutionalization) (Vargo et al. 2015). Thus, in both cases, innovation is driven by value cocreation and the integration and application of operant resources (Vargo and Akaka 2012).

These perspectives can provide insights for managers who find that linear innovation models are ill suited for nondeterministic social systems. Instead, design methodologies need to be explored that incorporate the institutional arrangements, dynamic views of resources, and established and emerging practices that drive value perceptions of human actors in various situations (Buchanan 1992). However, it is important to highlight that a service ecosystems perspective, while promoting a zoomed out view, does not lock-in this position. Instead, zooming out is a necessary but often overlooked step that enables the investigation of phenomena on micro-, meso-, and macrolevels. Chandler and Vargo (2011), for example, point out that a deeper analysis of resource integration and value creation practices requires oscillating foci to each of these levels and their influence on one another as many intra-institutional inconsistencies and contradictions only become salient in their interplay.

Although the discussion of practices in markets and marketing (Kjellberg and Helgesson 2007; Schau et al. 2009; Warde 2005) as well as value cocreation and innovation has begun, it is still in its infancy. This is especially true for work on the role of institutions in markets that explicates institutionalization processes in socio-technical and economic systems. As mentioned, zooming in is equally as important as zooming out, once the broader context of innovation is understood. It is by oscillating back and forth from the macro- to the microlevel of interactions and institutions within service ecosystems that we can begin to gain a deeper understanding of value cocreation, innovation, and market formation. We therefore conclude this chapter by calling for a deeper conceptual and empirical investigation of the role of institutions in socio-technical market systems in general and a deeper exploration of the linkages between, or relationships among, various levels (micro, meso, and macro) of institutional developments in particular.

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Chapter 3
Service Ecosystems Innovation in Systemic Perspective: Transitions and Coevolutions

Kyoichi Kijima, Marja Toivonen, and Sampsa Ruutu

Abstract Service ecosystems refer to such complex service systems that are self-adjusting systems of resource-integrating actors, connected by shared institutional logics and mutual value creation through service exchange with an emphasis on dynamic features like adaptation, viability, and sustainability. In this chapter, focusing especially on social innovation, we first analyze service ecosystems by adopting Panarchy and Transition Management Theory in a systemic perspective. Panarchy is a framework for analyzing ecosystems developed to account for the dual, often conflicting, characteristics of all complex systems, i.e., stability and change. Transition Management Theory has attracted attention as a framework to study the governance of social systems for sustainability. Based on the analysis, we identify adaptive transitions, phase transitions, and coevolution in service ecosystems innovation and derive a Systemic Innovation Model of Service Ecosystem. It describes dynamic behavior of service ecosystems innovation in a comprehensive way. Finally, we illustrate our model by applying it to the paradigmatic changes concerning the nature of the public sector.

Keywords Service ecosystems innovation • Sustainability • Systemic innovation approach • Panarchy • Transition Management Theory • Social innovation • Public sector paradigms

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1   Introduction

A service system is a dynamic configuration of people, technologies, organizations, and shared information that creates and delivers value to customers, providers, and other stakeholders (University of Cambridge and IBM 2008).

According to the Service-Dominant Logic (S-D logic), the traditional distinction between a "producer" as a creator of value and a "consumer" as a destroyer of value should be replaced with a more generic conceptualization of economic (and social) actors, which reciprocally create value in complex systems. S-D logic refers to such complex systems as "service ecosystems" (Vargo and Lusch 2011) to emphasize their dynamic features like adaptation, viability, and sustainability. S-D logic defines the concept of service ecosystems as "relatively self-contained, self-adjusting systems of resource-integrating actors connected by shared institutional logics and mutual value creation through service exchange" (Vargo 2014; Wieland et al. 2012).

These ecosystems are constantly adapting to changing contextual requirements and are simultaneously creating these changing contexts in the adaptive process (Giddens 1979). Contextual value creation (value-in-context) in these systems can be conceptualized as an increase in the dynamic viability of the system (Wieland et al. 2012).

One of the crucial ways to create new value and increase viability of a service ecosystem is to introduce new or significantly improved products (goods or services), processes, organizational institutions, and marketing methods in business practices or in the marketplace, i.e., innovation in a broad sense. Innovation is the fundamental source of value creation in a service ecosystem.

When we discuss service ecosystems in terms of innovation, it is important to note that service ecosystems are open systems that are (1) capable of improving the state of another system through sharing or applying resources (i.e., the other system determines and agrees that the interaction has value) and (2) capable of improving its own state by acquiring external resources (Maglio et al. 2009). These arguments suggest that a service ecosystem has to be identified as a complex system consisting of service systems.

We agree with the claim by Wieland et al. (2012) that a fuller exploration of the dynamic and complex nature of service ecosystems requires drawing on systems perspectives such as general systems theory (GST), complexity theory, and the viable systems approach (vSa). S-D logic and service science both point toward a need for a systemic understanding of value and value cocreation processes.

The purpose of the present chapter is threefold. First, we analyze service ecosystems innovation in the systems perspective. In order to obtain new insights on them, we employ Panarchy and Transition Management Theory. Panarchy is a systemic framework for analyzing the ecosystem development to account for the dual, and seemingly contradictory, characteristics of all complex systems, i.e., stability and change (Fraser 2014). It aims to explain the complex interactions among different areas and different levels, bringing together ecological, economic,

and social models of change and stability. Transition Management Theory, on the other hand, has attracted attentions as a framework to study the governance of social systems in the pursuit of sustainability (Loorbach 2007; Rotmans and Loorbach 2009). The model focuses on societal sustainability and discusses it in terms of interaction among micro-, meso, and macro levels in society. Since the service ecosystem, too, literally and ultimately seeks for sustainability in society, the model should be adequately applicable.

Second, based on the abovementioned arguments, we derive a new systemic model, called Rotation and Revolution Model of Service Ecosystems Innovation. It aims to describe the holistic and dynamic behavior of service ecosystems innovation in a comprehensive way. Finally, we illustrate the model by applying it in the case of three paradigms that have been the basis for understanding the nature of the public sector (in the European context in particular).

2 Systemic Innovation Approach and S-D Logic

Until the mid-1980s, the mainstream of innovation theories focused on science-based, technological inventions and adopted a linear model, which favored specialized R&D functions and systematic steps in the innovation process (Kline and Rosenberg 1986). A paradigmatic change took place during the latter half of the decade, based on the classic works of Schumpeter (1934, 1942).

Schumpeter had identified several different forms of innovation: the introduction of a new good or a new quality of a good; the introduction of a new method of production, including a new way of handling a commodity commercially; the opening of a new market; the conquest of a new source of supply of raw material or intermediate input; and the establishment of a new organization. He regarded adaptive new combinations of existing things as the most general form of innovations but also acknowledged the significance of radical discontinuities.

On the basis of these arguments, a "modernized" version of the Schumpeterian theory was developed and is called "the neo-Schumpeterian view on innovation" or "the broad view of innovation." This development was a prerequisite for the recognition of innovative outputs that are not tangible; so, it was crucial for the emergence of research into service innovation. It can be supposed that the majority of service innovations (as well as of organizational and business model innovations) have been discovered by using this view (Miles 1993).

The essence of the broad view of innovation can be characterized by (1) the recursive view about the innovation process, (2) emphasis on the cumulative nature of innovation outputs and the historical roots of novelties, and (3) the relevance of systemic innovation approach (Toivonen 2013).

The first point highlights that the process of innovation is recursive and complex, while the earlier view had regarded innovation as an event that can be localized in space and time (Kline and Rosenberg 1986). According to the broad view, innovation includes a fundamental element of uncertainty: the outcomes searched for

cannot be known beforehand and the procedure leading to a solution is unknown; most often there are several plausible alternatives to be explored (Dosi 1988). Innovation is closely linked with learning, particularly with its practical forms (Lundvall and Johnson 1994). Recursiveness also means that the creation and diffusion of innovations are not separate stages: innovations do not stay the same throughout their diffusion, but users reinvent them and give them new context-specific meanings (Sundbo 2008; Tuomi 2002).

From the viewpoint of the output, the broad view has brought to the fore the cumulative aspects of innovation – the dependence of future innovation on the past. In innovation, a new use of preexisting possibilities and components is often discovered as a more or less unconscious by-product. Also the conscious search for novelties commonly starts with existing problems. This leads to a situation where a large part of innovations are re-combinative and incremental in nature (Dosi 1988; Gallouj and Weinstein 1997).

Interactive learning is a fundamental aspect of the innovation process and shows its social nature. Innovation is a collective exercise involving a number of different actors with different skills and competences (Caloghirou et al. 2004). Organizations' capability to innovate depends to a great extent on knowledge produced externally, which highlights the significance of open practices (Chesbrough and Crowther 2006). Also the participation of users is often highly beneficial (Sundbo and Toivonen 2011).

Understanding innovation as a multi-organizational phenomenon has led to the examination of systemic aspects in innovation. The approach of systemic innovation is closely linked to the topics of networking and networks of service systems and provides insights concerning the complex adaptive behavior that these systems need in order to be viable and sustainable. Service systems that choose or are forced to innovate in cooperation with other service systems have to develop a co-innovation strategy. This strategy includes four stages: autonomous strategy making, cooperative strategy making, founding an organization for co-innovation, and realization of innovation (Bossink 2002).

According to our perception, the three characteristics of the broad view of innovation are also included in the basic postulations and newer developments of S-D logic (cf. Toivonen 2013). They highlight the central role of intangible outputs of innovation (new cocreated value), the recursive and complex nature of the innovation process (new practices), and the systemic nature of innovation (the institutional setup). Also the view that involving multiple actors is more beneficial than carrying out innovation in isolation constitutes a core of S-D logic (Vargo et al. 2015).

The broad view has gained ground in other studies, too. An important example is user-based innovation (Sundbo and Toivonen 2011). Other research streams with the similar emphasis are open innovation and co-innovation that highlight collaboration with partners and competitors and have developed specific applications for the service context (Bossink 2002; Chesbrough 2010, 2013). Opening of innovation leads to the issues of interdependencies between organizations and brings to the

fore one of main interests of the broad view – innovation systems – from a new angle.

However, in the innovation practice, various stage-gate models are still typical and are based more or less on in-house R&D activities. In this sense, innovation practice is lagging behind the research in which an increasing number of studies have indicated a need for new models. These models would consider the design, implementation, and diffusion of innovations as simultaneous, not sequential, network-based value cocreation processes (Vargo 2014).

In this chapter, we adopt a systemic innovation approach based on Panarchy Model and Transition Management Theory. We aim to construct a comprehensive dynamic innovation model of service ecosystems, taking into account those characteristics of innovation discussed by the broad view and S-D logic.

3 Adaptive Cycles of Service Ecosystem

3.1 Value Cocreation as Rotation

A service ecosystem is, first of all, a complex system of service systems, where service systems form a network to engage in the value cocreation process as a whole. Networks are generally thought as a third governance structure in addition to markets and hierarchies. A network cannot be managed via command-and-control types of management methods (Vargo 2014).

In a network, the participating service systems integrate various resources such as market-facing resources, private resources, and public resources to create service value. These service systems are symmetrically resource integrators, and through interactions they exchange service value with each other. Their role in the network changes from a provider to a customer and/or from a customer to a provider time to time, while some service systems may play a role of the coordinator of the network. Through the service exchange, the network of service systems will be restructured and reformed in three phases that can be modeled as a cycle or a rotation (Vargo 2014; Vargo et al. 2015).

In Fig. 3.1, we have modeled value cocreation as a three-phase cycle which rotates around its axis and consists of networking, resource integration, and service exchange. By this illustration, we can position the important concept of open innovation very clearly. Open innovation is described as "combining internal and external ideas as well as internal and external paths to market to advance the development of new technologies" (Chesbrough 2010, 2013). Because it focuses on how, what, and when knowledge and resources are required and used internally or externally for innovations, open innovation is a concept that sheds light on the networking phase of the cycle in particular. The cyclic model also shows that networking heavily depends on the other phases as well.

Fig. 3.1 Value cocreation
as rotation (cf. Vargo 2014)
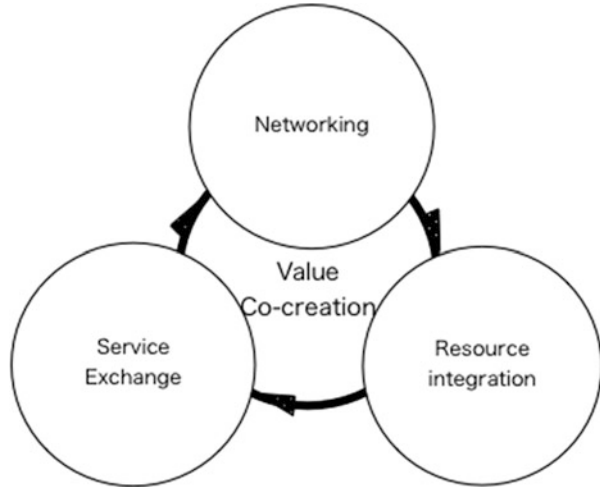
    In the next subsection, we model service ecosystem as revolution which the
rotation itself follows like the solar system.

3.2   Service Ecosystem as Revolution

Based on our assumption about a service ecosystem as a complex system that
follows the adaptive cycle, we consider Panarchy a suitable framework to investi-
gate its characteristics. Panarchy is an integrative reference framework of GST
which helps to understand the source and role of adaptive change of an ecosystem
(Gunderson and Holling 2001). According to it, the adaptive cycle of an ecosystem
is a process that accounts for both stability and change. It periodically generates
variability and novelty, either by internally accumulated resources through genetic
mutations or adaptation or by externally accumulating resources that may change
the internal dynamics of an ecosystem.

    Panarchy suggests that such changes can be observed in economic, ecological,
and social systems. They are evolutionary and concerned with rapid unfolding
processes and slowly changing ones, both with gradual and episodic change.
They take place and interact at various scales from local to global. Panarchy
identifies four basic stages in the adaptive cycle of ecosystems: exploitation,
conservation, release, and reorganization (Fig. 3.2). It claims that all ecosystems,
from the cellular to global level, go through these four stages in a dynamic adaptive
cycle (Allen and Holling 2013).

    The exploitation stage is a rapid expansion stage, when a population finds a
fertile niche to grow. The conservation stage is one in which slow accumulation and
storage of "energy" – i.e., "growth" and "saturation" – are emphasized, when a
population reaches capacity and stabilizes for a time. The release stage occurs
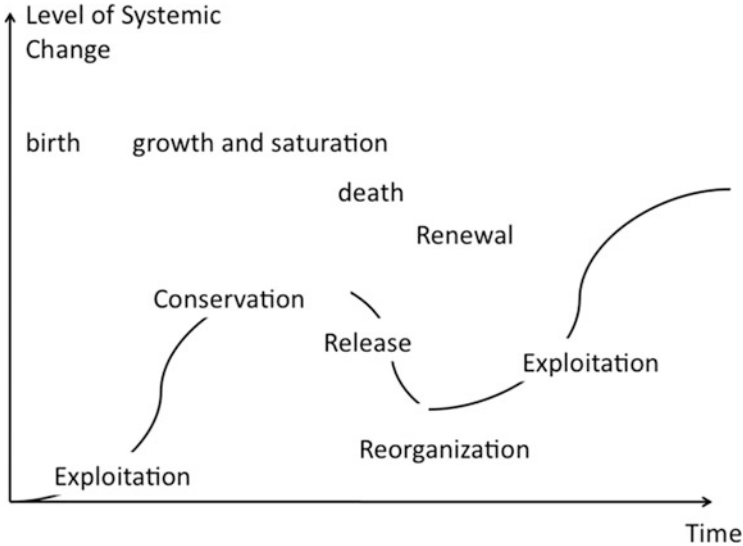
Fig. 3.2 Adaptive cycle as Panarchy

rapidly, when a population declines due to a competitor and/or some changed conditions. The reorganization stage can also occur rapidly, when certain members of the population are selected for their ability to survive in spite of the competitor or changed conditions that triggered the release. Then, a new cycle of four stages will begin again. We can easily recognize that the four stages of the adaptive cycle are analogous to the birth, growth and saturation, death, and renewal of living systems.

We now model a service ecosystem as a revolution system, analogous to the solar system, along which the value cocreation cycle rotates around its axis (Fig. 3.3). We can generally observe this revolution when new services or products are launched: they attract the market (exploitation) and become popular (conservation), though the popularity depends on various factors. Then, as time goes by, the attractiveness will fade out (release). Finally, the services/products are renewed to make them more suitable for the market (reorganization) and to enter the next round.

4   Phase Transition of Service Ecosystem

4.1   Adaptive and Phase Transition of Service Ecosystem

The system of service systems rotating as a value cocreation cycle around its axis follows a revolution orbit over and over in an adaptive way. This kind of a revolution can be called "adaptive transition." Adaptive transition is usually scale transition (Gunderson and Holling 2001). The adaptive transition view on an
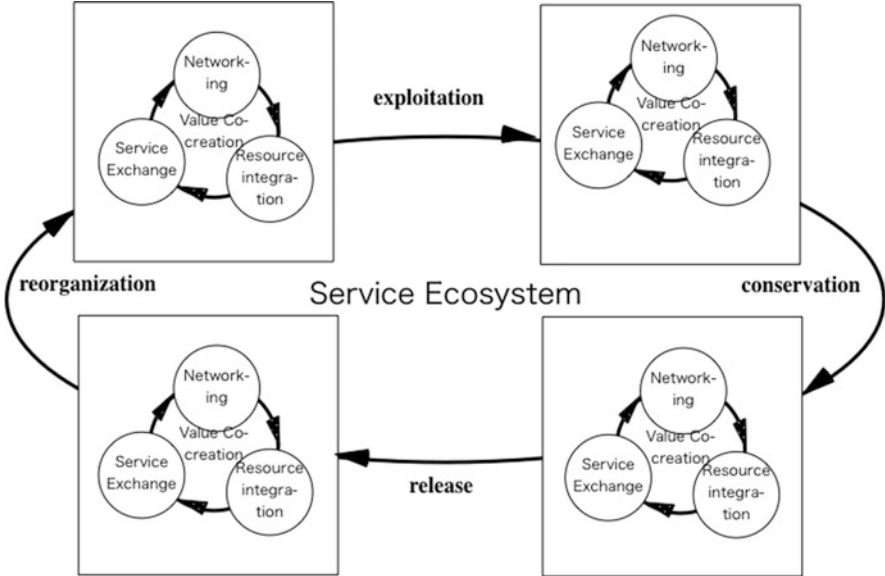
Fig. 3.3 Adaptive transition of service ecosystem as revolution

ecosystem is a natural way to explain why and how the system is maintained. It illustrates what we call a process change.

However, the adaptive cycle may sometimes break down and/or collapse and end up with a qualitatively different state. Synergetics (Fuller 1975) and Nonlinear Science (Scott 2006) claim that this phenomenon is a result of a structural change of the revolution orbit; they call it "phase transition." The essence of phase transition is type transition rather than scale transition. While following the revolution orbit repeatedly, the rotation system creates some fluctuations and then deviates and spins out from the orbit to another.

Panarchy illustrates how such deviation happens in a way that causes a rotation system at the release stage of the adaptive cycle to jump to a new conservation stage or a rotation system at the conservation stage jumps to a new reorganization stage (Fig. 3.4). In order to be sustainable, an ecosystem should possess the capacity to create, test, and maintain the capability for shifting to another ecosystem.

Concepts such as "destructive innovation" or "drastic innovation" can be described in terms of phase transition. Destructive innovation means a process by which a product or service takes root initially in simple applications at the bottom of a market and then moves up the market, eventually displacing established competitors (Christensen 2013; Ricciardi 2013). The essential idea behind it is structural jump from a service ecosystem to another. Drastic innovation sets the fundamental pace of economic progress by redefining production possibilities as Schumpeter emphasized (Panth 2013).
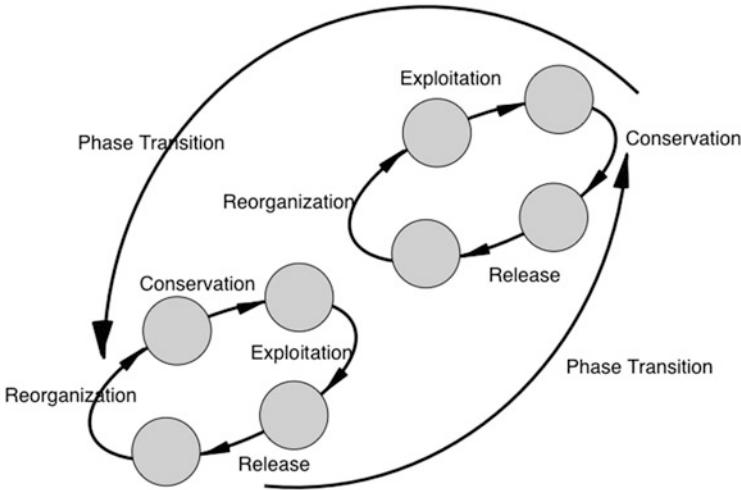
Fig. 3.4 Phase transition

5   Coevolution of Service Ecosystems with Societal Change

So far we have pointed out that both adaptive transitions and phase transitions are crucial for the sustainable development of service ecosystems. However, this is not enough: the sustainable development of a service ecosystem also requires changes in socio-technical systems as well as wider societal changes in beliefs, values, and governance that coevolve with technological changes (Kemp et al. 2009). In order to discuss a service ecosystem properly in the context of coevolution of technologies with wider societal changes, we adopt Transition Management Theory.

Transition Management Theory assumes three levels of innovation (Kemp et al. 2009). It provides a multilevel model of innovations which shapes cross-level processes of coevolution using visions, transition experiments, and cycles of learning and adaptation (ibid.). It claims that behind the process of social change, multiple and interrelated innovations take place at a different speed and level (Rotmans and Loorbach 2009).

The lowest level consists of micro level of innovations where so-called niche novelties are created, tested, and diffused. Such novelties can be new technologies, new rules and legislation, new organizations, or even new projects, concepts, or ideas. Terms like B2B, B2C, and C2C services are relevant to describe actual value cocreation cycles at this level.

Our arguments so far mainly shed light on the micro level. At this level, a combined process of adaptation of a relatively stable system (adaptive transitions) and a structural societal change from one relatively stable system to another (phase transitions) takes place, as illustrated by Fig. 3.5.

The second and middle level is the meso level at which the so-called regime is located. The term "regime" refers to the dominant culture, life style, brand, market,
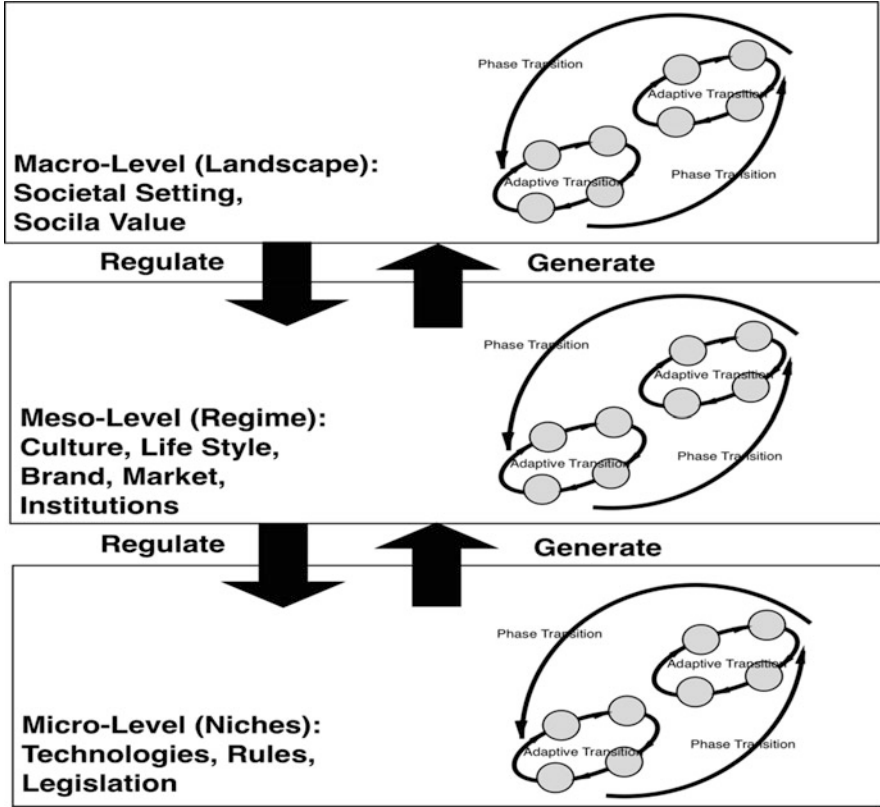
Fig. 3.5 Systemic innovation model of service ecosystem

and physical and immaterial infrastructures. These institutionalized structures give stability to a societal system and guide decision-making and individual behavior of actors. At the same time, the regime has a certain level of rigidity that normally prevents innovations from changing the structure fundamentally.

Faster and smaller adaptive/phase transitions at the lower level generate an impact on slower and larger adaptive/phase transitions at the higher level. At the same time, slower and larger adaptive/phase transitions at the higher level regulate faster and smaller adaptive/phase transitions at the lower level (Squazzoni 2008).

Applying these arguments, we can suggest that social needs and demands at the meso level trigger technological innovations and phase transitions at the niche level, while at the same time, new technologies create and lead to new lifestyles and social cultures. On this aspect, we can identify cross-level coevolution among markets, networks, institutions, technologies, policies, individual behaviors, and autonomous trends (Djalante and Djalante 2012).

The highest level is the macro level of innovation or "landscape": the overall societal setting in which the processes of change occur. The landscape consists of

social values, political cultures, economic environments, and trends. The landscape level regulates adaptive/phase transitions at the niche and regime levels by defining the room and direction for change. At the same time, the regime and niche levels generate adaptive/phase transitions at the landscape level.

Panarchy, which turns hierarchies into dynamic structures (Holling et al. 2014), claims that each level has nonlinear multi-stable properties and can be stabilized or destabilized through critical connections between the levels.

These considerations lead us to propose a Systemic Innovation Model of Service Ecosystem (Fig. 3.5). This model has a recursive structure across the levels, and it illustrates the ideas of social innovation as well. In social innovation, bottom-up generative activities constitute an "engine of innovations" and are linked to user-driven and employee-driven approaches in innovation (cf. Sundbo and Toivonen 2011). The creation and implementation of social innovations highlight empowerment: citizens are not passive recipients, but active codevelopers (Harrison et al. 2010). On the other hand, top-down regulative activities are also necessary for the materialization and dissemination of social innovations. Decision makers and managers have to support and organize bottom-up processes in order to make ideas implementable and scalable (Høyrup 2010).

Social innovations are often systemic in the sense that they emphasize the simultaneous development of organizations, technologies, services, and multiple network and partner relationships.

6 Paradigm Shifts in Understanding the Nature Public Services: Application of the Model

In this section, we illustrate our model by analyzing the shifts of public sector paradigms – studied most actively in the European context (Hartley 2005). Changes in understanding the nature of medical care are an illustrative example, and medical care is interesting also because it involves various service systems. It includes the public sector, private sector, and the third sector (NGOs) in an interacting network at the micro level. Since the end of the 1980s, there have been two paradigm shifts or phase transitions at the landscape level: from bureaucracy to market-imitation and further to empowered citizenship (Hartley 2005; Benington and Hartley 2001).

The first change meant a replacement of the traditional public administration with so-called New Public Management (NPM). The second change, which is still going on, includes a partial replacement of NPM with emerging patterns of citizen-centered service delivery and governance; this paradigm is called "network governance" (Hartley 2005).

Each paradigm is not only linked to a particular ideology, social value, or worldview, i.e., landscape in our terminology, but also contains particular conceptions and assumptions about the nature of institutions and the roles of politicians, managers, and citizens at the regime level. Further, while the different conceptions

of governance and public management have implications and regulations for the role of policy-makers, managers, and citizens in innovation at the niche level, they also generate adaptive/phase transition at the regime level. Thus, each paradigm generates adaptive/phase transition at the upper level in a bottom-up way.

6.1 The Public Administration Paradigm (Up to the Late 1980s)

The public administration paradigm is based on social values that highlight a legislative, bureaucratic, and rule-based approach to public service provision. The population is assumed to be homogeneous, and needs and problems are defined and answered by professionals who provide standardized services. Power and authority is linked to the government, and it is assumed that welfare and regulatory services should be provided by the state through elected representatives. National and local politicians play a central role in innovation through developing new policy frameworks and acquiring the support from citizens and their parties.

Under such circumstances, policy-makers act as commanders for innovation, while officials are assumed to carry out the detailed work of implementation. As for the population, the political and professional domination understates the role of users of services.

Despite these values and views, not only adaptive transitions but also phase transitions took place. Examples of the latter are the establishment of national health systems and the renewal of educational systems in many countries (Hartley 2005). In most cases, improvements were widespread and objectively evident to a range of stakeholders. However, the top-down implementation meant that the capacity for continuous improvement and adaption was limited.

6.2 NPM and Development from the 1980s Onwards

The approach currently known as NPM emerged and developed from the 1980s onward in the UK and elsewhere in Europe. Underpinned by a set of assumptions in neoliberal economics and related management theories, the innovations arising through this approach focus on organizational forms and processes at the regime level. Examples are executive agencies in the central government, the procurer-provider splits in healthcare, and a customer focus. Policy-driven innovations have created considerable organizational restructuring. The innovative elements are primarily institutional and imitate business processes. The customer focus has led to adaptive transition in some services: in healthcare for instance, users are called customers instead of patients. However, the importance of customer relationships is not appreciated to the extent which is common in the private sector.

The government has remained as "commander," but the managerial focus of NPM reduces the role of other politicians to "commissioners" of services or "announcers" of change (Pollitt and Bouckaert 2004). The public increasingly take on customer roles which give them a voice in the service scope and contents.

6.3   Network Governance

While the benefits of NPM are indisputable compared to the earlier bureaucratic paradigm, the limits of NPM have also become apparent along with the development toward increasingly complex issues, multiple actors, and a need for open dialogue. This has led to the emergence of network governance, in which relationships and partnerships and coproduction are the key concepts (Newman and Clarke 2009). Efficient in-house processes are no more sufficient, but the crucial issue is the empowerment of citizens (Määttä et al. 2014).

In network governance, cross-level innovations occur as a result of both bottom-up and top-down processes. This new paradigm highlights the growing role of self-organizing networks that involve different stakeholders from private, public, and voluntary sectors. Partnerships and networks – which can also involve individual citizens – are increasingly the locus for innovation, because they provide evolutionary advantages for learning in a complex and changing environment (Hartley 2005).

The paradigm of network governance revitalizes the leadership of policy-makers in translating new ideas into new forms of action at the regime level. At the same time, citizens are seen to have a larger role as coproducers of services and innovations.

Healthcare is an illustrative example. At the micro level, so-called integrated care programs have brought to the fore patient support and education, combined with structured clinical follow-up and case management. Multidisciplinary patient care teams, multidisciplinary clinical pathways and feedback, reminders, and education of professionals are concrete ways to implement new ideas.

Integrated care programs are usually based on the so-called chronic care model (CCM), developed to improve the management of chronic illnesses through six cornerstones at the regime level: utilizing community resources, developing health organizations, investing in self-management support, redesigning service delivery, employing decision support for professionals, and utilizing clinical information systems (Määttä et al. 2014). Integrated care programs and CCM are patient-centered in the sense that their focus is on planned, proactive care and they provide support to the patient. Patients are empowered by treating them as experts of their own health and as partners in healthcare, and this is eventually expected to ease economic constrains in the healthcare sector.

6.4 Relevance of the Model

The brief historical review above indicates that innovation is not serially associated with each period. Rather, each paradigm, with its particular set of assumptions about governance and management, engenders and supports particular emphases in innovation.

These arguments are summarized in Fig. 3.6 in terms of Systemic Innovation Model of Service Ecosystem. We can see the paradigmatic shifts as phase transitions at the macro (landscape) level; the three paradigms show the social value/setting of each period. The paradigm is challenged from the lower levels and it adapts as far as possible, but at a certain period, phase transition (a paradigm shift) is generated. While the paradigms refer to a conceptual and abstract social setting, the regime has more "visible" societal characteristics, such as the economy and governance style. The meso level challenges the paradigm and generates phase transition at the macro level, while the macro level regulates the meso level as far as the paradigm is "normal."

A similar relationship could be identified between the meso and micro levels. Because the adaptive transition mechanism is more visible at the micro level, we may observe technological and other enablers that form the basis for the transitions.
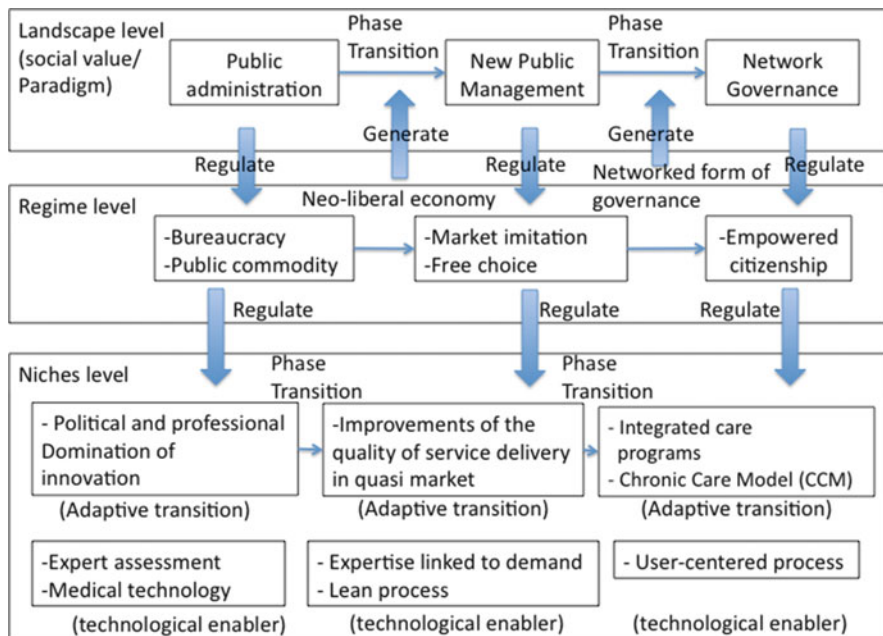

Fig. 3.6 The model applied in paradigm shifts in the public sector (particularly in healthcare)

7   Conclusions

The main insights that we have obtained in our analysis can be described as follows:

1. Value cocreation in service takes a form of a cycle consisting of networking service systems, resource integration, and service exchange. The value cocreation cycle rotates around its axis and at the same time follows a revolution orbit which is an adaptive cycle consisting of the four stages: exploitation, conservation, release, and reorganization. We call the adaptive cycle service ecosystem.
2. We have introduced the concept of phase transition to explain structural changes of a service ecosystem. The adaptive cyclic (transition) view on the ecosystem is a natural way to describe why and how the system is maintained (as analyses of ecosystems in biology have often argued). However, the adaptive transition sometimes breaks down and/or collapses and transfers into a qualitatively different state. A framework including both stability (adaptability) and change is needed for the discussion of viability and sustainability of a service ecosystem.
3. We have integrated Panarchy, a structural and process logic for analysis in systems science, with the Transition Management Theory to argue contents issues. Based on this integrated approach, we have derived a comprehensive model of service innovations, called Systemic Innovation Model of Service Ecosystems. Society, full of various adaptive transitions of service ecosystems, is examined at three levels, i.e., micro, meso, and macro levels. Within each level, a service ecosystem shows a dynamical and adaptive behavior and may sometimes experience phase transition, while between the levels we can observe generation and regulation.
4. Finally, we have illustrated the relevance of our model by examining paradigmatic shifts in the understanding of the nature of the public sector – medical care being a particularly illustrative area. Applying the model in a real context helps to evolve it. The model shown in Fig. 3.5 is a final version at present.

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Chapter 4
Social Innovation and its Relationships with Service and System Innovations

Luis Rubalcaba

Abstract This chapter proposes an analytical framework to understand the relationships between social innovations, service innovations and system innovations. These three concepts can be considered different dimensions of new innovation processes, not alternative but complementary and highly interrelated. Thus, social innovation is defined in connection with service innovation and system innovation. On the other hand, the chapter suggests that the concept of service innovation can be enriched on the basis of the social innovation approach. Starting from this approach, a three-dimensional model is proposed; it analyses social innovation as the outcome of three elements: social goals prevalence (vs. just business goals), social means for complex systemic co-productions (vs. nonsystemic) and service and non-technological innovation outcomes (vs. mainly goods-oriented outcomes).

Keywords Social innovation • Service innovation • System innovation

1 Introduction: Relevance of the Topic

The world is facing major social needs and challenges in which innovations are necessary. Prominent among these needs are ageing population, health and education, changing work and employment opportunities, social exclusion and climate change. These lead us to consider new forms of innovation, as attempts to answer the challenges. Traditional innovation processes have generally been driven by scientific knowledge and technology. Such is the case of R&D, focused on hardware and manufacturing and organized through models that only rarely involve users and consumers. Here, a full advantage is not taken of innovative business models and breakthroughs in the area of social networking. Current innovation processes are much more open: they engage users and various organizations in socio-economic systems. They go beyond the traditional (techno-economic) understanding of innovation and include new practices such as personal fabrication, open innovation, user innovation, design innovation, community innovation,

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crowdsourcing, etc. They have been boosted by the interconnectedness in the current world. Society is changing as a result of globalization and digitalization, allowing consumers, producers, innovators and investors to be connected and interact and empowering individuals to participate actively in society. This has fostered the emergence of three new innovation concepts:

- Service innovation – the necessary complement to traditional technological goods innovations – that allows the creation of new intangibles, and combinations of tangibles and intangibles, to increase growth and welfare in society.
- Social innovation as a new way of generating innovation processes oriented to social goals, with the involvement of social actors; here, different roles and new modes of interaction broaden innovation from the economic domain to social and public domains (OECD 2009).
- System innovation as the way in which organizations and institutions adapt themselves to promote and facilitate new comprehensive solutions to the societal challenges.

These three concepts represent different angles to innovation in an interrelated way. They all consider social organizations as well as product and process innovations in a wide context. They take into account the role of voluntary groups, third sector organizations, public institutions and private businesses to understand innovation in user-led markets and in non-marketed goods and services. Moreover, when we examine deeply one of the three, we arrive at the other two. For example, the ability to innovate in ways that deliver better services and social welfare coincides with the growing demand of citizens to be actors in their lives and to be enabled to find collective solutions to the social issues they encounter. In service innovations, one finds sooner or later need for social innovations in order to engage participants in co-production. And as co-production often requires the participation of institutions, the service and social innovations also require system innovations.

The relationship between service innovations, social innovations and system innovations is an important topic to advanced economies due to three factors: (1) the interrelations between the growth in services and the structural and systemic changes in national economies, (2) the role of service innovation in social innovation (most social innovations are leading to new or improved services), and (3) the need for articulating the participation of society in innovation processes both at micro level (services) and institutional level (systems). In particular, the emergence of service economies is changing the structures of social and economic systems. Service innovations (reckoning that a high proportion of them involve new technologies, e.g. ICT) have demonstrated a high impact on society. Empirical evidence shows that services are core areas in health care, education and training, energy and environment, workforce development and (e-)government. Innovative services are identified as a means to efficiently confront, manage and meet social needs linked to broad challenges. They facilitate, support, motivate and induce a sustainable, smart and inclusive socio-economic development. User-driven service innovation can be considered a part of social innovation since it makes social agents as coactors of innovation and because it is often linked to social (public) goals. Social innovation

is largely about inclusion of people and communities in economic growth and welfare.

Some examples of major societal challenges illustrate the interrelations. *Fighting against unemployment* – especially youth unemployment and generational worklessness – requires leveraging skills and encouraging lifelong learning opportunities. It requires changes in the educational and labour market systems and innovations in human resources, training and relocation and job-seeking services. Managing *the climate change* (whose costs and devastation are enormous) requires new sources of energy, new infrastructures, new working patterns, new methods of production and distribution, new forms of interaction and new behaviours and beliefs. Here, system innovations are needed, and they may also promote innovation in energy services. *Ageing population* is a major issue (by 2020, 25 % of the population will be over 60 and the 80+ population is expected to double before 2050), which will lead to an increase of costs linked to pensions, social security, health and long-term care (by 4–8 % of GDP by 2025). System innovations together with service innovations are again needed to produce better services at reduced costs (e.g. ambulatory surgery). Another issue is *social exclusion* (*and isolation*) due to ageing, poverty and/or cultural diversity. It implies an inability to participate in society on a level that the majority takes for granted. Avoiding it requires service innovations and changes in institutions to provide better access to services and opportunities for learning and inclusion. Challenges in the public sector – growing social needs combined with budgetary constraints – call for innovative, radically new and transparent *public service models*, with new institutional arrangements between public, private and the third sector agents.

This chapter studies the relationships between social innovations, service innovations and system innovations by analysing social innovation from a service perspective and by bringing the role of system innovations to the fore.

2 The Concept and Definition of Social Innovation

There are many definitions on social innovation related to different conceptions and perspectives. Pol and Ville (2009) pointed out the problems of the fuzzy use of the term. They identified four types of definitions related to the role of social innovation in:

  i. Institutional change (changes in cultural, normative or regulatory structures – e.g. Heiskala 2007)
 ii. Social purposes (new ideas that work in meeting social goals – e.g. Mulgan et al. 2007)
iii. Public good (new ideas that resolve existing social, cultural, economic and environmental challenges for the benefit of the people and planet – e.g. Centre for Social Innovation 2008)

iv. The needs not tackled by the markets (new answers to social problems by identifying and delivering new services that improve the quality of life of individuals and communities – e.g. OECD Forum on Social Innovation 2000)

Pol and Ville (2009, p. 882) also proposed their own definition on social innovations. They refer to "desirable social innovations based on the creation of new ideas displaying a positive impact on the quantity and/or quality of life".

Another definition is provided in the edited book on social innovation, by Ruiz-Viñals (2013, p. 4): "The term 'social innovation' refers to the design, implementation and diffusion of new social practice and public policies to promote change in the social organisation of people to achieve economic ends". The focus of this definition is on practices and policies. Social innovation is not related to the creation of radically new things, but to a new vision of the things present in our practices; this new vision further involves generating new, more efficient processes. Hochgerner (2013) defines social innovation as a new combination of social practices. This definition is compatible with the social innovation dimension existing in traditional technological innovation and takes into account the fact that social innovations are also created by businesses. Deviating from Pol and Ville (2009), who explore the differences between business innovation and social innovation, Hochgerner (2013) and Howaldt and Jacobsen (2010) consider social innovation as just an extension of the innovation concept itself. According to them, this extension reflects a way towards a new innovation paradigm through a revitalization of the social aspects involved in any kind of innovation. The definition of social innovation as a new combination and/or new configuration of social practices focuses on certain areas of action or social contexts prompted by certain actors or constellations of actors in an intentional targeted manner with the goal of better satisfying needs or answering problems. The concept of "practices" is usually linked to sociological literature, while economic literature uses the concepts like "ideas", "services" or new "systemic" transformations.

According to Pyka and Hanusch (2013), social innovation is a crucial driver of well-being, welfare and social progress. The empowerment of individuals and the broadening of their choices are core issues here (Sen 1999; Stiglitz et al. 2009). Innovation can improve the choices and capabilities of individuals through a varied set of channels. This is a central characteristic of business innovation, too, but a certain rethinking of the neo-Schumpeterian model should be adopted in the context of social innovation. This rethinking includes the following elements – proposed under the Comprehensive Neo-Schumpeterian Economics (Pyka and Hanusch 2013):

• Product innovation and the diversification of economic structures, leading to a larger number of differentiated choices for consumption and employment and hence expanding the standard of living.
• Process and organizational innovation fostering the efficiency of productive processes and hence allowing the provision of goods and services at lower prices, making them achievable to more people.

- Pure social innovation directly addressing societal challenges and needs (e.g. in education, health care and in the prevention of social exclusion). The main purpose of social innovation (and social entrepreneurs) is the empowerment of other individuals for the increase of well-being and social welfare of the society. An important goal is to expand the choices and capabilities of individuals to be active agents. The expansion of choices takes place via better coordination and network access (e.g. through ICT) and via the promotion of the individuals' capabilities (throughout educational and health innovation).

The diversity of definitions and approaches shows a certain ambiguity in the use of the term and a certain relationship with the background and discipline supporting each concept. However, some definitions point out a common denominator in the social innovation approaches: the role of social ends and social means and the linkages between them. Social innovations are innovations that are social in both their ends and their means. Following Stiglitz (2008), social innovation can be defined as new responses to pressing social demands, which affect the process of social interactions. The aim is improving human well-being. BEPA/Hubert (2010) provides a guiding heuristic in slightly different words: social innovations are social in both their processes and in their outcomes. This view differs noticeably from traditional models of technological novelties as the major criterion of innovation – new products, processes, marketing or organizational measures – and their diffusion and success in markets. Because the *prime* objective of social innovations is not a commercial one (though social innovations may lead to economic returns, too), success in markets does not suffice. What is required is acceptance and utilization of new social ideas, applied as superior social practices in relevant social environments. Social innovation is about new ideas (products, services and models) and practices (roles, norms, values, organizations) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. In other words, they are innovations that are not only good for society but also enhance society's capacity to act. Social innovation includes *a process of social interactions* between individual citizens and organizations, i.e. it is participative. It involves a spectrum of actors and stakeholders who have a vested interest in solving a social problem and aim to empower the beneficiaries (Hochgerner 2009; Pol and Ville 2009).

To some extent, social innovation is the result of the broadening of the innovation concept to include social change produced by social action. But there are also social changes and social actions that do not lead to a social innovation. The distinction between innovation and change is fully applicable in the case of social innovation and social change, too. Changes should be based on new ideas that are deliberate, repetitive and addressed to a particular social "market" to benefit a target group. As stated by Hochgerner (2013): since technical inventions are considered innovations only when they land on the market and are distributed as products and techniques, social innovations must sustainably benefit target groups.

Social innovation is not the only way in which the innovation concept has been enlarged. There are other concepts that are also the result of the same broadening

process and are connected to social innovation. Service innovation has been a key research area in this respect and emphasizes the role of interactions, co-innovation and value co-creation in particular. System innovation is another way of broadening the concept of innovation towards the full engagement of institutions.

3 Social Innovation and the Place of Service Innovation and System Innovation

3.1 The Role of Service Innovation in Social Innovation

Some of the definitions of social innovation include services just as one possible outcome. For example, the Tepsie (2013) project defines social innovations as new solutions (products, services, models, processes, etc.) that simultaneously meet a social need and lead to new or improved capabilities and relationships and better use of assets and resources. In other words, social innovations are both good for society and enhance society's capacity to act. In this definition, the main characteristics of social innovation are *novelty* (social innovations are new to the field, sector, region, market or user, or they are applied in a new way), *implementation* (social innovations describe the implementation and application of new ideas, rather than just the development of new ideas), *meeting social needs* (social innovations are explicitly designed to meet a recognized social need), *effectiveness* (social innovations are more effective than existing solutions) and *empowerment* (social innovations empower beneficiaries by creating new roles and relationships and by developing assets and capabilities and/or better use of assets and resources). In this picture, services are just one possibility among others that include products, models and processes.

The point that service can be considered as a part of any product, any process and any model is particularly visible in the approach of the service-dominant logic, in which all products are valued by the service function they incorporate (Vargo and Lusch 2004, 2008). In this context, service can also be regarded as a dimension of any social innovation: of its nature and outcome. This is the line adopted by international policy organizations that have defined the concept of social innovation. The OECD LEED Forum on Social Innovation (2000, www.oecd.org/cfe/leed/forum/socialinnovations) stated that "Social innovators identify and deliver new services that improve the quality of life of individuals and communities, using innovative processes aiming for instance at new labour market integration, social inclusion, finding new ways to address health care, education delivery, resource efficiency and environmental challenges". This definition has also been adopted by the EU Commission (2011) in the following form: social innovation "seeks new answers to social problems by: identifying and delivering new services that improve the quality of life of individuals and communities; identifying and implementing new labour market integration processes, new competencies, new

jobs, and new forms of participation, as diverse elements that each contribute to improving the position of individuals in the workforce". In both definitions, services are seen as the outcome of social innovations, which is somewhat surprising given the fact that services are generally not included in the definitions of social innovation or they are considered just a part of them, among many other outputs such as goods, practices, behaviours, etc. This is clearly visible, not only in the extensive survey on social innovation produced by the Tepsie (2013) project but also in the social change and systemic approach by Howaldt and Schwarz (2010) and in the evolutionary perspective by Reinstaller (2013). Services have a minor or no role in most of social innovation literature. This means that the emphasis on services in the OECD and EU definitions is an exception, rather than a rule.

The difference between the service-oriented definitions of international institutions and the service-neglecting definitions of social innovation scholars can be explained by the fuzzy and ambiguous nature of the concept itself. This became clear in the previous summary (Pol and Ville 2009), which also showed another reason: the relative newness of the research area on social innovation. As this research is only beginning, a detailed and generally accepted definition for the concept is difficult to find. Researchers have, however, quite unanimously stated that the distinctive feature of social innovation is not the content but the nature of the innovation process: the goals and the actors involved. The type of service resulting from social innovation cannot always be distinguished from the services created by public or private enterprises in the market sector. It has been highlighted that innovative solutions in this context are sought for a wide range of issues, representing different realms of society: the labour market, education, health, housing, etc. (Moulaert et al. 2005, 2013). Their common characteristic is that they concern complex economic and social problems with three components: (1) the satisfaction of human needs that are presently unmet, (2) changes in social relations, and (3) an empowerment dimension in the form of increasing sociopolitical capability and access to resources. The outcomes of innovation usually arise in the form of a service innovation which benefits the members of a community or the whole community (Harrison et al. 2010), but this is not necessarily the case. A different approach is suggested by Heinze and Naegele (2010) who regard services as a driver for social innovations: the growing importance of the service sector and the social services create demand for expanding the meaning of innovation to include the reconfiguration of social arrangements.

3.2 The Role of Social Innovation in Service Innovation

In addition to the parallel development of the literatures on service innovation and social innovation, there are examples of interconnections. Djellal and Gallouj (2011) describe the issue of how "social" elements are present in the service innovation literature. The first example is Gershuny's vision (1978; 1983; Gershuny and Miles 1983) of social innovation as the transition from formal to informal

satisfaction. This vision is heavily technologically oriented: services are replaced by technological goods in a self-service society. The second example includes a wider and genuinely social view on service innovation and was presented by Normann (1984): he highlighted innovation that creates new types of social behaviour, uses social or human energy more efficiently and is linked to social contexts in a new way. The third example is the characteristics-based approach in the context of multi-agent frameworks (Gallouj and Weinstein 1997; Windrum and Garcia-Goñi 2008).

Harrison et al. (2010) have created an explicit link between service innovation and social innovation. They consider that the term "social" used in "social innovation" allows different interpretations and opens up several approaches in relation to services and service innovation. Other authors have explored the relationship between social innovation and service innovation in particular services areas. Greenhalgh et al. (2004), for instance, provide a systematic overview on the scientific discussion concerning innovation in health care. They define service innovation in this context "as a novel set of behaviors, routines, and ways of working that are directed at improving health outcomes, administrative efficiency, cost effectiveness or user's experience and that are implemented by planned and coordinated action" (Greenhalgh et al. 2004, p. 1).

Social innovation can also be regarded as a particular case of service innovation. This is possible when the service dimension of every social innovation is considered, and service innovation is analysed in a three-dimensional framework proposed by Rubalcaba et al. (2012). Figure 4.1 illustrates this framework, which consists of innovation in service sectors, service innovation in any kind of business and services as multi-agent co-productions. The first dimension represents the wide literature on innovation in specific services. The second dimension covers most of the management and marketing approaches to service innovation. These approaches include both the views which examine service as a dimension of any kind of innovation and the views which analyse new service experiences by using various elements: a new service concept, a new customer interaction, a new value system/business partners, a new revenue model and a new organizational or technological service delivery system (den Hertog 2010). The third dimension is based on the multi-agent perspective on service innovation (Gallouj 2002; Windrum and Garcia Goñi 2008). It can be considered a framework of social innovation if the agent dimension and the activity dimension are linked together. The activity dimension in the multi-agent framework highlights the non-technological aspects of innovation (Gallouj 2002; Djellal and Gallouj 2011), leading to the inclusion of social issues and social actors in the development of new services. Empowerment has always been an important element here (Sundbo 1996; Gallouj and Djellal 2010) and is particularly relevant for the relationship between services and development (Rubalcaba 2015). The multidisciplinary nature of service innovation studies is an additional reason that justifies the inclusion of social aspects: the approaches include general service theories, general innovation theories and theories linked to new service development and innovation management (Toivonen and
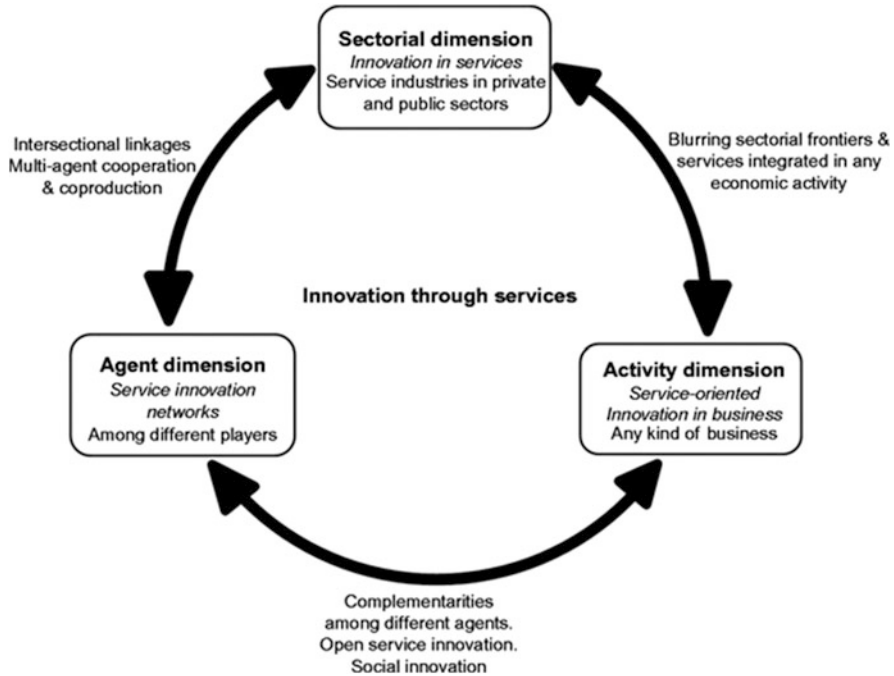
Fig. 4.1 Three dimensions of innovation through services (Source: Rubalcaba et al. (2012) Reproduced under the permission of the *Journal of Service Management*)

Tuominen 2009). This multiplicity is also related to the so-called tertiarization of innovation studies (Miles 2002).

3.3 Relationships Between System Innovation and Social Innovation

Many social innovations happen at a limited and small scale affecting the life of a particular community. Examples include programmes to avoid social exclusion in villages or new educational approaches in schools. However, there are also large-scale social innovations that require a systemic approach. Thus, a comprehensive definition of social innovation highlights that it is a complex, multifaceted phenomenon that spans a wide range of activities. The first group of activities include *grassroots initiatives* which respond pressing social demands not tackled commercially (due to market failure). The second group of activities takes place in the private, public and third sector organizations (or in their combinations) and results in *novel products and services*. The third group consists of new *combinations of social practices*, *attitudes and values*, and the fourth group involves *systemic innovations* meaning fundamental changes in strategies and policies, organizational

structures and institutional frameworks. In this definition, systemic innovation is like the final stage of social innovation, where the whole society and its institutions are moving in a certain innovative direction.

This can also be seen in the BEPA/Hubert (2010) definition of social innovation as a tension between social ends and social means. She proposes *three complementary approaches to the social dimension of social innovation*, the third of which is linked to systemic changes. The first approach includes the perspective of *social demand*; this narrow interpretation of "social" suggests the social dimension as complementary to the economic or business dimension. "Social" refers to the needs of those groups, communities or segments of society which are more vulnerable and less able to be involved or benefit from the value generated by the market economy. The second approach focuses on the perspective of *societal challenge*, adding a new dimension to the economic output: this broader view suggests that the creation of well-being should be valued in order to foster sustainable development. In a sense, the boundary between the social and economic domains blurs, and the "social" becomes an opportunity, rather than a constraint, to generate value. In other words, instead of complementing economic innovation with a social dimension, this view aims at "reforming" its very meaning. Here, innovation is seen as a process that should tackle "societal challenges" through new forms of relations between social actors. The third approach is the perspective of *systemic changes*, focusing on the ultimate objective of social innovation: sustainable systemic change to be reached through a process of organizational development and changes in relations between institutions and stakeholders. The processes of empowering, learning and networking are central, and the outcomes are improvements in the way people live and work. In a sense, the outcome of social innovation is reshaping society itself. Here, the social dimension of innovation relates to changes in fundamental attitudes and values, strategies and policies, organizational structures and processes, delivery systems and services, methods and ways of working and responsibilities and tasks of institutions. Also linkages between the areas of change and between different types of actors should be included.

The relationship between social innovation and system innovation can also be seen as a result of the co-innovation trends in businesses and in business-research linkages, towards collective value creation in society. Co-innovation beyond the business-to-business or business-to-research relationships and systems matters. Companies, technical schools and research institutes are not the only relevant agents in the process of innovation. Citizens and customers no longer serve as mere suppliers of information about their needs (as in the traditional innovation management), but they can make more direct contributions to the process of developing new products and processes to resolve problems. Terms and concepts like "user-driven innovation" (von Hippel 1986, 2005), "user-based innovation" (Sundbo and Toivonen 2011) and "open innovation" (Chesbrough 2003, 2011) reflect this development.

Summarizing, co-innovation in the context of social innovation can be seen as an innovation process which is based on co-production and value co-creation but goes beyond the businesses and customers. Business processes are generally bilateral or

Table 4.1 Relationships between open innovation and social and system innovation

	Open innovation	Social and system innovations
Focus of innovation/innovation outcome	Product and technology dominant	Social and systemic innovations are usually intangible in nature and often manifest themselves in service innovations
Innovation process	Applies the traditional stage-gate model enriched with the knowledge flows outside the organizational boundaries. Focus on inputs and outputs	Systemic and multifaceted; characterized by after-innovation and rapid application of small-scale pilots. Innovation process a key focus area
Actors involved	Mainly businesses and commercial markets	Private, public and third sector organizations, individual citizens and their communities
IP management	Strong IP protection enabling patents, licencing, technology-based acquisitions, joint ventures and non-equity R&D investments	Free access to knowledge, Creative Commons licencing (e.g. Cheliotis 2009), extensive publishing of knowledge

Source: Kuusisto and Vänskä (2012)

plurilateral between firms and clients; they are neither multilateral nor systemic from the societal perspective, and their goals are not necessarily social. The concept of social innovation can be seen as an extension and a step further towards the openness of society. The concept of open innovation alone is not enough because – even if multilateral interactions are possible and many agents may be involved – it is restricted within the frontiers of a particular market. Open innovation is generally a business and market concept, while social innovation is more systemic, referring to a wider context that may include the markets or not. The third sector, for example, has a major role in social innovations. Table 4.1 presents some of the key differences between open innovation and social innovation.

The relationship between system innovations and social innovations can also be approached from the perspectives of innovation networks and public management. The central role of networks in social innovations depicts their interlinkage with system innovations. A system innovation can be defined as *a new operational model*, *which is based on the simultaneous development of organizations*, *technologies*, *services and multiple network and partner relationships* – often in a situation where different interest groups have contradictory demands (Saranummi et al. 2005). An important characteristic of system innovations is that the novelty is not restricted to the ways of operating, but *also the ways to interact with other actors and knowledge sources are new* (Kokkinen et al. 2011). This aspect points out the multiplicity of the forms of knowledge included in innovation: "knowing who" is essential besides "knowing what" and "knowing how" (cf. Lundvall and Johnson 1994). According to Windrum (2008), system innovations have much in common with "conceptual innovation": they question the existing assumptions and knowledge that maintain current services, processes and organizations.

Several researchers have highlighted the *complexity* of social and system innovations, which is due to the fundamental changes required (Toivonen et al. 2012). These changes concern delivery systems and services, organizational structures and processes, attitudes and values, strategies and policies. The change of values has been emphasized in particular. Harrison et al. (2010) identify three dimensions in social and system innovations: (1) social dimension (strengthening the social links), (2) economic dimension (producing wealth) and (3) political dimension (demand-based actions and the democratization of socio-economic life). These dimensions can be crystallized into the requirements of valid empowerment, effective services and legitimate governance. The challenging nature of social and systems innovations becomes apparent when their preconditions are recognized. They require the growth of non-governmental organizations, new values and beliefs in civil society (participation, autonomy and empowerment), the presence of strong networks and social movements and the existence of institutions that can diffuse innovations.

An important source of complexity is the dual structure that is inherent in all social systems: they include an informal, loosely coupled interaction structure among people and a formal management structure which expresses the official goals, norms and values of the system (Giddens 1987). Social innovations require interaction between these two systems and are challenging from the viewpoint of governance and management as they include ambiguous, even contradictory features. They encompass initiatives to promote social cohesion but also movements protesting against the established order. They need managerialist approaches in order to result in efficient and effective services, but they also need approaches that emphasize grassroots initiatives (Harrison et al. 2010).

Currently, there is an ongoing change in the intervention strategies of public management which reconstructs its responses to economic and social crises, weakened social links and the challenges of the welfare state (Harrison et al. 2010). The need to foster learning and innovation in a changing environment has led to the development of new organizing principles in public administration that now evolve in parallel with bureaucracy and market imitating views of "customership". Several researchers refer to a shift from "government" towards "governance": the rise of networks and partnerships, innovations in democratic practice and the development of co-production as a service model. Hierarchically organized, unitary systems that govern by means of law, rule and order are replaced to some extent with horizontally organized and relatively fragmented systems that govern through the regulation of self-regulating networks (Newman and Clarke 2009; Sørensen 2002).

All this means that social and system innovations do not emerge without policy measures and governance structures that support their creation. In addition, there is urgent demand for the development of practices of innovation management for social and system innovations. Innovation management is equally important in this context as in the context of market-based innovations, and its practices can be either top-down or bottom-up. Kokkinen et al. (2011) identify three main ways in which social and system innovations can be managed on the basis of top-down principle: regulation-based management, management via the allocation of resources and delegation of decision power and political management. Typically, all of these

factors function today as both driving forces and hindering factors of innovation, depending on the specific situation. In the bottom-up management, the authors highlight user- and demand-driven practices and the fostering of open innovation. Regarding the practical models, the collaboration (or the lack of collaboration) across sectors and professions is a key question. Another important question concerns operational practices, among which difficulties in the utilization of expertise and the inefficient service management are typical problems.

4 Shaping Social Innovation from the Service Perspective[1]

Previous sections have shown that social innovation can be defined as new innovative solutions or new innovative practices which tackle societal challenges (social goals) and are based on new participatory and citizen-empowering processes (social means). Services and service innovations can be identified in four areas of social innovations: the innovative solutions are often service solutions (new or improved services), the societal challenges are often in the area of services (health, education, social services, etc.), the participatory processes often include service co-innovation, and the inputs for social innovation are often based on the use of knowledge-intensive services and service intangibles. In the following, these phenomena are discussed in more detail.

- *Services as outcomes of social innovation.* Social innovators identify and deliver new services that improve the quality of life of individuals and communities. Innovative processes are used for labour market integration, social inclusion, new ways to address health issues, educational purposes, resource efficiency and environmental protection, among others. Services as the outcome of social innovation have been recognized by some international organizations like the OECD and the EU Commission, as previously stated.
- *Services as areas where social innovations take place.* Most prominent examples of social innovation have taken place in health (e.g. preventive treatment), education (e.g. new pedagogic techniques), financial services (e.g. microfinance, mobile banking, financial inclusion), ICT services (services based on social networks), tourism (e.g. rural tourism initiatives), social services (e.g. innovations for inclusion), environmental services (e.g. smart cities) and energy and water supply (e.g. innovations based on inclusive technology). These areas are either purely services or include a strong service component.
- *Service co-production as the means for social innovation.* The participatory processes characterizing social innovation require a certain level of service co-production and co-innovation. Users are co-producers of service innovations

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[1] This section is based on the author's contribution to the paper: Rubalcaba et al. (2014)'s "Service innovation and social innovation: An analytical framework and its application to health services", *Proceedings of the 5th AHFE Conference*, *19–23 July 2014*, 623–636.

– thus, engagement orientation is inherent in the creation and improvement of service solutions to the societal challenges.

- *Services as inputs for social innovation*. Service innovation can be considered a dimension behind any social innovation process. Service dynamics are those creating transformations in economic and social life in any sector (within agriculture, manufacturing, market services and non-market services). Knowledge-intensive services (KIS) often play a facilitating role in the creation and implementation of social innovations, since even a basic social innovation requires a certain level of knowledge- and service-based skills. These KIS are not only business-oriented facilitators (KIBS) but also include KIS in the third sector and other parts of society.

All categories presented above follow the idea that social innovation includes novel service-based solutions to social problems. These solutions are more effective, efficient, sustainable or fair than existing solutions, and the value created accrues primarily to society as a whole. Societal needs and challenges require new or improved services that are at the forefront of social innovation.

Figure 4.2 presents the interrelations of service and social innovations on the basis of the role played by citizens and organizations. In the first phase of the cycle, citizens and organizations are a subject of action, causing an event in an object within the surrounding environment, the event being a social innovation. This social innovation commonly occurs in the form of a service and can take place in the governmental sphere (in areas such as health care or schools), in the business sector or in the third (non-profit) sector. As the subject of action, citizens play a
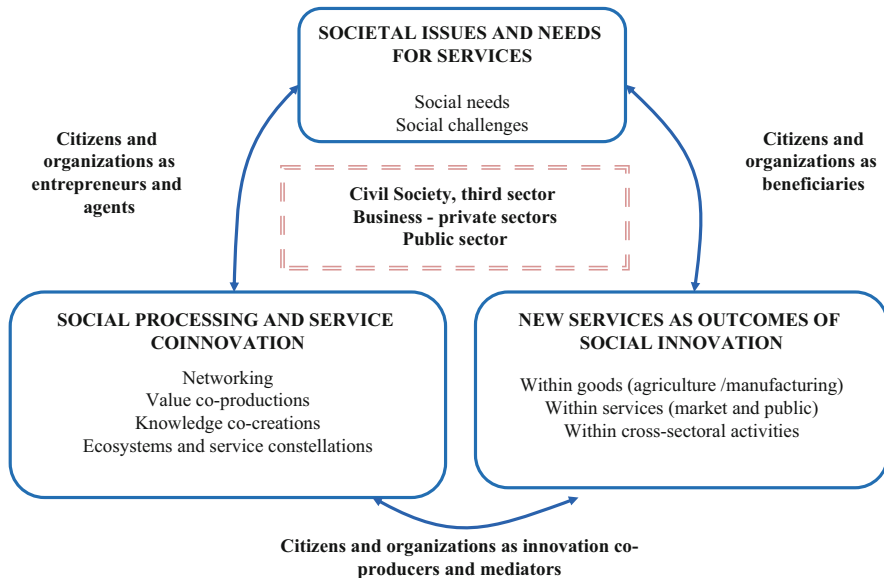

Fig. 4.2 Services in social innovation

fundamental role as producers of social innovation. They are social innovators or social entrepreneurs, working at the crossroad of market, state and civil society and often receiving considerable input from the public sector and the third sector. In order to find an answer to an unsolved societal issue, social agents and entrepreneurs aim at identifying and delivering new solutions within the system, pursuing the improvement in the quality of life of individuals and communities. While meeting social needs and tackling societal challenges, social innovations empower people and create new social relationships and models of collaboration. Cross-sectorial collaborative approaches, which favour cooperation between the public, private and third sectors, facilitate the emergence of effective responses to social needs and challenges.

Once a new solution (social innovation) emerges in the form of services within the socio-economic system, civil society is integrated in the innovation process, and the role of users comes to the fore. Here, again, citizens are active actors and innovators – not passive consumers of new services. The concept of co-innovation emphasizes the importance of customer-producer interactions in innovation activities. Typically, citizens and organizations participate in developing innovations without a profit motivation as their main target. They serve as a medium (mediator) to achieve a result or to transfer information in order to improve existing services or organizational forms. Users act in the role of principal social innovators for the benefit of civil society and contribute directly to welfare. Finally, in the last phase of the cycle, citizens and their well-being become the object of their own innovation developments, as service innovations aim at overcoming societal issues that civil society is and will be facing. The improvement of future standards of living is the result of service innovations, and citizens and organizations are beneficiaries of those innovative solutions.

The activities and actors involved show the multifaceted nature of social innovations, but first and foremost they reveal the specificities of these innovations: the interactions taking place *comprise much more than a traditional service relationship*. The sources and goals of innovation are more diverse, and the participation of actors often includes some voluntary elements (combined with commitment). Social innovations may (1) emerge at the grassroots level among individual citizens who respond to pressing social problems; (2) be produced by private, public and third sector organizations separately or in cooperation; or (3) result in fundamental changes at the societal and policy level. Research in these three areas has focused on the following topics, respectively: the empowerment of citizens and stakeholders, public-private partnerships and the so-called social economy and the governance and management of social and system innovations. The social economy consists of non-profit organizations (NPOs), cooperatives and associations, social entrepreneurs and of partnerships between the public and third sectors. Social innovations may be produced either autonomously by the third sector, with the state support or in a partnership with it. In the partnerships, the role of the actors of the third sector may vary from that of a subcontractor to common design and implementation of social policies with the public stakeholders (Harrison

et al. 2010). Public-private service innovation networks as such can be considered social innovation to some extent (Gallouj et al. 2013).

4.1 Similarities and Dissimilarities

The previous section has shown a clear relationship between service innovations and social innovations. There are plenty of similarities, both in the *goals* (due to the social dimension of services) and in the *means* (multiplicity of agents, co-productions). There are also similarities in the *nature*, since both types of innovations share intangibility-invisibility, interactivity and *policy issues* (appropriation issues beyond the traditional patents system and the lack of adequacy in public support policies). The similarities between service innovations and social innovations are mainly in the process side of innovations, as a case study in the health sector in Finland shows (Hyytinen et al. 2013). Social and service innovations coincide when talking about co-creation and co-innovation among different actors, although there may be different means to contribute to a systemic change in health organizations (Fig. 4.3).

However, there are also differences and not every service innovation is a social innovation and vice versa. Most service innovations are created by firms seeking for a business profit regardless of the social component of the innovative activities. Further, these innovations do not typically engage the society, only some customers in the most interactive cases – thus, they cannot be considered social innovations. On the other hand, there are also social innovations based on technological
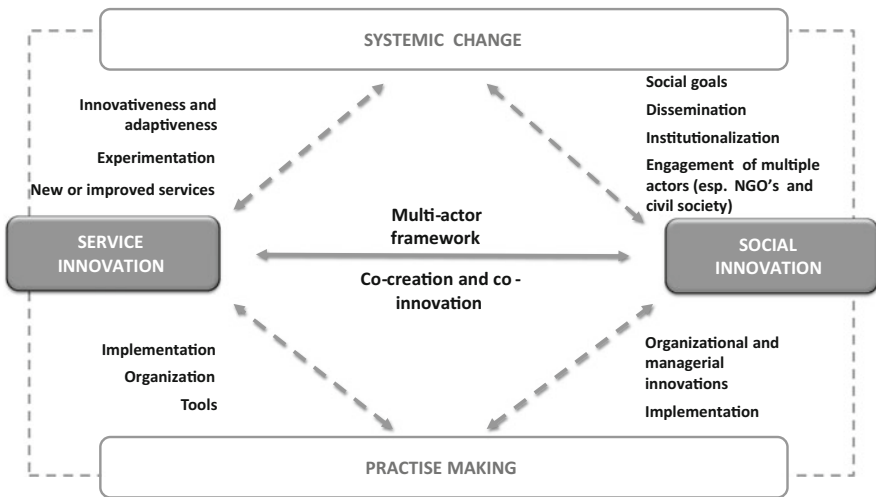

Fig. 4.3 Service innovation and social innovation in a health case study (Source: Hyytinen et al. (2013))

development (affordable technologies for inclusive innovation) that cannot be considered service innovations since they are goods-oriented. In addition, there are new social practices that do not lead to any particular new or improved service. However, in evolutionary terms, service innovations are becoming more multi-agent and multilateral. They take on board a wider spectrum of society and are oriented to social goals, which means that they are moving towards social innovations. And social innovations seek to be more and more professionally oriented, developing a wider range of services as an outcome.

4.2 Towards a Definition of Social Innovation from the Service Perspective

Given the previous analysis, social innovation can be redefined from the service perspective. To do this, the aforementioned relationships form the starting point: societal challenges can be addressed with new or improved services; social goals in a target community can be pursued in such a way that a social innovation is simultaneously a service innovation; and social means can be fostered via co-innovation and networking. Services are also linked to the collective co-creation of knowledge and social values in innovation and customer co-creation. In addition, empowerment is a key issue to reinforce service capabilities, and the perspective of systemic change is needed in order to understand those interactions between institutions and stakeholders that are based on a new service culture and management. Relying on these notions and taking into account the need for simplicity, social innovation can be defined as "new service solutions to societal challenges, aiming to increase welfare by coproducing the creation and implementation of new knowledge among a multiplicity of empowered actors".

5 A Three-Dimensional Model for Social, Service and System Innovations

This section integrates the previous observations into a three-dimensional model which shows the similarities and differences between social innovations, service innovations and system innovations. For clarity reasons, the model will be presented as a double two-dimensional model: social innovation vs. service innovations and social innovations vs. system innovations.

The innovation models focusing on interaction between the public, private and third sectors (Gallouj et al. 2013) are good examples of multi-agent models that analyse service innovation against social innovation. The opposite is also possible: to characterize social innovation from the perspective of service innovation, as the previous sections have shown. Merging the two concepts enables the creation of the

concept "socio-service innovation", which includes those social innovations that can also be considered service innovations and vice versa. The main problem in the application of this concept is specifying the extent to which a service innovation is social or not. *An important question is to clarify whether "social" is opposite to "business" or not.* Some scholars, who regard social innovation as a dimension of any innovation, see it as opposite to business innovations but interrelated with them. This would mean that all economic initiatives have these two dimensions (Harrinson et al. 2010). It is also possible to understand service innovations as a "new option for acting" (Jacobsen and Jostmeier 2010, p. 220). In this perspective, also social innovation could be "related to commercial services where the acting of corresponding service innovations is not based on companies broadly and unidirectionally reaching into the users' environments". This approach would foster "new possibilities to better understand the process of tertiarization and processes of service innovation" (ibid., p. 232).

There is a common agreement on the fact that social innovations have a social goal. The goal of business innovations is not equally clear. However, seeing business innovations and social innovations as opposites is questionable simply because some social innovations produce profits and private enterprises can also develop social innovations. In order to clarify the situation, Djellal and Gallouj (2011) have developed a revision of innovation types. Based on the distinction by Hochgerner (2009) between technological innovations (products and processes), non-technological innovations (organization and marketing) and social innovations (participation, procedures and behaviours), they propose a new typology. They suggest that firms focus on all three types of innovations while civil society is more related to social innovations (Table 4.2).

Djellal and Gallouj (2011) argue that business innovations are not independent of social innovation, while social innovation does not need business innovations. Excluding the initiatives on corporate social responsibility, some of which may be linked to social innovation, businesses create social innovations mainly regarding new forms of work organization (Cloutier 2003). Thus, firms understand social innovation in terms of process and organizational innovation in the first place. However, these social innovations are often open in nature: they tend to be go beyond the internal organization of the firm and include the relationship with customers. The more advanced innovations are in businesses, the more societal issues and stakeholders are taken into account. Business innovations have traditionally focused on market-oriented innovations, but recently the situation has

Table 4.2 Typology of social innovations

Business innovations	Technological innovations and non-technological innovations
Social innovation in businesses	Innovation in participation, procedures and behaviours
Social innovation in civil society and state	Innovation in participation, procedures and behaviours

(Based on Djellal and Gallouj 2011)

changed, especially in services, along with the involvement of final customers/users in the processes. Social innovation represents a further step in the evolution: instead of markets or individual customers/users as the main reference, the whole society (represented by new agents like those from the third sector) is taken into account. This evolution is shown in Fig. 4.4.

The evolution means that social innovation in the business context cannot be restricted to organizational changes or to innovative solutions regarding corporate social responsibility. Social goals and social procedures are increasingly penetrating into the main activity of firms. Sometimes, social goals are already as important as business goals, and innovative interactions may combine internal resources, external sources for innovation and social relationships.

Figure 4.5 shows examples of social innovations that take place in the services area. It also covers social innovations in businesses. Given the fact that almost every business activity has a social dimension and many social activities also have business dimensions, innovation activities inevitably combine socials goals and

Fig. 4.4 The evolution of societal reference for business innovation
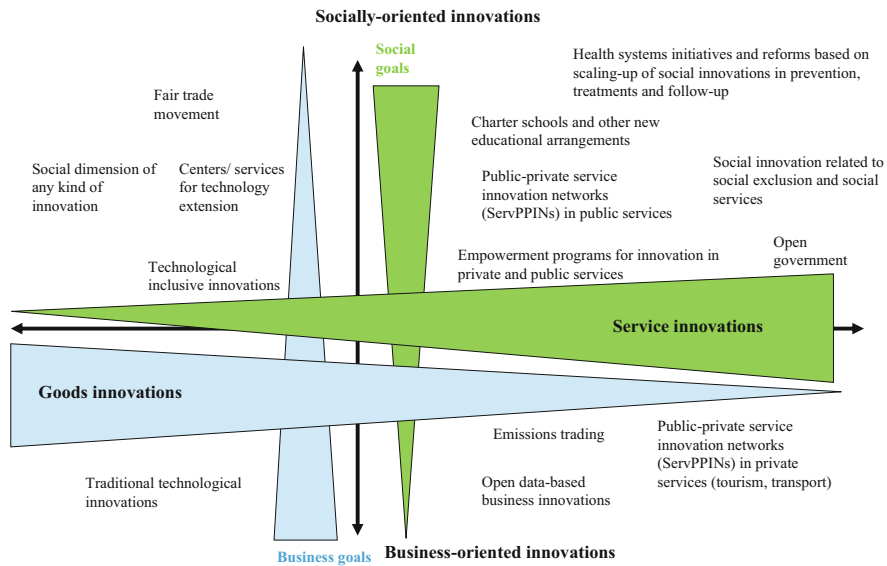

Fig. 4.5 Social innovation vs. service innovation: some examples

business goals. For example, public-private innovation networks in services can be considered genuine social innovations if the third sector is involved and has a central role, even if there are important business goals as well. Companies can do business in the field of social innovations together with agents who have social goals and non-profit aims. In principle, social innovation refers to those innovations where the social aspects prevail over the business ones – however, defining this in practice is not an easy task.

As regards services, the integration with goods is a growing trend; there are very few "pure" services. However, the degree of the service content varies: some products have multiple service elements and intangibility is characteristic of them, while others are mainly material. Irrespective of these variations, all kinds of goods produce service value for consumers and society. In this sense, all innovations can be considered service innovations, as is proposed by the service-dominant logic (Vargo and Lusch 2004) and other theories on value co-creation in service systems and constellations. Service co-production is social co-production, given the fact that the involvement of more than one agent is requested (e.g. there is co-production even in R&D laboratories). Yet, some innovations are mainly service oriented with little importance given to the final physical product supporting it. Thus, a distinction between service innovation and goods innovation still makes sense, and differences between innovation in goods and in services have been empirically demonstrated (Rubalcaba et al. 2010). Examples of social innovations in services can be placed in this context.

Traditional science- and R&D-based innovation is generally goods and business oriented, even if there are social components and service components, too. However, this innovation type does not address social and service goals by social and service means as its main target. Some technological inclusive innovations (such as water purifiers in developing countries) can also be considered social innovations but not service innovations as the innovation deals with a new technology only. The same holds true regarding the fair trade movements that are a highly relevant social innovation focusing on goods. However, if the goal is broadened to make the technology or innovation accessible to all potential users, then the "goods-tech innovation" may become a service innovation, too. Other similar examples can be found in innovations that aim at renewing agriculture and manufacturing: they introduce technological innovation to firms, but they may also provide knowledge through services. So, these innovations have a high potential to become service innovations. "Pure" service innovations and social innovations can be found mainly in the public sector. An illustrative example is preventive health care with a role for the third sector and patients' organizations. Another example is the charter school, which represents innovation in education; here, groups of promoters are recognized in their social goals. Further examples are the provision of social services by NGOs and the promotion of inclusion. Public-private innovation networks can be either socially oriented or business oriented as stated before. Rural tourism, for instance, links a business target with the empowerment of local communities.

Figure 4.6 illustrates the role of system innovation in social innovation with another set of examples. Again, the identification of the system nature is not clear,
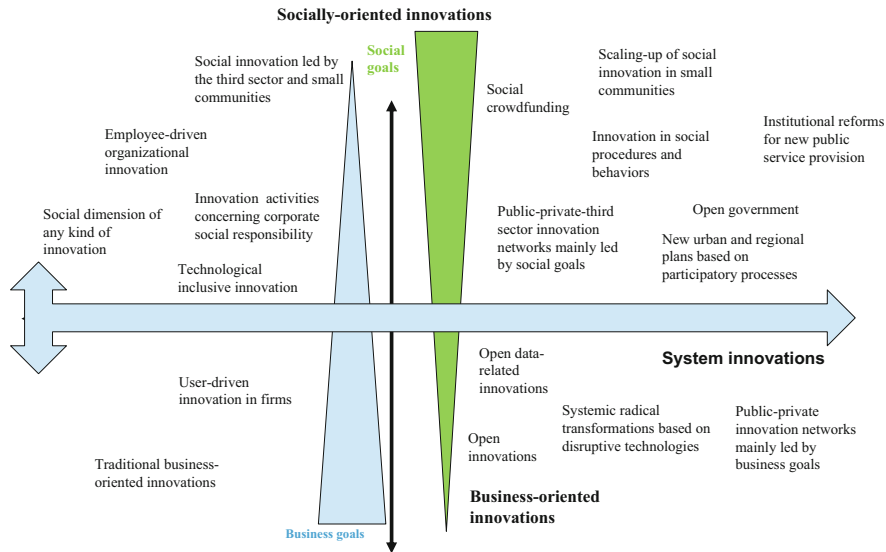
Fig. 4.6 Social innovation vs system innovation: some examples

because every single social innovation can be considered part of the system. However, there are some innovations that are clearly more systemic than others. System innovations are generally affecting institutional arrangements at a multilateral level (several types of parties are involved). Those innovations in which the systemic nature is less prominent typically occur in bilateral or plurilateral contexts (e.g. between a firm and its customers) and often in particular markets or communities. System innovations require scale and show complexity in the interactive processes among different parties, including institutions.

Examples of social and system innovations are the scaling-up of social innovations created in small communities (e.g. spreading local innovation pilots in health care to the national level); innovations in social procedures, behaviours and beliefs (e.g. the fair trade movement); social crowdfunding (e.g. initiatives for fighting against exclusion); institutional reforms for new public services (e.g. open government); and urban and regional plans based on participatory processes (e.g. new solutions for public transportation).

6   Concluding Remarks

This chapter has explored the relationship between service innovation, social innovation and system innovation. They can be considered different dimensions of the new innovation processes, not alternative but complementary and highly interrelated. In addition, the boundaries between them are blurred, and there are

many similarities between these three types of innovations, while there are also clear differences. The chapter has defined social innovation in connection with service innovation and within a system innovation framework. Services can be considered not just one type of social innovation outcomes but a dimension of any social innovation outcome, in which the "service" component can be present to a greater or lesser extent. The service innovation concept can also be enriched based on the social innovation approach. The multi-agent framework is useful to define innovative service co-productions, and service innovation can be approached from the perspective of social goals and means. This involves a potential to understand the engagement of society in a broad sense – not just the public-private collaboration but also the third sector and various institutions. A three-dimensional model is proposed in this chapter to analyse social innovation as the outcome of three elements: the prevalence of social goals (vs. mere business goals), social means for complex systemic co-productions (vs. a nonsystemic approach) and service and non-technological innovation outcomes (vs. mainly goods-oriented outcomes). A set of examples for each case has been provided to explore the very heterogeneous group of social innovations, growing up all over the world. Some social innovations have stronger service content than others, and some are in their way to make part of a system transformation. However, most still remain at a local level with difficulties to scale up. Thus, a challenge for policymakers is how to take lessons from existing social innovations linked to services and scale them up in the framework of systemic transformations. Research should help in tackling this challenge.

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Part II
Managing Service Innovation

Chapter 5
Developing Service-Based Business Models: Which Innovation Capability for Which Innovation Dimension?

Matthijs J. Janssen and Pim den Hertog

Abstract It is widely understood that firms innovate by altering their business model rather than only changing a particular technological aspect of their offerings. In many cases, also for manufacturers, actual value is being created through the provision of services. What has remained underexplored so far is the question of which innovation capabilities are most needed when developing a service-based business model. In this chapter, we discuss how both the concept of service innovation and the concept of business model innovation are variations of evolutionary theories typically applied only to technology. Using a large-scale survey, we test hypotheses regarding the co-occurrence of six (also evolutionary inspired) innovation capabilities on the one hand and changes in five particular business model dimensions on the other hand. Simultaneously regressing the capabilities on these dimensions confirms their distinctiveness, as each capability is linked to one or more dimensions. Our effort to combine two frameworks brings a vocabulary, mapping tools, measurement basis and empirical evidence on distinct patterns in the interlinkages between organizational capabilities and innovation outcome. These contributions can provide management guidance to organizations aiming to develop innovative service-based business models.

Keywords Innovation capabilities • Business model

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1   Introduction

In manufacturing as much as in services, being able to explore and exploit innovative business models is the key: even the most 'hardware-oriented' industries realize that novel technology alone is not enough to successfully introduce new propositions and solutions to the market (Teece 2010). Instead, firms also need to be able to align technological changes with changes in business aspects like the revenue system, the channel used for providing the product or the organizational structure (Baden-Fuller and Haefliger 2013). Successful innovation is thus a matter of being adaptive in various 'dimensions'. This view resonates with the claim that also service innovation is a multidimensional phenomenon (Carlborg et al. 2014; den Hertog et al. 2010). Hardly ever do service providers only introduce a new solution without altering the way they interact with, or charge, customers or the way they use organizational routines or technology to actually provide the novel proposition. Even though there certainly are theoretical merits in closing the gap between the discourses on service innovation and business model innovation (i.e. by articulating the parallels), it is equally (or even more) urgent to understand what firms need to be capable of in order to change particular innovation dimensions.

In earlier contributions (den Hertog et al. 2010; Janssen et al. 2015a, b), we have successively introduced conceptual multidimensional frameworks for characterizing service-inclusive or service-based business models as well as the innovation capabilities required for creating novelty.[1] The first framework discriminates between six dimensions that express the elements of an offering (and the way it is delivered) in which firms can introduce changes when developing a service-oriented business model. We will refer to it as Framework 1. In the second framework, a set of innovation capabilities is defined, a selection of which a firm or organization needs to master (or otherwise find access to) so that the organization will be able to bring about these business model innovations over and over again. We will refer to this innovation capability framework as Framework 2.

We have positioned these two frameworks in the current literatures, described them conceptually and empirically and developed and tested measurement scales for both. In Janssen et al. (2015a), for example, a multidimensional measurement scale for mapping novelty in service innovations (cf. Framework 1) was presented. It was not only shown that the multiple dimensions of a service-based business model can be measured separately in a reliable way, but also that firms renewing a higher number of dimensions tend to yield a higher percentage of their turnover from innovation. In a similar fashion, a scale for the innovation capabilities relevant

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[1] Although the type of organizations we look at in this chapter mainly concerns firms, many of the observations also have relevance for public organizations wishing to renew whatever it is they are providing. Perhaps incentives might be different, but governments do need to articulate how they create value that is not provided by the market (e.g. where private business models fail due to value capture problems; Teece 2010).

for creating new solutions (Framework 2) was introduced and tested based on the same large-scale survey used for operationalizing Framework 1. It resulted in a validated scale for five complementary innovation capabilities. This framework and scale proved to be instrumental in understanding the relative importance of these innovation capabilities. It was shown that the measured capabilities correlate (although to a different extend) with innovation performance measures.

The scales for measuring these two conceptual – and highly complementary (den Hertog et al. 2010) – frameworks were thus far presented in isolation. In this contribution, we aim at linking these frameworks conceptually and empirically. In brief, we ask: how do capabilities relate to dimensions? In Sect. 2, we will therefore, after briefly introducing our understanding of service innovation and business model innovation, introduce the two models. Importantly, we hypothesize how business model dimensions and innovation capabilities are linked. In Sect. 3, we provide an actual test of the hypotheses. We will outline the data set used, the measurement scales, the method for testing the hypotheses and the actual results. The results are discussed more widely in Sect. 4. In Sect. 5, we draw conclusions, discuss limitations of our study and point out promising future research avenues based on our frameworks. Ultimately, we aim at illustrating that both frameworks may inform managers responsible for creating organizations that are successful in continuously creating innovative and competitive solutions. Put differently, the two frameworks are not just abstract conceptualizations, but can provide management guidance to organizations that want to develop innovative service-based business models.[2]

2 Theory

2.1 Innovation in Service-Based Business Models

2.1.1 Service Innovation and Business Model Innovation

The term service innovation commonly refers to the successful introduction of a (replicable) solution with a particular degree of novelty.[3] 'In what exactly?' is not

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[2] This chapter is based on so far unpublished elements from Chap. 6 in den Hertog (2010) and Chap. 4 in Janssen (2015).

[3] The service innovation definition we provide covers the process of creating a new service and the resulting service itself. This ambiguity in the term 'service innovation' is even larger when considering the varied streams of relevant literature. As outlined in Janssen (2015), service innovation literature can refer to studies focused on innovation *for* service firms (but created by manufacturers, for instance), innovation *in* service industries (typically yielding new services, although the novelty could in principle still be purely technological); innovation *through* service firms (e.g. knowledge intensive business services helping others to innovate) and innovation *with* services (creation of solutions in which services as well as physical goods have a role, e.g. product-service systems).

always obvious, yet crucial, if we want to state whether innovation is truly present. A service in the narrow sense is a particular solution or experience provided to fulfil a certain customer need (Pine and Gilmore 1999). Services can be grouped according to a taxonomy, like maintenance services (e.g. inspection, repair, cleaning), personal services (e.g. manicure), delivering services (e.g. restaurants), distributive services (e.g. logistics), etc. Such a functionality-oriented way of looking at services underlines the value a firm is creating by providing a service (Vargo and Lusch 2004). However, the actual value proposition offered to the customer is just one dimension of what a service really entails. The increased use of notions like service systems (Roth and Menor 2003; Maglio and Spohrer 2008) reflects the interest for broader conceptualizations, also covering aspects like the way value is delivered and captured (Carlborg et al. 2014).

The first references to the multidimensional nature of services date back to Gal/ouj and Weinstein (1997) and den Hertog (2000). The line of thinking they proposed regards services as a coherent constellation of adaptable elements – or dimensions – with qualitatively different properties. Over the past decade, this approach to conceptualizing services largely co-evolved with advances in research on business models (Chesbrough and Rosenbloom 2002; Teece 2010), a notion typically studied by strategic management scholars. Both strands of literature claim that innovation is not just about inventing a technology or artefact, but about designing a proposition that delivers value to the producer as well as to the customer. Technology might sometimes be an important aspect in this regard, but it is never the only thing that counts.

In order to be successful, firms need to specify which assets they use, which partners they collaborate with, which market segment they target, which pricing strategy they deploy, etc. The discourses on service innovation and business model innovation are similar in their focus on the frameworks that describe particular features of a certain offering and the organization of its production. Service innovation literature in particular aims to go beyond the superficial distinction between the product and the process. In this literature, characterizations are based on dimensions like the role of the customer, the technology that is involved or the way a firm is organizing the delivery of a service (den Hertog 2000). Distinguishing such dimensions allows for comparison of the services of two firms (Gal/ouj and Toivonen 2011/2) or detailed analysis of how these services evolve over time. Business model innovation scholars pursue similar goals, albeit by using different frameworks. Due to the fuzzy nature of what a business model really is, a plethora of conceptualizations have been generated over the past few years (Zott et al. 2011; Saebi and Foss 2015). As can be expected in the field of management, these conceptualizations often emphasize the importance of elements concerned with the content, structure and governance of transactions (Amit and Zott 2001).

It is notable that both innovation literatures currently seem to be converging on each other. Service innovation studies have started identifying and examining the success of different business models (e.g. Visjnic and Van Looy 2013; Zahringer et al. 2011; Nair et al. 2013; Kuk and Janssen 2013). At the same time, strategy scholars – typically reasoning from a manufacturing perspective – have drawn

attention to business models built on service provision (e.g. Cusumano et al. 2015; Suarez et al. 2013; Chesbrough 2011; Witell and Löfgren 2013). Clarifying the communalities between these approaches might allow research to accumulate even more, which is why this chapter addresses any audience concerned with developing service-based business models.

2.1.2   Evolutionary Foundations of Service and Business Model Innovation

Although not always formulated explicitly, the fact that the abovementioned literatures are rooted in innovation thinking implies that they build on an evolutionary perspective on technological and economic change (Nelson and Winter 1982). This underlying body of theories regards innovation as experimental search within a design space. That is, firms develop new solutions by exploring different ways to shape the various dimensions a design space is composed of. Although the number of explorable dimensions is infinite, it is common to analyze innovation efforts and technological trajectories by focusing only on the key features of a product (Frenken 2005). For a coffee machine, this could be the presence of a grinder (yes/no), the capacity of the water tank (small/medium/large), the type of water tank (glass/insulated), the method for entering the coffee (raw/grinded/pads) and the physical design of the device (classical/modern). In this example, the options mentioned in brackets represent the most typical design options for each of these dimensions, also known as 'alleles' (Kauffman 1993).

Originally, the search interpretation has predominantly been applied in the context of physical artefacts. Given that it is merely an analytical way of thinking about innovation strategies and innovation options, there seems to be little reason why not to apply it also in the context of broader propositions. In fact, by proposing frameworks of particular dimensions and dimension-specific design options, the service and business model innovation literatures have already worked extensively with concepts that in essence are variations of the evolutionary approach. In order to facilitate business model innovation, many scholars have presented lists of suggestions of how to design a particular business model element (for instance, see Saebi and Foss 2015). The authors of this chapter performed a similar exercise in the context of services, leading them to identify archetypical ways of shaping service dimensions (den Hertog et al. 2010; den Hertog 2010; Janssen 2015).

Regardless of the framework one uses for conceptualizing a service, business model or design space, it is the configuration of design choices that determines the overall quality of a product. How well a product performs from a functional perspective is represented by the so-called technological fitness of that configuration (Kauffman 1993). The evolutionary fitness, on the other hand, expresses to what extent the market ultimately values the chosen configuration. These two types of fitness might not overlap. Essentially, service and business model innovations concern (a part of) the nexus between the two fitness types. In order for a technologically fit product to have success in the market, other aspects have to be taken

into account as well. Some aspects will remain beyond the influence of the firm, but indeed several of them can – or should – be managed. They include, for example, methods for ensuring that the client is able to use the product (good or service) and a mechanism for capturing revenues. One way to consider them in the context of service or business model innovation is the extension of the design space: largening the space from that one the designer has in mind when only focusing on the artefact. For instance, when analyzing developments in the car industry, Alkemade et al. (2009) exclusively took into account tangible features, whereas Bohnsack et al. (2014) also included service aspects and value network. A service innovation or product-service system lens has also been used by those researchers in the automobile industry who have focused on aspects such as end-of-life management, vehicle ownership structure, or modes of producer-user interactions (Williams 2006; Ceschin and Vezzoli 2010). Figure 5.1 illustrates how the multidimensional perspectives on both service innovation and business model innovation are actually extensions of evolutionary theories regarding the search in technology-only design spaces. The figure has been combined from den Hertog et al. (2010) and Osterwalder and Pigneur (2010). The former source describes the dimensions of service innovation and the latter source the building blocks of a business model canvas.

In sum, service innovation, like business model innovation, can be understood as an act in which firms experiment with novel design space configurations (i.e. by manipulating one or more dimensions). Crucial is that introducing a change might not only alter the fitness of the affected dimension but of other ones as well. In the literature on business model innovation, this phenomenon is implicitly referred to by stressing the importance of aligning business model components. Competitive
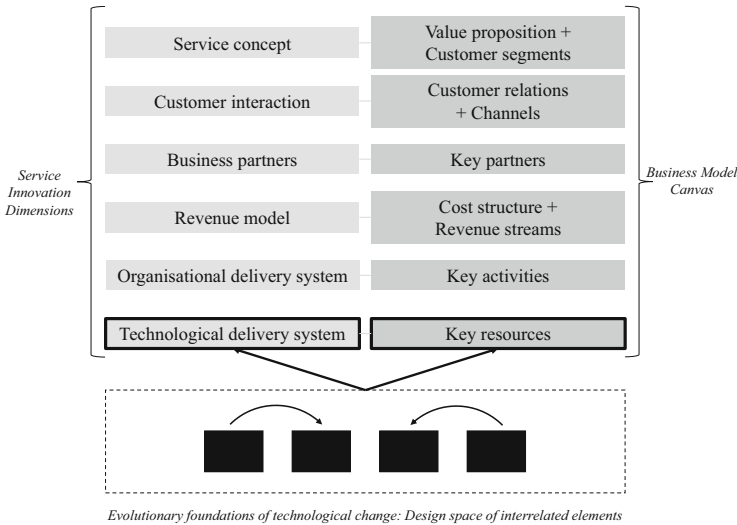

Evolutionary foundations of technological change: Design space of interrelated elements

Fig. 5.1 Service innovation and business model innovation as variations in the evolutionary perspective on search in multidimensional design spaces

advantage is not derived from the business model itself (as it is often readily observable and therefore relatively easy to replicate) but from the unique way in which components are adapted to each other and to the assets and client base of a firm (Teece 2010). This echoes discussions on the extent to which innovation in services is subjected to easy imitation (e.g. Bryson and Taylor 2010). The intangibility of services makes it easy at first sight to see what a competitor is doing, but delivering the same offering requires careful balancing of a multitude of elements. Recently, researchers have started to investigate this topic by applying evolutionarily inspired complexity theory to service innovation (Chae 2012; Desmarchelier et al. 2013; Janssen et al. 2015a). Although the importance of alignment is heavily emphasized in the literature, it should be noticed that it is a process of continuous experimentation and adaptation. In practice, firms often innovate by changing one element at a time. In this chapter, we will evaluate which innovation capability is most relevant for changes in a particular dimension. Doing so requires a framework for measuring the extent a dimension is affected.

2.2 Innovation Dimensions

Having discussed the theoretical underpinnings of the multidimensional perspective on service and business model innovations, we now take a look at a concrete framework suitable for our measurement purposes. Especially the literature on business model innovation stresses that selecting a particular set of dimensions when researching or innovating is not so much a matter of 'getting it right'. As the frameworks are only a lens for understanding the reality rather than the reality itself, the primary task is picking a combination of dimensions that is relevant for the context you are dealing with. Bohnsack et al. (2014), for instance, give a comprehensive account of business model evolution in the electric vehicle industry simply by focusing on the three dimensions most commonly found in business model studies: value proposition, value network, and revenue/cost model. Other studies often use a more detailed set of dimensions or one that fits specifically to the industry under investigation (Djellal and Gallouj 2005).

In principle, any comprehensive set of dimensions suitable for describing the characteristic features of a product suffices. Of course the applicability of a particular framework increases when it has been tried and tested before. As experience with a framework accumulates, it will be easier to use it for aptly analyzing the features that are most distinctive for a certain (change in) business model. For that reason, our analysis is focused on the six-dimensional framework for service innovation developed by den Hertog et al. (2010). This conceptualization builds on a simpler version introduced in 2000 and applied ever since (e.g. Droege et al. 2009; Agarwal and Selen 2011). The framework can be used both as a tool for mapping and analyzing discrete (service-based) business model innovations as well as for systematically creating new experiences and solutions.

Figure 5.1, above, already indicated how the six dimensions by den Hertog et al. (2010) correspond to a large extent to the ones used by Osterwalder and Pigneur (also 2010) in their popular business model canvas. Given that we are concerned with service innovation, we choose to build on the line of research that also has been looking at this context. Conceptually, the six-dimensional framework is not exclusively fitted to services – it covers diverse dimensions applicable to any business model – but the available empirical illustrations correspond rather well to the scope of this study.[4] Drawing upon such empirical material, we will now describe in detail each of the six dimensions. While doing so, we elaborate on what account the business model canvas by Osterwalder and Pigneur (2010) differs from the one we take as our starting point here (den Hertog et al. 2010).

2.2.1 Service Concept (Solution)

The service concept dimension – also named 'the service offering' (Frei 2008) – captures the actual solution or experience an organization is providing: what is the business proposition really about? Key here is the functionality that is being delivered. The word 'service' should therefore be interpreted according to the synthesis approach by Gallouj and Weinstein (1997) and the service-dominant logic by Vargo and Lusch (2004, 2008): every economic activity is designed to render service to a customer. This service can be fully embedded in a good or a device, it can have the form of a 'pure' service, or it can be anything on the spectrum in between. Especially for physical products, it might seem easy to formulate a list of functions and specifications, but accurate descriptions of a value proposition typically require more abstract language. For instance, a cup is not just porcelain in a particular shape but a device that renders the service of containing liquids and allowing you to drink. The value that is being delivered to customers depends primarily on how well their needs are fulfilled. Other important factors are quality (comfort level, timeliness, appeal) and price, as well as a broader range of values (aesthetic, environmental, social) related to the provided service. Quite often new concepts are combinatory, i.e. they combine parts of other services into a new configuration (Van der Aa and Elfring 2002). The service concept of a product can thus consist of one clearly definable solution (e.g. laundry service) or a bundle of multiple features (a laundry place with a coffee bar). Besides specifying what value is being delivered, organizations also need to think to whom this is most relevant. In the business model canvas by Osterwalder and Pigneur (2010), these

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[4] We keep referring to service dimensions simply because they have proved appropriate for characterizing (novel parts of) services, which are the object of our study. We do not claim that the framework as such is relevant for services only. Rather the contrary seems to be the case, given the holistic nature of the framework (including service, technological and organizational elements) and the similarity to the elements found in business model definitions (see Saebi and Foss 2015 for an overview of definitions and concepts).

two aspects are covered by two different elements: the *value proposition* and the *customer segment*.

2.2.2 Customer Interaction

This dimension concerns the role customers have in creating value, i.e. (new) ways in which a firm and its customer interact, communicate (and along the way generate cues for new propositions), codesign, customize or even coproduce (Normann 2002) new experiences or solutions. Osterwalder and Pigneur (2010) distinguish two business model elements that both can be grouped under one single dimension of the framework by den Hertog et al. (2010). On the one hand, we find the *channel* through which firms and customers interact. Every product is delivered to the customer in some way. For physical products this can be through, for instance, retail or online shops – both channels providing ample design aspects to be considered. For intangible offerings the possibilities are even more varied. The second element is the content of the interaction or the *customer relationship*. New types of interfaces imply in most cases a new distribution of tasks and responsibilities between firms and their customers. A service provider may take over tasks from the customer or the client firm, leading to more complete and richer propositions towards clients. Conversely, we also observe business strategies where clients are taking care of service activities formerly performed by the service provider, i.e. clients increasingly coproduce or even provide the services themselves (i.e. self-services). The two varieties may go together as well. The widespread use of online booking systems has led customers to increasingly organize and book themselves their travels and hotels, in combination with other services, and inform their fellow travellers. However, at the same time, ICTs also change the provider-customer interaction the other way round: as service providers get to know their customers more intimately, they are able to offer more customized offerings.

2.2.3 Value System (Business Partners)

Apart from the firm and its customers, also other parties can play an important role in the creation of value. This dimension is about the wider set of actors (next to customers) involved in creating and appropriating value and thus jointly producing an experience or solution. Combined functionality can be provided by a coalition of partners stemming from the same value chain or even a wider value network (Chesbrough 2011; Gawer and Cusumano 2002). The value system expresses which business partners are actively involved in the production and delivery of a solution. Active involvement can occur throughout the entire value chain in which the focal firm is situated. Partners can have a supply relationship, or they can participate in the actual service provision (e.g. by delivering complementary services) or in the after-sales stage (handling complaints, handling waste). By adding a new business partner and managing the (temporary or more permanent) coalition of

stakeholders, a successful firm is able to provide an innovative, more complete or more specialized experience and thus differentiate the actual offer.

2.2.4 Revenue System

The way an organization designs cost and income flows constitutes an import part of a business model. The fourth dimension is therefore related to new revenue systems. To develop the right revenue mechanism, fitting a proposition may require considerable ingenuity. Many ideas fail due to a misaligned distribution of *revenues* and *costs* – two distinct elements in Osterwalder and Pigneur's (2010) business model canvas. A variety of mechanisms can be deployed to charge customers. Instead of selling a good or service (including the change of ownership), firms have successfully introduced alternatives based on pay per use (Rolls-Royce's 'power by the hour'). Other possibilities are cross-subsidization in two-sided markets (one side consumes, while the other side pays; e.g. advertisers on search engines), the razor-blade model (a cheap core product and expensive add-ons), freemium models (free basic service, fees for premium), the 'Netflix'-plan (unlimited use on registration basis) and many other variations. A clever way to generate income streams can be the point which distinguishes a successful firm from the one that fails, although it is striking that some of the currently most disruptively innovating firms turn out to struggle precisely on this account.

2.2.5 Organizational Delivery System

This dimension refers to the human part of the delivery system and articulates what skills, organizational routines and even organizational culture are needed for creating innovative experiences and solutions. Apart from developing or attracting the required capabilities, they should be managed carefully in order to be effectively and efficiently applied. The organizational delivery system seems to be sometimes underestimated, not least as it is thought of as easy to imitate. Detailed research of the well-known IKEA case in manufacturing and retailing furniture has shown that an innovative design or franchise concept is not enough. IKEA is also innovative in many aspects of its organizational delivery system: how its HR function is organized, how it empowers its employees, how it motivates customers to assemble their own furniture and how it has established a very strong company culture to serve and approach clients (Edvardsson and Enquist 2009). Service workers not only contribute to developing and providing new solutions – requiring new organizational structures, working routines and (inter)personal capabilities – but they are also the key for establishing a dialogue with (potential) customers.

2.2.6   Technological Delivery System

Finally, it is acknowledged that every business model rests on the use of some technology. This dimension is about the technological systems and processes involved in delivering an experience or a solution. Truly 'pure' services are hard to imagine, as most people in service professions would be nowhere without some basic devices (whether it is a telephone, computer, pen, scissors, microphone or other tool or device). Predominantly ICTs (but not exclusively) have enabled numerous service-based business model innovations (Cainelli et al. 2004), ranging from electronic government and E-health to advanced multichannel management, customization of services, introduction of self-service concepts or virtual project teams. On the other hand, it is increasingly understood that technology in itself is not a business model (Teece 2010).

2.3   Service Innovation Capabilities

In order to be adaptive, firms need to be able to change their business model continuously. The capabilities required for doing so differ from the ones needed in ordinary business activities. Taking a hierarchical distinction, one could say that higher-order innovation capabilities have to be developed to modify the lower-order ones. Although those 'dynamic' capabilities represent a higher level of abstraction, they rely on actual behaviour just as much as any capability. This is commonly referred to as the micro-foundations of dynamic capabilities (Teece 2007). Investigating which kind of patterned behaviour underlies a firm's dynamic capabilities helps us to avoid the tautological statement that a firm has dynamic capabilities simply because we observe it has innovated (Williamson 1999). Distinguishing the input from the output is crucial if we want to state which capability is related to changes in a particular dimension of a business model.

There is a myriad of alternative conceptualizations available for measuring innovation capabilities (like in the case of frameworks describing service innovation and business model innovation). Reverting to the evolutionary perspective on technological and economic change, many of those conceptualizations turn out to be variations of a similar theme. Fundamental is that firms have to be able to source knowledge and ideas, to transform them into actual business propositions and finally to produce and deliver the new or adapted propositions.[5] These activities form the basis for the views of Hansen and Birkinshaw (2007) on the innovation value chain and of Teece (2007) on three key dynamic capabilities.

In the context of services, too, one can find many attempts to come up with a framework of capabilities suitable for analyzing a firm's ability to perform certain

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[5] Taking a Darwinist perspective, one can recognize the corresponding sequence of *variation*, *selection* and *retention*.

innovation activities. A review is provided in Janssen et al. (2015b). As noted in the introduction, the authors of this chapter have operationalized a framework to capture the peculiarities of service innovation processes and to allow interindustry and interfirm analytical comparisons (den Hertog et al. 2010; Janssen et al. 2015b). The proposed framework is not targeted exclusively at service innovation, while it also aims to be broader than the capability frameworks based on technological innovation only.[6] Importantly, it was drawing upon research in service context that enabled us to identify which behavioural fundamentals are relevant when studying innovation in firms wishing to develop a new service-based business model. The set of innovation capabilities is in our view more than an analytical research tool – this framework may also be used as a management tool. It facilitates steering and managing the processes of service-based business model innovation consciously and systematically.

The capability framework proposed by den Hertog et al. (2010) originally contained six dynamic capabilities, but some modifications were made during the operationalization. The ones we ended up with are shown in Fig. 5.2. In the identification of capabilities, we first dropped out the higher abstraction level meta-capability of 'learning how to adapt innovation capabilities'. Also the capability for 'bundling and unbundling service concepts' was excluded from our analysis, as it was recognized that the bundling of concepts is an outcome of innovation efforts rather than a capability for doing so. No micro-foundations for this capability could be identified, as opposed to the innovation activities we encountered when studying capability strengths. This orientating part of our empirical analysis was performed during one of the eight case studies in which we asked several individuals from a case firm about the activities they deemed relevant for their innovativeness (Janssen 2015). Measurement items were based on the results of these interviews. The actual testing of our measurement scales resulted in one more modification to the original framework. Sensing user needs and sensing technological options, reflecting an intelligence function for monitoring demand and supply side developments, were found to be very different from each other, and therefore they were split into two separate dynamic capabilities.

Figure 5.2 demonstrates how our final set consists of two capabilities for knowledge sourcing, one for knowledge transformation, and two for knowledge application, corresponding to the three phases of the innovation chain as introduced by Hansen and Birkinshaw (2007). Before we describe them in more detail, we note that the depicted structure of interrelations (capturing the evolutionary properties as reflected in the three stages of knowledge creation and application) matched our data better than a simple list of five distinct capabilities (Janssen et al. 2015b). In the

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[6] Because they are so broadly defined, the capabilities we adhere to might be used for studying innovation in very different contexts. When examining the importance of respective capabilities, it is likely that we might find gradual differences (e.g. due to variations in intensity of customer interaction), but we see no particular need to look at different sets of capabilities in different situations. It is the wide scope of the selected capability framework that allows us to engage in comparative analyses.
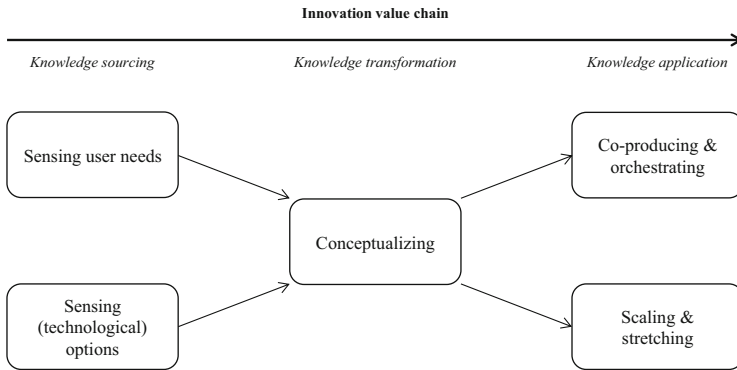
Fig. 5.2 Operationalization of service innovation capabilities (Based on den Hertog et al. (2010) and Janssen et al. (2015b)

empirical section of this chapter, we utilize this finding and study the capabilities jointly rather than in isolation.

Below we briefly characterize the five dynamic service innovation capabilities.[7]

2.3.1 Sensing User Needs

This dynamic capability refers to the often unique set of resources and routines organizations have to empathically understand users and sense their (potential) needs well in advance by interacting intensively with (potential) clients. This may include dialogues with lead users, joint experimentation and prototyping, user panels, account management systems, client profiling, detailed analysis of how current products are used or trend analysis in client groups. This capability aims at sensing user needs early on and informs the actual act of innovation. In larger firms, this capability typically resides in marketing, new business departments or innovation management if present (den Hertog et al. 2006). Sensing user needs is not a passive activity, but can be managed, for example, by a new business development unit as an active, though still rather open, process, with broad, well-specified questions in mind.[8] A deep understanding of how the relevant context of a firm or organization is changing, and being able to sense user needs well in advance and translate these into a search routine for a new experience or solution, is key here. Innovators first have to be able to manage internal and external sources of

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[7] The descriptions below are based on den Hertog et al. (2010) and den Hertog (2010).

[8] Examples of these questions include: what do customers expect from a reliable partner; are our clients in need of 24/7 availability of our services; what sort of time constraints do our clients face and can we use them to think of better solutions that help our time constrained clients; what types of clients are using what types of interaction channels; what proposition would be valued most by our clients (den Hertog 2010)?

information or knowledge and translate these into core problems and unmet needs, before more focused conceptualization can take place.

2.3.2 Sensing Technological Options

This dynamic capability pertains to the resources and capabilities a firm or organization has at hand to sense new technological options (Kindström et al. 2013; Teece 2007). They provide opportunities to adapt and renew the product portfolio, including new ways of interacting with clients, on-demand production, enriching service dialogues or offering opportunities for customized solutions which sometimes go hand in hand with new options for self-service. Innovators have to make sure they are informed about the latest options that technologies offer in their industry and related trades. In larger firms, this may be part of a business development function or an ICT department, although this capability can also reside in individuals that scan the organizational context for promising technologies and technology providers.

2.3.3 Conceptualizing

Although (service-based) business model innovation is par excellence a continuous and nonlinear process, we present – for the sake of simplicity – conceptualizing as the logically next capability after knowledge sourcing. Conceptualizing is about transforming various strands of knowledge and understanding into a prototype of a service concept. This dynamic capability concerns the resources and capabilities an organization has at hand for transforming a new, rough idea into a viable offering. Such an offering should be understood by colleagues and external partners and recognized by clients as a useful, valuable new proposition. As there are hardly ever ways in which new services or business models can be prototyped in a lab-like setting, new concepts and related business processes are simply tried out in practice in the form of prototypes and experiments (Toivonen 2010), mostly with trusted and well-known clients who operate as co-innovators. This requires a widely distributed preparedness or capability within the firm to think out of the box, question current practices and processes and be eager to test prototypes or run experiments. This preparedness in turn requires that ideas and suggestions for new solutions and delivery forms can pop up in diverse settings and parts of the organization, including in relationships with clients and suppliers. Conceptualizing, designing, prototyping or testing these more fuzzy types of innovations is a specific capability that is not based on tangible things and codified knowledge. For firms which develop service-based business models, it mostly is an ongoing process with selected (actual and potential) clients. In practice, this process is mostly in the hands of an interdisciplinary project team responsible for bringing an initial idea into an innovative solution (den Hertog et al. 2006).

2.3.4   Coproducing and Orchestrating

We see managing innovation across the boundaries of the individual firm, and managing or engaging in networks, as a key dynamic capability that enables the implementation of a new service-based business model on the market. Many propositions are combinations of activities (e.g. provision of goods or services) of different parties (including the customer) that together fulfil a certain need. This implies that the core firm or 'aggregator' – usually the one managing or 'owning' the client relationship – has to codesign and coproduce a new business model innovation with other suppliers and manage the accompanying alliances. Innovators therefore need to be able to engage in these alliances and networks (with different sets of partners) and manage and orchestrate these (Teece 2007). The capability to establish and sustain relationships with a varying set of potential partners, who might be needed now or in the future to create new experiences and solutions, is part and parcel of this dynamic capability.

2.3.5   Scaling and Stretching

The scaling and stretching capability is especially relevant for organizations with large-scale (semi-)standardized operations (Winter and Szulanski 2001). Service-based business model innovations are relatively hard to introduce on a large scale in a uniform way due to their intangible character and – hard to standardize – human component. Other potentially influential factors are their cultural dependency (Lyons et al. 2007) and the distributed character of services. Scaling is mostly about diffusion. To be able to diffuse a new business concept firm wide (multiple locations) or even internationally, it needs to be described (or codified) and the essential elements transplanted to other parts of the firm (den Hertog and de Jong 2007). This may lead to a process of cross-fertilization especially in larger firms where innovative practices and concepts are shared, codified and implemented throughout the entire organization. The scaling capability increases the efficiency of the service innovation process and helps in creating a consistent set of experiences, solutions and brand association. The related stretching capability is mostly linked to the intangible nature of service-based business models. Especially when services have a dominant role in a business model, communication and branding are essential for creating a unique and differentiated offering (Krishnan and Hartline 2001). Building up a brand which (potential) customers can be identified with, and coupling it with a certain set of solutions and quality, asks for serious investments and a consistent strategy. Once established, such a brand name can be really valuable for entering new, mostly related, markets and launching innovative business concepts using the existing brand name. The stretching capability is about stretching the core offering in such a way that it fits the overall firm strategy and is seen as logical from the perspective of (potential) clients.

2.4 Hypotheses

When introducing the innovation capability framework, validation efforts led to propositions on the dimensions most likely to be affected when firms possess a certain capability (see den Hertog 2010). In the following, we describe our hypotheses regarding the way in which innovation capabilities of Framework 2 are linked to the six innovation dimensions of Framework 1.

2.4.1 Hypotheses on Sensing User Needs

Having some sort of intelligence function is crucial for every innovator and means systematically or more haphazardly looking for and interpreting signals in the real world (see Teece 2007). Especially firms relying on service-based business models are to a great extent dependent on their (actual and potential) users and user interaction for codeveloping and coproducing new propositions Alam (2002). Therefore understanding users and their needs is a priority. Further, firms have to understand which new propositions would be valued by users; this question also includes the new ways in which the associated interaction is designed. As mentioned above, managing internal and external knowledge sources and considering them in the light of user problems and unmet needs are important before more focused conceptualization can take place and new ways of interacting with customers can be shaped. We therefore hypothesize that organizations with relatively strong capabilities for sensing user needs outperform their peers/competitors particularly in the dimensions concerning the service concept and customer interaction.

2.4.2 Hypotheses on Sensing Technological Options

Organizations with strong capabilities for sensing technological options (see Kindström et al. 2013; Teece 2007) have several competitive advantages compared to their peers/competitors operating in similar markets. They are better connected to actual and potential technology partners, they are more capable of making sense of technological information from different sources (also from contradictory sources) and they are also more capable of translating this information into an innovation. As pointed out above, the resulting information on technological options provides opportunities to adapt and renew the product portfolio. It also enables new ways of interacting with clients, on-demand production, enriching service dialogue, and the combination of customized solutions and self-service. We hypothesize that innovators who master this capability outperform their competitors especially in the technological delivery system but also in the customer interaction dimension. Particularly in service-based business model innovations, the latter is also very much technologically mediated.

2.4.3 Hypotheses on Conceptualizing

Once signals and initial ideas for new solutions have been collected, a creative process of reworking these into a proposition starts. The actual conceptualization and design of an innovation may also entail deciding on how the new offer relates to the firm's strategy, target audience, intensity and forms of customer interaction, organization of the delivery system, partners needed to bring about the solution, pricing and revenue model and the service dialogue foreseen. In the end, this dynamic capability is about transforming a rough idea for a new business model into a viable offering. It is critical to all other service innovation dimensions, but we hypothesize that organizations excelling in this capability outperform their peers/competitors particularly in two dimensions. First, as conceptualizing means detailing the new proposition, it is tightly linked to the new service concept. Second, conceptualizing is essential for tinkering and aligning organizational aspects in order for the new business model to be actually delivered. We therefore hypothesize that this capability is related to modifications in the organizational delivery system.

2.4.4 Hypotheses on Coproducing and Orchestrating

As outlined earlier, many business models rely on combinations of service and technological elements, often partially provided by suppliers or partners. Organizations with strong coproducing and orchestrating capabilities know how to coproduce and codesign services with clients by benefiting from customer interactions and access to a set of customers. They also know how to collaborate with other trusted partners and stakeholders to configure business concepts, and they are able to orchestrate partnerships or alliances. They also invest in a set of potential partners who might be needed in the future to create new experiences and solutions. This dynamic capability therefore refers to the capability of managing innovation across the boundaries of the individual firm and mostly requires executive ability. We hypothesize that organizations excelling in this capability outperform their peers/competitors in two innovation dimensions: value system/business partners and revenue model associated with the new business model. The first is evident, and the second needs to be designed in such a way that it makes attractive for all partners to participate in the collaboration in the long run.

2.4.5 Hypotheses on Scaling and Stretching

Organizations with strong scaling and stretching capabilities are particularly good in managing the identification and then diffusion of successful business concepts firm wide. These capabilities increase the efficiency of the overall innovation process and contribute to creating a consistent set of experiences or solutions through various outlets or channels. They also improve the brand image, which

Table 5.1 Hypothesized relationships between innovation capabilities and innovation dimensions

Innovation capability	Related innovation dimension (hypothesized)
Sensing user needs	Service concept, customer interaction
Sensing technological options	Customer interaction, technological delivery system
Conceptualizing	Service concept, organizational delivery system
Coproducing and orchestrating	Value system, revenue model
Scaling and stretching	Service concept, customer interaction, organizational delivery system, technological delivery system

may be subsequently used for brand stretching. These dynamic capabilities usually require strong executive ability as well. Organizations excelling here most likely outperform their peers/competitors in three dimensions: the organizational delivery system, the technological delivery system and the service concept (as a portfolio of strong service concepts is the first prerequisite for upscaling them).

Furthermore, firms with strong scaling and stretching capabilities are also particularly good in – after having developed a strong brand name – entering new, mostly related, markets and launching (related) innovative service concepts using the existing brand name. An important precondition is that stretching of economic activities is consistent with the overall firm strategy and logical from the perspective of potential and actual customers. Stretching involves either changing the service concept to target a new or wider audience or changing the way in which different audiences are reached or, most likely, both. We therefore also hypothesize that firms excelling in this capability outperform their peers/competitors in the dimension of new customer interaction.

Below we summarize the (hypothesized) links between dynamic service innovation capabilities and the service innovation dimensions that we have tested (Table 5.1). The way in which we have tested these hypotheses will be discussed in the next section.

3 Analysis

3.1 Data

The questionnaire data we use stems from a survey distributed in 2011. Almost all of the questions in the survey are based on a seven-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. The entire survey has been subjected to rigorous pretesting procedures, including feedback collection from academic peers as well as inviting respondents to fill in the questionnaires and discuss where confusion might arise. Asking respondents from different types of firms to complete

the survey led us to rephrase ambiguous questions in the items used for the development of the scale.

As for the sampling profile, the questionnaire was sent to single-business firms or business units with more than ten full-time employees. Using databases from Bureau van Dijk, we retrieved contact information of Dutch firms located in the Northern Randstad (i.e. the greater Amsterdam-Utrecht area). Availability of demographic information about the entire population allowed us to stratify in terms of sector and firm size; we created a multi-industry sample representative for the industry composition in the Northern Randstad.

The questionnaire was sent, in two consecutive waves, to 8,054 firms. We addressed the questionnaire and accompanying letter to the CEOs or senior executives, in order to ensure that the respondents were knowledgeable about the company's key processes under study. The questionnaire was administered by mail with the option to be filled in via the web if preferred. We obtained responses from 458 unique firms, which amount to a response rate of 5.69 %. In total, there are 386 cases with full response on the variables used in the final analyses. As the survey was of considerable length, and the sample did not have any particular relation with the researchers or the research project, the response rate was regarded as sufficient and common for similar types of research.

3.2 Measurement Scales

The key frameworks we are investigating have been discussed extensively here and in the publications where they were first introduced and operationalized. Therefore, we simply provide the items underlying each of the capabilities (Table 5.2, based on den Hertog et al. 2010; Janssen et al. 2015a) and innovation dimensions (Table 5.3, based on den Hertog et al. 2010; Janssen et al. 2015b). Table 5.4 provides the mean, standard deviation and Pearson's correlations of the variables featured in our empirical analysis ($n = 386$). The correlations are all significant at the 0.01 level (two tailed).

3.3 Method

Inspection of correlations (Table 5.4) reveals that, at the outset, all capabilities are significantly related to all dimensions. The theories discussed in this chapter suggest that having capabilities for engaging in innovation is positively related to actually bringing about changes (or 'mutations'), but the question is which relations are strongest. Our aim here is to test which capability is most strongly related to a particular dimension when regressing all capabilities *simultaneously*, as this allows us to examine the importance of one particular capability while controlling for the influence of the other ones. We assess this by using structural equation modelling (SEM). This statistical method is commonly used for analyzing the structural

Table 5.2 Measurement items for innovation capabilities

Sensing user needs (SUN). Cronbach alpha = 0.768
We systematically observe and evaluate the needs of our customers
We analyze the actual use of our services
Our organization is strong in distinguishing different groups of users and market segments
Sensing technological options (STO). Cronbach alpha = 0.820
Staying up to date with promising new services and technologies is important for our organization
In order to identify possibilities for new services, we use different information sources
We follow which technologies our competitors use
Conceptualizing (C). Cronbach alpha = 0.783
We are innovative in coming up with ideas for new service concepts
Our organization experiments with new service concepts
We align new service offerings with our current business and processes
Coproducing and orchestrating (CC). Cronbach alpha = 0.772
Collaboration with other organizations helps us in improving or introducing new services
Our organization is strong in coordinating service innovation activities involving several parties
Scaling and stretching (SS). Cronbach alpha = 0.749
In the development of new services, we take into account our branding strategy
Our organization is actively engaged in promoting its new services
We introduce new services by following our marketing plan

Table 5.3 Measurement items for innovation dimensions

Service concept (SC). Cronbach alpha = 0.846
Our organization developed new (service) experiences or solutions for customers
We combined existing services into a new formula
We developed a new way of creating value for ourselves and our customers
Customer interaction (CI). Cronbach alpha = 0.815
Our organization developed new channels for communicating with its customers
The way we have contact with our customers is renewed
Value System (VS). Cronbach alpha = 0.646
The role of external parties in producing our services is renewed
We involved new partners in the delivery of our services
Revenue model (RM). Cronbach alpha = 0.699
By introducing new services, we changed the way we generate revenues
The way we get paid (financial construction) is altered
Organizational delivery system (ODS). Cronbach alpha = 0.721
We changed our organization in order to produce our new services
Our production of new services requires new skills from our employees
Technological delivery system (TDS). Cronbach alpha = 0.806
Technology plays an important role in the renewed production of our services
We renewed our service offerings by new or different use of ICTs

Table 5.4 Descriptive statistics for innovation dimensions and innovation capability constructs

	Mean	Standard deviation	SUN	STO	C	CO	SS	SC	CI	VS	RM	ODS	OTS
Sensing user needs (SUN)	4.61	1.25											
Sensing technical options (STO)	5.06	1.27	.548										
Conceptualizing (C)	4.63	1.22	.536	.548									
Coproducing and orchestrating (CO)	4.54	1.35	.322	.326	.381								
Scaling and stretching (SS)	4.30	1.42	.478	.458	.459	.240							
Service concept (SC)	4.76	1.44	.493	.419	.566	.374	.396						
Customer interaction (CI)	4.31	1.42	.321	.363	.336	.231	.401	.379					
Value system (VS)	3.85	1.51	.206	.257	.302	.493	.244	.444	.279				
Revenue model (RM)	3.55	1.54	.244	.315	.402	.319	.278	.461	.340	.551			
Organizational delivery system (ODS)	4.19	1.52	.267	.355	.442	.374	.354	.488	.305	.512	.597		
Technical delivery system (ODS)	4.78	1.70	.304	.577	.420	.254	.312	.464	.351	.369	.346	.530	
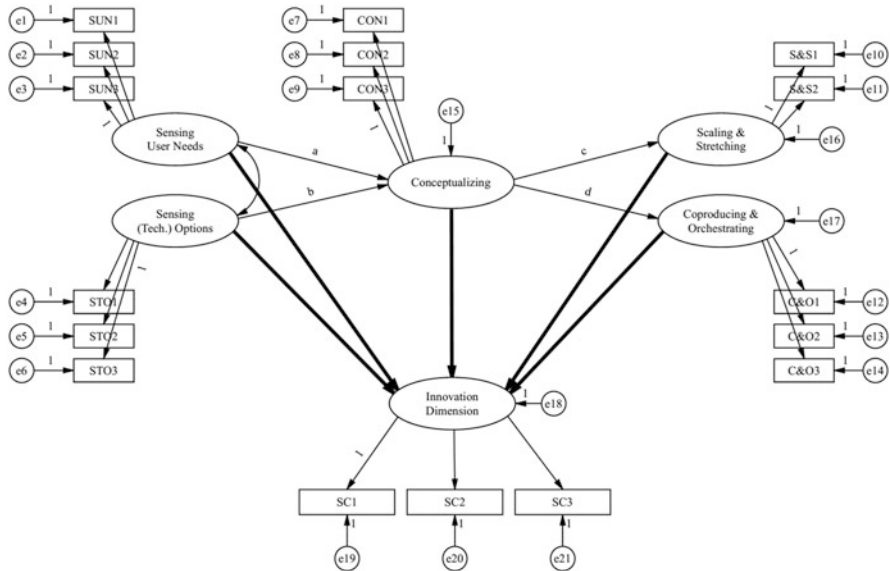
Fig. 5.3 Model for testing which capability is most strongly related to changes in a particular innovation dimension

relations between latent variables (Hooper et al. 2008). Using SEM makes it possible also to take into account the relation between the capabilities themselves.

   As noted, earlier tests revealed that the capabilities cannot be seen independently from each other (Janssen et al. 2015b). Firms only have the possibility to engage in scaling and stretching or coproducing and orchestrating when they actually are able to sense developments and turn that into a feasible concept. To correct for these dependencies, we implement a model shown in Fig. 5.3. The relation between the capability strength and innovativeness is assessed by replacing 'innovation dimension' items for the ones corresponding with one of the actual five dimensions. In Fig. 5.3, we depict the exemplary situation in which the service concept dimension (having three underlying items) was chosen as the dependent variable. Our approach leads us to run the model five times, each time with a different dependent variable. In order to also validate our earlier findings regarding correlations among the constructs, we compare an unrestrained model (i.e. including structural paths between the capabilities themselves) against one in which the four intra-capability paths are eliminated.

3.4   Results

Due to the multitude of relations being tested in our study, we use a table instead of graphs to present the output of our analyses. Table 5.5 presents the standardized regression coefficients for the paths between capabilities and the dependent service

Table 5.5 SEM results: relation between innovation capability strengths and service innovation dimensions

		Service innovation dimensions (Y)[a]					
		SC	CI	VS	RM	ODS	TDS[b]
Service innovation capabilities (X)	Sensing user needs	0.196**	0.007*	−0.143	−0.107	−0.225**	−0.297***
	Sensing (tech.) options	−0.073	0.193	0.073	0.042	0.087	0.724***
	Conceptualizing	0.507***	0.047	0.036	0.403***	0.456***	0.186
	Coproducing and orchestrating	0.127	0.074	0.648***	0.214***	0.456***	0.015
	Scaling and stretching	0.090**	0.346***	0.142*	0.097	0.189**	0.073
Goodness of fit: With structural paths	X2/df	2.527	2.382	2.360	2.337	2.436	2.613
	RMSEA	0.063	0.060	0.059	0.059	0.061	0.065
Goodness of fit: No structural paths	X2/df	5.703	6.045	6.007	5.981	6.105	–
	RMSEA	0.111	0.117	0.114	0.114	1.554	–
Difference in goodness of fit	Significance of change (p)	0.000	0.000	0.000	0.000	0.000	–

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

[a]*SC* service concept, *CI* customer interaction, *VS* value system, *RM* revenue model, *ODS* organizational delivery system, *TDS* technological delivery system

[b]For the model in which Y = TDS, and in which structural paths are absent, no fitting model could be estimated

innovation dimension (i.e. the bold lines in Fig. 5.3). The table includes goodness-of-fit values for the model in which the capabilities are linked to each other, as well as for the model in which these intra-capability paths are taken out.

The model variants including structural paths have a fairly good goodness of fit of a χ^2/df below the threshold of 3 (Hooper et al. 2008). A key finding is that simultaneously regressing the capabilities on the innovation dimensions confirms their distinctiveness: generally, each capability is linked to one or more innovation dimensions implying that there is not a straightforward relationship between one capability and one single innovation dimension. The analysis also reveals that there are distinct patterns in the interlinkages between capabilities and dimensions. In the following, we will simply interpret what we can learn from Table 5.5 and go through our set of hypotheses formulated in Sect. 2.4.

1. Starting with the capability for sensing user needs, we notice that the strongest relation exists with the service concept and a weaker relation with customer interaction, both of which we hypothesized. This suggests that, compared with firms where this capability is less strongly present, firms that excel in sensing used needs will concentrate on service-based business model innovations that specifically develop the service concept and (to a lesser extend) customer interaction. It seems logical as sensing user needs is a capability that plays a role in the knowledge sourcing (i.e. the beginning phase of the innovation value chain) and must result in information that feeds the actual design of both the service concept and the customer interaction. In a way, the negative correlation with both the organizational delivery system and the technological delivery system confirms this, as these are typically dimensions of service-based business model innovations that play a more prominent role when the actual innovation need to be realized in practice, i.e. mostly in later phases of the innovation value chain.

2. From Table 5.5, we also learn that firms with the capability of sensing technological options focus on creating the technological delivery system among the service-based business model innovations. This is a substantial and highly significant correlation that matches our hypothesis on this capability: organizations that want to excel in creating an innovative technological delivery system need to invest in the capability for sensing technological options. We also expected to find a link with customer interaction, as this dimension is to a large degree technology mediated as well, but we only found a weak (effect size) and statistically nonsignificant link here. This indicates that creating innovative customer interfaces is not necessarily defined by the capability for sensing technological options in an innovating organization.

3. With regard to the conceptualizing capability, we hypothesized that organizations excelling in this capability likely outperform their peers/competitors in the dimensions of service concept and organizational delivery system in particular. This is indeed the case as we find strong and highly significant correlations here. However, a third dimension – the revenue model – is strongly linked to this capability as well (the relationship is highly significant). In an ex post

interpretation, this seems logical as translating a concrete service concept into a concrete business proposition also means considering the revenue model that is feasible. Actually many service-based business model innovations are essentially about designing new revenue models. An example is manufacturing firms looking for service concepts that allow them to sell access to their goods instead of only selling goods and offering services for free (Witell and Löfgren 2013). Illustrative are also service firms searching for innovative pricing schemes, as found in the mobile telecom or in the leisure industry where revenue systems with slogans like 'all you can eat' or 'pay per use' are introduced as part of new business models.

4. The coproducing and orchestration capability is also linked to three out of the six innovation dimensions. We anticipated two of these: the dimensions of value system/business partners and revenue model associated with the new business model. Our analysis indicates that organizations highlighting this capability need to establish partnerships in order to realize the service-based business model innovation and to find a model for splitting costs and revenues among them. We did not anticipate that the organizational delivery system would be strongly linked to this capability. As this was the case, we interpret it as a sign of the importance of the actual knowledge application phase in the value chain – to which this capability evidently belongs. In other words, firms have to be innovative in how the new value propositions are actually worked out in day-to-day practice. Therefore, also the organizational delivery system (together with the business partners and the related revenue model) needs to be in order.

5. Also the scaling and stretching capability is clearly a capability that is most relevant in later phases of the innovation value chain. We hypothesized that the sub-capability of scaling would be linked to three dimensions: organizational service delivery system, technological delivery system and the service concept. Correspondingly, we hypothesized that the stretching sub-capability would be linked to the dimensions of new (related) service concepts and new customer interaction. Actually, we found correlation between the scaling and stretching capability and three out of the four hypothesized links. Most obvious and most substantial (and also most significant) is the link with the customer interface dimension. This can be possibly explained by the fact that both scaling and stretching set high demands on the customer interface. Innovations that are rolled out on a large scale require not only reliable and appealing but also multiple ways of interacting with customers. Strong brand names that are able to stretch the offerings have a reputation of fostering customer interaction in multiple and quite often innovative ways. Our analysis also shows that scaling and stretching are negatively correlated with the renewal of the business partner dimension and the technological delivery system (although the correlations are weak). The first is possibly due to the fact that especially scaling requires discipline and control, and this is most likely easier with fewer and/or well-known business partners than with new ones. For similar reasons, one can imagine that when rolling out a new value proposition at a massive scale, an

organization will be less inclined to experiment with new technology delivery systems and possibly prefer proven technology.

Finally, when comparing the unrestrained model with the restrained one, we observe that including paths between the capabilities yields the best results for all of the dependent variables. The structural relations from the knowledge sourcing capabilities to conceptualizing are statistically significant in every model, and so are also the relations from conceptualizing to the capabilities concerning the application of knowledge. Whether a firm is able to actually implement new propositions thus depends on its ability to transform raw ideas into propositions, which in turn depends on its ability to acquire or conceive ideas (Janssen et al. 2015b). The analyses without these paths are significantly worse and did not even deliver a fitting model for the 'technological delivery system' dimension. This confirms our finding that the operationalized constructs (based on den Hertog et al. 2010) are not just a random collection of capabilities but should be seen in relation to the sequence of knowledge processing activities.

4   Discussion

In our view, multidimensionality is crucial for characterizing and understanding both service-based business model innovations themselves and the organizational capabilities needed for creating these innovations time after time. Thus far we have presented the frameworks for innovation dimensions and innovation capabilities mostly in isolation, whereas they are at least conceptually linked from the beginning (see den Hertog 2010). Only after scales for both models/frameworks were developed (mainly through extensive case-based research) and subsequently tested in practice using large-scale survey data, we were able to examine the linkages between the two models empirically.

From the empirical test, we learned that ten out of the 12 hypotheses we formulated in 2010 regarding the five innovation capabilities were confirmed. Two hypotheses were not met using our extensive dataset. The first of them concerned the link between the capability for sensing technological options and the dimension of customer interaction. The other concerned the capability of scaling and orchestrating and the dimension of technological delivery system. On the other hand, we also found unexpected links. In total, four of the five capabilities turned out to be linked to multiple innovation dimensions (see Table 5.5).

What else did we learn from linking services innovation dimensions to underlying capabilities? Below we present some observations that we think are helpful for making progress in the academic discourse on service innovation/business model innovation and the various underlying capabilities. Also, they can be informative for those organizations that eventually have to decide on how to design new service-based business models and make decisions which types of capabilities to invest in. Clearly, we are putting these observations up for discussion.

A first observation is that our analysis confirms the discriminant properties of both abovementioned frameworks and shows their usefulness for mapping, measuring and discussing on how to build service-based business model innovations. It provides a vocabulary, repository of examples and not least a pool of evidence about what is important and what is not when working on the multiple dimensions of service-based business model innovation and underlying dynamic capabilities needed for it. The sheer availability of the two frameworks fosters conversation in the first place. This brings us a step closer to 'prescribing' or providing hands-on advice on how to manage service-based business model innovation (Zolnowski et al. 2013). The two frameworks in combination are valuable in systematically assessing on which dimension an innovator is usually strong or weak and in which capabilities it excels or needs to improve. Ultimately, our findings help organizations to choose in which types of capabilities they need to invest or collaborate. This presumes they already know which dimensions are important for them. To assess this, we advise organizations to use the innovation dimension framework as a basis for designing new propositions. Because of its wide applicability, the framework allows organizations to look at concepts in entirely different industries. The framework can also be used to determine which kind of changes an organization can think of when dealing with a particular dimension (cf. 'archetypical changes'; Janssen 2015). However, by linking the innovation dimensions to capabilities of Framework 2, the innovator can come to grips in which capabilities it might want to improve its performance.

Second, we observe that there are logical combinations of dimensions and capabilities: they tend to co-occur. When knowledge sourcing is concerned, for example, sensing user needs and sensing technological options are separate capabilities that help in creating a new service concept and a new technological delivery system, respectively. The dimensions concerning new business partners, a new revenue model and the creation of a new organizational delivery system are interlinked and heavily dependent on the coproduction and orchestration capabilities of the innovator. Organizations that excel in innovations with a great service concept are more likely to have capabilities for sensing user needs, for conceptualizing and for scaling and stretching, too. The analysis provided in this chapter reveals that especially the capability of conceptualizing and the capability of scaling and stretching are powerful capabilities as they are linked to many service innovation dimensions. They facilitate implementing prototypes of service innovations (or service-based business model innovations) and subsequently launching these on the market. It should be noted, however, that our analyses in this chapter do not offer a clear-cut recipe: after all, we did not study what works best. We only investigated which capabilities and dimensions tend to occur strongly together. Whether these combinations are the most effective ones remains to be investigated. A merit of the current study is that it invites organizations to ask themselves if they possess the capabilities that could be associated with a particular dimension. Although we do not prove the need for a certain capability, we do provide a basis for organizations to reflect on why they miss a capability associated with a certain dimension or – the other way around – why they have a capability not associated

with any of the dimensions a firm is targeting. Thus, the combination of Frameworks 1 and 2 provides pointers where to improve and where to invest.

Third, we observe that organizations rarely excel in all phases of the innovation value chain. Those organizations that are good at the beginning of the innovation value chain should combine the sensing of user needs and sensing technological options with strong conceptualizing capabilities. This helps in ensuring that the results of sensing activities are translated in a working prototype of an innovative service-based business model; it also helps in focusing the sensing capabilities. Organizations that excel in knowledge application and are able to build and scale service innovations should make sure that their scaling and stretching as well as their coproducing and orchestrating capabilities are well developed and possibly buy in sensing capabilities. We do think, however, that hardly any innovator would survive without a basic conceptualizing capability as this capability is positively linked to all six innovation dimensions, of which three are highly significant (see Table 5.5).

Another point for discussion is that organizations face a 'make or buy' decision when strengthening their innovation capabilities. The evolutionary properties of the various capabilities suggest that organizations wanting to develop new business models need to master or at least have access to most of the capabilities we investigated (or rather the micro-foundations underlying these capabilities). However, creating and sustaining organizational capabilities is expensive, and therefore it is logical that some capabilities are bought in. One could even argue that some of the business partners that are involved in creating and producing a new business model are brought in mainly for that reason. They bring on-board capabilities that are needed for providing a new experience or solution. In that sense there is a trade-off between developing and sustaining an organization's own capabilities and investing in sometimes complex alliances to make sure that the needed capabilities are there to realize a sustainable business model innovation.

Finally, and in line with Eisenhardt and Martin (2000), we stress that there are commonalities in the key features of the five innovation capabilities – otherwise there would be no best practice to be used for learning purposes. On the other hand, there are idiosyncrasies in the details and in the underlying micro-foundations.[9] This means that an innovative service-dominant organization can develop its innovation capabilities over time, but simultaneously it has to deliberately adapt and specify a particular mix of regular resources and capabilities underlying the innovation capabilities in which it wants to excel. This process needs to be aligned with the chosen strategy of the firm. The firm has to develop and detail individual capabilities further in order to be competitive in a sustainable fashion. This also

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[9] Eisenhardt and Martin (2000, p. 1108) remark in this context that: 'Yet, while dynamic capabilities are certainly idiosyncratic in their details, the equally striking observation is that specific dynamic capabilities also exhibit common features that are associated with effective processes across firms.......there are more and less effective ways to execute particular dynamic capabilities ....there is best practice'. Similarly Winter and Szulanski (2001) indicate that there is a lot of specificity in how dynamic capabilities are translated and implemented in a particular firm.

implies that an organization can take several paths to becoming a successful business model innovator. However, using the leading organizations as a source from which to copy innovation capabilities and their shaping in practice is not a suitable approach. It does not support becoming a sustained and successful innovator as it does not include adaptation and specification (and thus not develop a unique, organization-specific set of micro-foundations for dynamic service innovation capabilities).

5 Conclusions

5.1 Contributions

This chapter started out with a clarification of the relation between service innovation and business model innovation. We demonstrated how both domains are (often implicitly) based on evolutionary theories – particularly on those theories which interpret innovation as a matter of search in multidimensional design spaces. Service innovation and business model innovation extend that line of thinking by also involving non-technological dimensions. These 'extra' dimensions, like the revenue system or the form of customer interaction, might in fact be the ones breaking or making the success of an innovation.

The core contribution of this chapter is our analysis of the relations between innovation capabilities and innovation dimensions. Innovation capability frameworks, like the ones we examined here, tend to be grounded on evolutionary foundations as well. Using SEM, we were able to show how capabilities in all stages of the knowledge transformation processes not only differ from each other in terms of underlying activities but also have specific accents when it comes to the dimensions they are most related with.

Ultimately, we aimed to illustrate that the innovation dimension as well as the capability framework eventually may inform managers responsible for developing organizations that are able to create successful innovations over and over again. Put differently, the two models are not only conceptual frameworks, but can provide management guidance to organizations that want to develop innovative service-based business models.

5.2 Limitations

Given that the reported measurements stem from the same data source, a major methodological concern for this study is a common bias: do the operationalized frameworks really reflect two distinct concepts? In other words, did we ask respondents twice for the same phenomenon when measuring innovation capabilities and

the supposed effect of having those capabilities (changes on a certain dimensions)? This issue is particularly relevant for capability-dimension combinations where there is a close conceptual relation. For instance, sensing technological options has an obvious connection with the dimension of technological delivery system, just like coproducing almost inherently points at the presence (and perhaps changes) of business partners. We noted, however, that the survey items for operationalizing both frameworks are quite distinct from each other. Our phrasing of capability items aimed to ask for actual activities in order to exclude the possibility that firms suppose they have a capability simply because they realized they changed a certain business model dimension. Moreover, the differentiated patterns we encounter suggest that we really do identify peculiar relationships. We leave it to future research to contextualize these patterns and assess which capability-dimension combinations are the best predictor for firm performance in terms of turnover.

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Chapter 6
Innovating in Practices

Tiziana Russo-Spena and Cristina Mele

Abstract This work builds on a practice-based approach to offer a fresh understanding of innovation. The authors address innovation not simply as an outcome but as something actors do: a practice in terms of a collective doing that connects knowledgeable actors. The term 'innovating', rather than 'innovation', reflects the dynamic aspect of the phenomenon. Innovating is thus conceptualised as a texture of practices that seamlessly interweave relationships and actions. It emerges through two collective practices performed by multiple actor-to-actor interactions: networking and knowing.

Keywords Innovation • Practices • Knowing • Networking

> Innovation is by definition an emergent phenomenon based on gradually putting into place interactions that link agents, knowledge, and goods that were previously unconnected, and that are slowly put in a relationship of interdependence.... What marks innovation is the alchemy of combining heterogeneous ingredients: it is a process that crosses institutions, forging complex and unusual relations, the market, law, science, and technology.
>   Callon (1999)

1 Introduction

Emerging perspectives provide a different way to view innovation, unlike the paradigmatic approaches that have long shaped business literature: Schumpeterian creative destruction (Schumpeter 1912), the systematic character of innovative process (Drucker 1954) and the linear-rational stage gate model (Cooper 1988). Fresh views have emerged from fields outside product innovation and technology. In service research, for example, scholars are moving away from a positivistic view of innovation focused on goods and technology and toward more interpretive views (Edvardsson and Tronvoll 2013), in which service innovation is a process of new

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benefit provision rather than an intangible outcome (Lusch and Nambisan 2015; Lusch and Vargo 2014; Mele et al. 2014).

Service innovation arises from the interplay of multiple actors finding new ways to integrate resources, resulting in mutual value creation (Edvardsson and Tronvoll 2013; Michel et al. 2008; Ordanini and Parasuraman 2011). The service-dominant logic (Vargo and Lusch 2004, 2008) emphasises the role of relationships, knowledge and the dynamic nature of the assets, such that 'Innovation is about applied knowledge, used both to create resources and resourceness through integration with other resources and to apply these resources to provide service' (Lusch and Vargo 2014, p. 122). Moving away from the planned linear and rational development of new products (Cooper 1988), the service-dominant logic proposes an iterative, effectual process in which 'actors operating in an open system riddled with uncertainty cannot predict the future but can take actions that effect it, a step or two at time' (Lusch and Vargo 2014, p. 22). The firm is not the sole innovator but rather is an open system that cannot separate 'from the society in which it is embedded' (Lusch and Vargo 2014, p. 22). Encompassing more than just business and economics, innovation involves the intricacy of sociocultural phenomena (Toivonen and Tuominen 2009) and structural changes stemming from either a new configuration of resources or a new set of schemas (Edvardsson and Tronvoll 2013), allowing actors to cocreate value. Vargo et al. (2015), drawing on institutional theories, propose an ecosystems approach to innovation and its complex nature. The service ecosystems approach broadens the scope of innovation beyond firm-centred activities to include collaboration, emphasising both social practices (e.g. representing, normalising, integrating; Lusch and Vargo 2014) and processes that drive value co-creation.

Taken as a whole, these studies shed light on the complex and multifaceted nature of the structure and processes of innovation. However, service scholars have not gone as far in understanding how innovation occurs or offering a more comprehensive conceptualisation of the phenomenon. The discussion seems to focus more on antecedents (interaction and resource integration) and benefits (value co-creation) and less on practices and the dynamic aspects of multiple actors innovating for mutual value.

We build on a practice-based approach within organisational studies to offer a fresh understanding of innovation (Brown and Duguid 2001; Orlikowski 2002). The focus is on neither the individual nor the organisation but rather on the 'way of doing' that is embedded in a context of interlinked elements (Korkman et al. 2010; Schau et al. 2009). By examining how changes occur, we address innovation not simply as an outcome but as something actors do: a practice in terms of a collective doing that connects knowledgeable actors. We emphasise the social connections occurring among a group of actors – individuals, collectives and organisations – that integrate an array of resources (e.g. tools, knowledge, images, material objects), as well as the contexts in which knowledge creation and sharing take specific forms for innovation to occur. The practices are viewed as connections (Gherardi 2012a, b), sustained by an ongoing series of relationships in actions – that is, connections in actions.

The term 'innovating', rather than 'innovation', reflects the dynamic aspect of the phenomenon. As Weick (1969, p. 188) notes, 'verbs keep things moving'. In line with postmodern thinking (Chia 1995 p. 579), the change of expression stresses 'action, movement process and emergence' and not only 'nouns, end-states, insulated, discrete social entities and events'. Innovating is thus conceptualised as a texture of practices that seamlessly interweave relationships and actions. It is a social emergent process in which a collective doing activates and connects distributed knowledge in and between social groups (Nicolini 2011; Gherardi 2012b).

We organise the remainder of this chapter as follows: First, we conduct a brief review of practice studies and innovation. Second, we present our research method and findings. Third, we present the main discussion and conclusions.

2 Literature Review

A 'practice-based approach' is a broad term that encompasses many different research fields (Gherardi 2006), unified by the common premise that social reality is fundamentally composed of practices (Schatzki 2001). Rather than viewing the social world as external to human agents, this approach views it as being produced and reproduced through everyday actions. 'Practices' refer to an embodied, materially mediated array of human activities that are centrally organised around shared understanding. They are not simply synonymous with actions, routines or processes (Schatzki 2001, 2005) but rather are understood to be constitutive of the socio-material world (Orlikowski 2002), in which human agency is not only shaped by but also produces, reinforces and changes structural conditions in a recursive process of reproduction and transformation. In other words, a practice involves the production of social relations (Rouse 2002).

The adoption of a practice-based approach to innovation is still in its infancy. The following subsections briefly review three main fields offering novel perspectives.

2.1 Knowledge, Learning and Workplaces

By offering a fresh understanding of knowledge, learning and workplaces, scholars in the social learning and organisational research tradition offer insights into how innovation unfolds in the practices of communities. By moving away from mere cognitive approaches and examining the knowledge and learning processes within their social and situated contexts (Lave and Wenger 1991), scholars have replaced the expression 'knowledge' – and its connotation of a passive view of its material nature – with the term 'knowing', a social process that takes place in everyday activities in environments such as workplaces and social communities. Knowing is viewed as integrated and distributed in the life of the community, and it is an act of

belonging that requires active participation (Cook and Brown 1999; Lave and Wenger 1991, Wenger 1998). In the formation of and changes to communities in which work takes place, learning practices provide a rich foundation from which innovation can potentially flourish (Brown and Duguid 1991).

Other scholars suggest the perspective of knowing in practice to contribute to understanding of how innovation unfolds through the working practices of the complex organisations (Orlikowski 2002). The competence to develop a global product is both collective and distributed, grounded in the everyday practices of organisational members. Knowing is not a static, embedded capability or stable disposition of actors but rather is an ongoing social accomplishment, constituted and reconstituted as actors engage the world in practice (Orlikowski 2002). This view is more in line with an understanding of organisational activities as contingently reproduced by knowledgeable human agents to enable the reproduction of activities and produce change and innovation. In this view, the embeddedness of knowledge enables innovators to reorganise practices themselves, particularly across work boundaries (Dougherty 2004, Dougherty and Dunne 2012). By addressing social rather than routine aspects of practices, some scholars focus on knowing in practice as a collective accomplishment of innovation that depends on a range of spatially distributed knowledge within a wider network of relationships (Amin and Roberts 2008; Swan et al. 2002). Actors cannot innovate in isolation (Swan and Scarborough 2005; Swan et al. 2002, 2007); they are part of networks in which partners with different backgrounds and interests are dependent on one another. At the intersection of individuals, organisations and communities, through the underpinning of relationships among practice, politics, networks and technology, distributed knowledge can be brought together and integrated into new products, processes and services (Swan et al. 2007).

2.2   Innovation as Connections in Actions

Some scholars (Gherardi 2006; Nicolini 2011) advocate replacing (1) the notion of a community of practices with that of the practices of a community and (2) the view of connections in actions rather than boundaries. The shift from community of practices to practices of a community involves a change of perspective and epistemology: 'knowledge is not an 'asset' of the community, but rather an activity (a 'knowing'), that itself constitutes the practice ('knowing-in-practice')' (Gherardi 2009, p. 523). In the community of practices, people convey a sense of belonging by engaging themselves in doing things together, talking and producing artefacts (Gherardi 2000, 2001, 2009). The attention shifts from the acting subject (i.e. the community) to the practices the collectivity performs: 'knowledge, activity, and social relations are closely intertwined, and in a sense the common activity provides the medium and the resource for the act of generating a "sense of community"' (Gherardi 2009, p. 522). In the practices of a community, innovation emerges not only from collective action but also as a process of comparison of participants'

perspectives (Gherardi 2012a, b); innovation results from continuous discussion and negotiation.

In this view, knowledge and innovation occur at the interplay of different practices or connections in actions and at distances between communities:

> The relations that connect practices and extend them beyond the boundaries of an individual organization, or among heterogeneous communities within the same organization, are conceptualized not as structural relations but as connections-in-action. (Gherardi 2012b, p. 221)

By assuming a processual view, the focus moves to interactions and connections rather than boundaries. Due to the weakness to operate a closure around networks and to analyse separations and distinctions on the one hand and how to overcome them on the other, scholars suggest 'focus[ing] on how connections are established and developed over time' (Gherardi 2012b, p. 224). Networks are viewed as containers of knowledge and network relations as conduits that convey knowledge from one place to another. Adopting the idea that knowing occurs in a 'constellation of interconnected practices' (Gherardi and Nicolini 2003), researchers have introduced the term 'texture of practice' to overcome the notion of boundaries. The term harkens back to the idea that organising and innovating are complex social processes that internally and externally extend the organisation, in which distributed knowledge is activated through establishing connections in action that give them specific forms within a situated practice.

2.3 Innovation as Practices of Co-creation

Building on the service-dominant logic and practice-based approach, some studies (Mele et al. 2014; Mele and Russo Spena 2015a, b; Russo-Spena and Mele 2012b) abandon a passive view of the material nature of knowledge that is transferred and exploited in a linear innovation process and espouse instead a view of practices as 'a bricolage of material, mental, social, and cultural resources' in which 'to know is to keep all these elements in alignment' (Nicolini et al. 2003, p. 27). These studies address practices as the locus of innovation.

Moving innovation into the realm of practice means going from the outcome to the process: from innovation as a new artefact to innovating as a set of co-creation practices performed by people who merge knowledge, actions, tools, languages and artefacts to create something new and better. Innovating is not only an economic process but a social process of construction by a group of actors, in which a company's borders vanish in favour of an actor-to-actor market ecosystem (Vargo and Lusch 2011). Innovators are perceived as carriers of practices who perform actions by using and integrating resources (including symbolic, linguistic and material ones) (Russo Spena and Mele 2012a). Innovation is co-created through resource integration to increase actors' mutual value (Mele et al. 2014).

Scholars propose various classifications of innovation practices according to the context and the aim of the study. For example, Mele and Russo Spena (2015b)) propose four practices: engaging, exploring, exploiting and orchestrating. Exploring and exploiting support the generation, dissemination and discussion of knowledge and ideas, and engaging and orchestrating sustain the other practices by creating contexts, connecting market actors and enabling resource exchanges and integrations, as well as facilitating the sharing and dissemination of market and technological knowledge.

These contributions represent attempts to adopt a practice-based view of innovation; however, a more comprehensive understanding of the phenomenon is necessary. Moreover, few empirical studies specifically analyse the practices of innovation. With the current study, we aim to close this research gap.

3 Research Design

Because this multifaceted and complex field is still emerging, we chose to adopt a qualitative research design (Denzin and Lincoln 2013). Using case study-based research, we conducted an intensive, in-depth study of a new innovation project of a leading multinational pharmaceutical firm. Pharmaceutical industry characteristics provide a well-suited context in which to analyse the complex social dimension of innovation practices.

We selected a specific innovation project because of the collaborative dimension involved in its development. Our analysis focused on the practices of knowledge creation and sharing between involved actors. We followed the practices and acquired concrete meaning, in line with Gherardi and Nicolini's (2006, p. xviii) methodological principle ('the researcher observes a situated practice and moves up from it to the institutional order or moves down from it to the individual-in-situation'). The interviewed participants include the company's project members, represented by an innovation manager, the medical research manager, the team research leader, the clinical study manager and clinical research associate responsible.

We chose the 'problem-centred interview' (Witzel 2000) technique to access the narrated experiences of the participants. To this end, we began by asking the interviewees to explain how they personally experienced the project; we asked them for their own story about how the company practices innovation and knowledge through the network. All interviews were guided by an open approach to questions that were generated from their understanding of knowledge and innovation. We first asked for a description of activities and their dynamics and then explored the interpretations of organisational practices more closely to foster knowledge and innovation. We conducted a total of 20 interviews, each approximately 1.5 h in duration.

We also used project and program documentation, published sources, follow-up e-mails and telephone calls as other sources of information. The interviews were

tape-recorded, transcribed and analysed. First, we coded all material without predefined categories. Then, we scrutinised the interview transcripts and other documents to identify patterns and recurring themes in the data. We adopted an emergent, flexible and inductive process by alternating between theoretical insights and empirical work (Dubois and Gadde 2002).

4 The Case Study

The case study involves a pharmaceutical firm founded at the end of the twentieth century, through the merger of Swiss chemical and life science firms. Less than 20 years since its foundation, the company has become a world leader and one of the top innovators in the pharmaceutical industry. Its mission is to discover, develop and successfully market innovative products for patients and consumers worldwide. Its innovation efforts span the health care spectrum: pharmaceuticals, eye care treatment, generics, consumer health products, vaccines and diagnostics. As a result, the company has one of the strongest and most productive new product pipelines in the industry, with 152 projects, including new molecular entities and additional indications or formulations for marketed products at the time of our study.

'Health care innovation' refers to a complex process of drug discovery and development that involves two main activities: an exploratory phase and a confirmatory phase (Fig. 6.1). Typically, making a drug begins with identifying a protein
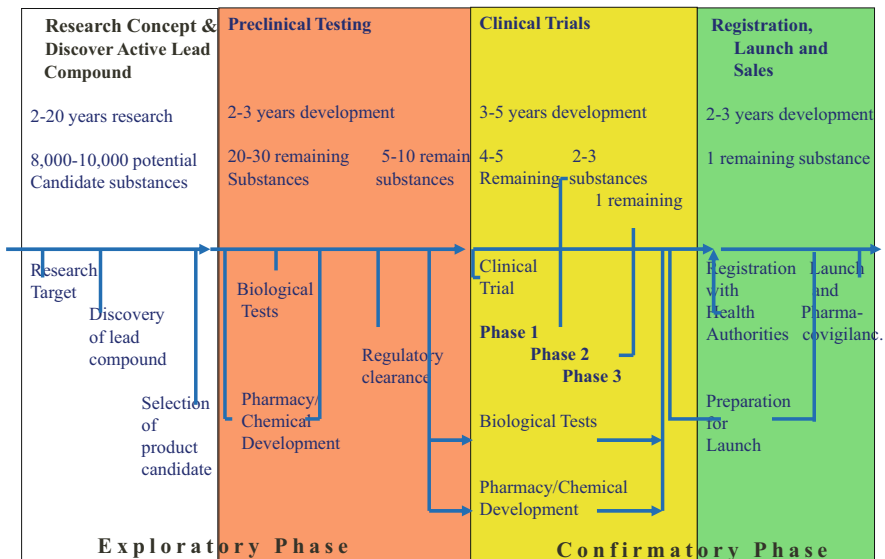

Fig. 6.1 Health care innovation (Source: Company's documentation)

associated with human disease. This protein is known as the 'target'. When it is confirmed that a target plays a role in the disease, scientists conduct an experiment to find a chemical compound that 'hits the target' in a way that alters the disease. The identified chemical compound becomes a drug candidate. The firm's scientists must then determine an initial profile of a drug candidate's safety and effectiveness using computer models and laboratory tests before testing the drug in humans.

In the confirmatory phase, the drug enters full development. The firm conducts clinical studies in larger patient groups to test the effectiveness of the drug, determine the appropriate dosage and further evaluate its safety. To register a new drug, the firm must submit all preclinical and clinical study results, along with descriptions of the manufacturing process, to regulatory authorities to obtain authorisation to market the drug. This process occurs through a complex network organisation that includes internal and external partners. The internal networks involve two main types of research networks that are built through a progressive strategy of mergers and acquisitions that are located internationally.

The first network is the Biomedical Research Institute, where scientists and physicians work to discover compounds and move them along through the initial tests. Headquartered in Cambridge, UK, and other strategic locations in the United States (California, Texas and Massachusetts), the United Kingdom, Italy, Switzerland, Japan and China, this internal network has developed well-established collaborations with academic scientists, clinical investigators and biotechnological companies that provide the firm with a strong research capability. The network is comprised of 6,000 scientists, physicians, business professionals and other research experts all around the world.

The second network includes the development pharmaceutical units that perform confirmatory testing and facilitate the process of gaining regulatory approval. These units are located in the most strategic regions for research activities and comprise most of the global line functions.

The following section details how innovation occurs in the confirmatory phase, with a focus on the clinical trials. We describe the clinical trials practice, its limitations and the changes in innovation practices. The analysis focuses on how knowledge emerges at various points in the network members' interactions to modify the existing practice.

4.1   The Clinical Trials Practice

Clinical studies represent a critical phase of the development processes, when the firm determines whether a new treatment is safe and effective. Such studies are possible because volunteers agree to participate and try new medicines. In these phases, the network of internal and external partners plays a crucial role. The external network includes the corporate medical department at the company's headquarters, the regional medical department and the contracted research organisations where the clinical trials are implemented. The regional medical department
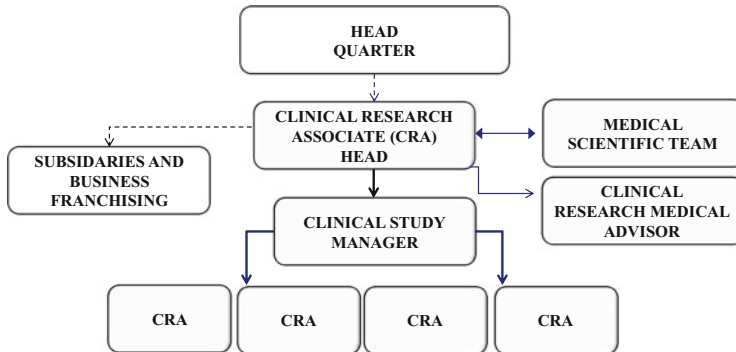
Fig. 6.2 The research team (Source: Company's documentation)

operating locally is responsible for the process, and its interfunctional team (research team) is composed of actors positioned at different levels of the company's organisation (Fig. 6.2). The team is responsible for providing direction, guidance and support to the innovation phases according to their specific competencies.

The confirmatory phase involves a highly negotiated and mediated process among the actors. At the preliminary stage, the owner of the clinical proposal is the medical department operating at the company's headquarters. This department identifies and approves the area of clinical research within a broader program of clinical development of a product. This department offers, to the medical division at the local regional area, a brief of the study protocol, requesting a quick decision of commitment to participate in the clinical trial.

Within 48 h, a unit of the local medical department – clinical operations – expresses an opinion on the draft study proposal. The local unit's response relies on a preliminary evaluation of the availability of competencies and financial resources to be used for the testing proposal, as well as the interest of the local scientific community regarding the possibility of the clinical studies.

After the preliminary acceptance, the clinical department develops a more in-depth analysis of the strategic feasibility of the proposal. With the support of key opinion leaders (KOLs) selected from the company's local network, the specific research and methodological contents of the proposal are evaluated (number and type of patients); the evaluation also addresses the difficulty of the proposed study's methodological procedures.

The analysis of centres where the clinical projects would be implemented is one of the most critical phases of the confirmatory process. With collaboration from the medical scientific liaison (a leading figure in the KOLs' scientific network), the research team identifies a portfolio of clinical centres, selecting from a pool of new centres and those that have been involved in previous trials with the company. In this phase, a highly participatory process is implemented that places the potential of clinical centres at the focus. The feasibility of research objectives is evaluated in the context of common clinical practices that characterise the specific therapeutic area

of the potential clinical centre. In addition, the trial program goals must match those of the clinical centre in terms of the innovative approach the trial will implement for the diagnostic and/or therapeutic treatment of patients. The following quote by the project leader clarifies this aspect:

> The complete alignment between the 'real life' of [the] clinical centre and our expectations must be verified and negotiated. Only this allows us to proceed into the first step of the clinical trial program. The compatibility of the methodological criteria must be ensured and fixed in the trial proposal with the specific context of clinical centre and, if necessary, intervention is considered. The choice of centres is based on quantitative and qualitative evaluation. This process includes consideration of strict protocol criteria such as the portfolio of patients enrolled, the methodological standard adopted and the quality of data processed. Also, we prefer to prioritise centres that are investing to enhance the performance and strive to learn with us how to perform best-in-class clinical research.

The goal of the clinical studies is to ensure the effectiveness and quality of the data and their diffusion. The research team works as part of a company's effort to expand and improve clinical research information and to share data across disciplines and across partners, including local institutions and other actors in the local and international networks.

4.2 The Valorisation of Clinical Trials: Changes in Practice

To succeed in the scientific and pharmaceutical industry, it is crucial for firms to be involved in clinical trials. Thus, they are a key part of the company's investments in research and development (R&D), and they represent an important way to align the firm's research aims with scientific communities' innovative approaches to diagnostic and/or therapeutic treatment, as well as to specific patient needs.

The company aims to establish common background knowledge, skills and practices among the partners of the process. To optimise the R&D investment through improved knowledge and skills in the trial research process, in mid-2012, the company launched a new project: the valorisation of clinical trials. This process has two objectives. First, it aims to reinforce and increase the knowledge base of key clinical centres to diversify the company's medical investments and achieve a more appropriate allocation of trials in light of the firm's goals. Second, it supports the company in building a strong knowledge and relationship space where clinical trials can be addressed, scientific needs can be met and a community of knowledge for new research can be built.

The project involves strategic and organisational aspects of the company's internal network and its interaction with external partners. In Italy, the project involves nine clinical research centres, and the process owner is the director of the firm's medical research department.

The internal network must avoid the fragmentation effect that is likely to emerge when managing trial activities as a result of the many autonomous and separated units of the company's network. Previously, the internal clinical research project

oversaw the participation of various research team members who were involved at various trial development stages, often according to a partial perspective of the project's aims (see Fig. 6.2). In addition, the complex interactional context that emerged through these complex and articulated relationships only partially involved the business franchising unit, which has a commercial responsibility in the regional area. The company's internal policy prioritised the need to avoid a strong interaction between the research and commercial tasks. The result of this complex set of interactions was often a critical misalignment of the project's purpose and important milestones among the functions involved and the external partners' (the clinical research centres, KOLs and scientific communities) perceptions to interact with different companies with diversified objectives and competencies.

The changes in practice that the research team task force implemented to combine competencies, experiences and perspectives into shared aims are the first example of building a collaborative innovation network in action. The first change introduced by the valorisation project was the 'valorisation visit', which consisted of preliminary interactions between the research team and clinical centres. The purpose of these contacts was to introduce partners to a better overview of the competences and roles of each research team and to present the research aim in a more integrated and unified way. These articulated interactions at the preliminary stage of the clinical trial project arose from the need to respond effectively to the alignment of research needs of the company's units that were involved in the team and to propose a local partner as a unique organisational identity that could share a communal perspective of interest. A medical research director explains the constant negotiation:

> In uncertain and complex interaction activities such as those that are characterized in the first stage of a new project, it is necessary to rely on the integration of different perspectives and interests inside and outside the firm. The firm strives to establish a communal knowledge background among the different competences involved in the team, a strong corporate culture, an organisational identity and kinds of shared understanding that effectively lead the clinical research work in addressing a unified aim.

After the first contacts during the project stage, the firm implemented continuous and more in-depth interactions between the clinical local partners and the research team. The firm's aim was to make the partners aware of the knowledge, competencies and financial resources that the company's members make available to the trial project, as well as to fine-tune knowledge about the actual contribution of the partners to their research aims. In terms of learning, the organisational teams can better verify the potential contribution of the partners in their real working context; at the same time, the local partners could benefit from updated know-how and expertise regarding the therapeutic area that is under clinical investigation. The project leader notes the following regarding this aspect:

> It begins a series of contacts (face-to-face, conference call) that provide a continuous exchange of expertise, of technical information, scientific insights and shared reflections on the ultimate purpose of the project, representing the real added value in terms of 'learning' for both the sponsor (the company) and the investigator (the local partners). In

this way the firm may know more clearly how the potential outcomes of the research will or [will] not [be] able to meet its objectives of clinical trials, verified by the clinical centre in [its] real life daily. At the interaction among firm and partners, the combination of skills, know-how, professional experience [of those] who regularly face the ongoing context of experimentation, create a continuous flow of information between the organizational units and these units and the partners, and this inevitably leads to a real added value in terms of learning interaction. It becomes evident the potential benefits for the partner resulting from the updated know-how and expertise on the area covered by the therapeutic clinical trial.

The valorisation project relies on a large network knowledge infrastructure in which each partner knows his or her own part, but they are also required to know 'who knows what'. The strategy is to let knowledge flow in place and let actors learn how to search for relevant partners and knowledge bases that fit one another's interest and practices. The firm stresses at the outset that the continuous interaction between the local centre and the various members of the research team will enable it to add new skills in terms of methodological-clinical, scientific and organisational protocols, as well as the different management models that are implemented at the local partner's research centre. The project leader describes this process:

> What to achieve is rarely reasonably clear in advance to our partners [because] the clinical trial process is always a matter of complex collaborative multidisciplinary and organizational efforts. We bring new, different knowledge and methodologies to bear on understanding the fundamental practices behind [the] clinical partner context. Rather than dump simple information, the focus is on understanding the clinical context as experienced by the partners and then [shaping] each other's knowledge to the clinical research objectives. We work at fostering the creation of collaborative groups that are not close in their background and interests but that are used to join their experience in a collaborative effort. We strive to promote interaction across units and knowledge areas, the negotiation on compromises and the alignment of the actors' aims. We know that this effort requires not only a simply transfer of information or other form of material knowledge. We need to work ... in a mediated process to provide our partners with something that they can understand and share and that they can transfer in their process. This requires more attention to the way we dialogue with our partners and to the tools and artefacts (document, protocol, dataset) we use to interact with them even if we know that we have our interest to accomplish.

The valorisation project promotes the research team's efforts to collaborate with partners to translate and disseminate emerging knowledge into real-world practice. To this end, the project creates and promotes the diffusion of multicentre research protocols. This method of practicing clinical trial protocols is based on constant and structured interactions among the local centres that are involved in other trial projects, among which the company strives to develop established networks. The firm's aim is to promote the enrichment of the clinical centres by encouraging a mutual sharing of scientific and/or technical study protocols and the exchange of know-how, skills and insights to clinical, diagnostic and management practices and encourage centres to venture into new therapeutic areas outside their specific knowledge domain. The project leader details this aspect:

> The company's research team works in collaboration with partners to translate [and] disseminate ... new findings into real clinical practices. It promotes the creation of a social space to encourage the adoption of shared knowledge and practices. In the multidisciplinary context, there is a high potential of overlapping knowledge base at all stages of clinical

development, and the team works quickly to let [knowledge] emerge and shape a communal and integrated knowledge-sustaining innovation process. Working closely with different research partners becomes an increasing necessity for us; it expands our horizons and acts as a quality control. The basis of partner relationships for us is the partner-to-partner collaboration. We've tried to remove institutional and cultural barriers so that our organisation and our partners can work together because they are unique entities.

Finally, the valorisation project serves to expand the multilevel interaction at different stages of the company's and the partners' network. From the company's perspective, a formal interaction with clinical partners also includes the business franchise unit, whose aim is to reinforce communication of the clinical partners in the context of the local scientific community by creating two-way synergies with the national and regional medical communities, thereby helping disseminate new technologies and advances into clinical practice. The firm set up an advisory board that included clinical partners that had distinguished themselves in their research project achievements. The board, in collaboration with the medical director and the business franchise unit, is responsible for improving the scientific information process through the creation and diffusion of various tools (e.g. reports, documents, news, website updates) to allow not only a simple information transfer to the scientific community but also support training programs for clinical researchers and general practitioners. Training meetings and working sessions are also among the board's planned activities, with the aim of introducing clinicians and general practitioners to new practices in health services, using a more integrated approach to the care of patients' disease and wellness:

> To reinforce our knowledge, community is a priority for us. The quality of scientific data produced by studies, the effectiveness of our information protocol and the improvement in the sharing and dissemination of our results are increasingly becoming our priorities in the management of trials. We strive to improve all these activities and to contribute to the advancement of the knowledge of the scientific community.

5   Innovating in Practices

Prior research has used a practice-based approach as the epistemological choice to analyse how a company and its partners innovate. This case study sheds light on how that innovation occurs as changes in practices and their related elements (e.g. actors, resources, activities). Moving away from traditional models built on planned activities and new outcomes, we offer a more comprehensive conceptualisation of 'innovating', emphasising the emergent character of the phenomenon. Innovating emerges through two collective practices performed by multiple actor-to-actor interactions: networking and knowing (Fig. 6.3).
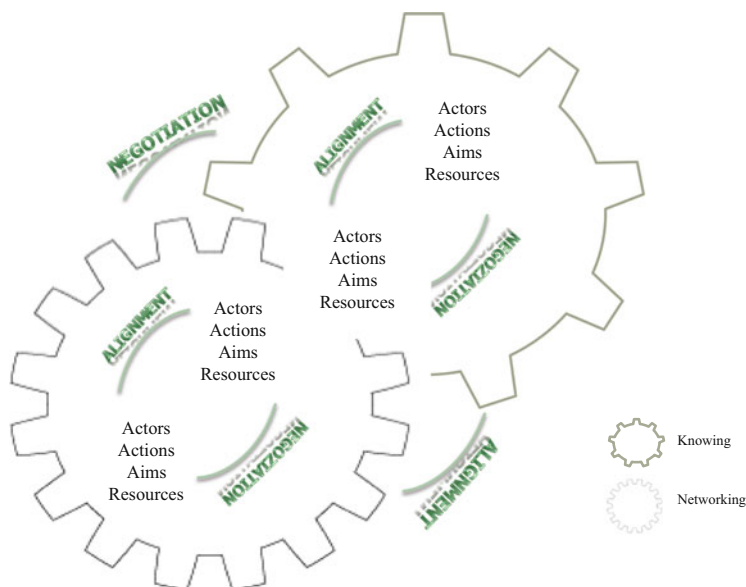
Fig. 6.3 Innovating in practices

5.1 Networking Practices

Networking practices are a way of connecting heterogeneous actors and resources. Firm members search for relevant partners and knowledge bases. Through interacting and collaborating, a knowledgeable community develops with several partners, either internal or external to the company. Being inside or outside the firm's boundaries is not as relevant as establishing connections that foster knowledge sharing. Such connections are a precondition to actions. In this community, each research partner must know not only his or her own part but also who knows what. The company's efforts aim to build a sense of relatedness among actors. Relying on their knowledge of who knows what, partners not only view one another as external sources of information but also as partners with whom to engage in purposeful resource exchange and integration and in the co-creation and sharing of knowledge.

Actors change their practices and strengthen the knowledge community through processes of negotiation and alignment. In fostering networking, the project's members align different interests, contexts of knowledge and practices of different actors involved – namely, corporate headquarters, clinical centres, partners and scientific communities. Their efforts are directed at mobilising the necessary people, knowledge and materials from variously connected contexts.

In the alignment between the corporate and local unit research aims, negotiation takes place at different levels of the multinational network by promoting and mobilising the participation of local research departments in accordance with

their specific competencies and interests, as well as those of the scientific community in which they take part. The next step of the alignment effort involves the company's need to match its clinical interests with those of the involved external partners to extend the network. The internal organisation must present itself in transparent and unambiguous ways, which is complicated by the multiple areas of expertise involved in the clinical project.

Through negotiation, it becomes possible to connect the multiple interests and practices of the company's members with those of the external clinical centres involved in the execution of trials. The possibility for effective collaboration is influenced by company members' ability to access the clinical centres in their context, which requires them to look internally and foster knowledge sharing with each partner. In addition, it is necessary to involve expert knowledge in a given domain in a collaborative effort to establish common practices and to develop a joint perspective on the proper methods and approach. Finally, aligning methods among clinical centres and within the local scientific community fosters the research team's need to expand and strengthen the external network through the translation and dissemination of new findings into real clinical practices. This negotiation and alignment networking practice contributes to making collective sense of the value of a new project, and it fosters a sense of community as partners recognise the need to dedicate themselves to a significant new project in medicine and clinical practices.

5.2 Knowing Practices

Knowing practices emerge through the interconnections or 'entanglements' of different forms of knowledge, and they enable actors to modify the status quo of innovating and promoting changes. Actors engage in knowledge creation and sharing with regard to the aims and content of collaborative interaction. In a multidisciplinary and complex project, it is not enough simply to determine relevant elements. Whether a knowledge flow is perceived positively depends on significant interaction and recognition between knowledgeable actors in the activities of their daily work. Actors question the what, why and how of current and emerging knowing.

The important aspects of a project – defining the partners to be involved, the activities to be undertaken and the aims to be achieved – cannot be identified as prespecified outcomes transferred among partners. As the investigated project shows, in a complex collaborative innovation, the setting of the problem is a critical step that involves a highly negotiated process within the community. This process relies on continuous experimentation and construction among the involved partners of what is relevant in the context of innovative clinical interests and practices. Advancing knowledge with partners requires practice, and scientific interest becomes the locus of 'knowing what to achieve'.

An important aspect of knowing questions the contextual principles underlying the current practice (knowing why to change). The focus of the company is continuous experimentation across the connections of different clinical and work domains. It looks for clues in partners' clinical trial experience and in the compendium of medical and scientific knowledge, as well as their integration with the growing knowledge of new practices in therapeutic and clinical areas. By promoting their confidence of different contexts and work domains, actors can exploit knowledge more productively. Actors engage in relevant reflection and critical inquiry beyond traditional and routine medical practice. Knowing why becomes a prerequisite to making informed partners and putting them in continuous tension, which fosters improvement and changes in innovating.

Knowing how includes considerations about the social interaction context of collaborative innovation and the expectations of all involved partners. Rather than simply prescribing the tasks to perform according to a rigid structure that must be adhered to, knowing how works as a call for collective knowledge to be developed. The actions of all actors are arranged according to the connectedness of different knowledge bases, and collective knowledge emerges through the shared context of practical working interaction. A different type of characterisation of expert and codified knowledge is experienced. Specialists do not simply put knowledge into the innovating practice of partners and go away; they promote translation of knowledge. Ongoing articulation and the negotiation of knowledge become central to a collective sense-making process. Toward this end, knowledge and artefacts are managed, to be adapted to partners' needs and constraints, without ignoring the need to make them robust enough to establish a common point of reference among the partners.

6   Conclusion

In this study, we frame innovating as collective practices performed by a knowledgeable community. This emergent process arises through negotiation and alignment among actors, resources, activities and aims. Innovating emerges through interacting parties who create and share knowledge through their working activities. Networking practice consists of bringing together knowledgeable actors. Fostering knowing practice is not sufficient to sustain innovation.

The investigation of networking allows us to examine the efforts and challenges of a firm in mobilising the necessary people, knowledge and materials, from variously connected contexts. Networking practice supports knowing practice, which consists of bringing and aligning different knowledge domains within a working context.

A clinical trial is a complex activity that involves multiple expert knowledge domains using different technologies and methods that rely on a widely available body of knowledge within the scientific community. Significant alignment effort is necessary to develop methods, know-how and various ways to navigate the

therapeutic and other practices of clinical centres. These occurrences are characterised by the interplay of enacting and changing practices in the community context that are mutually composed of the material nature of interactions and dissemination activities.

Understanding the knowing and networking practices enables us to describe the complex and social activities of a knowledgeable community in combining different perspectives across connections of knowledge domains and ways of doing (Wenger 2003). A company operates by distributing knowledge tasks among an articulated network of partners, and its means of enabling integrated collective actions relies on the effective connectedness of practices and knowledge in action.

The practice lens captures the central aspect of innovation that occurs within a texture of interconnected practice and is realised through the connections, associations or assemblages of various elements shaping one another. Innovation is not just conceived of as the result of deliberate activities that introduce discontinuities (Gherardi 2012b); it is also produced in working activities on a daily basis. It is viewed as provisional and emergent processes that are sustained by a mechanism of social interactions in interconnected practices.

We contend that innovating is a more emergent, ongoing, deliberate and negotiated set of practices. It emerges in a nonlinear pathway associated with knowing practices, embedded in the ubiquity of connections in action of multiple actors. These results provide evidence of the agential role of networking in innovation, beyond its importance as structures (Kahler 2009). Analysing how innovating emerges through networking networks involves understanding the core of knowing practices.

In line with Nicolini et al.'s (2003) idea of practices as bricolage, innovating in a network is mainly a question of knowing *how* to keep all elements – knowledge, resource actors, aims and so on – together by reforming traditional ways of doing as well as encouraging the development of newly emerging practices (Owen-Smith and Powell 2008). Innovating thus becomes a transformative matter (Kahler 2009), focused more on deepening ways to foster knowing practices in dynamic networking.

In addition, our results position this work within the research of practice scholars (Ellström 2010; Melkas and Harmaakorpi 2012), who recognise an epistemological foundation to practices and practical terms. As Nooteboom notes (2012, p. 27), the practical term has not been observed in its 'derogatory sense of ignoring foundations and principles.... [that] ... allowing for ignorance, incoherence, or even inconsistency ... the application [practice] is part of a learning process where ideas change in their application and yield new ideas [knowledge in our sense], so that application is part of discovery'.

This study extends the debated question of knowledge transfer from tacit-codified to tacit knowledge as an aspect of the driving and dynamic force that leads and sustains innovations. Knowing should be viewed in innovation as an exercise in the intermeshed and ongoing shaping of new practices in a network. The generation, transfer and transformation of knowledge are useful for providing the exploitation that inspires exploration in an endless innovation process in moving

from one context of application to another. Through this process, the transformative power of networking comes into focus and provides support for the continuous tension toward innovation.

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Chapter 7
Innovating Services Through Experiences: An Investigation of Servicescape's Pivotal Role

Antonella Carù, Laura Colm, and Bernard Cova

Abstract Customer experience has become one of the greatest challenges for companies: this tendency is also present in services, where innovation is often a way to impact customer experiences. After a brief review of the literature on service innovation and on customer experience with regard to studies on the services, this chapter focuses on the servicescape as a platform able to support activities and interactions with customers and analyzes the role that innovative servicescapes can play on customer experience. Based on a three case vignettes analysis, the chapter identifies three main findings. The first is related to the dynamic nature of service experience and consequently to the need for a continuous improvement of servicescapes by understanding the evolving customer needs. The second is linked to the "container" in which the service experience takes place – the servicescape – that is becoming "content" itself. The third concerns the role of technology, with respect both to service providers and service customers.

Keywords Customer experience • Service innovation • Servicescape • Service design

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1 Introduction

A recent study in the *Harvard Business Review* (2014) with a panel of international, medium, and large enterprises demonstrated that in the near future, experience is going to be one of the greatest challenges for companies. Organizations who are able to manage successfully the entire customer experience can earn enormous rewards, which go from greater customer satisfaction to reduced churn, increased revenues and ROI, higher employee satisfaction, and, last but not least, a more effective collaboration across functions within the company.

This tendency is also present in services. If services inevitably require customer participation, it is not necessarily true that the latter is automatically translated into a pleasurable or memorable experience (Pine and Gilmore 1999). Understanding the service experience and the managerial decisions relating to it is definitely a topic deserving more attention (Helkkula et al. 2012). Indeed, innovation in services can also take place through the creation of memorable experiences for customers.

After a brief review of the literature on service innovation and on customer experience with regard to studies on the services, we will look, in particular, at servicescape (Bitner 1992), at innovation linked to its transformation, and at the role that it may play in the generation of customer experience. Servicescape is a subject that has received considerable attention in the literature on services (Rosenbaum and Massiah 2011; Mari and Poggesi 2013) and which, in adopting a customer experience perspective, can be considered a pivotal element in the creation of value through customer interaction (Nilsson and Ballantyne 2014). In its orientation toward customer experience, service innovation possesses a driver for the design of servicescapes that constitutes a platform able to support activities and interactions with customers, going beyond context design and aware of the active role played by the customer.

Three case vignettes, selected according to the categorization proposed by Bitner (1992), are used to identify which elements linked to innovation and to the consequent redesign of servicescapes represent strategic tools that companies can rely on in their aim of constantly improving and offering dynamic service experiences, according to changes in consumers' tastes.

2 Service Innovation

Since consumers do not simply want to be satisfied, but expect companies to delight them by going beyond their expectations (this is the reason why service providers should invest and deploy resources to delight, rather to just satisfy consumers; Finn 2012), it is crucial for firms to renew continuously their offerings and value propositions. An effective way to do so is through service innovation.

Service innovation is crucial in maintaining a firm's competitive advantage in an increasingly service-centered economy (Vargo and Lusch 2004a; Alam 2006; Lusch et al. 2007). For this reason, the topic has attracted researchers' attention over time and has been studied from many different standpoints, e.g., in relation to the success of service innovation (de Brentani 1991; Montoya-Weiss and Calantone 1994; Hennig-Thurau et al. 2001), by a whole stream of literature on new service development (NSD) (see, e.g., Alam 2006 on the NSD process), or with respect to customer involvement in the service innovation process (Alam and Perry 2002; Magnusson et al. 2003).

Researchers have taken different approaches in their attempt to operationalize the service innovation construct, including the reactive–proactive continuum (Hunt and Morgan 1995), the product–process dichotomy (Damanpour 1991), novelty–meaningfulness (Sheth 1981), the incremental–radical distinction (Garcia and Calantone 2002), and NSD processes (Johne and Storey 1998; Matthing et al. 2004). Moreover, they have tried to categorize service innovations, for instance, according to their typology (Avlonitis et al. 2001), dividing them into new-to-the-market services, new-to-the-company services, new delivery processes, service modifications, service line extensions, and service repositioning. The impact that these kinds of innovations have on the service experience that the customer perceives during the delivery process can be huge. Sometimes even small or incremental changes can shape the experience in a totally different way – an effect that is amplified as the level of innovation rises. In fact, service innovation has been defined as innovation applied to one or more of the following areas of a company (Wooder and Baker 2012): new concepts and/or value propositions (i.e., the service idea or value proposition), new delivery mechanisms and/or business models (how the service is realized in terms of people, processes, systems, and devices), and *new experiences* (the way in which customers participate and how they perceive the value of this participation).

3 Customer Experience in Service Contexts

Customer experience has increasingly become a crucial topic in service research and management in recent years. The concept of experience has its roots in different fields (e.g., economics, psychology, anthropology, sociology) and has already been developed in several disciplines related to management, e.g., consumer behavior, marketing, and managerial practice (Klaus and Maklan 2012).

As far as consumer behavior is concerned, experience has been defined as a subjective state of consciousness with a "variety of symbolic meanings, hedonic responses, and aesthetic criteria" (Holbrook and Hirschman 1982. p. 132). Since then, the concept of experience has, in fact, often been used in connection with hedonic consumption, i.e., to describe or study situations with a prevalence of hedonic connotations in the consumption process, even though some authors have underscored how the concept had been and could be characterized in many different

ways based on its different facets – emotional, physical, sensorial, cognitive, and social (Carù and Cova 2003).

In marketing, Pine and Gilmore (1998) introduced the term *experience economy* to describe the concept following the agrarian economy, the industrial economy, and the service economy. They argue that companies have to imagine and organize memorable events for their customers and that memory and the experience themselves become the ultimate and actual product for consumers. Schmitt (1999) provides a conceptual framework for experiential marketing, which considers consumers not only as rational decision-makers (caring just about functional features and benefits) but also as emotional human beings who aim at living pleasurable experiences. He identifies five types of experiences, or strategic experiential modules, which firms can create for their customers (sense, feel, think, act, and relate). These are supposed to help firms in creating and achieving holistic experiences they can offer to their customers with the ultimate goal of generating value for them and the company itself. The two authors notice that "as services, like goods before them, increasingly become commoditized – think of long distance telephone services sold solely on price – experiences have emerged as the next step in what we call the *progression of economic value*" (Pine and Gilmore 1998, p. 97).

In the context of services, the concept of service experience has been recognized as a core element of the service offering and design (Zomerdijk and Voss 2010). In this sense, it is a key concept in the emerging paradigm of Service-Dominant Logic (Helkkula 2011), since this theory considers experience as the basis of business (Lusch and Vargo 2006; Schembri 2006; Vargo and Lusch 2008).

According to this understanding, service experiences have been studied especially in relation to other relevant dimensions and constructs of the services' arena, such as service quality and value, service process, service encounters, and service relationships.

Only in 2011 did Helkkula offer a thorough review of the characterization of service experience in service marketing research, explaining that scholars have approached and characterized experience in three different ways: as a subjective, internal experience (as a phenomenon), as a sequential process (process-based approach), and as one element in models linking a number of variables or attributes to various outcomes (outcome-based approach).

The first category corresponds to the very origins of research on service experience. Such a characterization looks at *experiences as* a *subjective and internal phenomenon*. It is adopted by researchers who follow Holbrook and Hirschman's (1982) approach to experience (e.g., Schembri 2006, who tried to encourage such an approach in S-D Logic, and Vargo and Lusch 2008, who applied this line of reasoning to value co-creation). The process focuses on the subjective experience of the service phenomenon, assuming it to be specific to an individual (be it a service customer or provider) in a certain event or context-specific situation. This implies experiences also have a relational, social, and intersubjective dimension (Pullman and Gross 2004), since customers do not live apart from others. As pointed out previously, such a view has been criticized for being too narrow, since it tends to consider only one specific type of service experience – the hedonic one – neglecting

the other cases (Carù and Cova 2003). If hedonic experiences have the merit to have shed the first, initial light on the phenomenon, it is also true that they are not the only possible examples. In fact, there are also other less-considered situations, but which have a lower emotional intensity. This is the case of e-services and high-tech and financial services.

Another characterization of service experiences in literature is a *process-based* one, which usually sees the individual customer as the main actor of the experience. This category understands service experience as a process focusing on the service's architectural elements during an action (Toivonen et al. 2007). It is worth underlining that such actions, phases, or stages do not necessarily need to take place sequentially, but usually tend to follow each other chronologically.

In this context, the role of learning is particularly emphasized, with a frequent link to experiential learning theory (e.g., Coffey and Wang 2006; Hunter 2007).

The third and last category of service experience that has been identified in literature is an *outcome-based* characterization. Studies belonging to this group characterize services as one of the elements in models linking a number of variables or attributes to various outcomes.

Compared to the previous two cases, this characterization adopts a more "simplified" perspective, focusing on relationships affecting the outcomes of the service experience or on how the latter moderates other relationships – i.e., in terms of quality (Flanagan et al. 2005), value, satisfaction, and repurchase intentions (Doolin et al. 2005; Galetzka et al. 2006; Holloway et al. 2005; Menon and Bansal 2007).

While the main focus of the process-based characterization is on B2C interactions, the outcome-based case tends to consider B2B relationships, especially in terms of aggregate or collective service experiences involving multiple subjects. Another difference consists in considering more the immediate result, instead of a sequential or longitudinal process.

Helkkula (2011) also analyzes the different meanings that experience can have based on different situations. The subject of an experience can be an individual (single person), a community, a nation, or even humankind as a whole. A characteristic of many consumer service experiences that increasingly needs to be taken into account and that is receiving growing attention both from scholars and practitioners is linked to its frequently *collective* nature. In fact, a common trait of most experiences in the realm of services – be they underlined or not – is that customers do not live them in isolation, but instead they belong to a collective dimension. Service experiences are individually but also socially construed (Crossley 2006), and there is certainly a rather joint and collective sensemaking of the value in the experience (Helkkula et al. 2012). There is an interplay between customers and companies to generate value, and there are also exchanges among customers – in groups, communities, or with strangers – shaping the individual's experience (Tynan and McKechnie 2009) during the service experience itself. As a result, the latter becomes an interactive situation. A recent study is provided by Carù and Cova (2015) who stress this collective dimension in the co-creation of service experiences by companies and customers and customers themselves.

In addition to this, an experience can be "real" (taking place in the physical and real world), "virtual" (happening in an online environment and hence lived through observation – an important topic in digital marketing studies), or even a combination of the two (as is the case for holistic experiences encompassing both dimensions).

In fact, the environment, which is already known as *servicescape* in literature (Bitner 1992) and integrates both the real and the online contexts (Benford et al. 2009), can make the difference in creating a service experience (Karmarkar and Karmarkar 2014).

4 Servicescapes: Issues and Priorities

The ambience or setting where such relations and the service experience itself take place is the servicescape. Booms and Bitner (1981, p. 36) defined a servicescape as "the environment in which the service is assembled and in which the seller and customer interact, combined with tangible commodities that facilitate performance or communication of the service." The concept was then further developed in Bitner's (1992) seminal article that has become one of the main references in the literature: the servicescape is the physical environment in which a service process takes place. The model she proposes divides the various stimuli into three categories (signs, symbols, and artifacts) and underlines the impact on both customers' and employees' feelings and behaviors.

The attention to the role of servicescapes and their design (and redesign) have now been developed more explicitly in the literature, e.g., by Rosenbaum and Massiah (2011) and Mari and Poggesi (2013). Following Mehrabian and Russel's (1974) and Donovan and Rossiter's (1982) work, many scholars have focused their attention on retail settings, looking at the impact of single elements of the servicescape on the customers' response – e.g., music (Milliman 1982; Chebat et al. 2001; Macintyre and Homel 1997), colors and lights (Areni and Kim 1994; Chebat et al. 2001), and temperature (Rose and Neidermeyer 1999) – as well as at the interaction of the elements themselves (Mattila and Wirtz 2001).

Another research topic is connected to the social dimension of servicescapes (Grove and Fisk 1983, Grove and Fisk 1997) and particularly to the relationships between customers and companies and among customers themselves. The theater metaphor is frequently used to describe servicescapes and to explain what kinds of relationship take place there (Grove and Fisk 1983; Wagner 2000). Servicescapes have also been defined as socializers (Bitner 1992), whose design plays a crucial role in shaping relationships among the actors present, as well as in defining their behaviors and attitudes. In the servicescape, dyadic relationships between employees and customers and consumer-to-consumer interactions take place. Aubert-Gamet and Cova (1999) investigate the servicescape as an element that facilitates social interactions among customers.

Recently, the effects of service remodeling have been analyzed in their short- and long-term effects on customer cognition, affect, and behavior and on results such as customer expenditure and store traffic (Brüggen et al. 2011). A relevant finding is that the various dimensions of the servicescape – physical, social, socially symbolic, and natural environmental – are not all under the company's control. Rather, some of these stimuli are not manageable, since they are not only made of a physical dimension but also of subjective and often managerially uncontrollable aspects. Moreover, these elements are often the most relevant for the person–place attachment (Rosenbaum and Massiah 2011).

Some authors have studied the concept of servicescape in relation to new virtual contexts, enlarging the model and underscoring the customer's role in the value creation process, according to the S-D Logic (Nilsson and Ballantyne 2014).

Many terms have been adopted to define the virtual servicescape (Mari and Poggesi 2013), "e-scape" (Koering 2003), "cyberscape" (Williams and Dargel 2004), "bricks-and-clicks setting" (in contrast to "bricks-and-mortar), or "clicks-only setting" (Tuzovic 2008), but certainly the most common term is "e-servicescape" (Hopkins et al. 2009). These scholars underline how servicescape design logic does not only apply to physical spaces but also to virtual environments, where more and more (shopping) experiences take place. The traditional models need to take the web dimension into account, while companies need to integrate it into their business models and managerial practice.

Customers' behaviors in the servicescape need to be considered in this context. Indeed, they can be dysfunctional compared to what companies expect or different depending on the servicescape configuration and even generate disaffection toward the service provider (Daunt and Harris 2012).

For instance, customers tend to replicate dysfunctional behaviors of other fellow customers (Harris and Reynolds 2003), and this underscores the importance of a space design able to preempt or reduce the risk of inadequate or detrimental behaviors. Customers' perception of outlet vulnerability "denotes customers' perceptions of the ease at which they can misbehave within or against an individual service outlet" (Daunt and Harris 2012, p. 135) and hence needs to be accurately managed by the service provider.

5 The Role of Servicescape in the Innovation of an Experiential Context: A Multiple Case Vignettes Analysis

The following section will focus on how servicescapes can become effective instruments to innovate services through experiences, both in physical and in virtual settings.

Adopting Bitner's typology of servicescape ([1992](#)), we present three cases of services that have been innovated by building valuable experiences basing on renewed and redesigned servicescapes.

Bitner defined a service categorization as composed of two different dimensions. On the one hand, the types of service organization – based on who performs activities within the servicescape – have been captured. This dimension considers who is present in the servicescape: the customer, the employee, or both. On the other hand, the physical complexity of the servicescape is considered, which can be lean (as in the case of very simple servicescapes, with only a few elements, spaces, and structures) or elaborate (referring to more complicated environments made up of many elements and forms).

In some environments, there is "only" the customer with no or only a few employees, i.e., the extreme case of a *self-service* condition, e.g., a movie theater (lean servicescape) or a golf course (elaborate servicescape). In an intermediate position, there are *interpersonal services*, which refer to organizations where both employees and customers are present and perform actions of some kind. Typical examples for a rather lean servicescape would be hair salons, while hotels or hospitals represent more elaborated ones. At the other extreme, there are *remote services*, where the customer's involvement (and sometimes even that of the employees) in the servicescape is limited, such as telephone mail-order desks, with a low physical complexity, and insurance companies – where the degree of complexity is higher.

Through a multiple case vignettes approach (Holland and Naudé [2004](#)), examples from different industries are selected to show how servicescapes can be implemented as tools to innovate services and "transform" them into experiences. This is done by providing a detailed account of what happens and takes place during the service experience in each service context, underscoring the relevance of the innovations introduced.

We chose to focus our attention on elaborate servicescapes, which best highlight the role of companies and customers in crafting the experience. Three case vignettes were selected according to the abovementioned categories of servicescapes identified by Bitner:

- *Agenzia Tu* and *Superflash* agencies are a case of interpersonal services, because both the company's employees and customers are present in the stores and participate in the service delivery process. Their innovativeness is linked to the new banking concept they propose with the aid of redesigned spaces: an agency which targets specific customers – foreigners and young people, respectively – offering them a great variety of services matching their specific needs in a friendly and, to some extent, playground-similar environment.

- The *Mercedes-Benz Museum* in Stuttgart is a case belonging to the self-service category, because customers are free to enjoy the exhibition and to move through its spaces with little interaction with service personnel. This case highlights how even an already hedonic service like a museum can gain a greater experiential connotation by transforming what was simply a "place" (even though an already

fascinating one) into a real "space," conceiving servicescapes that are not just focused on the core product (cars), but on a "story" about the brand that the customer lives while walking through the exhibition.

- The *e-Pitti* digital tradeshow is a case of remote services, since customers do not attend physical servicescapes and enjoy the service at a distance. The Pitti fashion trade fair, held in Florence, Italy, each year, has been transferred also into an online environment, stretching the event's duration and experience and allowing visitors to enjoy several additional activities.

5.1 Interpersonal Service/Superflash and Agenzia Tu Agencies: From Traditional Bank Counters to Customer-Centric Contexts

Many service companies claim that their principal interest is the satisfaction and well-being of their customers who are at the center of the company structure. However, this does not always lead to equally concrete actions. This is true, above all, in traditional industries, with laborious bureaucratic processes and structures designed in function of the back office and consequently not very visitor-friendly. The largest banking group in Italy, UniCredit, has recently set up a service model offering an innovative design of the service environment for a clientele that has changed both in terms of composition and of needs. The service, called Agenzia Tu (Agency You), is aimed at foreign citizens and immigrants and presents itself as a friendly and open bank. Rather than a new banking model, Agenzia Tu is a new way of thinking that supports the integration in Italy of (new) residents by offering a vast range of ad hoc products and services for particular targets, such as house helps, carers, babysitters, young people, and atypical workers.

The format is that of a branch, and there are 12 across the country with the first one opening in Milan in 2006. There are 37 members of staff in these branches, 15 of them foreigners (at least 1 in each branch), in line with the target that Agenzia Tu is seeking to address and in order to facilitate communication and generate empathy. Opening hours from 10.20 to 14.30 and from 15.45 to 18.15 are also designed to accommodate the target segment. Therefore, the bank is open during the lunch hour and into the evening, i.e., the only periods in which the target customers would have time to go to the branch. Also in terms of innovation (Wooder and Baker, 2012), it is worth underlining that the walls of the point of sale and the main doors are made of glass, a resilient and modern material that represents transparency and openness even before the first contact. Inside, there are ATMs allowing the more technology-savvy customers to serve themselves, as well as separate desks and chairs where individual customers can speak to a member of staff and explain without any pressure (and even in their own language) their particular needs. Each branch also has a number of PCs, where customers can use

online banking without having to queue, so saving time for themselves and reducing the wait for others.

Furthermore, the branches also organize language courses for foreigners, a service which appears to be a long way from the core business, but which becomes very close when the focus is on the customer's needs. Therefore, Agenzia Tu customers can learn the language of their new home in the same place in which they can also role-play an interview to obtain a residence permit and where they will also go for their money-management needs.

The Intesa Sanpaolo group presented a similar concept in 2011 with its Superflash point of sale. In this case, the target is very precise: young people under 35 years of age. However, Superflash does not merely focus on young people as a group, but seeks to offer specific services for their needs through an enriched, ad hoc value proposition. The aim is to bridge the gap that has been created between the new generations and the banking world, which has often been accused of being out of touch with the needs of young people (e.g., looking for work and often with little money and little time to dedicate to managing a bank account).

Here again, the first branch was opened in Milan followed by others in the main Italian cities. You just need to enter a branch to realize that the model goes beyond the provision of banking services in a strict sense, offering a new concept of experience. Superflash branches are used for cultural events and concerts; they sell tickets for other shows and events and provide in-store ticket booking. There are Internet points with high-speed connections, shelves for book-sharing, and, in some cases, temporary stores, all of which aim to create a bond between the location and the customer and even between customers (Tynan and McKechnie 2009; Crossley 2006; Helkkula et al. 2012). The experiences that can be enjoyed within the points of sale vary with the needs and the conduct of the customers and aim to offer a service that satisfies expectations.

5.2 Self-Service/The Mercedes-Benz Museum: From "Place" to "Space"

Even in a hedonistic context that is already a pleasurable experience for the customer, such as a museum (Holbrook and Hirschmann 1982), careful redesigning of the space can innovate the value proposition and render it unique. A good example is the Mercedes-Benz Museum, which, although it is already a very popular venue among aficionados of the marque who wish to see the famous automobiles on show, has also managed to become an interesting place to visit as a result of the space in which it is located and the way in which the experience is presented to customers.

The Mercedes-Benz Museum is in Stuttgart, Germany, where the company was founded, and each year, it is a favorite attraction for thousands of enthusiasts. Opened in 2006, the museum has an exhibition space of approximately 17,000 m

[2] and is housed in a 47.5 m tall designer building made of glass and using different tones of gray.

It is not a typical automobile museum, but a location that traces the history of the marque, covering the life of the vehicle itself and so facilitating a complete immersion in the context even for those visitors who are less expert in or enthusiastic about automobiles. Indeed, museums are places that people typically do not visit alone, but with friends and family who are not necessarily as competent or as interested. Through a careful design of the space and an intelligent use of technology, a museum aims to make the experience immediately memorable for all visitors. The audio-guide provided at the entrance is not an optional at extra charge, but is handed out as an integrating part of the museum experience. Moreover, it is a state-of-the-art technological device offering wireless interaction with various installations, e.g., pointing at an object to obtain extra information or "to bring a figure to life." The visit is laid out from top to bottom and starts with a elevator ride to the top floor and back to 1886 and the statue of a horse bearing the famous words of Kaiser Wilhelm II, "the car is just a passing phenomenon, I believe in the horse," which amuses and teases the visitor.

From there on, famous automobiles follow in chronological order along a path covering seven floors from the top to the ground floor where the visit began. In addition to the historical dimension, there are also the themed rooms: one dedicated to the "helpers" (i.e., emergency and public service vehicles, trucks, heavy-duty conveyances) or another to famous automobiles (the one used by the Pope or the Mercedes in the film Jurassic Park).

All five senses are involved – this is a fundamental aspect to consider in the design of a service environment (Bateson and Hoffman 2011). For example, the background music changes with the period, with classical symphonies for the vintage automobiles and more exhilarating notes in the rooms with the sports cars. To get to the racing cars, you have to go through what looks like a real tunnel full of the noise of the cars streaking past at top speed. To admire the Formula 1 cars, you can sit on racetrack seats set out on a turn, giving the impression that you are watching a Grand Prix. The sense of sight is also involved through the illumination: elegant chandeliers produce effects of light and shade that recall the entrance hall of a theater or a luxury jeweler's.

The opportunity to do a lap in a racing car simulator and have a drink at a fountain with the sign "Are you thirsty? H_2O: fuel for automobiles" is an extra treat that makes the experience even more special.

It is, then, a dynamic as well as an avant-garde context, which can accommodate new installations or new "pieces" of experience, thanks to the technology used and the multilevel design.

5.3   Remote Service/e-Pitti Tradeshow: The Extension and Amplification of Service Experiences Through e-Servicescapes

A brilliant example of an e-servicescape (Hopkins et al. 2009) that is not only combined coherently with the traditional context but is even exploited as a strategic lever to offer additional services to business customers is e-Pitti.

Pitti Immagine is an Italian company whose mission is to promote the fashion industry (recently also wine and food and fragrances) globally. The firm organizes some of the world's main trade fairs in the sector, which are seen in a modern way as events that are being continuously innovated and developed. Indeed, it is their view that trade fairs must create and stimulate relations and involve exhibitors and their collections, as well as the buyers and visitors by providing information, knowledge, and experience. One of the company's key values is innovation and, with this, the ability to rethink continuously their range of activities and current projects both in terms of entrepreneurial spirit and with regard to planning. It is not enough to offer customers what they expect and to be in step with the times; you have to be ahead of the times (especially in a sector in decline such as trade fairs). Pitti Immagine is aware of the current digital revolution and the consequent need to move on from Web 1.0 (with sites that offer one-way communication with customers without interaction) to Web 2.0 (including social networks, blogs, user-generated content, platforms to share files and/or information). The new trends and tools are considered, because they are seen as an opportunity to revitalize trade fairs. They can offer promotions and generate (positive) word-of-mouth, facilitate so-called web-listening or realize targeted CRM. Moreover, surfing with a smartphone or tablet further enhances the possible effects (e.g., through dedicated applications or more flexible connections with the social media used by customers).

With this in mind, Pitti Immagine set up a new subsidiary – FieraDigitale (Digital Trade Fair) – in March 2010 which created the e-Pitti project, a B2B website that hosts online trade fairs and virtual showrooms for the fashion brands attending the trade fair. It is an evolution from a physical to a digital experience. The Pitti fashion shows are replicated online together with a whole series of extra services and offers. The platform extends and amplifies the trade fair experience, providing greater business opportunities for exhibitors, who can increase their contacts in terms of numbers (through longer access to the site before, during, and after the event) and cultural variety (the web offers connections), as well as greater depth (as during trade fairs, meetings between exhibitors and visitors are often short and "superficial"). For exhibitors, the controlled access areas of the site that offer opportunities for business intelligence are also an advantage. For buyers, the added value is that they can discover new trends, save the products of interest in a "wish list," and search and surf easily using, for example, tags. The results speak for themselves. The figures for 2013 show that in an online session, a user views on average 29 pages, stays connected for 12 min, and consults at least 8 product

descriptions. Paradoxically, this would not be so easily possible in a traditional trade fair.

6   The Main Evidences from the Analyzed Case Vignettes

The cases presented in this chapter belong to Bitner's (1992) elaborate categories of servicescapes. Each one proposes the example of a company that managed to renew, (re)design, or change its service offering through servicescapes, in order to deliver an enhanced service experience to customers. In fact servicescapes represent key instruments for companies to innovate the service offered, creating experiences and consequently improving the overall value proposition.

Designing new contexts where customers can live the experiences they expect or wish to find is not an option anymore. Service firms need to stay one step ahead in (re)designing their servicescapes to satisfy their customers' desires. Indeed, three main findings emerge from the cases analyzed. The first is related to the dynamic nature of service experience and consequently to the need for a continuous improvement of servicescapes by understanding the evolving customer needs. The second is linked to the "container" in which the service experience takes place – the servicescape – that is becoming "content" itself. The third concerns the role of technology, with respect both to service providers and service customers.

Starting from the first element, renewing servicescapes is only possible by considering them *as strategic assets that are able to answer the dynamic nature of service experiences*. In fact, servicescapes are interactive settings, where experiences are shaped by companies' initiatives and customers' actions and reactions. Experiences can change from customer to customer, according to their perceptions, needs, etc., but also because of an organization's interventions, programs, and (re) designs, which allow a service to evolve over time and remain up to date with regard to customers' requests and desires. Companies have to create engaging platforms (Ramaswamy 2011), and according to the literature on servicescapes (Rosenbaum and Massiah 2011) and on customer experience (Carù and Cova 2007), they have to consider customers' self-determination spaces.

Organizations need to consider that their customers' experiences are not static and are not simply made up of actions and processes that each one of them replicates individually, according to the companies' expectations. The Mercedes-Benz Museum, e-Pitti, and the Agenzia Tu and Superflash branches have renewed the experience they offer in different ways through the development of very diverse servicescapes, but all show a common understanding of customers needing continuously changing stimuli to have a reason to remain loyal over time. The German museum structured its own offer around topics and different automobile categories, which can easily be updated both in terms of models and in terms of visit order processes. The idea of presenting a brand's history in a storytelling way instead of just chronologically allows for greater flexibility and offers modular opportunities. The e-tradeshow enables offline customers to continue their experience in a virtual,

and therefore dynamic, environment. Furthermore, the online experience of the tradeshow's website allows visitors to go back and forth between the pages – the e-servicescape – and to do so for a longer period of time with greater freedom than in the physical environment. The same goes for the two new bank concepts, which updated their value proposition by completely rethinking the spaces in which the customer has contact with the organization. Agenzia Tu and Superflash understood that customer needs were changing and that it was necessary to accomplish this evolution to generate customer satisfaction and, possibly, ensure survival in the long term.

Properly designed servicescapes give consumers the instructions they require to build their own experience, but do offer a charted course they simply need to follow. This means settings need to be built that are able to change according to individual differences but also to evolve with customer needs over time. A core element here is the deep understanding of customer wishes, needs, and behaviors, both now and for the future.

A second element emerging from the cases is linked to the *changing role of servicescapes themselves*, *from mere "containers" of the experience to "content" itself that is part of the experience*. This concept is close to what happens in many museums, where the container turns into content (Eco 2001). All cases show how the location that the provider adopts to deliver the service to customers is not simply a setting where the exchange between company and consumers takes place. The location itself plays a strategic role and is more than just a frame with the aim of involving all the actors present in the experience process. The Mercedes-Benz Museum is housed in an avant-garde building, a masterpiece of architecture, which customers photograph before entering the museum itself. Its illumination and furniture recall more a jewelry store, and the store also has more in common with an exclusive designer boutique than with the traditional stands in most museums. Some customers go to the museum's restaurant to enjoy a good meal and a nice view of both the nearby circuit, where some Mercedes cars run sometimes, and the automobile exhibits that are visible from the tables. Some other visitors come just to try the Mercedes' simulator and are ready to accept long queues just to do so. All these aspects go beyond the main content offered by the museum. The location housing the museum has become content itself and therefore transfers an own specific value to the customer. Agenzia Tu and Superflash tell a similar story. They are more than just bank branches or stores where customers can go to fulfill their financial needs. They are even more than just "unusual" and modern environments; they are able to add value to the value transferred by the core service offering because the servicescape itself is able to answer specific needs (e.g., meeting places where foreign people can gather after work and share their own daily life experiences in a "safe" environment). This is also true in the digital dimension in which e-Pitti is located. The well-conceived website allows virtual visitors to move around the trade fair and view the items of interest, even when the "physical trade fair" has already finished. So the website becomes more than just an intangible host for Pitti, but is a container, which delivers an exclusive value to the consumer.

The third element that emerges is *the integrating role of technology*. According to the evidence provided in our cases, the latter plays a crucial role due to its twofold nature. As the examples highlight, the service providers have a great innovation potential in their hands: they can innovate the service context by drawing upon new technologies, both in offline – like the Mercedes-Benz Museum with its modern audio-guides or Agenzia Tu and Superflash stores with their avant-garde Internet positions – and in online environments, e.g., e-Pitti, which has extended and in fact "invented" a new trade fair format by going digital. In this respect, we must underline how an increasing proportion of the "game" between firms and their customers is, in fact, played out in the virtual world. Accessing a website to gain greater information, using remote or online services, or making purchases in e-shops are just some examples of opportunities offered to both B2C and B2B customers. Indeed, the first contact between a service brand and its consumers is now frequently via the web (e.g., booking a hotel room), or a significant part of the service delivery process is digital (e.g., purchasing a plane ticket and checking-in online). We can go further and claim, in Bitner's words (2001, p. 377), that the Internet itself is "one big service [· · ·], given that the tools, concepts and strategies of service marketing are applied directly in the digital world and in e-commerce." This observation is in line with the literature which draws attention to the importance of the consumer in integrating the different platforms of the servicescape, be they physical or virtual (Nilsson and Ballantyne 2014), and requests that firms create platforms able to facilitate the co-creation of value (Prahalad and Ramaswamy 2004) and coordinate their management. The need to include the e-servicescape among the traditional models is the result of an ever-increasing need within companies, obliged to manage the two dimensions in a harmonious and mutually beneficial way (see, e.g., Mari and Poggesi 2013).

Marketing managers dedicate considerable attention to servicescape design, because once the layout of a point of sale, for example, has been defined, it is extremely costly, or in some cases even impossible, to make changes without overturning the whole concept. For this reason, experimenting with service setting or trying out new configurations or settings can be very difficult (Fisk et al. 2014). This is much easier with an e-servicescape, because the virtual environment offers firms much greater freedom of action. Obviously, the level of freedom is directly proportional to the attention required when making choices. As in a traditional environment, an e-servicescape also needs to communicate brand values in a coherent manner and must appear "stable" in the eyes of the customer. If it is true that it is easier to make changes and corrections in an online setting, this is not a reason for a lack of care. A website cannot change every 2 weeks; the consumer would be disoriented and would end up associating a less than positive impression to the brand. Consequently, learning to design and manage virtual environments correctly is a fundamental for a firm.

On the other hand, it should be noted that customers also hold considerable technological potential in their hands, which firms need to explore and to capitalize on. First of all, an increasing proportion of customers tends to stretch the experience to the digital realm, by posting pictures and observations on their social network

accounts (Facebook, Twitter, Instagram – just to name a few) after or even during the experience. Ad hoc websites, like TripAdvisor, are dedicated to collecting customers' experiences in order to assess a "value" that can be useful for others who want to try the same experience. By doing so, but also by simply patronizing stores and service settings, customers "leave traces" and a lot of valuable information about their behaviors, attitudes, etc., to companies. Firms have the duty – which is also a great opportunity – to collect this data, understand its meaning, and exploit it to improve their service experiences (Ramaswamy 2011).

7 Managerial Implications: The Crucial Role of Customer Research

That experiences in the service context can be renewed, redesigned, and better conceived with the aid of servicescapes is an extremely useful information for service, marketing, and general managers. They have the opportunity to (re)shape their service delivery process thanks to this tool. However, they need to understand, first, the best way to intervene in the servicescape and where it is worth making changes. To do so, consumer research plays a crucial role and represents a very useful tool companies can employ to align their offering to the actual and future needs of their customer base.

Great help is provided by *qualitative research*, which is a suitable methodology to gain an in-depth understanding of the customers. Understanding the ways customers immerse themselves into their consumption experiences and how they take place is fundamental knowledge for service firms seeking to gain useful managerial insights (Thompson 1997). For this reason, in-depth interviews, focus groups, ethnography, and netnography are precious tools for service (marketing) researchers to gain a thorough understanding of consumers, their dynamic ways of thinking, their roles, their motivations, and their behaviors. For instance, in addition to observation, a way to collect data about experiences is introspection (Holbrook 1995). This technique has its roots in the narratives from customers about their experiences (Wallendorf and Brucks 1993) and in an analysis of such introspective narratives by the researcher. Introspection is usually based on storytelling (i.e., consumers are asked to tell and report the experience they have had) and is often accompanied by participant observations (Holbrook 1995). When the experience is studied through introspection, the researcher can also take part in the first person, together with other subjects. The main goal here is to get close enough to be able to interpret customers' narratives and then present the deriving results using their own words (Spiggle 1994). Carù and Cova (2008) underscore the necessity to adopt both observation and introspection together, because the combination of the two can "enrich researchers' toolboxes in the quest to unravel the increasingly complex and unpredictable experiences the consumption of [. . .] products and services affords consumers" (p. 166). There are many such examples. Eataly, the high-end, Slow

Food-sponsored, Italian food market and mall chain, with a variety of restaurants, food and beverage stations, bakery, and retail items in its points of sale, is an example of a provider who has completed a significant job in terms of consumer understanding. The entrepreneur and founder, Oscar Farinetti, recognized that customers are not simply looking for functional food purchases, even though they have limited time and live frenetic lives. Consumers want pleasurable spaces, where they like to spend time and feel at the very center of the service offering. The Italian company has consequently reinvented a very traditional store concept and managed to propose spaces where people find the basics (i.e., Italian food selections and restaurants), but also a myriad of events (from cooking courses to business events, from concerts to contests, etc.).

Once the firm has understood in-depth the phenomenon of interest, this can then spur further research through *quantitative inquiry*, in order to capture and generate useful information about the topic as a whole. Quantitative approaches, and especially big data, represent a great opportunity for companies in this sense. Statistically relevant information can be gained from large amounts of already available data that firms often just need to monitor or register in order to derive into valuable insights. Technology plays a crucial role, being a facilitator both for companies, who can have easier access to customer data (in offline and online environments, i.e., in social networks), and for customers, who can contact with the service provider directly, again generating new information for the provider.

Disney World is a successful example of this kind, with the MyMagic initiative. After having profoundly understood visitors' needs and desires, Disney World had to gain more knowledge about customers' actual preferences and behaviors. So, the company provided theme park visitors with rubber bracelets embedded with microchips to help them to organize their experience better (customer payoff) and, at the same time, to map their preferences and behaviors (company payoff and ultimate goal). These wristbands – equipped with radio-frequency identification chips that interact with RFID scanners – record how much time customers spend at the various attractions and where they go and help them to skip queues (for instance, by suggesting games with shorter waiting lines, but still aligned with the visitor's preferences). They also record what and when customers eat or when their birthday will be. This inevitably leads to a more customized consumer experience and allows Disney World to gather reams of personal data about millions of people visiting the amusement parks each year. Privacy is a big issue here, but if companies succeed in managing this correctly and building strong relationships with their customers, the latter will not mind sharing information with the service provider, as long as their experience benefits from the initiative and is enhanced through it.

Hence, it is crucial that managers attribute the right importance to qualitative and quantitative research methods to know their customers better and know more about them. Techniques from both approaches need to be adopted in a combined way, in order to capture the picture as a whole.

8 Conclusions

Service experiences are dynamic in nature and consequently require continuous adaptation, change, and improvement of the setting in which they take place. Nevertheless, Roederer and Filser (2015) argue that servicescapes become obsolete too quickly for being the only asset to be leveraged. Hence, servicescapes are strategic assets that can provide answers to such dynamic questions, only if they become ever-evolving contexts and if they are part of a broader marketing strategy.

Moreover, servicescapes have become and are becoming more than just the place where the experience takes place. From being only a container, they are now becoming the content itself, i.e., places with an identity, where customers go also because of the setting they find and, to some extent, independently of the core offering. In such a situation, the role of technology is continuously growing, already representing a useful tool that companies can use to gather data about customers, map their experiences, and provide an improved service. Furthermore, it represents an opportunity for customers as well to communicate more directly with the provider and receive, in turn, a qualitatively superior service experience with a greater perceived overall value.

We can state that companies wishing to deliver service experiences that truly meet or go beyond consumers' expectations and desires need, first of all, to understand fully the latter's way of thinking and preferences. This becomes especially true when considering the continuous change in customers' tastes and needs. Consequently, service experiences have to be dynamic in nature and able to keep up with these evolutions. This implies being aware that the physical and the virtual servicescape are two faces of the same coin and that they need to be treated jointly to create synergies for the company and continuity in the eyes of the customer. The role played by other customers must also be clearly understood and considered by the company, especially in its negative and potentially dysfunctional implications. Since a company cannot control each and every element of the servicescape – especially the social–emotional aspects linked to individual behaviors and attitudes and the influence of others – a strong awareness of the "status quo," of what customers desire today, as well as what they will require tomorrow, is crucial and mandatory for the management of the service.

Meeting such goals is only possible by combining different research techniques (e.g., observation and introspection), appreciating various standpoints, and integrating different research methods (qualitative and quantitative) to gain an overall view.

In this way, firms will be able to develop new or renewed servicescapes that will finally succeed in generating improved, customer-centric service experiences.

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Chapter 8
Struggling at the Front Line: ICT and Service Innovation

Silvia Gliem and Christiane Hipp

Abstract Information and communication technologies (ICT) are one of the drivers of service innovation. In many services, the introduction of ICT has resulted in significant changes in relation to service provision and service delivery. It has triggered the development of self-services and remote services, for instance. The acceptance and adoption of technology by service providers and service customers has become an important issue in service research. Being now at a state where technology, especially ICT, forms part of our everyday lives and work routines, it is time to extend research in this field from aspects of technology acceptance and technology adoption to aspects of technology usage. Focusing on face-to-face service encounters, we will elaborate the advantages and disadvantages of ICT, taking into account customers and frontline employees. The concept of ICT literacy will be introduced in order to provide the means for further research.

Keywords Service innovation • ICT • ICT literacy • Frontline employees • Service encounter • Perceived quality • Service quality

1 Introduction

Information and communication technologies (ICT) present one of the most prominent drivers of service innovation (Bygstad and Lanestedt 2009; Gago and Rubalcaba 2007). The constantly ongoing development of ICT enables service providers as well as service customers to enhance the creation and co-creation of value during service processes, e.g., by trimming down back office processes or by promoting the conversion of face-to-face services into self-services. However, there are services that still rely on face-to-face interactions between service customers and service providers. For these "pure" services (Solomon et al. 1985, p. 99), frontline employees (FLEs; Hartline, Maxham, and McKee 2000, p. 35) play a special role (Bitner et al. 1990). They guide service customers through the service process as smoothly as possible, thereby ensuring rising, or at least constant, levels

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of customer satisfaction (Rust et al. 1996; Singh 2000). One the one hand, ICT can be a worthy ally for FLEs during service encounters. On the other hand, it can be the source of disturbances that affect the customer's evaluation of the service quality. We assume that the effect of the perceived service quality in a face-to-face, but ICT accompanied service delivery process, depends on the ICT literacy of the customers.

In this chapter, we depict the two-way character that ICT demonstrates when it is integrated into a face-to-face service production and delivery process. The remainder of the chapter is structured as follows. As the starting point for our analysis, we will take a look back and present basic concepts emerged in service research to explain the interplay between ICT and service innovation. We then shortly present how services have transformed as a result of the influence of ICT and why adding a front line perspective will be valuable. Thereafter, we introduce the concept of ICT literacy as a possible means to operationalize ICT's impact on customer perceived service quality. By means of a short case study settled in an educational service context, we will shed light on the quality evaluation of an ICT supported face-to-face service process and discuss if the concept of ICT literacy is appropriate in a service context. Recommendations for further research conclude our chapter.

2 The Relationship Between ICT and Service Innovation

The relationship between technology and service innovation is manifold. Every different type of technology reveals different facets of the interplay between technology and service innovation. For instance, automation technology in conjunction with ICT allowed the introduction of automatic teller machines (ATMs) in the 1980s. By then, the only operation of an ATM was to let customers withdraw money. Today, ATMs offer customers more: charging credit on prepaid credit cards or SIM cards, allowing the initiation of money transfers, and printing of bank statements or the deposit of cash. In general, since the introduction of ICT, we have been able to observe the complete or partial substitution of manual labor in a wide range of services. As demonstrated by the example of the ATM, service innovations take place.

Barras (1986) was the first to describe the relationship between ICT and service innovation. One of his central findings was that the stage of development of the technology itself influences considerably the spectrum of application possibilities and can vary over different service branches (Barras 1986, 1990). Passing through three stages of technology adoption, firms can continuously eliminate uncertainty concerning a new technology. During the first stage, a technology new to a service branch is adopted and deployed for incremental process innovations. Significant for the second stage is the shift from incremental to radical process innovations. As uncertainty decreases in the first two stages, firms learn more about the possibilities to engage a technology in their processes. In the third stage, firms possibly are even more familiar with the technology. They are aware of a wide range of application

possibilities which results in the creation of product innovations (Barras 1986). Barras found out that innovation cycles in manufacturing industries and services do not share the same trajectory. In fact, the innovation cycle in services is a "reverse innovation cycle" (ibid., p. 165). As Utterback and Abernathy (1975) recognized, a "usual" innovation cycle is initiated by a product innovation that in the course of time is followed by process innovations. However, in services this relationship of product and process innovations is reversed.

Apart from his achievements, Barras' model is subject to certain restrictions. First, the study is limited to financial and business services and services provided by local governments (Tether and Howells 2007). Second, it is thought to be difficult to differentiate between incremental and radical process innovations and product innovations in a service context (Gallouj and Savona 2009; Salter and Tether 2014; Uchupalanan 2000). A different perspective is taken by Cusumano et al. (2006). They hold on to the distinction of innovations that goes back to Utterback and Abernathy's "dynamic model of process and product innovation" (1975). Instead of a reverse innovation cycle, they consider service innovation as the stage that follows from the stages of product innovation and process innovation in manufacturing industries (Cusumano et al. 2006). It transforms solely good-producing firms to hybrid firms, offering services that seek to secure their competitive position. The third limitation of Barras' model is the exclusive focus on technology, ICT in particular, which excludes other interferences, such as accumulated know-how regarding former innovation processes (Cusumano et al. 2006; Uchupalanan 2000) that might contribute to a technology-service innovation relationship (Gallouj 1998). The model also leaves us with "a chicken or an egg" causality dilemma. It states that service innovation is promoted by (new) technology. This means that service innovation is technologically induced. At the same time, the development of new technology can be the result of increased efficiency demands that originate in certain service branches.

An approach to address this dilemma and further enlighten the relationship between ICT and service innovation can be seen in the service innovation typology of Miozzo and Soete (1989, 2001). Using as a basis Pavitt's taxonomy of innovation patterns of different industry branches (1984, 1991), the authors differentiate between three types of service firms: supplier-dominated, knowledge-intensive, and scale-intensive service firms. These three types obtain ICT from different sources, e.g., from the manufacturing sector versus own R&D, and deploy the obtained ICT differently, resulting in either process or product innovations. Furthermore, each type is represented by service firms of either large size or small and medium size. An empirical proof of Miozzo's and Soete's typology was made by Evangelista (2000), resulting in slight modifications and the awareness that service innovations also can be the result of aggregated knowledge. Miozzo and Soete are followed by others who have focused on their work, e.g., in small- and medium-sized firms (De Jong and Marsili 2006) or in the topic of innovation intensity (Vence and Trigo 2009).

Both innovation cycle models and typologies or taxonomies try to simplify and at the same time acknowledge the complexity of the service sector. Referring to our

example of the ATM, a service process that previously required an interaction between customer and provider and that was subject to certain conditions, such as opening hours, is nowadays substituted by a piece of technology that allows customers to use the service 24/7. ICT in combination with automation technology created self-service. In our further discussion, we want to illuminate major directions of transformations in the service sector owed to ICT and present the latest issues in research.

3   Service Encounters and ICT: False Friends?

Service encounters are the "critical moments of truth" (Bitner et al. 2000, p. 139) in every service experience. During service encounters, "promises made to customers are kept or broken" (ibid., p. 140). In line with Grönroos and Ojasalo (2004), we define a service encounter as the production of a service during an interaction of the provider together with the customer. This interaction can be, but need not necessarily be, of a face-to-face nature – for instance, customer support via call centers is carried out in a "face-to-phone" system (Dean and Rainnie 2009). No matter to which type the service encounter belongs, the service customer plays a crucial role in it. Being unique in terms of needs, preferences, and character, service customers can be considered as unpredictable components from the perspective of service providers. Service providers try to leverage this unpredictability by the use of technology.

The "technology infusion" (e.g., Bitner et al. 2000) – first and foremost the infusion of ICT – has led to fundamental changes in service encounters and in the whole service sector. ICT has enabled service providers to simplify their back office processes. Furthermore, the delivery of many services has been altered in a way that benefits both providers and customers (Froehle and Roth 2004). Referred to as technology-mediated services, self-services, remote services, and interactive consulting services are all services where technology is required to allow communication between providers and customers (ibid.). Self-services and remote services enable customers to use or consume a service independently from time and location (Schumann et al. 2012). Providers can cut costs by substituting face-to-face interaction with ICT. Additionally, they are able to address more customers because ICT allows them to react to customer requests whenever and wherever they come from. The same holds for other services previously requiring a face-to-face interaction and now being realized through a "technological interface" (ibid., p. 136). All technology-mediated services omit face-to-face interactions. In other words, technology-mediated services reduce complexity when interaction with the customer takes place by means of technology. For instance, customers requesting remote service usually receive this service in an environment which is familiar for them and where they feel more comfortable than in usual service environments such as repair shops. A typology of technology-mediated services and related research topics can be found in Schumann et al. (2012).

Besides the advantages of technology-mediated services, there is a concern that the substitution of face-to-face interactions encompasses lost chances to improve the customer-provider interaction and to create more value (Meyronin 2004). Activities that embroider the interaction process such as listening to customers, understanding what they want, reacting with empathy to their needs, or simply socializing cannot be fulfilled in the way they can be performed by human beings (ibid.). Obviously, someone you call at a customer's support center listens to you and hopefully understands your problem, but the call center agents can barely socialize with you. Apart from the fact that you are not face to face, although a face-to-face interaction is technically possible, you are not in the same room feeling and recognizing empathy from the person in front of you. Researchers share the opinion that communication via Internet, smartphones, etc., is not the same as talking to each other face to face (e.g. Greengard 2011). Furthermore, call center agents usually cannot afford having a chat with you. Instead, they have to meet certain performance goals such as minimum number of processed calls per hour. Of course, different customers exhibit different preferences regarding the way they want to interact with a service provider for a certain service. Ostrom et al. (2015) address preferences of Generation Y as one possible reason for different customer preferences. The generations of digital natives, that is, Generation Y (people born between 1980 and 1990; Cahill and Sedrak 2011) and Generation Z (people born later than 1999; Sparks and Honey 2014), may, in fact, take interaction via ICT interfaces for granted, whereas other customer groups might hold on to face-to-face or at least "face-to-phone" interaction. Thus, for certain services, providers should allow customers to choose between different channels of delivery (Bitner et al. 2000, p. 147). Finally, service providers should consider case by case if the advantages obtained by the use of ICT pay off the before-mentioned disadvantages linked to the elimination of a face-to-face interaction (Meyronin 2004, p. 223), especially when not offering alternatives.

With the "technology readiness index (TRI)," developed and modified by Parasuraman (2000) and Parasuraman and Colby (2015), service providers are given the opportunity to measure "[...] people's propensity to embrace and use new technologies for accomplishing goals in home life and at work" (Parasuraman 2000, p. 308; Parasuraman and Colby 2015, p. 60). To tackle the different aspects of technology readiness, four dimensions were introduced. Optimism and innovativeness represent a positive position toward technology, whereas discomfort and insecurity express a person's negative thoughts about technology and the corresponding consequences, e.g., concerns about the reliable operation of technology. To clarify that we want to assess technology readiness of customers, we slightly modified the four dimensions. They and the aspect of technology readiness they represent are shown in Table 8.1.

Used as a subscale, the four dimensions allow the forecasting of customers' attitudes toward technology (Parasuraman 2000). Motivation and need for a revision of the former index arose from the considerable technological developments occurred in the last 15 years. Technological achievements such as the World Wide Web were experienced far more innovative 15 years ago than there are today where

Table 8.1 Four dimensions of the technology readiness index

Optimism	Customers see technology as a positive add-on to their life that leverages efficiency, control, and flexibility
Innovativeness	Customers are eager to experience new technology and perceive themselves as technology vanguard
Discomfort	Customers see technology as a negative add-on to their life that causes feelings of discomfort
Insecurity	Customers find it hard to trust in technology and lack confidence about its reliability

Source: Modified from Parasuraman (2000, p. 311) and Parasuraman and Colby (2015, p. 60)

it is part of our everyday life. Furthermore, technological advancements have triggered the emergence of new issues. Therefore, wording of some items had to be adjusted and new items were added (Parasuraman and Colby 2015). As a result, some of the items no longer fit into the dimension they originally belonged to and had to be reclassified. Consisting of 36 items at first (Parasuraman 2000), the index was shortened down to 16 items, making it more feasible for practitioners (Parasuraman and Colby 2015). With the information gained from the index, service providers can draw a precise picture of their customer's different levels of affinity to technology. As a result, they are more likely to cope with the heterogeneity of their customers in relation to the usage and handling of technology.

The technology infusion into services is not yet finished. ICT has arrived in almost every service we can think of. Even in the services where a face-to-face interaction cannot be spared by any means of technology, ICT is involved in various ways (Bitner et al. 2000). In the following section, we will focus on such services and how ICT contributes to the value creation process during the corresponding service encounters.

4   Why Is the Adding of a Frontline Perspective Valuable?

In the previous section, we pointed out that the deployment of ICT in services can be seen as a mean to simplify one of the vulnerable stages of a service experience – the service encounter. Now we want to examine the activities of employees who are engaged in the service encounter as another means of simplifying the face-to-face interaction between customers and providers.

As stated in Sect. 8.3, every service customer is unique. Their uniqueness turns them into a component of the encounter whose actions cannot be foreseen. Consequently, value co-creation may as well turn into value co-destruction (Plé and Cáceres 2010). As a result, the outcome of a service encounter fluctuates. The customers' evaluation of the service encounter's outcome has a crucial share in the overall perceived service quality (Bitner et al. 1990). This in turn has demonstrated to influence on customer loyalty (Dean 2004; Hennig-Thurau et al. 2006), customer trust and repurchase intentions (Guenzi and Georges 2010), and positive word of

mouth (Harrison-Walker 2001). Hence, to prevent or at least limit these fluctuations, the employees interacting directly with the customers can guide the customers through the encounter. This specific group of service employees is called customer contact employees or frontline employees (FLEs, Hartline, Maxham, and McKee 2000). Being unique individuals themselves, frontline employees are subject to influences that emerge from different sources within their operating range. This does not mean that we have another unpredictable component here since frontline employees have to comply with the rules and regulations their employer has set up for them. Instead, we want to point out that the frontline employee's performance during a service encounter might fluctuate as well. Their unsteady performance might be the result of dissatisfaction regarding the behavior of their superiors (Kim et al. 2015; Yang et al. 2010) or insufficient possibilities for creative labor (Coelho et al. 2011), for instance.

5 Frontline Employees and ICT Literacy

In many services, frontline employee's actions during a service encounter are supported by ICT. It permits frontline employees to adapt to individual and spontaneous customer needs, recover for service failure, or create additional value by "pleasant, unexpected actions" (Bitner et al. 2000, p. 142, 146). These three roles of ICT are not mutually exclusive. For instance, in customer support services, frontline employees use electronic databases to access a customer's case (ibid.). By this, they lay the foundations for the customization of the service encounter. Further, such a database allows frontline employees to browse possible solutions available for the customer's problem and put a chosen one into action to resolve the customer's problem. Adding some extra service as compensation for service failure, e.g., discount on a regularly purchased consumable supplies such as a water filter for a coffee machine, can be regarded as a pleasant action.

Using technology, of course, implies certain knowledge and skills (Hays 1971; Spencer and Spencer 1993, cited by Li et al. 2009). We assume that it can be taken for granted that frontline employees know how to use the technology at hand. Of course, there are different levels of know-how in relation to technology due to length of working experience and/or general technical comprehension. Furthermore, Li et al. (2009) found out that the need and level of technical know-how varies in relation to the specific service context.

However, positive effects of ICT deployed in face-to-face service encounters bring up the question about possible negative outcomes. To illustrate our idea, let's take a closer look at a specific service process and consider the following situation: *A professor is preparing a projector setup in order to give his or her lecture at the university. The lecture hall is filled with students. The professor enters the stage and starts his or her lecture. During the first 10 minutes of the presentation, the connection of the projector and laptop breaks down. The professor tries several possible procedures to reestablish the connection: unplugging everything and*

plugging it in again, restarting the projector and laptop, and adjusting the screen and the projector setup. Nothing works. The audience gets nervous; students start engaging themselves in conversation with the people sitting next to them. It is the second time that this has happened. In the end, the professor shrugs and continues his or her lecture using the chalkboard. The audience calms down.

What occurred to our professor here is what the writer Douglas Adams (2002, p. 115) expressed with the words, "We are stuck with technology when what we really want is just stuff that works." With all the advantages that technology offers to us, sometimes it just does not work. In fact, the more we use technology, the more it seems that we depend on it. The story continues as follows: *At the end of the semester, the whole course undergoes a student evaluation. The general evaluation of the course is good although worse than last year. Some students state as suggestions for improvement to eliminate technical problems.*

What happened here? A frontline employee, our professor, used ICT for a more efficient service delivery. He or she was, although showing a certain level of technical know-how, not able to fix the technology at hand. As a result, perceived quality levels of the whole service experience decreased, probably in part because of technical problems that occurred during several service encounters. To make our point, we looked at course evaluations at Brandenburg Technical University, Institute of Economics, from years 2009 to 2015. We discovered that out of eight evaluations on courses with more than a hundred participants, an average of nine people criticized the occurrence of technical difficulties. In smaller courses (less than a hundred participants), an average of 7 students out of 31 who gave evaluations remarked about technical difficulties.

Although every student should have noticed the occurrence of technical difficulties during the course, not all of them remarked on them in the evaluation sheets. This may be due to different expectations regarding the service encounter. In addition, the student's own level of technical know-how might as well have an influence on their evaluation of the professor's technical know-how. In other words, technical know-how of service customers influences how they evaluate a frontline employee's technical know-how. This evaluation may form one part of the overall service evaluation, where the frontline employee's technical know-how is a possibility to leverage perceived service quality. Hence, we want to explore our idea in further detail.

To put what we have described in our example in a measureable concept, we propose to introduce the concept of ICT literacy. Defined as "[...] the interest, attitude, and ability of individuals to appropriately use digital technology and communication tools to access, manage, integrate, and evaluate information, construct new knowledge, and communicate with others in order to participate effectively in society" (Lennon et al. 2003, p. 8), ICT literacy maps the today's self-evident handling of ICT as well as cognitive abilities and problem-solving skills (ICT Literacy Panel 2002). To elaborate the different components of ICT literacy in further detail, we present the work of Markauskaite (2007). She combines the former ETS approach (ICT Literacy Panel 2002) consisting of five components with approaches targeting specific forms of literacy, e.g., information literacy

Table 8.2 Nine components of ICT literacy

Areas of ICT literacy	Which technical skills are necessary?	Which cognitive abilities are necessary?
1. Plan	Use of tools that, i.e., facilitate planning and support decision processes	Make up an algorithm for solving a problem
2. Access	Being familiar with a desktop environment, basics of computer maintenance, the use of digital resources for information retrieval, etc.	Choose the right tools, sources of information, etc.
3. Manage	Use software and its basic functions for organizing, sorting, collecting data, etc.	Use established mechanisms for structuring data or information and keep track of its origin and place of storage
4. Integrate	Use software for solving problems via modeling, simulation, and manipulation of data	Find structures in data and information in relation to a specific problem or question
5. Evaluate	Choose digital resources, tools, or information in relation to their relevance	Select relevant information, evaluate quality of information resources, make up correspondent evaluation criteria
6. Create	Generate digital documents for presenting information, e.g., graphics or web pages	Arrange and create information, deduct implications, make up ideas, etc.
7. Communicate	Use of software and other ICT infrastructure to share and distribute research results	Inform and explain ideas and solutions tailored in terms of target groups, applying regulations concerning form, legal rights, etc.
8. Collaborate (interpersonal capabilities)	Use of software and other ICT infrastructure to exchange ideas, work together on problem solutions, etc.	Work and act in different contexts concerning people, groups, number of partners, etc.
9. Reflect and judge (metacognitive capacities)	Use of tools fostering self reflection, etc.	Evaluate and reflect results, solutions, implications, etc., and apply problem-solving algorithm

Source: Modified from Markauskaite (2006b, Table 5; 2007, p. 551)

(Bundy 2004) and concepts for capturing problem-solving capacities (Eisenberg and Johnson 2002). The resulting ICT literacy concept consists of nine components that tackle comprehensively the aspects of using and maintaining ICT as a means of achieving certain goals. We modified these nine components to carve out the importance of ICT literacy for problem solving and exchange of ideas or solutions. The nine components are presented in Table 8.2.

The nine components of ICT literacy emphasize the different facets of ICT usage. In fact, the components focus mainly on the usage of software, whereas aspects in relation to the hardware, e.g., maintenance and general understanding of hardware functionality, play a minor role. In our example presented earlier, there occurred a hardware problem that could not be solved by the user. One could argue that such kinds of situations are not reflected appropriately in the concept of ICT literacy. We think that it is reasonable to assume that hardware problems, especially

when someone is using that hardware in his/her everyday routine, occur rather seldom. Furthermore, we assume that frontline employees hold a sufficient level of ICT literacy that allows them to do their everyday work and run the necessary software without knowing how to help themselves when hardware problems occur. If hardware problems would occur more frequently, frontline employees probably would be trained better to help themselves. The more unreliable a technology is, the more unlikely it would be deployed during service encounters. When we think of the purpose intended with technology that is deployed during service encounters, we think of facilitating the interaction process, boosting efficiency, and guaranteeing a smooth course of interaction with no technical problems. Simply put, unreliable technology that causes more trouble than help and support would not be deployed. Going back to our example, we said that there might be a relationship between the student perceived ICT literacy level of the professor and the student's own ICT literacy level. This relationship influences student perceived service quality presented by the students in their evaluations at the end of the semester. We suggest that ICT literacy levels of customers influence the perceived ICT literacy levels of frontline employees. Also, this relationship shapes the customer perceived service quality. A customer with low ICT literacy level might be more tolerant about a frontline employee with low ICT literacy level, whereas a customer with high ICT literacy level might not. This means in the former case, there probably will be no significant influence on customer perceived service quality, whereas in the latter case, customer perceived quality is expected to decrease.

To this day, ICT literacy has not really found its way into service research. However, in the following, we want to briefly present in which contexts the concept of ICT literacy in conjunction with frontline employees was employed in the past research. Adeyoyin (2005) assessed ICT literacy levels among Nigerian university library employees. The results demonstrate that a great portion of library employees do not hold an adequate ICT literacy level. A second study of Adeyoyin (2006) further suggests that library employees in francophone African countries hold higher ICT literacy levels. A study in the health sector at a Nigerian teaching hospital revealed that two-thirds of the surveyed people did not have an access to any ICT, which can be regarded as one possible reason for lagging behind ICT literacy levels of colleagues with access to ICT (Adeyoyin et al. 2009). This inequality in terms of access to ICT and resulting opportunities to get hands on ICT is termed "digital divide" (ICT Literacy Panel 2002, p. 5). Other studies in an educational context were done by Markauskaite (2006a). She analyzed gender differences in ICT literacy levels among trainee teachers. Her results were mixed and revealed that among other variables, only technical ICT capabilities could be predicted by gender. Mahmud and Ismail (2010) looked at teachers who are already in service and highlighted the importance of experience and training to leverage ICT literacy levels.

Our short review shows that only little research has been done using the concept of ICT literacy in a service context. We identified several reasons for this research gap. First, the context where the concept of ICT literacy can be employed is somewhat specific. This means that there has to be a technology during

customer-frontline-employee interaction whose deployment can be perceived by the customer because only then the customer has a chance to evaluate the frontline employee's ICT literacy level. Secondly, ICT literacy focuses on a determined group of technologies. Thirdly, in contrast to the technology readiness index, ICT literacy does not bother with assessing the customer's or the frontline employee's attitudes toward technology, e.g., willingness to use, trust, or distrust. Instead, ICT literacy focuses on the stage of technology usage reflecting the complexity of ICT at hand. Not for every service ICT poses a means that is used naturally by frontline employees and/or customers alike.

The relationship between customer perceived frontline employee ICT literacy level and customer ICT literacy level was not analyzed in any of the studies. Even performance variables were not looked into. Instead, levels of ICT literacy and factors leveraging ICT literacy levels were assessed. For future research, we think of ICT literacy as a valuable extension of the established concepts. In this way, the actual usage of ICT can be surveyed in detail. On the provider side, knowledge about frontline employees' ICT literacy levels can be a potential source of productivity gains. Knowing about the customer's ICT literacy levels might give service providers a hint on what their customers expect. This will help service providers meeting service customers' expectations and minimizing the gap between customers' expectations and actual perceived service (Parasuraman et al. 1985).

6   Concluding Remarks

Playing a role for frontline employees and service customers alike, ICT is present in many services. Without question, ICT revolutionized services in several ways. On the provider side, back office processes could be trimmed down significantly. Service encounters have been facilitated because frontline employees could use ICT to deliver services faster, more accurately, at a higher quality. For customers, ICT has enabled new types of services: self-services and remote services allowing customers and providers more flexibility in accessing or providing a service, respectively. Until now, the complex interplay between ICT and service innovation has been uncovered only in parts.

In service encounters, customers and frontline employees interact with each other. For their interaction, ICT can be a means of facilitation, acceleration, quality improvement, or a combination of the three. Until now, many studies have focused on the customer's attitudes toward technology in service experience. However, aspects in relation to the actual usage of technology, especially ICT, and the respective know-how required have been brought up in a small number of studies. We propose ICT literacy as a concept to complement present measuring instruments to shed light upon a new aspect of ICT as means of value creation in services.

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Part III
Opportunities and Challenges for Service Innovation in Different Contexts

Chapter 9
Service Innovation for Sustainability: Paths for Greening Through Service Innovation

Faridah Djellal and Faïz Gallouj

Abstract The purpose of this work is to examine the extent to which services and service innovation can contribute to sustainable development in its environmental dimension. The supposed immateriality of services seems to argue in favour of their natural sustainability. This is actually just a myth – one we examine the roots of and which we refute. This calling into question of the naturally green services myth does not, however, mean that the greening of the economy cannot rely on services. On the contrary, greening also fundamentally depends on innovation dynamics being implemented in or by services.

Keywords Services • Innovation • Greening • Sustainability

1   Introduction

More than two decades of research in economics and management science has helped to make service innovation a relevant, legitimate and increasingly important issue in the field of innovation studies. The (recent) maturity of this field of research is illustrated, to some extent, by the rising number of both qualitative and quantitative literature reviews covering the topic of innovation in services, in both its general and its specific (sectoral or thematic) aspects. A recent review of these reviews is provided in Gallouj and Djellal (2015).

Research efforts have naturally mainly focused on two (often related) issues, namely, the nature of innovation in services and its production modes. Does innovation in services (in terms of form, how it is produced) differ from innovation in goods? This is the main question that has long guided the emerging field of service innovation studies. Depending on how this question is answered, the literature considers three analytical perspectives used to address innovation in services: a technologist/industrialist or assimilationist perspective (negative response to the question), a demarcation/differentiation perspective (positive response) and an integration/synthesis perspective (reconciling goods and services,

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their differences and similarities, within a single analytical model) (Gallouj 2010). A fourth perspective, labelled inversion perspective, focuses on the strategic role played by certain services (KIBS) in their customers' innovation.

In recent years, innovation studies have been bolstered, in various ways, through the exploration of new themes (e.g. KIBS in innovation, social innovation, public-private innovation networks, public policies for service innovation, etc.) and through empirical investigation in new sectors. They have also been reinforced by complementary qualitative work using quantitative surveys, relying in particular on the revision of OECD Manuals (Oslo and Frascati Manuals) as well as on the launch of national surveys (see Community Innovation Surveys in particular).

However, the maturity and legitimacy of service innovation studies also depend on their ability to be in line with the great contemporary socioeconomic issues. From this point of view, sustainability is undoubtedly a key issue. Contemporary economies are certainly *service economies*, and if they are – or truly aspire to be – *sustainable development economies*, then the question of the relationship between *services* and *sustainable development* has to be addressed. However, in spite of certain notable exceptions – such as reporting on the adverse effects of transport and tourism on the environment – little attention has been paid to this question so far. Sustainability is still seen as a predominantly industrial issue (Djellal and Gallouj 2010, 2015).

The purpose of this chapter is to examine – mainly from a theoretical angle at this stage – to what extent services and service innovation can contribute to sustainability in its environmental dimension (in other words to 'economic greening'), that is, to the satisfying social needs while leaving the smallest possible ecological footprint. Our focus in this work is thus not (or at least not directly) on the economic and social dimensions of sustainability.

Some intrinsic characteristics of services – especially their immateriality – seem to argue in favour of their natural sustainability. This is actually no more than a myth[1] – one we propose, in Sect. 2 of this chapter, to examine the foundations and to achieve the deconsruction. This calling into question of the myth of 'naturally green' services does not mean that the greening of economic activity (at either micro or macro level) cannot rely on services. On the contrary, in Sect. 3 we show that greening also fundamentally depends on innovation dynamics implemented *in* or *by* services.

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[1] It should be noted that this is a positive myth, while the service economy is more verbose in negative myths: for a discussion of these myths, see Gallouj (2002).

2   Services Are Green by Nature: The Foundations of a Myth and Its Deconstruction

The idea that services would be greener and more sustainable, that is, less damaging to the environment than goods, is not uncommon in the literature (Claval 2006; Illeris 2007; Rifkin 2000; OECD 2000; Ellger and Scheiner 1997). It even seems to be confirmed by some statistical analyses at both international and national level. For example, the International Energy Agency (2008) estimated that, in 2005, services (excluding the transport sector) accounted for 12 % of CO_2 emissions and 9 % of total final energy consumption, worldwide. In the case of France, although the service sector (excluding transport) accounted for almost 75 % of GDP and employment, it was responsible for only 7 % of CO_2 emissions in 2008[2] and consumed 15 % of total energy in 2010 (CEREN 2012).

This idea of the 'natural greenness' of services is based on their immateriality, which is meant to provide a relatively satisfactory criterion with which to distinguish services from goods (see Sect. 2.1). Because they are supposed to be immaterial, services would, the thinking goes, be less harmful to the environment than material goods – whose manufacturing process gobbles up natural resources and is a source of pollutant emissions. The tertiarization processes at work in contemporary economies should therefore automatically lead us to more immaterial/intangible and therefore more sustainable economies (Ettighoffer 1992; Romm et al. 1999).

This attractive hypothesis is, however, debatable. It is possible, for example, to note that the most tertiarized contemporary economies are also the biggest polluters and that certain service sectors (e.g. transport in all its forms) are among the top sources of negative environmental externalities. Beyond simple fact, our purpose is to reconsider the myth of immaterial and therefore green services, from an analytical angle. Step 1 in this reconsideration process is an attempt to identify a certain number of (forgotten or neglected) sources of service materiality (from a static point of view) (Sect. 2.2). Step 2 is the highlighting of the socially constructed (and therefore changing) nature of service materiality/immateriality, depending on the output convention adopted (Sect. 2.3) and Step 3 consideration of the search for materiality as the subject of active strategies carried out by service organizations (Sect. 2.4). Inverse dematerialization strategies will be considered in the second section of this work, which is exclusively devoted to them.

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[2] Data from CITEPA: Centre Interprofessionnel Technique d'Etudes de la Pollution Atmospherique [Interprofessional Technical Center for the Study of Atmospheric Pollution] concerning CO_2 emissions, excluding LULUCF (Land Use, Land-Use Change and Forestry).

2.1 The Foundations of the Green Services Myth

Across the board, from economics to management science, works on services ritually recall a list of technical characteristics that are supposed to be intrinsic to services, namely, intangibility (immateriality), heterogeneity, interactivity and perishability. This is particularly true in marketing, where the IHIP acronym is common knowledge. These characteristics have long been considered quasi-genetic criteria (a kind of DNA) serving to distinguish services from goods.

This definition of the essence of services by their immateriality is rooted in the history of economic thought, particularly among classical economists (Smith 1960 [1776]; Say 1972 [1803]).[3] Even though he does not explicitly use the term 'immaterial', Adam Smith is considered the precursor of the definition of services by their immateriality. This intrinsic technical characteristic of services comes from the distinction Smith made between 'productive' and 'unproductive' labour. Only productive labour (e.g. the labour of the workman in a factory) creates wealth, because it adds value to the material it processes and it brings about material results, which are likely to lead to accumulation. In contrast, services[4] are performed by unproductive labour, that is to say, which 'does not fix or realize itself in any permanent subject, or vendible commodity, which endures after that labour is past, or for which an equal quantity of labour could afterwards be procured' (Smith 1960 [1776]). The immaterial nature of services is often derived (in a way that is perhaps somewhat unsatisfactory) from the idea formulated by Smith (and taken up by Alfred Marshall) that the 'work of all [the services] perishes in the very instant of its production' (ibid.). Admittedly with some ambiguity, then, the unproductivity of service work (its inability to create wealth) is, in Smith's words, a synonym for immateriality.

It was another classical economist, Jean-Baptiste Say (1972 [1803]), who first explicitly introduced the 'immaterial' qualifier to the definition of services. Jean-Baptiste Say called into question the implicit and ambiguous identity established between *unproductivity and immateriality* (*the evanescent nature of the output*). According to him, services, while immaterial, are not unproductive, since they are useful, the source of visible and enduring (accumulative) results (changes) – for example, the healing produced by the work of doctors. In Smith's analysis, Gadrey (2000) identifies the premises of a distinction between immediate or direct output and the mediate output – the outcome or long-term or indirect result ('change of state' in the reality subjected to the services provided). Only the immediate output is evanescent; the outcome itself is lasting: for example, health, education and culture have durable effects on the mind or body. To take another example provided by Smith himself, though the immediate work of the domestic servant may be

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[3] For a review of the debates on services in economic thought, see Delaunay and Gadrey (1992).

[4] Smith provides a number of examples of service providers including domestic servants, servants of the state, servants of the church, artists, lawyers, doctors, etc.

evanescent, the resulting cleanliness does not vanish once the work is done, but endures some time.

The reasoning which, in modern economies, involves translating this genotype (i.e. these technical characteristics) into an environmentally friendly phenotype is obvious. Since the output of services is immaterial, evanescent and transient, it is supposed not to harm the natural world, unlike industrial and agricultural production which transforms raw materials into physical goods, damaging the environment in both their production and their consumption. Such reasoning is clearly mistaken. Services are both less immaterial and less green than they seem – it all depends on how the materiality issue is addressed. Services are of course immaterial in the sense that they are not intended to produce tangible goods as final output. However, their relationships with materiality may take a range of forms, in line with the types of services envisaged. In the following section, we examine these different relationships.

2.2 The (Neglected) Sources of Service Materiality

Given the link established between the level of materiality and the sustainability of services, in calling into question the principle of intrinsic immateriality of services (genotype), we also query its supposed positive effects in terms of sustainability (phenotype). We therefore propose, in this section, to seek to identify neglected sources of service materiality which undermine the myth of its natural sustainability.

Service materiality may manifest itself in different places: (a) in the service medium or target; (b) in various estate facilities, that is, the physical spaces of production/consumption; and (c) in the production factors deployed in the service relationship. While it is important not to neglect the (physiological) materiality of the human factor, it is of course on the capital factor that we focus here. A further significant source of (direct and indirect) materiality stems from another intrinsic characteristic attributed to the service – its interactivity, its coproduced character (d). Indeed, interactivity is often associated with mobility, which requires implementation of a certain number of transport facilities and infrastructure – these being highly material and damaging to the environment.

2.2.1 Materiality of the Service Medium

The diversity of services in their relationship to materiality is obvious. Even intuitively, it escapes no one that transportation, waste processing, cleaning, catering, hostelry and car repairs are more 'material' services than consultancy, training, insurance or psychotherapy. Even within the confines of these few examples alone, we might add that nothing is more material than the dishes prepared in a restaurant's kitchen, whereas psychotherapy is primarily a verbal exchange.

Beyond plain intuition, by mobilizing theoretical works devoted to definition of the service concept (Hill 1977; Gadrey 2000), this difference in materiality between services can be interpreted by the difference in materiality between their mediums. Indeed, drawing on Hill, Gadrey (2000) defines the service as a 'set of processing operations seeking to change the state of the service medium'. The service medium is in turn defined by the target or reality modified or worked upon by the service provider on the customer's behalf. It may take different, more or less, material forms: (i) a material goods; (ii) codified information; (iii) individuals (customers, users) themselves having physical, intellectual or locational characteristics; and iv) organizations, again in their various aspects (technologies, structures, collective competences and knowledge).

The 'change of state' effected by the service can be considered immaterial (healing for the sick, satiety for the guest of a restaurant, repairs to a car, improved cultural awareness, knowledge and employability for a student). Such a change of state can neither be stored nor surrendered, regardless of the medium to which it is consubstantially linked. The service medium may, however, be more or less material, leading to the service itself in turn being considered more or less material.

The degree of materiality of the medium is the basis for a number of service typologies. Thus, when focusing on the difficulty of defining and measuring productivity in services, Gadrey (1996) has proposed a typology which can be extrapolated without difficulty to the service sustainability issue. This typology includes three groups of services whose differences are marked by their main medium:

- Services that mainly involve the physical processing of technical mediums. These differ little from the conventional production of physical goods, which is the category to which the statistical conventions would in any case have assigned them. Examples include passenger and goods transportation, repair of goods, catering, hostelry, retailing, various rentals, standardized processing of codified information (e.g. some functions of banks and insurance companies, etc.).
- Intellectual services applied to organized productive knowledge, often referred to as 'intangible' or 'pure' services because, unlike those of the previous group, these services are not primarily focused on goods (engineering, consultancy services, R&D, software production, advertising/PR services, etc.).
- Services applied to individuals' knowledge and capabilities, in final consumption, and posing significant problems with regard to the identification and measurement of output (education, health, leisure, culture, etc.).

In the previous typology, the service is defined by the *main* medium that is the subject of the 'state change process'. This means that in reality every service activity operates, to varying degrees, on *several mediums*, so that every service activity is in fact a combination of functions associated with these different mediums (material, informational, cognitive, relational, etc.). These combinations vary across space and especially over time (we will return to this issue in Sect. 3.1.1).

2.2.2 Materiality of Service Production/Consumption Spaces

Another key expression in the materiality of services is the materiality of their production/consumption spaces. The service economy is often associated with the absence of factories and heavy-duty production lines. However, services do also require production/consumption spaces such as offices, classrooms, hospitals, railway stations and airports. It would clearly be wrong to conclude that these spaces are environmentally benign – one has only to consider the space taken up by such service facilities as supermarkets, airports, logistics platforms, university campuses, hospitals, landfills, etc. The environmental damage attributable to these production/consumption spaces manifests itself in a variety of ways: use of space, energy consumption, waste generation, emissions, noise, visual and olfactory disturbances, etc.

From an organizational perspective, the question of the production space materiality is often considered via making a distinction between two different spaces: the back office and the front office. The back office is where the material or informational transformations of service mediums take place in the absence of the customer (e.g. the restaurant kitchen or the various departments within a company). The front office is the customer-facing area (e.g. the floor of a restaurant, the bank counter or the hotel lobby).

In management science, and in marketing in particularly, an extensive literature has developed in recent years, seeking to take full advantage of these production/consumption spaces and enhance their materiality. This aspect of materialization strategies will be discussed in Sect. 2.4.

2.2.3 Materiality of the Production Factors Deployed

Even though the labour factor has an evident physical existence, here we are addressing the issue of capital materiality. The third sector theory is built upon the idea that services are low capital intensive and primarily based on the mobilization of labour. Colin Clark, a founding father of the theory of the third sector, observes that 'most service businesses require far less in the way of capital goods than industry or agriculture' (Clark 1940). This low capital intensity lies at the heart of the first positive (rather than residual) definition of the tertiary sector. According to Fourastié (1949), the service sector includes activities for which productivity growth rate is low due to weak mechanization. Baumol (1967) relies on the same assumption in his unbalanced growth model which defines services as a stagnant sector, whereas goods belong to a progressive sector. It should however be noted that in a later work, Baumol et al. (1985) qualified this analysis by introducing an asymptotically stagnant sector combining a progressive and a stagnant component. An example of this is provided by the IT sector, whose hybrid nature (hardware + software) starts out progressive, while the hardware element is proportionately

dominant, then evolves towards stagnation as the software component grows stronger.

This negative assessment of the capital intensity (and materiality) of the services (and, conversely, the positive assessment of their sustainability) must be qualified and called into question – both statically and dynamically. First of all, it is undeniably true that some services have long been characterized by their high capital intensity: this is the case not only of transport in all its forms (passenger and goods transport, air, rail, land and sea transport, etc.) but also of energy and water supply activities (public utilities) for which the question of their belonging to 'industry' or 'services' continues to be a matter of debate (Broussole 2015). Yet it is clear, from a dynamic perspective, that services are increasingly capital intensive. They fall within the scope of natural technological trajectories in the sense of the evolutionary theory (Nelson and Winter 1982), i.e. trajectories of increasing mechanization. We will return to this point in Sect. 2.4.

2.2.4   The Material Dimensions of Interactivity

Interactivity is another essential (intrinsic) technical characteristic of services. It refers to the different forms of interaction between service consumer and service producer (different modalities of the service relationship), which reflect various levels of co-production of the service by the consumer. Like immateriality, this technical characteristic of services also has its roots in the history of economic thought. Storch (1823) is often cited as its precursor.

This service interactivity is also a source of materiality – and therefore of adverse effects to the environment. It often presupposes a physical encounter, which entails travelling on the part of service relationship protagonists. These journeys are material intensive because they mobilize not only transport infrastructure and technical systems but also different encounter venues, depending on the nature of the mobility in question. Interactivity thus has an effect on materiality, especially through the two above-mentioned vectors of materiality (see 2.2.2 and 2.2.3) – namely, the factors of production and production/consumption spaces.

Several types of journeys can be distinguished (Gadrey 2010; Fourcroy et al. 2015): (i) journeys by consumers or users to the place of service production/consumption (e.g. in trade, catering, hostelry, education or health, at least in their traditional dominant form); (ii) journeys by service providers to the customer, be this a firm or an end consumer (e.g. consultancy, certain sales formulas, home services); (iii) simultaneous journeys by service providers and clients (passenger transportation in all its forms); and (iv) journeys made by service organization employees to their workplace.

These different types of journeys involve individuals whose mobility is required for the establishment of the service relationship, that is, the encounter between client and provider. The mobility can however also concern material goods (material inputs required to produce the service) as well as the goods that are the

subject of the service transaction (e.g. supply to stores in retailing, delivery of goods to customers in mail-order selling).

Service-associated journeys are a major source of energy consumption. In 2007, in France, they represent approximately 40 % of official tertiary sector energy consumption (Fourcroy et al. 2012). The scale of these journeys and their impact on sustainability are such that Gadrey (2010) has no hesitation in predicting the decline – and even the demise – of whole swathes of the tertiary sector, unless appropriate solutions (innovations) are found. Examples of such activities are transportation and all services relying heavily on transportation – including international tourism and business travel, hostelry, postal services, etc.

2.3 A Materiality/Immateriality That Depends on the Output Convention Adopted

Immateriality is not an (objective) intrinsic technical characteristic of services, just as materiality is not anymore always seen as a fundamental dimension of goods (see Sect. 3.2). The degree of materiality is a social construction, which depends on the output conventions adopted. The materiality of the service and its impact on the environment differ, depending on the delineation of the border of the service, according to its topographical and temporal coordinates. In the following paragraphs, we consider the output convention at three different levels:

- The technical (topographic) delimitation of the boundaries of the service activity as such (this level essentially reflects the direct materiality of the service)
- The focus on the indirect dimensions of the materiality of the service, particularly (but not exclusively) from a time perspective, involving an analysis in terms of life cycle
- The focus on the universal nature of the 'service provided' as an ontological characteristic of both services and goods

2.3.1 The Physical Scope of the Service

It is obvious that, depending on the border that is drawn to delimitate the service, the level of its materiality and therefore of its sustainability can vary considerably. This relationship between the output convention adopted and sustainability can be illustrated in the case of the evaluation of energy consumption. Such an exercise was performed by Fourcroy et al. (2012), who propose to break down the service into three components (basic services), which give rise to different energy needs (see Fig. 9.1): conditioning, service operations and travel.

According to the definitions of the service previously mentioned (Sect. 2.2.1), *service operations* consist in the mobilization of competences and techniques in order to make transformations on the various mediums of the service (material
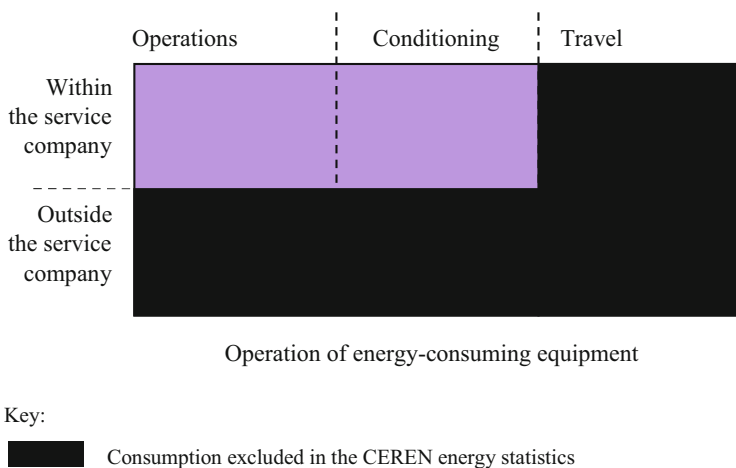
Operation of energy-consuming equipment

Key:

Consumption excluded in the CEREN energy statistics

Fig. 9.1 The Scope of Energy Consumption in the tertiary sector as assumed in CEREN statistics (Source: Fourcroy et al. 2012)

object, information, knowledge, the individual). These operations require technologies, particularly technologies for material and information processing, which are energy consuming. *Conditioning* refers to the whole set of energy-consuming activities achieved for the preparation of the physical space of the service activity (fitting out, cleaning, heating, air conditioning, lighting, etc.). These activities take place upstream of the service operations but also during the operations and partly after them. *Travel* refers of course to the different configurations of the journeys made by the service protagonists before, during or after the service operations (see Sect. 2.2.4). It is a major source of energy consumption and pollution. It should be noted that conditioning activities and service operations could take place in the premises of the company or outside the company.

However, the official energy statistics (e.g. in France those of CEREN[5]) limit the scope of energy consumption to *conditioning activities* and *service operations within the service firm*. The only energy consumption taken into account are those of the equipment used within the premises of the service organizations. Therefore, the measurement conventions underestimate the energy consumption and more generally the negative environmental externalities in the tertiary sector. They exclude, in fact, on the one hand, the energy consumption of conditioning activities and of service operations performed outside the service firm and, on the other hand, the consumption related to travel activities.

By adding to the official statistics, the energy consumption generated by the whole set of journeys related to the consumption or production of services (journeys

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[5] CEREN: Centre d'Etudes et de Recherches Economiques sur l'Energie [Centre for Economic Studies and Research on Energy]. This is the major French organization supplying energy statistics on the tertiary sector.

by service consumers in order to consume the service, journeys by service organization employees from home to their workplace, journeys by service providers for professional reasons), Fourcroy et al. (2012) estimate, in the case of France, in 2007, that the energy consumption is multiplied by a factor of 1.4.

2.3.2 The Direct and Indirect Sources of Materiality

The discussion of the materiality of services (and of its negative effects in terms of sustainability) is often restricted to its *direct* sources. But there are also *indirect* sources of materiality. Taking them into consideration would contribute to scale up the adverse environmental effects of services.

Direct sources of materiality (and corresponding negative externalities) are those which appear immediately within a given service provision. They reflect the negative externalities directly generated by the use of the different material elements (service medium, production factors, production/consumption spaces, etc.), within the different component of a service (operations, conditioning, travels).

Indirect sources of materiality, for their part, are those that are induced by the service in question in the rest of the economy and/or at other times, upstream or downstream the service. There are (at least) two different types of indirect sources of materiality (Fourcroy et al. 2012).

The first type can be addressed by an analysis in terms of life cycle, applicable to the whole set of material goods mobilized during the service provision: technical equipment of course but also buildings, furnishings, intermediate consumption of various goods and goods sold (e.g. in retailing). These different material goods are not only sources of materiality (and externalities) during their use (direct materiality previously mentioned) but also, upstream, at the moment of their own design, production and selling and, downstream, when they are maintained or repaired and possibly recycled at the end of their life. By analogy with grey energy, this incorporated materiality can be labelled 'grey materiality'.

The second type of indirect source of materiality of the service corresponds to the materiality associated with the different types of intermediary services, necessary for the provision of the final service in question. These may include, for example, cleaning services, catering services and consultancy services. These intermediary services also, recursively, involve direct and indirect sources of materiality. The former correspond to the negative externalities that appear immediately during the delivery of the intermediary services in question and which are generated by the different vectors of materiality of these intermediary services (equipment, furnishings, buildings, etc.). The latter correspond to the grey materiality of these intermediary services themselves and, recursively, to the materiality of the intermediate services necessary for the provision of these intermediate services themselves.

Figure 9.2 provides an illustration of the distinction between direct and indirect sources of materiality, in the sole case of energy consumption. It can easily be generalized to all direct and indirect sources of materiality. Using an input-output
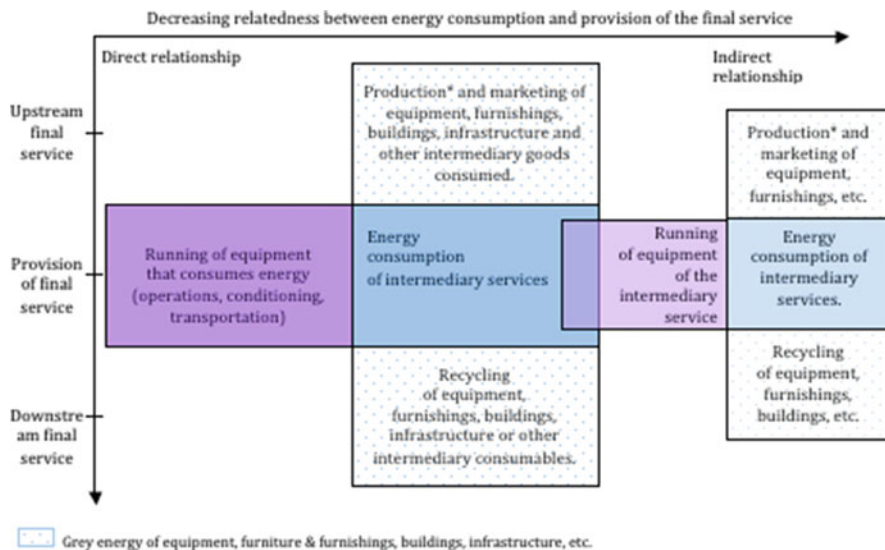
Fig. 9.2 The total direct and indirect sources of energy consumption in a final service (Source: Fourcroy et al. 2012). *Production in the broad sense. This includes the design of the project, the extraction and transportation of the necessary raw materials, the processing of raw materials and fabrication of the product

method, Fourcroy et al. (2015) estimate that in France, in 2009, taking into account grey energy multiplies the energy consumption in services by a factor of 1.6 (it is even doubled in certain service sectors such as the information and communications sector).

2.3.3 The Service as a Common Ontological Characteristic of Both Goods and Services

The idea of the subjective and conventional nature of the border of services (of the difference between goods and services) probably culminates in the recent theoretical work, which considers that the search for specificity (materiality of goods vs. immateriality of services) is counterproductive, since in fact 'everything is service'.

These works share the idea of a certain (observed or desired) blurring of the boundaries between goods and services and the need for common theoretical models. They actually rediscover the principles of consumer microeconomics: the utility, the value in use, the service or final characteristic as an ontological characteristic of both goods and services. This common immaterial nature of goods and services, which militates in favour of integrative or unifying theoretical analyses, is at the heart of all the following theoretical constructs: the functional economy theory (Stahel 1997; Du Tertre 2007; Boutillier et al. 2014), which defines any

output (goods or services) by the function (service) it provides; the experience economy theory (Pine and Gilmore 1999), which defines the output by the experience it provides to the consumer; the 'service-dominant logic' (SDL) (Vargo and Lusch 2006) which defines the value by the value in use, therefore erasing the difference between goods and services; and the 'service science' (Maglio and Spohrer 2008) which is a science of both goods and services. Another formulation of this integrative theoretical perspective is more directly focused on the innovation issue. This is the approach (of the product and of innovation) in terms of characteristics developed by Gallouj and Weinstein (1997) and extended by a number of other works (De Vries 2006; Windrum and Garcia-Goñi 2008; Gallouj and Toivonen 2011, etc.).

However, if they share a common desire of theoretical synthesis, these integrative theories do not pursue the same key objectives. Thus, the main initial project of the functional economy theory (Stahel 1997) is to develop a theory of sustainable development. Therefore, environmental issues occupy a central place in this theory. The analysis in terms of SDL (Vargo and Lusch 2006) and the experience economy theory (Pine and Gilmore 1999) essentially fall into the scope of a perspective of service marketing. They rediscover and operationalize the use value and the new consumer economics (Lancaster). The approach in terms of characteristics (Gallouj and Weinstein 1997) is also of Lancasterian inspiration. Its main purpose is to provide a theoretical model that accounts for the diversity of the innovation dynamics in both services and goods. But, of course, these theories can add (or have already added) to their research agenda, purposes other than their original purpose. Thus, for example, the functional economy theory and SDL are increasingly addressing innovation issues (Ordanini and Parasuraman 2011; Vargo et al. 2015). The approach in terms of service characteristics strives to integrate environmental and more generally sustainability issues (Djellal and Gallouj 2015; Cruz et al. 2015).

2.4   The Rise in Materiality as an Active Strategy of Service Organizations

In management sciences, real or supposed immateriality of services has long been regarded as a weakness to be corrected. This immateriality of the service and its associated heterogeneity/variability character are the origin of performance evaluation issues (service quality, cost or labour productivity) concerning both the client and the service provider (Gadrey 1996; Djellal and Gallouj 2008a). Therefore, different (innovation) strategies have been implemented to introduce material elements in services or optimize existing ones. Some authors (especially Levitt 1972) established this rise in materiality as a strategic imperative for service organizations, advocating for a systematic 'industrialization' of services.

The increase in material intensity of services and their industrialization can take different forms that are closely related, but that we present separately, in order to highlight the different materialization (and industrialization) mechanisms at work.

The first form of materiality rise is the introduction of material technical systems in service companies and organizations. The information and communications technologies that spread invasively in services are (especially in their hardware dimension) an essential source of this materialization process. But other technologies also play a key role (often by hybridization with ICTs): cooking, cooling and ventilation technologies, transportation technologies, medical technologies, etc. As highlighted by a certain number of works (Berkhout and Hertin 2001; Faucheux et al. 2002; Gadrey 2010), these technical systems are intensive consumers of exhaustible natural resources (rare metals) and energy. They also raise formidable problems related to the treatment of waste. Their development is often artificially supported by extremely short life cycles associated with quasi-programmed obsolescence (Desmarchelier et al. 2011).

The second form of materiality rise is, paradoxically, the implementation of what may be called soft or 'immaterial' technologies. This is the standardization of work processes and the implementation of industrial production methods, models and blueprints (Levitt 1972; Lovelock 1992; Kingman-Brundage 1992), which are veritable production 'manuals' of the service. These invisible technologies lead to a standardization of the service itself. The product, in this case, is not a good but a quasi-product: for example, a standard insurance contract or a standard financial product, a tourist standard package and a standard menu item identical throughout a fast-food chain (McDonald's is often cited as the archetype of the industrialization of catering). Industrialization means, then, eliminating cases that are not standard cases.

The third form of materiality rise involves the physical spaces of production/consumption of the service. It can be addressed in two different ways. The first reflects the development, in possibly innovative forms of these spaces defined as architectural entities (*external or 'property' materiality*). The icons of this property materiality are large shopping centres, logistics platforms, transportation hubs, etc. It should be noted that this property materiality can even, in certain cases, rely on industrial production processes, since some modules of the building infrastructure are prefabricated in a factory (e.g. this is the case of Hotel Formule 1 of Accor Group). The second way to address the rise of materiality of the physical spaces is to look at the materiality that manifests itself within the infrastructures. This *internal materiality* is critical to customers, who are sensitive to the aesthetic and functional qualities of the internal architecture and of the furnishings: accessibility to spaces, signage, appearance, decor, comfort, ergonomics, etc. All these elements contribute to make tangible the immaterial and the heterogeneous and are the subject of intense innovation efforts. The strategies implemented to optimize the internal materiality may have different but complementary goals: communication/advertising, improving access and mobility, optimizing the client-provider interaction, reducing uncertainty about the quality, etc.

The last form of materiality rise that we evoke does not concern the production but the consumption sphere. It manifests itself by the rise of the self-service in Gershuny's meaning (1978), that is to say, the replacement of services by industrial goods used at home: for example, the replacement of the laundry service by the use of one's own washing machine, the replacement of the cinema by the DVD at home, etc.

3   Greening the Economy by Innovation *in* Services and *by* Services

In the first part of this work, we have argued that, contrary to an old assumption, the service is not green and sustainable by nature, but that it includes direct and indirect sources of materiality, which serve to increase its ecological footprint. We have raised the innovation issue only in addressing these sources of materiality in dynamic terms, that is to say, by focusing on the materialization/industrialization strategies implemented in service companies and organizations.

In this second part, we address innovation from a different angle, that of dematerialization strategies. In a service economy, innovation in services and by services plays a key role in the process of dematerialization and greening. This greening of the economy by services and service innovation can take two different but complementary paths: first, the greening of the services themselves through the implementation of dematerialization strategies and green innovation trajectories within service sectors (Sect. 3.1) and, then, the greening of goods by services and service innovation (Sect. 3.2).

3.1   *The Greening of Services Themselves: The Green Innovation Trajectories in Services*

We consider here how, through appropriate innovation strategies, services can dematerialize and green themselves. To account for these *internal or endogenous dematerialization* strategies, we rely on the different dimensions of the materiality of the service previously considered, namely, the materiality of (i) the service medium, (ii) the production/consumption spaces and (iii) the production factors. We will not discuss here separately dematerialization strategies associated with the interactivity of the service, to the extent that they are actually special cases of dematerialization strategies related to production factors (transport systems) and production and encounter spaces. This analytical approach is simplifying since the different materiality sources separately addressed here are interdependent in reality.

3.1.1 Dematerialization and Greening of the Service Medium

As we mentioned in Sect. 2.2, the medium of the service can take different more or less material forms: a (material) good, the individual himself, codified information and knowledge. If, in theory, a service activity may be defined by the nature of its main medium (therefore several types of services are distinguished: material, informational, cognitive, relational services, etc.), a service organization is mostly processing simultaneously these various mediums, combined in varying proportions. These combinations are not static but dynamic, and in particular, they may evolve according to dematerialization trajectories.

Depending of the analytical level adopted (macro, meso, micro), the dematerialization of services, considered in terms of the dematerialization of their mediums, can be interpreted in different ways.

At the macro- or mesoeconomic level, the dematerialization of the medium may manifest itself by a rise of informational, cognitive and relational services at the expense of material services. This structural change is reflected by concepts such as 'information economy' or 'knowledge economy'. It is also at the heart of the post-industrial society as defined by Daniel Bell (1973), namely, a society that is moving towards the higher-level services in which the mediums of service provision are human beings and knowledge (in particular health, culture, leisure, research and public administration) to the detriment of so-called lower-level services characterized by the processing of tangible goods (transport, retailing, etc.).

At the micro level, this dematerialization is expressed by the rise, within a given organization (or activity), of processing operations of immaterial mediums (information, knowledge and relationship with the individual) to the detriment of processing operations of physical mediums. The outsourcing of certain material service activities (e.g. catering, transportation, cleaning) can contribute to this process of dematerialization. However, as highlighted by Djellal and Gallouj (2008b), the various mediums of the service and the various corresponding functions (operations) can be associated with different technology families: material processing technologies (robotics, mechanics, etc.), information processing technologies (IT, telecommunications) and knowledge processing technologies (soft technologies, methods, etc.). Thus, in a given activity (or service organization), the rise of the immaterial mediums and functions with respect to material mediums and functions is bound by a reciprocal causality to the change of relative weights of technological families and corresponding innovation trajectories. The dematerialization of the service is thus associated with the rise of immaterial innovation trajectories (pure service, cognitive or methodologial, informational or software) at the expense of material innovation trajectories (see Sect. 3.1.3).

3.1.2 Dematerialization and Greening of Production/Consumption Spaces

The dematerialization and greening process of production/consumption spaces fall into the scope of two distinct groups, which are not fully independent. The first group includes the different operating modalities of the dematerialization and greening of traditional production/consumption spaces, while the second group consists of 'alternative spaces' to these traditional spaces.

In the first group, dematerialization and greening of the traditional production/ consumption spaces can be operated in different ways, which, essentially, refer to building engineering and architecture (including interior architecture). Thus, dematerialization and greening cover, first of all, innovation efforts to build sustainable property infrastructure (ecoconstruction, HQE approach) whether these efforts focus on the nature of the materials used, the nonintrusive inclusion of infrastructure (the buildings) in the natural environment or the configuration of interior spaces, etc. They also cover, in some respects,[6] 'architectural and spatial' facets of the so-called low-cost or service regression strategies (Djellal and Gallouj 2005, 2008b). Indeed, these service regression strategies simplify not only the service offer (by limiting it to the central service and eliminating peripheral services) but also the physical environment of this offer. They are less demanding in volume and quality of reception areas (e.g. see the frugal reception areas of low-cost airlines companies at airports, the Spartan material organization of shelf spaces in discount retail chains) and, according to Fourcroy (2015), less energy consuming. Dematerialization and greening of traditional production/consumption spaces finally also cover the experience of 'smart buildings', reflecting a hybridization of real estate techniques and information technologies (see Sect. 3.1.3).

In the second group, dematerialization and greening of production/consumption spaces are obtained by the introduction of spaces, alternative to traditional production/consumption spaces. Some of these alternative spaces are not new, but they are experiencing a significant development. These include, for example, alternative spaces associated with the following services: (1) home services (e.g. home care services, especially elderly care); (2) remote services relying on post mail, telephone, but especially the Internet; and (3) services in shared space (e.g. village shop that provides postal services). These alternative spaces can contribute, in varying proportions, and all things being equal, not only to reduce the production/consumption spaces but also the amount of travel.

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[6] In other respects, and primarily, regression strategies aim more, as we have already stated (see Sect. 1.4), to industrialize the service, to make it less intangible, less interactive.

3.1.3 Dematerialization and Greening of Production Factors

The process of dematerialization/greening production factors (limited here to technical systems) can be addressed by focusing on the different ways that innovation trajectories at work in service organizations may evolve: (i) the rise of immaterial innovation trajectories at the expense of material trajectories, (ii) the strengthening of the immaterial dimension within a given innovation trajectory and (iii) the hybridization of several trajectories. The process of the dematerialization of production factors can also be addressed (iv) through changes in material goods ownership and use regimes.

Changing Relative Weight of Innovation Trajectories in Favour
of Immaterial Trajectories

First, within a given service company or service activity, the dematerialization/greening process can be considered (as we have already pointed out above) to be a rise in immaterial innovations and technologies at the expense of material innovations and technologies, alongside the rise of the intangible components of the service provision, which is at the expense of its tangible components. In other words, material innovation trajectories reflecting technological developments relating to the transport and transformation of material substances, whether human or physical,[7] become less important than immaterial innovation trajectories which reflect, on the one hand, the production and evolution of formalized methods of knowledge processing[8] and, on the other, the implementation and evolution of 'pure' service innovation, independent of any technical medium.

Strengthening of the Immaterial/Green Dimension Within a Single
Innovation Trajectory

The dematerialization process may also be considered at the level of any one component of the service (material, informational, cognitive or relational) or at the level of the corresponding innovation trajectory, whether material or immaterial. The idea here is that the innovation trajectories, whatever form they take (material or immaterial), are becoming more environmentally friendly, meaning that efforts are being made to develop and adopt cleaner, more energy-efficient technologies. For example, within the logistics material innovation trajectory, efforts are made in favour of cleaner transport technologies (electric and hybrid vehicles). Within the

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[7] For example, passenger or goods transportation systems, cooking and refrigeration systems, cleaning systems, various kinds of dispensing machines, visitor attractions, biomedical or bio-pharmacological innovations, etc.

[8] For example, new consultancy methodologies, new health or cleaning protocols

material and information innovation trajectories, efforts are also made to reduce the volume (materiality) of new technical systems, so that they are more compact. This trend towards miniaturization and integration is not, however, new. Though evolutionary economics (Foray and Zuscovitch 1988) has described it as a specific natural technological trajectory insofar as it characterizes the technological evolution of a particular sector (electronics), it is tending to become a generic natural technological trajectory (concerning many sectors). In the specific case of the informational trajectory describing the dynamics of information systems, it is generally assumed that (immaterial) 'software' dimensions tend to outweigh the (material) 'hardware' dimensions as the trajectory evolves. Acceptance of this hypothesis thus means that the informational trajectory will evolve in line with a growing dematerialization process. It is on the basis of this hypothesis that Baumol et al. (1985) introduced an asymptotically stagnant sector in the so-called unbalanced growth model.

Hybridization of Material and Immaterial Innovation Trajectories

Dematerialization and greening can also happen through the hybridization of innovation trajectories. In the most common case – the hybridization of material and informational innovation trajectories – the question arises as to whether hybridization helps reduce the level of materiality of the new hybrid technical systems formed (to which the answer is probably yes, assuming that the software dimension overrides the hardware dimension). However, beyond this hypothetical dematerialization, there is no doubt that some hybridization strategies, all other things being equal, do have a greening effect: this is the case where the introduction of ICTs helps streamline use of a technical system with a view to sustainability and in particular to energy-saving (smart grid solutions) (Hyytinen and Toivonen 2015). This is also the case where ICTs are used to carry out service transaction without travel (e.g. remote surgery). Conversely, it should be noted that the hybridization of immaterial (pure service and methodological) innovation trajectories and informational innovation trajectories, that is, the introduction of ICTs to both pure service and methodological innovations, contributes to the pro-materialization dynamic in services (see Sect. 2.4).

Changes in Production Factor Ownership and Use Regimes

Dematerialization of production factors (and more generally of material goods) may be achieved through changes in ownership and use regimes. Within the sphere of production, as in that of consumption, individual ownership and private use may give way to different service consumption patterns that do not include ownership (or do not include exclusive ownership) of the goods: leasing, renting, sharing and pooling (see also Sect. 3.2.3). Examples include car sharing (such as BlaBlaCar), shared use of certain sophisticated and expensive technologies, possibly within the

context of public-private partnerships (e.g. scanners in hospitals), etc. This fall in materiality, voluntary though it may be, can also be fortuitous, a joint by-product of the pursuit of other objectives. This is, for example, the case of the pooling of heavy equipment in hospitals, which primarily pursues an economic objective.

3.2 The Dematerialization/Greening of Goods (and of the Whole Economy) by Services

As we noted in the previous section, services (as activities or organizations) may themselves be subject to dematerialization and greening dynamics. Here, we look at another relationship between services and greening, namely, the potential role these activities may play in the greening of other economic activities than their own. These greening (dematerialization) strategies can be described as *external or exogenous*. Within the framework of the so-called economy of functionality, and within a servitization perspective (Vandermerwe and Rada 1988), the concept of product-service system (PSS) (for a literature survey, see Goedkoop et al. 1999; Mount 2002; Tischner et al. 2002; Tukker 2004; Baines et al. 2007; Beuren et al. 2013) occupies an important place in this issue of the greening *by (rather than of) services*. Although it is becoming catch-all and ambiguous as it seeks to gain theoretical consistency, this concept has undeniable heuristic value. Indeed, the concept of PSS (initial, pared-down definition: a combined offering of goods and services) has extended to cover more abstract content and in particular the idea that everything is service.

   In this section, we begin by discussing the analytical ambiguities introduced by enriching the concept of PSS (Sect. 3.2.1). We then examine the implications in terms of the dematerialization/greening of different PSS formulations, distinguishing two cases: (i) product-oriented PSS and dematerialization through the addition of services to products (Sect. 3.2.2) and (ii) use-oriented PSS and dematerialization through the substitution of services for products (Sect. 3.2.3).

3.2.1   Different Concepts of PSS and Some Ambiguities

Strictly speaking, product-service system can be defined as the association (the joint supply) of products and services to meet consumer needs. Such systems existed long before the concept of PSS was explicitly introduced. Although other denominations reflecting the same idea (the combination of products and services to meet consumer needs) preceded PSS, these have been less successful (Bryson 2010). Examples include 'goods-services complexes' (Barcet 1987) and 'compacks' – a neologism (from 'complex packages') coined by Bressand (1986) (see also Bressand et al. 1989), comprising 'bundles of services and manufactured inputs'.

In the literature, the 'mechanical' definition of PSS soon gave way to a more complex definition, going beyond the combination of products and services to include utility and environmental issues. Thus, according to Manzini and Vezzoli (2002), 'the concept of PSS promotes a focus shift from selling just products to selling the *utility*, through a mix of products and services while fulfilling the same client demands with less environmental impact'.

On the whole, in recent literature, the PSS concept seems to be a heterogeneous category, covering various modalities of the (real, theoretical or even rhetorical[9]) integration of products and services. These modalities are described in the following terms (Mont 2002; Tukker 2004; Bryson 2010; Vandermerwe and Rada 1988; Boutillier et al. 2014): the association of physical products with intangible services, the definition of the product by the services it renders, the sale of the use of a product rather than the product itself (leasing, renting), the sharing or pooling of the use of a product and repair rather than disposal. Such a broad and open definition of PSS introduces an ambiguity related to the confusion between the service as an activity (as opposed to a product) and the service as utility or use in the sense of economic theory. A PSS connects products and services. But the ambiguity arises, on the one hand, out of the semantic shift that characterizes the term 'service' and, on the other, out of the nature of the relationship which causes a system to exist.

In an attempt to formally summarize these semantic ambiguities, let's call P the product; S the service; s the final characteristic (utility, use value, service characteristic); σ the general (generic) function attributed to a product, a service or a combination of products-services; and Σ the service uses that can be made of the product P.

In contemporary literature, as we have just stressed, the PSS concept now, in an ambiguous and catch-all way, encompasses a broad set of relationships (which are not always systemic), associating a product (P) and an expression of the service from among those just mentioned (S, s, σ, Σ). The main relationships in question are as follows:

- $P + S$. This is the PSS in the strict sense, combining tangible products with intangible services.
- Σ (P), which expresses the service uses of a product. These service uses include leasing, renting, sharing, pooling, etc. While a relationship between Σ and P does exist here, it can only be called a PSS via erroneous use of language.
- P (σ) or S (σ), which formalizes the idea that a product or service is defined by the general function it performs: mobility, leisure, health or education, for example. The relationship between P and σ and S and σ is not itself systemic. In reality a system exists only when P and S are combined to satisfy a function, which can be formalized as follows: $(P + S) (\sigma)$.
- P (s) or S (s), which, in the Lancasterian tradition, reflects the idea that any product and service is defined by the service characteristics it provides. As in the

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[9] This is sometimes a marketing discourse.

previous case, the general idea is that products (like services) are defined by the service provided. The difference lies in the fact that the service is not approached in general terms (as a function), but rather broken down into more specific basic service characteristics (e.g. the transport or mobility function is replaced by a vector of service characteristics: speed, security, comfort, etc.). Both approaches to the relationship between products and services can have critical implications on both perception of the level of materiality and the definition of innovation. However, the relationship between P and s or S and s is not systemic. Indeed, the service characteristics are consubstantial to P and S; these are not external components capable of creating a system.

The first of the above relationships $(P + S)$ reflects what the literature on PSS (Tukker 2004) calls 'product-oriented PSS', while all the other relationships fall within the scope of the 'use-oriented PSS'.

3.2.2 The Product-Oriented PSS: Dematerialization and Greening by the Addition of Services to Products

Product-oriented PSS are established by the addition of services to products. They may, however, take more or less sophisticated and integrated forms, featuring more, or fewer, added services. Within this product-oriented PSS diversity, it is possible to distinguish two main subcategories, according to the knowledge intensity of added services.

The Addition of (Relatively) Low Knowledge-Intensive Services: Services Around the Product

The best-known form of product-oriented PSS is that which entails adding traditional services (generally those having (relatively) low knowledge intensity) to a product. These PSS are similar to what Furrer (1997, 2010) calls 'services around the product'. Examples include the addition of different pre- and after-sales services, financial and insurance services, etc., which made Fordist economies so successful. Such PSS may be considered at micro level (the same company provides the combined supply of products and services) or at meso level (the joint offer is the result of a partnership between different actors). In the latter case, the PSS is more than just a design and product engineering concept since it also reflects a production and innovation network dimension.

It should be acknowledged that the original purpose of such a system is not ecological. By adding services to products, the objective pursued by companies is to gain a competitive advantage. Companies seek to improve the quality of goods, reduce costs, boost sales and thus increase profits. In some cases, the services added to the product can even be more profitable than the products themselves (Furrer 1997). By adding services to products, companies may also seek to lock down the

relationship with the customer – in other words, to generate customer loyalty (Bryson 2010). The multiplication and tightening up of service relationships (i.e. customer interaction) help keep the provider attentive to client needs, favouring adaption and innovation. It is now possible to state that the addition of services to products and the concept of PSS have enriched innovation theory, ahead of sustainable development theory. The two fields (innovation and sustainability) are now reconciled within this concept.

In this PSS approach, dematerialization arises out of multiple sources. First and foremost, it is mechanical (passive), a result of the rise of intangible services in the PSS. In other words, by adding services or service to products, the degree of immateriality of the entire PSS rises. In this way, the ratio between the 'volume' of material products and the 'volume' of intangible services serves an indicator of the degree of the service's materiality/immateriality. Within the supply of a given industrial firm, the volume of intangible services may increase, outweighing the volume of material products. This development, which raises sectoral allocation issues, is illustrated by the case of iconic industrial companies (particularly in IT) that have essentially become service providers. It should be noted that in this simple PSS approach, the reverse process of adding products to services also contributes to the creation of a PSS. Such a process, however, helps increase materiality, rather than reduce it.

Dematerialization is also active for some added services. This is, of course, the case of repair and maintenance services, as well as of take-back and recycling services at the end of product life. All of these contribute to dematerialization through the expansion of the lifespan of either the products or some of their components and by reducing use of virgin materials in the production process (Agri et al. 1999).

The Addition of KIBS: The P-KIBS System

A product-oriented PSS can also be constituted through the addition of knowledge-intensive business services (KIBS) (various types of consultancy services, engineering, training and research) to products (and services). The product KIBS system also contributes to dematerialization of the system, in a mechanical (passive) way, by the simple juxtaposition of intangible services and physical products. This is not, however, the most important dematerialization/greening mechanism. Above all, KIBS contribute via an active role. Indeed, in this type of PSS, KIBS are primarily mobilized as agents of change. They can accompany and support the greening/dematerialization efforts of a business and corresponding innovations, whether technological or non-technological. A number of consulting companies have thus either specialized in providing greening services or included this expertise in their service supply.

3.2.3   Use-Oriented PSS: Dematerialization by the Real or Theoretical Substitution of Services to Products

The currently dominant PSS approach is broader than the previous one, since – beyond the systemic dimension (linking products and services) – it is the distinction between products and services (and paradoxically between components of the system) that is called into question. Indeed, the main idea here is that, by nature, everything (including the product) is service and that material goods are subject to service uses. This PSS approach is called 'use-oriented PSS'.

From the theoretical (and sometimes rhetorical) point of view, this PSS approach falls within the scope of a perspective that reflects a radical change in perception of the nature of goods and services. In this vision 'everything is service'. Agricultural products, industrial products and services alike are of value only based on the service(s) or function(s) they provide.

From the operational point of view, this PSS approach reflects, then, a change in the way products are used by consumers, associated with a change in the producer's business model. The company no longer provides products, and the consumer no longer acquires ownership of a product – rather, both, respectively, sell and buy the use of the product and the service it provides. From this perspective, products (such as cars, photocopiers and machines) are no longer what are sold, but rather kilometres travelled, the number of photocopies made, hours of operation and so on. This purchase of the service provided by the products can take many forms: renting and leasing (potentially even going as far as a 'pay per service unit' model[10]), as well as sharing and pooling.

In this PSS approach, dematerialization and greening are not limited to the rise of mechanical immateriality through the addition of intangible services. Here, the sources of immateriality and greening are more complex and difficult to grasp. They are linked to the decline in consumption of durable goods and the efforts made by producers to upgrade durable goods (sources of the services they sell) or extend their lifespan.

Though it reflects a blurring of the traditional analytical 'product and service' categories, PSS also questions (scrambles) our analytical categories in the field of innovation (whether or not related to sustainable development): its nature, its actors, its appropriation regime and its evaluation systems. In a PSS, therefore, innovation in products can come out of innovation in complementary services (this is well known in mature sectors, such as the automotive industry). Innovation takes systemic, architectural form. It concerns not only products as such but also their consumption or use modes. It also raises appropriation issues, given the multiplicity of stakeholders (and in particular the role of the user). It requires innovations in our innovation and performance measurement apparatus, in order to reflect – beyond industrial and technical performance – environmental and social performance (Hyytinen et al. 2015).

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[10] An illustration is provided in the area of rental and leasing photocopiers.

4 Conclusion

Insofar as it is through their material dimension that economic activities damage the environment, the alleged immateriality of services is often seen as a guarantee of their natural sustainability. Unlike goods for which the production process swallows up exhaustible natural resources and harms the environment, services, by dint of their evanescent nature (long since emphasized by the founders of classical economics), are supposed to have a smaller environmental footprint.

In this work we have sought, firstly, to refute this myth of the immateriality of services. Even though a service outcome may be (or seem) immaterial, we must not forget the many materiality sources that the service conceals: materiality of the service medium, the production factors deployed and the production/consumption spaces, as well as materiality relating to interactivity (which is integral to the previous two vectors of materiality).

Moreover, the materiality/immateriality of a service is not an objective, intrinsic, technical characteristic. It depends, firstly, on the output convention adopted – that is, the scope agreed upon for definition of the service, whether this is its topographical delimitation or its time horizon. Massive underestimation of service materiality often results from the exclusion (as often practised by official statistics conventions) of certain components (such as travel) from the scope of a service. The materiality of the service is similarly underestimated when it is limited to direct materiality, excluding indirect ('grey') materiality, which is 'incorporated' to buildings, furnishings, intermediate goods and technical systems in particular, as well as to intermediary services mobilized in the course of the service transaction. This service materiality also depends on the materialization/dematerialization strategies being implemented by service organizations.

Thus, while the service is not intrinsically intangible, innovation strategies can be implemented that will make it more or less material/immaterial. In this chapter, we have only briefly touched on service materialization (industrialization) strategies in order to focus on dematerialization and greening strategies.

In their relationships to services, such dematerialization strategies can take two forms, each covering different sustainable innovation trajectories. The first of these internal dematerialization/greening approaches describes a set of innovation strategies entailing services dematerializing and greening themselves through actions designed to affect the vectors of materiality: service mediums, production/consumption spaces and production factors. The second form, known as an external materialization/greening strategy, encompasses a set of innovation strategies which comprise the dematerializing/greening of goods (and of the whole economy) through services and service innovation. The PSS concept occupies an important position in these dematerialization/greening strategies. It reflects (though sometimes ambiguously) various mechanisms: mechanical (passive) dematerialization via the simple association (juxtaposition) of goods and services; more complex dematerialization, based on a unified ontological conception of goods and services (everything is service) and on changing production and consumption patterns and

ownership regimes; and dematerialization/greening though active KIBS intervention.

Overall, we can conclude that services are not by nature intangible and green, but that they are capable of dematerializing and greening themselves via the implementation of appropriate innovation strategies. This process of dematerialization and greening, supported by sustainable service innovation, must however be qualified by a number of remarks, some of which may be considered interesting avenues for a research agenda:

- In this work, we have focused on the dematerialization dynamics of services and of PSS. However, in contemporary economies, the two often go hand in hand with the contradictory dynamics of materialization. These are the two inseparable faces of Janus. Gallouj et al. (2015) describe the industrialization/servitization dialectic as one of the most powerful megatrends at work in contemporary economies. We might also ask to what extent these two contradictory processes lead to a zero-sum game in terms of materiality and sustainability.
- Analyses of dematerialization must take into account what is called the rebound effect. Indeed, the success of eco-friendly solutions can induce increased production and consumption, thus reducing the overall benefit.
- The two remarks above refer to the fundamental question of measurement systems. Most of our analyses remain theoretical or qualitative. The dematerialization issue raises formidable measurement problems. Thus, the idea of PSS sustainability, that is, their less material-intensive nature (though considered acceptable in theory), is not validated by measurement. This is an important research issue.

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Chapter 10
Innovation in Public Service Systems

Lars Fuglsang and Jon Sundbo

Abstract In this chapter, we examine service innovation in the public sector. We outline the characteristics of service innovation and the conditions that in the public sector differ from market-based service sectors. We use the concept of innovation capabilities as the core concept for comparing private and public service innovations. Service innovation within public service systems requires some of the same innovation capabilities as market-based service sectors. However, because public service systems are integrated in political systems, other, partly overlapping, innovation capabilities are required. The political system's lead is a particularity. Innovative co-production with users and the involvement of employees and their bricolage are important capabilities, which we find in both private and public services. Yet, in the public sector, these particular capabilities are related to the fact that employees and 'users' (citizens) may be driven by a public ethos towards adding value to the public sphere (Benington 2011) and service providers cannot abstain from delivering a given service if the context becomes wicked or complex. The capability of externalizing some services to external partners and create networks among public and private actors is important for innovation in public services. It involves such elements as being able to specify the services, coordinate public and private interests, create trust among public and private partners and justify externalization and collaboration vis-à-vis citizens.

Keywords Service innovation • Public sector • Public service innovation • Innovation capability

1 Introduction

In this chapter, we examine service innovation in the public sector. Drawing on the scientific literature (see Gallouj and Djellal 2010 for an overview), we outline the characteristics of service innovation, which has usually been studied within market-based service sectors. The chapter highlights what determines service innovation,

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how service innovations are created and what is unique to innovation in service sectors compared with innovation in manufacturing sectors. Further, drawing on the studies of public innovation and public service delivery, we outline and discuss what may be particular to innovation in public service systems, i.e. what makes conditions in the public sector different from those in market-based service sectors (see Windrum and Koch 2008 for an overview).

We use the concept of innovation capabilities as the core concept for comparing private and public service innovations. Innovation capability is an organization's ability and competence to initiate and carry out innovation processes – an adaptation of David Teece's concept of dynamic capabilities (Teece and Pisano 1994; Teece 2014; see also Barreto 2010; Sicotte et al. 2014). More specifically, innovation capabilities manifest themselves in the processes of an organization which uses its resources (Eisenhardt and Martin 2000) to initiate and carry out innovations. Similarly to Eisenhardt and Martin (2000), we argue that although capabilities may be idiosyncratic in their details and may emerge in different ways, there are common features across organizations associated with effective innovation capabilities. A high innovation capability requires several types of resources (cf. the resource-based view of the firm; Wernerfelt 1984; Barney 1991), such as competencies (Hamel and Prahalad 1994), capital, technology, knowledge base and so forth. Also the management capacity is needed to handle the resources. We describe the core capabilities that are crucial for developing service innovations and those specifically required for developing innovations in public service systems.

The chapter is structured as follows: first, we present and define service innovation as a generic phenomenon and discuss the public sector as a service system. Next, we present and discuss innovation capabilities in service sectors and examine the particular innovation capabilities in the public sector. Finally we present our conclusions.

2 Service Innovation and the Public Sector

2.1 Service Innovation

Service innovations have particular characteristics. It has been discussed whether and how service innovation is different from manufacturing innovation (Howells 2010). Much of the theory and empirical knowledge about manufacturing innovation can be applied to services, but service innovation also has its own characteristics. These particular characteristics have been investigated and reported in overview articles (van den Aa and Elfring 2002; Rubalcaba et al. 2012) and in several anthologies (Boden and Miles 2000; Miles and Metcalf 2000; Andersen et al. 2000; Tidd and Hull 2003; Gallouj and Djellal 2010; Sundbo and Toivonen 2011).

Service innovations are generally of the same type as those mentioned in general innovation theory, which is based on manufacturing studies: new products (in services: service products), new processes (in services: new production and delivery processes), new organizational forms, new market behaviour and – we may add – new strategies or business models. The particularities for service innovation are linked to the issues of how these innovation forms are integrated, how much the innovations (e.g. a new service product or a new procedure) are repeated (or reproduced) and in which ways new services are developed (Sundbo 1997; Gallouj and Weinstein 1997; Gallouj and Djellal 2010). Service innovations are often integrated: since services traditionally cannot be stored, but must be produced at the moment of consumption, the product, the production and the delivery procedure are integrated. However, along with the development of information technology (IT), storing of services is increasingly possible and the users can practise self-service.

Another traditional feature of services is their tailor-made nature: a new solution for one client is not repeated for other clients. The innovation has not been reproduced – so, its effect has been minor. On the other hand, services can also be standardized, mass-produced and distributed, in which case the innovations are reproduced. Finally, innovation processes – the ways in which new services are developed – are complex in services. Service innovation is often an unsystematic process, emerging from practical ideas supplied by customers or employees. Service innovations are rarely R&D based and have traditionally not been technological. The latter situation has changed, however, as IT has become the basis for services (especially for knowledge services). Simultaneously, most service innovation processes need the efforts of many actors. They are largely based on users (or customers): either they apply knowledge about the users and the market or users are directly involved in innovation activities (Sundbo and Toivonen 2011; Edvardsson et al. 2012). Managers and employees are involved as 'intrapreneurs' (cf. Pinchot 1985), and employees' encounters with customers are often the starting point for innovative ideas (Sørensen et al. 2013; Sundbo et al. 2015).

Innovation processes, and therefore also the necessary effective capabilities, are generally of a similar kind in both knowledge services (such as education, consultancy, administrative services and engineering services) and manual services (such as cleaning, catering and transport). Knowledge services have become more IT-based and thus slightly more technological. This has made industrialization of knowledge services possible and has led to many process innovations that include rationalization.

2.2 The Public Sector and Services

The public sector has been studied mostly as a political system. However, the public sector also provides services to citizens, and consequently, it can be considered as containing service systems. For example, the public sector provides educational

services, health services, protection services (police and defence), transport services and so forth. According to some political theorists, many of these services might as well be produced by private organizations. According to others, most market-based services could be produced by public organizations. This debate illustrates that the service perspective and service innovation are relevant topics for discussion and research in a public context.

The delivery of services, as this concept is understood within the market-based service sector, is not the only task or role of the public sector. However, it is one which has attracted increasing awareness. The recent discussion about cost reduction and tax reductions has emphasized the public sector's role as a service provider. In line with the ideas of new public management and new public governance (e.g. Osborne 2010), politicians and public administration increasingly emphasize that service delivery processes could be more efficient and user-friendly. This highlights the role of service innovations, particularly process innovations. Also, citizens' satisfaction with public services, and the growing demand for quality, has attracted political attention. The ability to deal with quality issues as well as so-called wicked problems to which it is difficult to find simple solutions (such as crime or terrorism) is defined by politicians as central to voters' assessment of the performance of governments and political parties. Innovations in service products as well as organizational, systems and 'business model' innovations are therefore important in the public sector.

Research has not yet focused much on public service innovation (a few examples include Windrum and Koch 2008; Hartley 2005; Sørensen and Torfing 2011; Gallouj et al. 2013; Fuglsang et al. 2014). However, this is a growing research field. Many similarities have been found between service innovation in the market-based sector and that in the public sector, while some elements unique to the public sector have also been identified.

3 Innovation Capabilities in Services

Drawing on research into service innovation, we identify six main innovation capabilities, i.e. abilities to use resources to generate innovations that show commonalities across firms. These six capabilities derive from our interpretation and summary of many empirical results and theoretical suggestions and models. In the following paragraphs, we summarize detailed empirical results on these main capabilities (the order does not reflect any specific criteria). The capabilities are based on our interpretation of what research so far tells us about the issues that are important for service firms.

3.1   Design and R&D

Service innovations can be designed (Tax and Stuart 1997; Edvardsson et al. 2000; Lenfle and Midler 2010; Kimbell 2011). Research has shown that service innovations are not research-based and service firms do not have R&D departments to the same extent as high-tech manufacturers (Sundbo 1997; Drejer 2004; Howells 2010). However, service innovation is becoming increasingly systematic and thus follows the rules of science. Research about service products and activities, particularly within management, marketing, IT and software, psychology and sociology, has been carried out and forms the basis for service innovations (Evangelista 2006; Miles 2007; Hipp 2008; Camacho and Rodriguez 2010). Taking advantage of the opportunities that science can provide requires that a service firm or a public organization has the ability to do so. It requires absorptive capacity constituted of the organization's ability to find, understand and use external knowledge (Cohen and Levinthal 1990). The service organization should also have the internal ability to design and develop new services and service delivery systems. This demands professional developers and possibly R&D or innovation departments; the latter are departments tasked to ensure that innovation processes are carried out, either bottom-up as employee intrapreneurship (cf. Pinchot 1985) or top-down as organized innovation projects (Sundbo 1997; Sørensen et al. 2013). Methods of systematic service design have also been developed and can be important in terms of innovation ability (Cooper and Edgett 1999; Edvardsson et al. 2000).

3.2   Technology: Particularly IT

Even though service innovations are not as technology-based as manufacturing innovations (Sundbo 1997; Drejer 2004), they are often co-determined by technological development that provides possibilities for new services or new ways of delivering services (Sundbo 1996b; Evangelista 2000; Djellal 2002; Hipp 2008). The ability to adapt new technology to services and perhaps develop new service technology is therefore an important ability in terms of service innovation. Sometimes, service firms themselves develop new technology. An example is cleaning companies that produce and sell cleaning machines and chemicals and develop new machines and chemicals. Another example is banks that develop ATMs or administrative IT software. Technology can be used to develop self-service products that are new and which also have great potential for productivity increase. Self-service systems based on new technology can be seen in supermarkets and banks, for example. IT in particular is important for services (Scupola 2012; Henten 2012). This is obvious when we talk about knowledge services, but IT can be a basis for innovation also in manual services. For example, IT systems can be used by burner service firms to monitor oil or gas burners remotely. This can even be automated.

Service firms' technological capability is therefore an important innovation parameter.

3.3   Networking and Co-operation

Service firms often innovate in networks with external actors – not only with customers (whom we treat as part of another capability) but also with competitors, suppliers, public institutions and authorities and knowledge institutions. The ability to create and participate in such networks and to co-operate with external partners is important for service innovation (Tether 2002; Tether and Tajar 2008; Hipp 2008; Chesbrough 2011). This co-operation can be effected with different types of actors: knowledge or technology providers (including researchers); other firms that can provide knowledge or inspiration, even competitors (in developing common innovations); or public institutions or politicians. Some networks become institutionalized innovation systems, but most collaboration is carried out in loosely coupled networks within services (Sundbo and Gallouj 2000). The latter are not fixed constellations and the co-operation is not strictly regulated (e.g. by contracts or institutionalized norms), but the networks can take numerous forms and imply different actors. The ability to navigate in such loosely coupled networks is important for achieving a beneficial innovation process. Often it is individuals, not the firms as such, who participate in such networks; this capability thus often depends on individual managers or employees. Networking may lead to value chain innovation whereby several firms, entrepreneurs or public institutions participate in innovation activities, and the service firm profits from ideas and assessments from all the steps in a value chain (Sundbo 2011); the advantage of value chain innovations is that the market possibilities are comprehensively assessed beforehand and problems in developing new services can be solved quickly by some of the other participants (e.g. technology suppliers).

3.4   Market and Customer Base

Compared with high-tech manufacturing firms, service firms tend to be more pull- or market-oriented with regard to their innovation activities (Sundbo 1997; Gallouj and Djellal 2010). Service innovations have developed to a lesser degree from new technology and basic research, but are based much more on customers' practical problems (Sundbo and Gallouj 2000). Service firms are strongly oriented towards the market and the desires of potential customers. Service is seen as an activity that solves customers' problems in interaction and co-production with the customers, something recently termed as service-dominant logic (Vargo and Lusch 2008). The ability to 'read' the market and involve users (or customers) in the innovation process is crucial. Much research has been carried out to find the best ways of

involving customers in service innovation processes (Edvardsson et al. 2000, 2012; Alam and Perry 2002; Kristensson et al. 2008; Sundbo and Toivonen 2011). Involvement of customers (or users) may differ depending on whether the customer is a firm or a public institution (business-to-business) or an individual consumer (business-to-consumer). Customers can be just idea providers or they can be actively involved in the innovation process. In some business-to-business cases, they can be partners because the service firm develops a service innovation for the customer firm (e.g. when a management consultant develops a strategy for a client firm that wants to enter the Chinese market). A crucial factor is the service firm's ability to reproduce this single-client solution and sell it to other clients. Only then will the innovation be of greater economic importance to the firm itself, and only then will it have a stronger social effect as a solution to the problem (in the example, entry to the Chinese market).

3.5 Employees' Intrapreneurship and Customer Interaction

The employees' ability to act as intrapreneurs is important. Many innovation ideas and initiatives stem from employees encountering customers. The employees' capability to understand customers, feel empathy and derive ideas from customer encounters is essential. Since the service innovation process is not generally systematic and planned, many new solutions are developed by employees in concrete situations where a customer has a problem. The employees' ability to apply 'bricolage' (Fuglsang 2010) is important. It means tailor-made solutions for individual customers in specific situations with available resources (see also Sect. 10.4 on public services). Also, the organization's ability to generalize and diffuse the bricolage solutions to the rest of the organization is crucial. The ability to engage employees in innovation processes may be viewed in three different ways. First, it may refer to the capability of involving employees in innovation processes, i.e. the management's efforts to mobilize the knowledge and experience of employees in a careful and relevant way (Sundbo 2008) as intrapreneurs (Pinchot 1985). Second, it may refer to the employees' participatory capability and empowerment capability of controlling their own working environment by contributing knowledge about their well-being, skills and customers – so-called employee-based innovation (Høyrup et al. 2012). Third, it may refer to the organizational ability to conduct a 'balanced empowerment' system between the management's control by strategy and the employees' empowerment and control of their own work and hence the capability of working within a dual structure of bottom-up and top-down forms of interaction (Sundbo 1996a).

3.6 Balanced Innovation Management and Strategic Reflexivity

Service innovation is a complex, laborious, balanced and labile process that can develop in many directions (Sundbo 2010). Management must therefore engage with and motivate employees' participation as intrapreneurs and bricolage-makers, but also balance this engagement against the use of resources (time and money) (Sundbo 1996a). The management in service firms must continuously guide the innovation process – without determining it. The managers' ability to do this is important. Service managers often seek guidelines that can give a direction regarding innovation work and act as a framework for deciding which innovative ideas to accept and which to reject. Service firms often have a strategy for their business, market behaviour and development (Sundbo 2001; Tidd et al. 1997), or they have a business model (wherein understanding and ideas are primarily emphasized; Teece 2010). Often, the strategy or business model is used as the framework for innovation. It becomes the inspiration for innovation and the framework for decisions about which innovative ideas to develop. Even when innovative ideas have been selected, debate continues as to whether the innovation will be successful and whether other ideas and bids for innovation should be chosen instead. Service firms rarely follow a technological trajectory that gives guidelines from a technology push or development perspective. This continuous consideration is often made within the framework of the strategy (or business model) and has therefore been termed 'strategic reflexivity' (Sundbo and Fuglsang 2002; Fuglsang and Sundbo 2005). The managers' ability to follow the innovation's fate on the market and their ability to involve employees in their reflections are important innovation capabilities.

4 Innovation Capabilities in Public Services

Drawing on literature dealing with public service delivery and innovation, we now describe four capabilities of service innovation that are important to innovation in services in the public sector. They overlap with the capabilities described above and may also be relevant to private services, but we stress the public context of these capabilities in the following.

4.1 Bricolage: Using Resources at Hand in the Public Sector

Research shows that an innovation process is not always goal-oriented and based on an economic calculation. Innovation can start from available means and be understood more as a social change process. For example, the effectuation model in

entrepreneurship research has indicated that experienced entrepreneurs start from the available means. They consider who they are, what they know and whom they know. They can generate varied user-friendly effects based on these considerations, rather than formulating goals based on risk calculation and generating new means to achieve them (Sarasvathy and Dew 2005). Small business research has further shown that small enterprises often use a strategy of bricolage to remain robust and innovative. They 'make do' with resources at hand which they recombine for new purposes (Baker and Nelson 2005). Particularly for small enterprises with resource constraints, this can be an effective strategy of business development and a path to innovation (Senyard et al. 2014).

For public services, the bricolage method has been shown to be an important path to innovation thanks to its impact on the well-being of both employees and clients (Fuglsang 2010; Fuglsang and Sørensen 2011; Borins 2001; Andersen 2008). There are special conditions for bricolage in the public sector because it is a politically driven system and because employees may be driven by a public ethos towards adding value to the public sphere (Benington 2011). Furthermore, public service providers are obliged to produce services. They cannot 'leave the market' in the same way as a private company. Together with resource constraints, this may create a greater willingness and ethos to improve and innovate services in everyday practice by resources at hand. The minor changes in services that are created through such bricolage can over time accumulate into important new innovative solutions or new ways of using resources, thus generating new variations of public services from specific problem-solving events (cf. Lévi-Strauss 1966). Yet, using the capability of bricolage is not unproblematic in the public sector. For one thing, in some cases, such as medical care, bricolage activity can mean that important rules and protocols are bent and perhaps even ignored in favour of quickly solving problems on the spot with the available means (Timmermans and Berg 1997). Further, the capability of bricolage can be kept secret and away from managers' attention, because it is seen as partly illegal or as cheating and lacking recognition. Finally, because it is context-dependent, the results of bricolage can be difficult to generalize and transfer to other contexts.

The capability of bricolage has, for example, been shown to be important to home-helpers in elderly care positions who must often solve unexpected problems with the resources available to them (Fuglsang and Sørensen 2011). They organize small change processes by means of bricolage that allow them to increase the well-being of clients in a human-centred way inspired by their working values. Home-helpers have also been shown to diffuse new ideas by discussing them with their colleagues and taking them up with management.

Although there is evidence that bricolage can be a path to innovation in public services, less is known about how such small incremental innovations can be organized in a more systematic way. What we do know is that such activities may be organized more or less spontaneously by individuals confronted with problems, yet they may also be organized at the collective and organizational level. It may be the responsibility of management to make selective choices and

direct bricolage in order to make more systematic use of some of the bricolage ideas (cf. Baker and Nelson 2005). For example, home-helpers' bricolage activity may be performed on the spot by experienced service workers, and examples of bricolage may be further discussed and qualified through discussions with colleagues and management at the organizational level. These emerging ideas may be further accepted in the institutional context and authorized at the political level. Bricoleurs may themselves have the ability to do justification work (Oldenhof et al. 2014) in order to gain further legitimacy for using resources in new ways.

4.2   Co-producing Service Innovation in the Public Sector

Clients of public services have been shown to have mixed roles including the following three (Alford and O'Flynn 2012; Langergaard 2011): beneficiaries of public services (similar to customers in the private sector), obligatees (clients under public force and control) and citizens (the collective 'we' linked to wider societal outcomes of service development, such as access to services or equality among service receivers). It follows that public service delivery can be considered in terms of concrete benefits for the service receiver, of an obligation for an obligatee (such as a prisoner; Alford and O'Flynn 2012) and of an outcome for society or citizens (such as social security or societal equality). For example, receiving education is a benefit for students, but it can also be thought of as an obligation for citizens, and it may provide a societal outcome for citizens by decreasing disparity.

Service research shows that service receivers will always, to a greater or lesser extent, co-produce a service together with the service provider (Pestoff 2012; Alford 2009). A student must do her homework, a person allocated to a job-seeking program must write job applications, a prisoner must enact and perform certain obligations and a receiver of home help must invite a home-helper into his home and perform certain tasks. As citizens, we contribute through behaving in an 'adult' way vis-à-vis public services and doing the duties we are supposed to do, such as paying taxes and taking a constructive part in the community. Yet, even if service receivers co-produce services, the public sector – for example, in the shape of new public management (NPM) – has mostly focused on the internal management of services. Little has been done to develop services based on user involvement in a more cocreational way.

The innovation capabilities in question mean that public service providers enable co-production and use inputs from co-production for innovation and cocreation. Innovative capability may also include the ability to create relevant new forms and mechanisms of co-production at the concrete as well as the organizational level and balance the roles of clients. For example, in the case of crime prevention, citizens can help the police patrolling in local areas (Ostrom 1996). In the case of children's education, parents can support school activities; in the case of health, citizens can adopt healthy behaviours; and in many social services, citizens can contribute through mutual aid. Furthermore, apart from such day-to-day

co-production and cocreation at the individual level with regard to the service encounter, collective and institutional arrangements of co-production can be provided (Pestoff 2012). Governments can allow parent groups to create publicly financed schools or kindergartens (ibid.). Provision of organized systems of co-production that facilitate the cocreation of services among obligatees and citizens through individual and collective arrangements can be an important innovative capability of public service providers.

4.3 Authorizing Service Innovation and Policy Innovation

Public sector services are decided and controlled by policymakers and politicians who also create services through policy innovations. How policy innovations are created and implemented is still under-researched. What we know is that political parties have important roles in conceiving and legitimating new or changing public services (Rhodes and Wanna 2007). Further, political boards and ministries have leading roles both in creating innovations and in overseeing the innovation process, including the implementation of innovations and the delivery of services. The format of innovation is one of downward decision-making and control and upward accountability. In Western countries, public innovations involve democratic decision-making procedures and the use of legitimate systems of power (Langergaard 2011). However, corresponding to the private sector, the practical development of services may be network-based (Hartley 2005; Osborne 2010), management-driven (Benington 2011; Moore 1995) or incremental and employee-driven (Borins 2001). This is because ideas for service development can emanate from practice, from perception of problems and opportunities, from day-to-day problem-solving and from collaboration among interdependent actors who share resources (Sørensen and Torfing 2011). Upward innovation based on strategic initiatives of public employees and managers is not entirely consistent with bureaucratic and political procedures (Rhodes and Wanna 2007). Yet, such innovation processes may be legitimate to the extent that professionals in the public sector are assigned some degree of autonomy with which to experiment. Autonomy can be defined as a certain level of freedom granted to employees to make choices or to experiment and create variety (Berg 2014).

The capability of managing and authorizing employees' autonomy to generate innovation within the public sector may take different forms in different subsectors of public services. In some subsectors, like public universities and science-driven institutions, employees may have extensive freedom to formulate ideas, identify goals and define strategies and measures for quality developments. Peers on funding bodies and boards lay out the overall strategies of development and allocate resources. However, science is also becoming more strategic and connected to political missions and tasks. At the other end of the scale, professionals in human services often have to make decisions on the spot and act swiftly to solve problems,

but the overall service system is created by involving political boards and through political decision-making.

The delegation of initiative and innovation to employees and public managers can be conceptually framed as a government capability of 'restrained power' (cf. Ringen et al. 2011). Politicians, political boards and ministries must use their power, i.e. make decisions about important reforms and control their implementation. Yet, policymakers with formal power, such as ministers, must also be able to refrain from using their power and let others with more direct knowledge and experience make innovations. Without relying on experienced service providers to carry out policies and experiment with solutions in practice, policy actors may create few results in practice, because it is difficult for them to understand the practical context of innovation.

Use of restrained power is, for example, illustrated by the aforementioned case of bricolage in home help (Fuglsang and Sørensen 2011). Services performed in the homes of the elderly can be difficult to control, because problems that arise can be difficult to foresee. Various attempts have been made to control home-helpers better to ensure that they carry out the assigned task in a relevant way. Smartphones and other electronic devices are used for this purpose. Yet, such systems still rely on employees' self-reporting, and it is not entirely possible to control how home-helpers carry out their job. They can 'edit' their time; they can tinker with rules, break with routines, change small aspects of their work practice so that their work activity becomes more relevant and maximize their preferences. Therefore, in order to maximize the value of work with the intended consequences for clients, decision-makers must let employees make some of the decisions concerning innovation and the issues of when and how.

Yet, in the public sector, the capability to ensure political authorization of such practices is critical in order for decision-making to be democratic (Langergaard 2011) and legitimate. Further, letting employees and management drive changes places the responsibility of innovation directly on public employees and managers – who can risk their career if something goes wrong (Rhodes and Wanna 2007) – rather than on politicians, who are members of political parties and participate in political deliberation. Given the above examples, the capability of authorization of innovation can take at least three forms: direct authorization by politicians who take the initiative in terms of policy innovations, retrospective authorization by politicians of new services before they are further diffused and recognition of employees' autonomy and freedom to make choices and experiment with services.

4.4   Externalizing Innovation

Public services may be organized and innovated through various types of public-private innovation networks (Gallouj et al. 2013; Alford and O'Flynn 2012). For one thing, services are always to some extent co-produced and cocreated by clients, as already described. Furthermore, some aspects of services or whole services are

often 'externalized' (Alford and O'Flynn 2012) and given to private enterprises or even to volunteers. There are varied rationales for externalizing services. This practice can increase competition, enable economies of scale and scope, increase specialization, create more choices for clients or increase the diffusion of a service innovation. In the case of volunteers, it can increase citizen responsibility, increase constituency support, increase co-production and cocreation benefits or create channels of solidarity and mutual aid among citizens.

The capability of externalization includes several abilities of policymakers and administrators: they must be able to specify the requested service, to be clear about quality demands and to understand where there is a potential market for a service. However, in some cases, it may be difficult to specify a service, because it can take many forms, be context-bound (e.g. a museum) and rely on the combined abilities and enthusiasms of certain policymakers, administrators, public managers and front-line employees. In some cases, it may be difficult to create a market for a service because the service is difficult to generalize across municipalities with different standards and political views on outsourcing.

Alford and O'Flynn (2012) have investigated different types of public-private relationships, including contracting out, public-private partnership, partnering and calling on volunteers. Contracting out is a form of outsourcing that implies that government makes a contract with private, public or voluntary organizations to develop and deliver a specific service, such as garbage collection, bus-driving or a residential service for the elderly. This format is used when it is believed that a private organization can perform a service in a better and cheaper way or in order to increase competition and consumer choice. Public-private partnership (PPP) is a different form of outsourcing which is nevertheless difficult to distinguish from contracting out; the concept also has many meanings. It usually means a long-term contract between a government and a private organization concerning the building (and financing), operation, maintenance and transfer to the public sector of a range of technologies and services affiliated with large infrastructure projects. PPP usually involves more complex services than contracting out. However, the concept of PPP has also been used in a looser sense as 'partnering', i.e. collaboration and coordination across organizations. Examples include collaboration among public and private schools in a local area, collaboration among schools and kindergartens or collaboration among a range of organizations involved with the prevention of crime and the struggle against terrorism. Finally, volunteers can sometimes be involved in delivering complementary services. A Danish example is taking elderly people on a rickshaw and a corps of volunteers to drive them ('Cycling without age'). A British example is 'Meals on Wheels': bringing a meal to elderly people and checking their well-being if they live alone (Alford and O'Flynn 2012).

In a European project, informal public-private innovation networks in services (ServPPINs) have been investigated as a particular innovation capability (Gallouj et al. 2013). The authors argue that service partnering or networking activities among public and private partners can often entail innovation. Djellal and Gallouj (2013) distinguish different types of public-private innovation networks in services. (1) Simple ServPPINs set up to adopt a technology. For example, a hospital

department can collaborate with private firms in order to adopt a new medical technology. (2) ServPPINs set up to produce a technological innovation. A network of different partners can be built to develop new technologies that can be used against stroke, for example. (3) Simple ServPPINs set up to produce non-technological innovations, such as partnerships between different professions and sectors around rehabilitation services. (4) Complex ServPPINs set up to provide organizational meta-change. For example, a shift from treatment to prevention can be made by creating a variety of new services that make this possible.

Green et al. (2013) argue that partnering activities in ServPPINs can be characterized with life-cycle taxonomy. First, there is a period before actual collaboration where partnering is prepared and the network for an innovation is formed. This stage is critical to the success of the network. Next, there is a growth stage when more actors participate and the network starts to go into operation. Finally, there is a maturity stage where the network becomes more sustained, or is closed down. Each of these stages may be characterized by two different modes of organizing the network relations: spontaneous or planned. Fuglsang (2013) shows that service partnering can lead to the deepening of trust and collaboration over time between public and private actors who may be sceptical about each other's motives.

Windrum and García-Goñi (2008) applied a characteristics-based model to describe the different elements of a ServPPIN as a multi-agent framework of policymakers, service providers and politicians. Providers usually seek to maximize the preference for efficiency, users to maximize their own preferences for good services and policymakers to maximize political preferences. According to the framework, a service cannot function if it merely reflects the efficiency requirements of the provider and the policy preferences of the policymakers. It must also fit the competences and preferences of users at a given time, who must be able to maximize their preferences. Windrum and García-Goñi's framework can be used to analyze how technologies and services may be difficult to implement in practice. For example, rehabilitation technologies and services may not sufficiently reflect users' attempt to maximize their preferences as patients in the treatment of illness.

Overall, the capability of externalization is important for innovation in public services, and it involves such elements as being able to specify services, coordinate preferences, create trust among public and private partners and justify collaboration.

5   Conclusion

The public sector is a service sector and enshrines service systems as well as other tasks and characteristics. Service innovation within public service systems requires the same innovation capabilities as market-based service sectors. However, because public service systems are integrated in political systems, they may tend to stress particular innovation capabilities, some of which nevertheless overlap with innovation capabilities in the private sector. These particular capabilities are related to

the fact that employees and 'customers', who also have roles as citizens, are perhaps more idealistic. Public service providers have obligations to produce services and cannot 'leave the market' if service problems become too wicked and complex. This may create a greater willingness to improve and innovate services in everyday practice. The political system's lead, by creation of policy innovations, or authorization, in terms of service innovation processes is a particularity. Another particularity is the issue of out- and insourcing of services in the public sector and networks with private actors (typically market-based service firms).

These particular capabilities should be taken into consideration when one studies or makes innovations in public service systems. Their importance is growing in the near future as pressure to rationalize and reduce the cost of public services, and increase citizens' satisfaction with such services, is likely to increase in all societies.

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Chapter 11
Service Innovation in Industrial Contexts

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Abstract Both academics and practitioners emphasize the importance for product firms of pursuing service innovation. Despite a strategic focus on service-led growth, however, many firms struggle to succeed with their service innovation initiatives. In order to increase our understanding of the nature of service innovation in product firms, this chapter discusses the specificities in, and dynamics of, service offerings, service processes, and business models in industrial contexts. First, it outlines key differences between new product development and new service development and highlights issues like sales and delivery, which firms frequently fail to accomplish. While product development is generally "back heavy" with many resources required for prototyping and technology development, service development is more "front heavy" with more weight placed on market introduction, pilot testing, and securing the skills, systems, and infrastructures for sales and delivery. In terms of service offering innovation, a taxonomy based on service focus and revenue model is presented. In order to better understand service process innovation, Larsson and Bowen's (Acad Manage Rev 14 (2):213–233, 1989) service design typology is then revisited. Finally, common service business model archetypes are introduced and discussed.

Keywords Service innovation • Business-to-business services • Service classification • New service development • Business model innovation

1 Introduction

> Everybody is in service. Often the less there seems, the more there is. The more technologically sophisticated the generic product (e.g., cars and computers), the more dependent are its sales on the quality and availability of its accompanying customer services (e.g., display rooms, delivery, repairs and maintenance, application aids, operator training, installation advice, warranty fulfillment). In this sense, General Motors is probably more service-intensive than manufacturing-intensive. Without its services its sales would shrivel. (Theodore Levitt 1972, p. 42)

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As Theodore Levitt pointed out over 40 years ago already, services are fundamental for the competitiveness of product firms. Since then, business researchers have noted the ever-growing importance of services in product industries. Consequently, major opportunities for service innovation reside in product firms as services become more central for their strategies and business models. In fact, as product firms have typically not pursued service innovation systematically, there is substantial improvement potential in the management and success of service innovation. The potential benefits of service-led growth are well documented, and rapid technological advances, such as cognitive computing (e.g., IBM) and Industrial Internet initiatives (e.g., General Electric), further spur new service opportunities. Despite the identification of such business opportunities (Baines and Lightfoot 2013; Fischer et al. 2012), it has generally proven difficult to pursue service-led growth in product-dominant settings. In addition, even with substantial growth in service innovation research (Carlborg et al. 2014), we still lack understanding of service innovation in product firms (Ostrom et al. 2015).

In engineering-driven companies and other product-centric firms, innovation still tends to be synonymous with new products or manufacturing processes. The old view of services as "innovation laggards" prevails in many organizations, and service innovation often becomes a concern only once the new product is ready to launch. Consequently, product firms typically adopt what Coombs and Miles (2000) refer to as an assimilation or technologist perspective, which treats service activities as being similar to manufacturing activities. That is, methods and processes originally developed with manufacturing in mind are applied to services, which means that differences between services and manufacturing are suppressed and that unique service characteristics for that reason are undermined. On the other hand, a synthesis or integrative perspective to innovation has recently gained major ground among service innovation scholars (Carlborg et al. 2014). Synthesis-focused research aims to integrate insights from manufacturing-oriented and service-oriented research to advocate a unified perspective on innovation (Coombs and Miles 2000; Gallouj and Savona 2009).

However, in order to gain an in-depth understanding of service innovation in product firms, it is fruitful to adopt a demarcation perspective, which is the third main approach to service innovation. This research stream seeks to identify any possible particularity in the nature and organization of innovation in services, attempting to highlight the specificities in service offerings and service processes (Gallouj and Savona 2009). When discussing service innovation in product firms, a demarcation perspective is particularly useful. In manufacturing firms, new service development (NSD) and service innovation inevitably is compared with, and related to, the established bricks-and-mortar product development (NPD) processes and platforms. Hence, in order to gain an in-depth understanding of service innovation in product firms, it is advantageous to not only investigate the characteristics and nature of service innovation in general but also, whenever pertinent, to contrast it with product innovation.

Against this background, this chapter focuses on increasing our understanding of the nature of service innovation in product firms and industrial contexts. More specifically, I will discuss specificities in, and dynamics of, service offerings, service processes, and business models in product-dominant settings. First, however, I will briefly discuss how NSD differs from NPD. The arguments put forward are drawn on field studies of leading producers of capital goods, representing industries such as commercial vehicles, fluid handling and separation, industrial machinery, material handling, and mining equipment (see Kindström and Kowalkowski 2014; Kowalkowski et al. 2015, for information on the methodologies of the research conducted). Common denominators between the firms are that they have strategically worked with service-led growth and extensively pursued service innovation activities. Nonetheless, the relative size and importance of the service business differed significantly, as did the scope of service innovation. The company-specific differences, as well as industry-specific variance in terms of business network, customer characteristics, and industry lifecycle, enabled valuable insights into the dynamics of service innovation.

2 New Service Development in Product-Centric Firms

In order to structure the development of new services, many companies blueprint existing NPD processes and methods. Alternatively, they modify the steps in these stage-gate processes to accommodate some of the service specificities they have experienced in previous NSD projects. Nonetheless, as Kindström and Kowalkowski (2009) report, product firms may fail to commercialize compelling service concepts due to this practice, which resonates with an assimilation perspective on service innovation. While the specific stages in the development process may not necessarily differ, the relative emphasis on each stage in terms of time and resources required generally does differ between NPD and NSD. While product development is generally "back heavy" with much resources required for prototyping and technology development, service development is more "front heavy" with more weight placed on market introduction, pilot testing, and securing the skills, systems, and infrastructures for sales and delivery. Figure 11.1 shows a schematic representation of these differences. While the differences may vary considerably between types of offerings, they are nonetheless essential to consider.

While the differences in resource requirements between the stages of NPD and NSD may vary considerably between types of offerings, they are nonetheless essential to consider for any company pursuing both product innovation and service innovation. Developing a first draft of a new service concept is rather straightforward compared to a new physical product prototype. The key challenge for many firms is instead to ensure that the sales and delivery organizations have adequate competence and commitment before launching the new service on the market (Kindström and Kowalkowski 2009). Table 11.1 shows important differences between product development and service development processes.
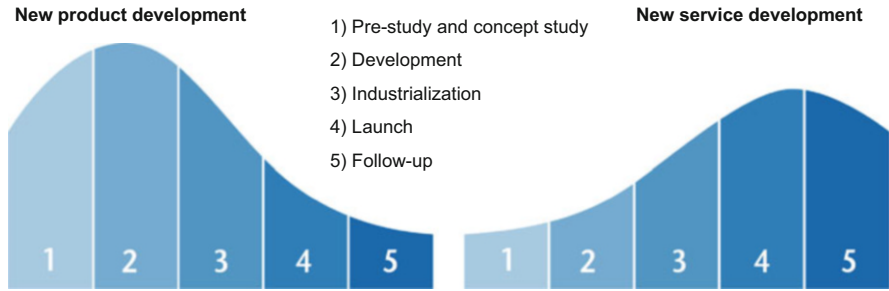
New product development   1) Pre-study and concept study   **New service development**

2) Development

3) Industrialization

4) Launch

5) Follow-up

Fig. 11.1 Differences in resource requirements between the stages of NPD and NSD (Kowalkowski and Kindström 2012, p. 112)

Table 11.1 Differences between product development and service development

Dimension	Product development	Service development
Initiation	Centrally initiated, structured, technology driven: new technology or new use of existing technologies	Locally initiated, close to customers, ad hoc: new value creation potential identified
Strategic perspective	Inside-out	Outside-in
Key asset	Patents	Customer knowledge
Development	Closed process, involving R&D and production	Open process, involving sales companies and service organizations
Tools and methods	Stage-gate models	Service blueprinting, service engineering
Critical resources	Production facilities, components, subsystems, supply chains	Knowledge and skills, relationships and networks, including the resources of service partners
Stakeholders	R&D and other central units and functions	Local and central units, customers, partners/dealers
Marketing and sales	Market to (push): management of customers and markets	Market with (pull): collaboration with customers and partners
Result	A tangible offering that is easy to understand	An intangible service that is difficult to visualize

For product firms that successfully pursue product development, the changes needed for service development may prove challenging. Many firms have a shortage of resources and support for service development, and formal roles and experience within the organization are lacking. Successful service innovators generally have dedicated roles and units responsible for the development of new services. At the same time, they collaborate with product development teams to foster design-to-service capabilities (see also Ulaga and Reinartz 2011). Institutionalized collaboration between product and service development teams is also important as new product features and designs drive requirements for the service

business, such as legal demands, product cost, new spare parts, and hardware and software design.

One company to have developed a service-specific development process is Volvo Group, a 110,000 employee strong supplier of trucks, busses, and construction equipment, which includes the Mack and Renault truck brands. As other multinational product firms, the company uses a global product development process which is based on a traditional stage-gate model. Since the development of software in many ways differs from the development of vehicles and engines, Volvo also has a specific development process for such projects. None of these processes were however regarded as adequate for service innovation. The structures and processes of product development were too rigid; service innovation requires a more flexible and iterative process with more active customer involvement in the development and launch phases, increased collaboration between functions and central and local units, and securing of resources and competences for sales and delivery. For example, the process has to consider that many innovative ideas emerge on the local level, in interaction with customers. Consequently, the company developed a global service development process. After a pre-study and several iterations, the first version was presented and the process was tested in real life for the first time in pilot projects. Based on feedback from these projects, the process and documentation were then revised and further refined. Emphasis is on the iterative characteristics of the process, and an interdisciplinary and holistic process with the means to systematically work with customer involvement and visualization are other cornerstones.

2.1 Sales and Delivery

The creation of a service-savvy sales force is a key attribute in the practice of companies that succeed with their new services (Reinartz and Ulaga 2008). Typically, companies that fail with their NSD projects launch the service before they have ensured that the sales organization is ready to sell services (Kindström and Kowalkowski 2009). For instance, moving from a situation where many basic services are given away for free, in order to land the product deal to actually start to charge and actively sell services, can be a strenuous effort. Similarly, moving from selling basic services to more advanced ones, such as outcome-based contracts, implies changing the revenue logic and is associated with additional competence requirements and risks (e.g., Renault et al. 2010). In particular, if a consequence of the new service is that it sells its customers fewer products, the sales-related challenge can be major.

Overall, the sales cycle for advanced services and solutions are longer than for products, and the sales are more complex. While customer requirements are less well specified, more customer involvement and contact with more senior decision-makers in the customer organization are required. As a result of these characteristics, more actors from both parties are usually involved in the sales process

(Kindström et al. 2015; Ulaga and Loveland 2014). For service selling, the supplier takes the role of a "customer problem solver," assisting the customer in solving problems and facilitating value creation, and the role of "brand-value deliverer," which implies becoming a representative of the brand rather than the product. This requires that the sales force and the sales function have a comprehensive understanding of the service and its value potential for the specific customer. Similarly, the customer should be encouraged to play a more active role in formulating the problem and sharing the information with the supplier (Kindström et al. 2015).

Another key challenge for successful NSD is the delivery of the service once it is sold. Depending on service characteristics, different investments in technology and people are needed. For new products, given that the manufacturing is according to plan, the delivery process is rather straightforward. For services, however, delivery is often a long-term, interactive value-creation process in which the supplier has opportunities to learn about the customer operations (and vice versa) and receive input for how to improve the service. This is especially true if the service is continuous or repetitive, such as monitoring or contract-based service. Many companies underestimate the need to invest in the delivery infrastructure and people when developing the service, which potentially results in deteriorated service quality once the service is to be produced and delivered (Kindström and Kowalkowski 2009). Such problems are especially hard if the supplier has only recently moved into the service domain, as the credibility of the overall service initiative may be affected negatively. In addition, there may be negative spillover effects on the brand and reputation of the firm in general. On the other hand, other firms take a more proactive stance on service delivery, striving to find new opportunities to innovate not only the services but also the delivery processes. For example, in order to outline the methods for delivering services and interacting with customers, some firms have developed service scripts, service blueprints, and other techniques (Kindström et al. 2013).

For most product firms, the management of service delivery processes is not only an internal issue. Regardless of company or industry, external service partners (including dealers) are also involved in service delivery. Hence, delivery in many cases involves a continuous balancing of the comparative strengths and weaknesses of the internal service organization and the external service companies. This balancing act includes a control-versus-flexibility trade-off, such as which services to provide in-house and which ones to outsource to external service firms (Kindström et al. 2013). While services related to the core product business are typically favorable to maintain in-house (Fang et al. 2008), there is a large variability in the types of organizational arrangements product firms have for their service delivery. Since the characteristics of the market channel and the firm's position in the business network differ between companies and markets, the possibilities to influence the organizational arrangements also vary considerably.

3   New Service Offerings

For many firms, innovation is still synonymous with new or significantly improved offerings. In terms of service innovation, even for product firms, there is a wider range of possible new options than there is for product innovation. In order to structure the service opportunities of the firm, taxonomies and other types of classification frameworks are useful tools. A common distinction, which is particularly relevant to product firms, is that between product-oriented services and process-oriented services (Mathieu 2001; Raddats and Kowalkowski 2014). Product-oriented services are related to the firm's (or others') products and focus on ensuring that they function as expected, for example, through spare parts provision, reactive (breakdown) maintenance, preventive maintenance, or reconditioning. The focus of process-oriented services is instead the customer's business processes in which the firm's products may – but do not have to – be included. Examples of process-oriented services include customer training, consulting, fleet management services, and outcome-based contracts.

Another important distinction, related to the revenue model of the service, is between input-based and output-based services (Ulaga and Reinartz 2011). Most services, whether product-oriented or process-oriented, are input based. Such services are sold with the promise to perform a deed, for example, by charging per service hour, per course participant or training module, or per spare part sold. In practice, this means that the revenue model is not linked to customer value-in-use. On the other hand, providers of output-based services are to various extents compensated on the basis of value-in-use. For instance, a customer may buy the service "availability" or "uptime" by paying a fixed monthly fee for the remote monitoring of a product or process. In other cases, services are even closer tied to customer value-in-use by focusing on the performance which availability enables. Performance services such as energy performance contracting can have the revenue mechanism linked to predefined value metrics such as achieved availability, production targets, and production outcome. If the value metrics are not achieved, the actual payment may be reduced, while it may increase if the actual performance is above target. A taxonomy based on the two dimensions – service focus and revenue model – is presented in Fig. 11.2.

In general, research on service innovation in product firms takes the perspective on service-led growth as a process, from basic product lifecycle services to more advanced availability services and potentially performance services (Matthyssens and Vandenbempt 2010; Oliva and Kallenberg 2003). Nonetheless, reverse growth trajectories are also evident, albeit on a smaller scale (Finne et al. 2013; Kowalkowski et al. 2015). From an innovation perspective, there is often inherent potential to utilize elements of process-oriented, outcome-based services and solutions, which are usually offered to large clients. As Kowalkowski et al. (2015) point out, firms can exploit the knowledge and experience gathered in these more complex, resource-demanding, and relationship-intensive offerings, by downsizing them and standardizing various service elements according to service modularity

	Input based	Output based: Availability	Output based: Performance
Customer process	Process Support Services E.g. engineering, training, process simulation	Process Availability Services E.g. rental plans, fleet management, service contracts	Process Performance Services E.g. gain-sharing and outcome-based contracts
Product	Product Lifecycle Services E.g. spare parts provision, repair, safety inspection	Product Availability Services E.g. preventive maintenance, remote monitoring	Product Performance Services E.g. reconditioning, systems integration, customized software

Service focus (vertical axis label)

Revenue model (horizontal axis label)

Fig. 11.2 Taxonomy for service offerings (Kindström and Kowalkowski 2014, p. 102)

thinking. In doing so, they are able to offer these recombinative innovations in a more cost-efficient manner to a larger and more heterogeneous customer base.

As illustrated in Table 11.1, local employees or customers often initiate new services, many times in an unplanned, ad hoc manner. This differs from NPD, which is typically centrally initiated, more structured, and driven by new technology or the new use of existing technologies. A key to successful service innovation is to understand the customers' businesses and needs, including involving customers in the development process, from idea generation (Matthing et al. 2004) to pilot testing and continuous feedback during usage (Oliveira and von Hippel 2011). By fostering customer relationships, companies become more knowledgeable about their operational and strategic needs. This knowledge can provide inputs to service innovation, for instance, by differentiating between different types of customer needs (see Table 11.2). Depending on customer needs, companies can identify different opportunities for new types of services.

While much research focuses on the internal requirements for service innovation, such as critical resources and capabilities (Fischer et al. 2010; Kindström et al. 2013; Ulaga and Reinartz 2011), less literature is concerned with the overall service system. While value constellations with external actors can be vital for successful service innovation (Kowalkowski et al. 2013), many service initiatives can also be constrained by other network actors. For example, service companies and other intermediaries between the supplier and the customer may hinder the development of new services (Matthyssens and Vandenbempt 2008). Even if several options of disintermediation mechanisms are available to firms faced by undesired intermediaries in their market channels (Nordin et al. 2013), the potential risks for the individual company may be considered too large. One of the capital equipment manufacturers I studied developed a rental service on one of its most

Table 11.2 Customer needs and their implications for service innovation

Customer need	Implications for service innovation
Focus on core activities	Design services to seamlessly support and enhance the value of the customer's core activities
Restructuring costs	Evaluate the option of retaining product ownership and offering a leasing or rental service
Access to talent	Adopt a customer-centric focus and ability to offer expertise adapted to customer needs
Reduce time to market	Offer engineering and R&D capabilities as a service to the customer and become a development partner
Manage risk	Consider how scale, specialization, and expertise can become a valuable source of mitigating business risk
Manage capacity	Increase flexibility of resources to mitigate fluctuations in demand when customers procure services to manage capacity
Increase scalability	Increase volume flexibility and ramp up speed

Modified from Avlonitis et al. (2014, p. 17)

important markets. While the service offering resonated with the needs of several customers, the company nonetheless had to abruptly abandon its rental service initiative. The reason was rather simple: one of its largest customers was a national rental company that was buying the equipment to rent out to users. When the product firm entered the rental market, it started to compete directly with the customer, and the customer responded by discontinuing all collaboration with the provider. Consequently, the company had two choices: either continue to market the service and lose one of its key customers or scrap the service and restore the customer relationship.

4   New Service Processes

In innovation and management research, process innovation is generally concerned with manufacturing processes (Adner and Levinthal 2001; Utterback and Abernathy 1975). For services, the production process is an open system (Eiglier and Langeard 1976), which is influenced not only because of endogenous factors but also due to the influence of customer participation and other exogenous factors (Grönroos and Ojasalo 2004; Larsson and Bowen 1989). In fact, customers can be regarded as "partial" employees of the provider (Mills and Morris 1986) as they unequivocally are part of the social system in which the services are produced (Parsons 1956). Service production can take place through different production modes: either partly or fully in interaction between service provider and customer (i.e., service encounter) or in isolation from one another. Process innovation can involve alteration of any of the modes or change the service process from one production mode to another, such as in the case of self-service innovation.

In order to facilitate the management of the design and coordination of services, Larsson and Bowen (1989) conceptualized a service process framework, in which different types of services require different processes and thus different relationships between the provider's front-office and back-office entities and between the provider's and customer's employees. The first dimension in the framework concerns the customer disposition to participate, which is defined by the extent to which the customer plays an active role in supplying inputs to the service production process (labor, information, technology, time, etc.). Depending on the customer and the type of service offering and service system, the level of customer participation can differ significantly. The second dimension concerns the diversity of customer demand, which includes both the uniqueness of the entities to be served and the uniqueness of the desired outcome. Together, the two dimensions constitute a process framework with four distinct, interdependent patterns: pooled service design, sequential standardized service design, sequential customized service design, and reciprocal service design. Depending on service design, the degrees of coupling and the main locus of interdependence, which is the most complex area of coordination, differ.

Building on Thompson's (1967) interdependence typology, Larsson and Bowen (1989) align the interdependence patterns according to complexity: pooled ⇒ sequential ⇒ reciprocal. Pooled service design is dominated by standardized back-office operations, whereas the front-office coordination of service interaction is limited, with tightly specified service scripts. It is the preferred service process design if both the diversity of demand and the customer disposition to participate are low. Remote monitoring and control are an example of a service that can be effectively managed through this kind of service design. Next, sequential standardized service design is customer dominated with tightly specified service scripts for front-office coordination. This service design is common if the customer disposition to participate is high, while the diversity of demand is low. In those cases, the provider can offer the customers the technical infrastructure and training required for them to perform the service themselves. Examples are online spare parts ordering, surveillance, and basic maintenance work. Sequential customized service design, which is the third mode of interaction, is suitable if customers are less inclined to participate and the diversity of demand is high. In those cases, front-/back-office coordination for service support is the main locus of interdependence, and emphasis is placed on adjusting customer orders and input to agreed performances. Traditional product-oriented industrial services, such as repair and maintenance, are generally designed in this manner. Finally, reciprocal service design relies on mutual customer/employee adjustments and large, loosely specified service scripts. Close interaction and dialogue are required for these types of services, which span from process support services, such as training and lifecycle analysis, to more complex problem-solving and process-oriented services. In addition, since service production is an open system with customer contact and participation, there is input uncertainty facing the system; the higher the degree of customer involvement is, the higher the level of input uncertainty (Larsson and Bowen 1989).
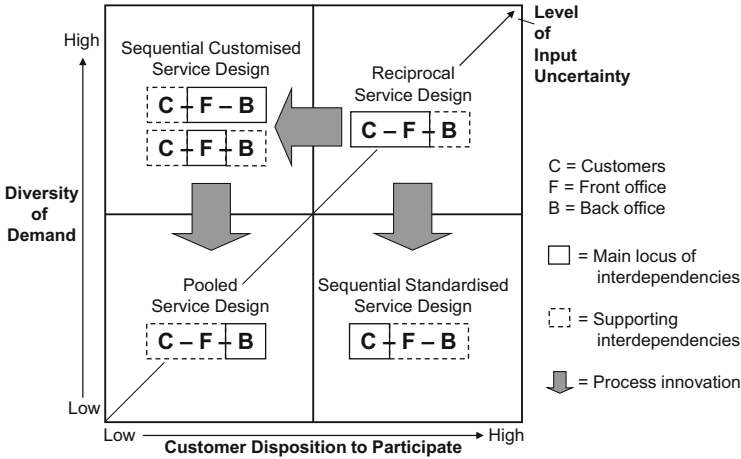
Fig. 11.3 Dynamics of service process design (Based on Larsson and Bowen 1989)

As technological advances are enabling already existing services to be performed in new ways, hence changing the service process design, services do not necessarily fit into predefined service process interfaces in the original, static framework. For example, after formalization and standardization innovation (cf. Gallouj and Weinstein 1997), reciprocal services may no longer require the same degree of interaction and dialogue. As routines are established and more tasks can be automated, process designs can change from reciprocal to standardized. For example, a combination of local responsiveness (front office) with standardization and internal integration across organizational entities (back office) enables sequential customized design, whereas more consistent and less people-dependent local service processes facilitate sequential standardized design. In addition, new technologies and systems, such as automated, remote monitoring and control, and software updates, can change the service design from sequential customized to pooled service design. This dynamic view on service process design and innovation is illustrated in Fig. 11.3 (Kowalkowski 2008).

5 Business Model Innovation and Dynamics

Business models may be conceptualized as depicting the rationale for how a firm creates, delivers, and captures value within a network of exchange partners (Massa and Tucci 2013). While business models may be decomposed into many different elements, such as Osterwalder and Pigneur's (2010) 9-point decomposition, business model innovation typically involves changing the offering, the revenue model (s) by which the firm will be paid for the offering, and the organizational processes (cf. Chesbrough and Rosenbloom 2002).

In literature on service-led growth in product firms, three business model archetypes (i.e., ideal examples) are common: equipment supplier, availability provider, and performance provider (Kowalkowski et al. 2015). Each archetype resonates with the categories of revenue models in Fig. 11.1 (input based, availability based, and performance based). They also correspond to Helander and Möller's (2007) three system supplier roles which they link to the strategic position of the firm and to customer strategies (equipment supplier, availability provider, and performance provider) and Windahl and Lakemond's (2010) categories of offerings (maintenance, operational, and performance offerings). The three archetypes are also analogous to Tukker's (2004) categories of product-service system models (product oriented, use oriented, and result oriented).

An equipment supplier provides mainly product-oriented services aiming to protect and support the core product business. The services are input based and standardized, and the degree of customer business process integration is low. Availability providers offer more complex services with use-oriented revenue models and organize for higher degrees of business process integration. Finally, the performance provider business model implies even closer customer relationships and more advanced services for managing and operating customer processes where the customer frequently pays for actual, achieved results (Kowalkowski et al. 2015). When customers outsource service operations, such as the management of telecommunication networks or the energy maintenance of a production plant, firms acting as availability providers and performance providers are generally those that capture the business.

In terms of business models, product firms are generally transitioning from more traditional to more service-oriented and customer-centric business models. This is illustrated in Fig. 11.4 as "becoming an availability provider" and "becoming a performance provider." However, a third service growth trajectory, which goes in the opposite direction, is sometimes also evident. "Becoming an industrializer" can be understood as standardizing and scaling down previously customized, output-based offerings in order to make them attractive and feasible to provide to a larger, more heterogeneous customer base. For example, service innovation opportunities can be identified by codifying and formalizing reciprocal services so that some of the service elements can be combined with other resources and offered to other customers in a repeatable and scalable manner. Availability and performance offerings might have been too extensive for the needs of more traditional equipment customers or unprofitable to offer due to their system scope, complexity, and risks. As Kowalkowski et al. (2015) show, this innovation path is however the most challenging to many firms. Prerequisites typically include long-term service experience, profound customer knowledge, product and process data, feedback loops and the ability to learn from existing solutions and lead users, and modularization competence. If these competences are lacking, they may constitute major hurdles for industrialization-type service innovation.

While product firms may be putting more relative emphasis on availability and performance business models, practice firms often manage two or three of the archetypes simultaneously, rather than transitioning from a more traditional to a
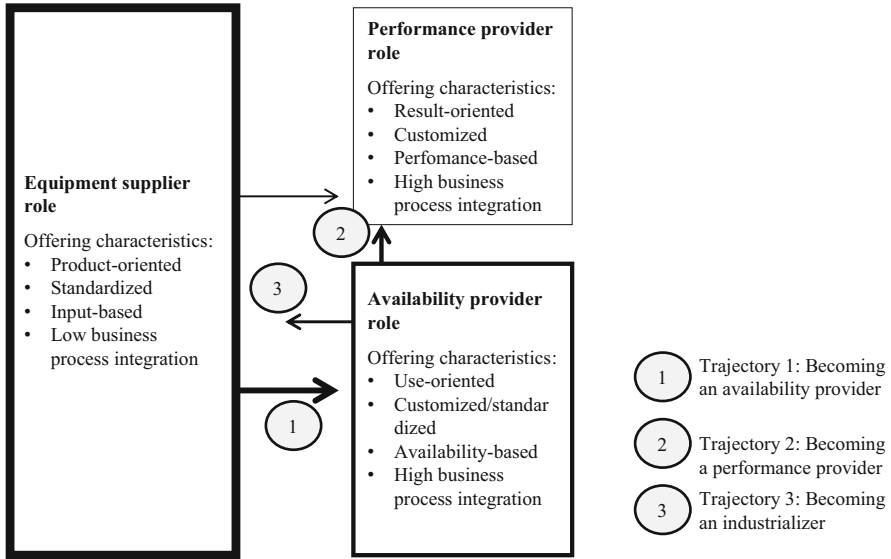
Fig. 11.4 Business model innovation and dynamics (Kowalkowski et al. 2015, p. 66). Note: The thickness of the *arrows* and *boxes* only indicate that certain trajectories and roles are more prevalent than others and do not show exact proportions

more service-centric business model only. Hence, firms typically work concurrently with different business models and depart from them to seize different service innovation opportunities.

6   Conclusions

Drawing on field research with product firms and business customers, this chapter outlines key differences between NSD and NPD and issues of particular importance to product firms pursuing service innovation. Sales and delivery, which are often insufficiently addressed during service development, are specifically discussed. Based on a taxonomy of six combinations of service offerings and revenue models, opportunities for new service offerings are then discussed. Furthermore, departing in a typology of four service interdependence patterns, service process design is examined. Finally, three business model archetypes for service innovation in industrial contexts are presented. Familiarity with these different aspects of service innovation can provide valuable guidance to innovators and other organizational practitioners responsible for service development.

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Chapter 12
The Role of Knowledge-Intensive Business Services in Innovation System: The Case of China

Jiang Wei and Dan Zhou

Abstract This chapter examines the relationship between KIBS and manufacturing industries. It uses an input-output framework and a curve estimation to explore the relationship between KIBS input and manufacturing innovation in China. The results indicate that the KIBS input is positively related to innovation in manufacturing industries. Drawing on the innovation system theory and the knowledge-based view, the chapter argues that KIBS act not only as coproducers but also as disseminators of knowledge-based resources. The results extend the KIBS literature to the analysis of innovation systems and suggest that the influence of KIBS on manufacturing industries may determine the role of KIBS in the innovation system of China.

Keywords KIBS • Innovation systems • China • Input-output • Knowledge coproduction • Knowledge dissemination

1 Introduction

Knowledge-intensive business services (KIBS) are defined as private companies or organizations that rely heavily on professional knowledge and operate in the business-to-business sectors (den Hertog et al. 2011; Miles 2005). Though KIBS have been the fastest growing sector in the developed countries during the last 40 years (and started to grow in developing countries as well), it was not until the mid-1990s that they became the focus of research. From then on, there has been a constant growth in research interest into the nature of KIBS and their roles in society. KIBS are important objects of academic concerns largely because of their

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close ties with a particular form of innovative activity, namely, service innovation. Investigating KIBS and service innovation sheds light on issues that contribute to our understandings of innovation in general. Such issues include the significance of incremental innovations, innovation combinations, interactions between product and process innovations, and the coproduction of products and services together with clients (Gallouj and Weinstein 1997; Sundbo and Gallouj 1998). Research topics such as these have broadened the traditional conceptualization of innovation, which focuses on science and radical inventions and neglects the special nature of service innovation and system thinking of innovation.

The role of KIBS in innovation systems has attracted increasing attention. Innovation is, by nature, a multi-organizational phenomenon and as such its success depends on efficient forms of coordination. Of central importance is the perception that many different actors are involved in the innovation process. The capabilities of companies to innovate depend to a great extent on knowledge produced externally. Hence, innovation is shaped by various factors, such as suppliers, collaborators, competitors, customers, technological infrastructures, and professional networks. To manufacturing firms, which are important actors in the innovation system, cooperation with KIBS is of vital importance. Such cooperation helps manufacturers, not only to strip their internal supplementary activities to become more professional (Kotabe 2004) but also to obtain external knowledge-based resources to stimulate their innovation (den Hertog et al. 2011; Miles 2005). The significance of KIBS in innovation systems stems from their numerous and versatile contacts with different stakeholders. On this basis, it has been suggested that KIBS act as orchestrators of innovations, even of whole innovation networks. They are considered to form a node in the system which contains customers, cooperation partners, public institutions, R&D establishments, etc. KIBS constitute a part of the knowledge base and innovation infrastructure of society (den Hertog 2000b; Miles 2001; Werner 2001).

China, as a developing country, is usually considered manufacturing based with a limited level of knowledge intensiveness. The emerging economy of China is characterized by a volatile environment and the lack of institutions (Luo 2003), which makes it difficult for local manufacturing firms to become stronger. With intense global competition and shortened product life cycles, there is a considerable need in these firms to acquire critical knowledge-based resources to grow rapidly. Interaction with KIBS could provide profound and far-reaching benefits for manufacturers in China. Therefore, we have made the choice in this chapter to analyze the role of KIBS in the Chinese innovation system from the perspective of the manufacturing industry.

The extant literature has highlighted the positive influence of KIBS on innovation systems. However, the role of KIBS in these systems has been defined only rarely from the perspective of manufacturing firms. The present chapter aims to narrow this research gap: it examines in more detail how KIBS are connected with manufacturers and in this way identifies some main roles that KIBS play in innovation systems.

The chapter is structured as follows. The second section is a review of literature, followed by an illustration of the developmental situation of KIBS in China in the third section. The fourth section introduces the theoretical model and the methodology, which are followed by a presentation of our findings. The fifth section includes the discussion. On this basis, the sixth section brings forward conclusions, implications, and future research directions.

2   The Roles of KIBS in the Innovation System

2.1   The Architecture of the Innovation System

A national innovation system can be analyzed in terms of its core and supplementary elements. Firms, especially manufacturing ones, and their networks constitute the core elements. They function as the systems of knowledge application and exploitation (Cooke 2002). The supplementary elements include public research institutions, laboratories, and higher education institutions, which are responsible for mining and developing the frontier of knowledge and technologies. They also include KIBS, such as human resource management and training agencies, financial service institutes, industrial associations, and technological service agencies (Asheim 2003). The government, especially in the Chinese context, is a particular element of the innovation system: it guarantees the steady development of this system. As a whole, innovative organizations and supplementary agencies make up the national innovation system. Stating this more specifically, KIBS, research institutes, the government, and public policy agents all belong to the infrastructure of the national innovation system.

In accordance with the architecture of the innovation system, organizations and knowledge bases are attached with different functions. The main task of innovation organizations is acquiring new knowledge, recombining this knowledge with that already existing, and finally creating new knowledge. An organization's absorptive capacity is of critical importance. The first-order knowledge infrastructure, consisting of public research institutes and universities, is responsible for creating and originating new knowledge. In order to help organizations to acquire new knowledge created by these stakeholders, the diffusion of knowledge in the innovation system is of equal importance. Facilitating the dissemination of knowledge created by public research institutes and universities and strengthening the absorptive capacity of innovation organizations are two ways that ultimately influence the development of the innovation system. These are the roles that KIBS play in the innovation system.

2.2   KIBS as the Infrastructure of Innovation System

Since the mid-1990s, KIBS and their roles and functions in the innovation systems have gained more and more attention from scholars and practitioners (Müller and Doloreux 2009). The literature highlights that the innovation system includes knowledge generation and knowledge diffusion subsystems (Cooke 2002). Manufacturing firms are primary members of innovation organizations. Their interactions and close cooperation with KIBS can produce knowledge-based resources for them (Landry et al. 2012) and stimulate their development (Fernandes and Ferreira 2013). Thus, KIBS can promote manufacturers' knowledge transfer and knowledge generation by interacting with them.

KIBS can be seen as a new knowledge infrastructure in the innovation system (Bilderbeek et al. 1998; Doloreux et al. 2010). They not only diffuse knowledge to their clients but engage in collaborative learning processes (Toivonen 2006). Bessant and Rush (1995) argued that KIBS play a bridging role: they are experts, brokers, diagnosticians, benchmarkers, revolutionary agencies, etc. They can directly fill up the gaps existing in the area of resource management and innovation capabilities of manufacturing firms. Miles et al. (1995) and den Hertog (2000a) further argue that the roles of KIBS in the innovation system can generally be depicted as sources, carriers, and facilitators of innovation. They can support clients' innovation, transmit innovations to clients, and initiate innovation for clients (Miles et al. 1995). As a whole, KIBS contribute to the diffusion and development of knowledge in the innovation system to strengthen the innovative capabilities of other organizations (Corrocher and Cusmano 2014). Consequently, KIBS play a vital role in implementing and diffusing innovation (Mas-Verdu et al. 2011).

3   KIBS in China: The Empirical Context

KIBS have undergone fast development in China in recent years, especially in advanced regions, such as Beijing, Shanghai, and eastern coast of China, where KIBS mostly dominate regional economies. The Chinese government welcomes the interactive relationship between KIBS and manufacturing sectors. Today, almost every regional government in China implements measures to stimulate the development of KIBS. Indicators of KIBS' performance, such as the income of their employees and their foreign direct investments, are increasingly used.

According to the Categorization of National Economy Industries in China (GB/T4754-2002), business services include ten fields: renting, managerial services, law services, consultancy and investigation, advertisement, intellectual property services, occupational intermediaries, marketing management, travel agencies, and exhibitions. Characteristic to these fields is that they provide important inputs in the development of manufacturing firms. In line with our definition of KIBS, and

taking into account the manufacturers' primary demand for KIBS, we have selected the following subsectors as representatives of KIBS in the analysis of this chapter: ICT services, financial services, business services, R&D services, and cultural creative services.

3.1   The Current Situation of KIBS in China

The incomes of employed people in KIBS indicate KIBS' current situation of development in China. Table 12.1 shows that these incomes have increased fast from 2010 to 2013. While the growth rate of ICT-related services is remarkable, the absolute incomes of employed people are relatively small in this sector. Financial services are the biggest sector in the terms of incomes. Business services have undergone a steady growth; their growth rate (119.39 %) is the second biggest (after ICT-related services), and the incomes of employed people in this sector are relatively large in absolute terms. Among the five types of KIBS, the growth rate and absolute incomes of employed people are smallest in cultural creative services.

As regards the growth trends, shown in Fig. 12.1 (drawn by ourselves based on the database mentioned in Table 12.1), all five types of services have increased through the years. From 2010 to 2012, the incomes of employed people in financial services enjoyed the biggest growth. Also ICT-related services and R&D services increased significantly from 2012 to 2013 when measured in this way.

Foreign direct investments (FDI) of KIBS tell a different story. Among the five types of services, the absolute volume of FDI was largest in business services, but it experienced negative growth from 2010 to 2013. In ICT-related services, the absolute volume of FDI is relatively small, but these services have grown most rapidly. Financial services have had a relatively balanced growth rate and an absolute FDI volume. Corresponding to the measurement of incomes of employed people, cultural creative services are smallest in the absolute volume of FDI, and their growth rate is slowest among the four types of services.

Table 12.1 Growth of incomes of employed people in different KIBS sectors in China

Type of KIBS	Income/billions of CNY				2010–2013 growth rate/%
	2010	2011	2012	2013	
ICT-related services	1171.7	1475.6	1769.4	2957.7	1,52.43
Financial services	3219.0	4007.0	4669.0	5269.0	63.68
Business services	1198.5	1325.3	1531.2	2629.4	119.39
R&D services	1619.3	1879.6	2259.4	2,940.3	81.58
Cultural creative services	543.7	642.1	735.4	867.8	59.61

Source: Chinese Yearbook, Chinese Information Yearbook, Chinese Accounting Yearbook (the unit is billions of CNY)
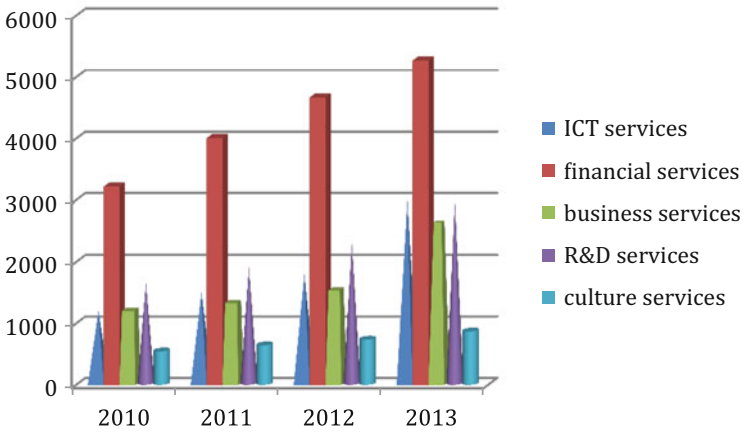
Fig. 12.1 Comparison of the growth of incomes of employed people in KIBS in China (the unit is billions of CNY)
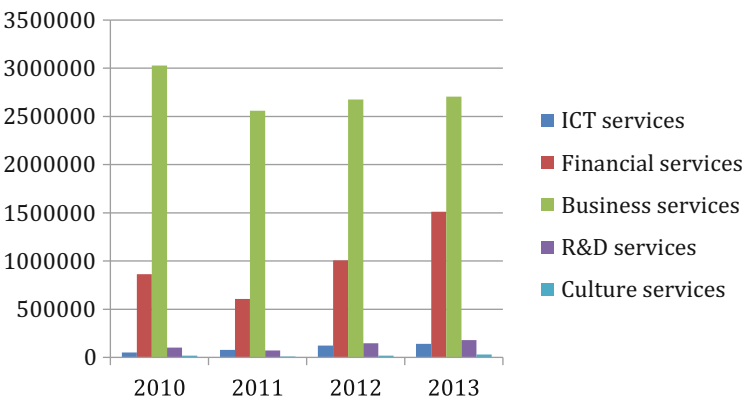

Fig. 12.2 Comparison of the growth of FDI in KIBS in China (the unit is millions of dollars)

As seen in Fig. 12.2 (drawn by ourselves based on the database mentioned in Table 12.2), business services, financial services, and R&D services decreased their FDI in 2011. From 2012 to 2013, their FDI started to grow steadily. In comparison, ICT services experienced continuous increase in FDI from 2010 to 2013.

Table 12.2 Growth of FDI in different KIBS sectors in China

KIBS type	FDI/million dollars				2010–2013 growth rate/%
	2010	2011	2012	2013	
ICT-related services	50,612	77,646	124,014	140,088	176.79
Financial services	862,739	607,050	1,007,084	1,510,532	75.09
Business services	3,028,070	2,559,726	2,674,080	2,705,617	−10.65
R&D services	101,886	70,658	147,850	179,221	75.90
Cultural creative services	18,648	10,498	19,634	31,085	66.69

Source Chinese Yearbook, Chinese Information Yearbook, Chinese Accounting Yearbook (the unit is millions of dollars)

3.2 Characteristics of Relationship Between KIBS and Manufacturing Industries: Five Chinese Regions

Ordinarily, KIBS generate and diffuse knowledge via the provider-user interaction (Fuglsang et al. 2011). Hence, the influence of KIBS on innovation in client firms depends on the intensity of the relationship between these two parties. The diffusion of knowledge can be divided into disembodied flows and embodied flows. The embodied flows are generally analyzed through the input-output framework (Papaconstantinou et al. 1998). Hauknes and Knell (2009) have also applied the input-output framework to analyze the knowledge transfer between two sectors. Thus, we chose the input-output methodology to assess the relationship between KIBS and manufacturing firms in the innovation system. The input-output approach studies the interdependency between input and output among every subsector. The main analysis focuses on the primary demand effect of KIBS in manufacturing firms, and relevant sectors are incorporated in this research. In order to avoid repetition, this chapter uses only the direct consumption coefficient to measure the interactive relationship of two parts.

The formula is expressed as follows:

$$a_{ij} = x_{ij}/x_j$$

It is indicated that the expenditures with which a certain input of industry i provides output per unit of industry j.

As mentioned earlier, R&D services, financial services, ICT services, business services, and cultural creative services are selected to represent Chinese KIBS in this study. We chose these five KIBS sectors in our measurement because in our pre-data analysis, we found out that the general extent to which Chinese manufacturing firms use or acquire KIBS is relatively low. R&D services, financial services, ICT services, business services, and cultural creative services constitute the majority of existing KIBS usage. We collected samples from developed regions in China, including Beijing, Shanghai, Guangdong, Jiangsu, and Zhejiang and then we compared them with each other to present an in-depth understanding of current situations. Here we do not have as recent material as we had in the above-described general analyses; the reference year is 2007.

Table 12.3 Demand for all KIBS and separately for T-KIBS and P-KIBS in the Chinese manufacturing (comparison between five regions, year 2007)

	Beijing	Shanghai	Guangdong	Jiangsu	Zhejiang
KIBS	0.2490	0.0365	0.0206	0.0171	0.0213
T-KIBS	0.1921	0.0122	0.0091	0.0062	0.0087
P-KIBS	0.0569	0.0244	0.0114	0.0109	0.0126

Source: Chinese Statistics Bureau (10,000 of CNY per unit)

3.2.1 The Relationship Between KIBS and Manufacturing Industries: General Observations

As can be seen in Table 12.3, the demand of manufacturing industries for KIBS is the largest in Beijing province. Comparatively, figures of Zhejiang province, Jiangsu province, and Guangdong province are relatively small.

We applied in our study the further division of KIBS into T-KIBS and P-KIBS. The former are technology based, while the latter focus on professional knowledge in different areas (and are users of technology) (Miles et al. 1995). In our analysis, R&D services and ICT services belong to T-KIBS, while financial services, business services, and cultural creative services belong to P-KIBS. Table 12.3 indicates that the demand of manufacturing industries is bigger for T-KIBS than for P-KIBS in Beijing. On the other hand, manufacturing industries in Shanghai, Guangdong, Jiangsu, and Zhejiang demand for P-KIBS more than for T-KIBS.

This finding raises the question, why the demand is different even though the economic development level of all these five regions is similar in the sense that they are above the national average? Hence, we made further efforts to analyze the relationship between different kinds of manufacturing industries and KIBS.

3.2.2 The Relationship Between Different KIBS Sectors and Different Manufacturing Industries

Based on the analysis above, we continue to explore the relationship between different kinds of manufacturing industries and KIBS. Table 12.4 describes the demand for the five types of KIBS in various regions. It shows that business services are the most popular service type among the manufacturers in Shanghai, Guangdong, Jiangsu, and Zhejiang. However in Beijing, R&D services and ICT services hold the first positions. This finding illustrates the exceptional position of Beijing: R&D services and ICT services are not very popular in most Chinese regions, but manufacturers consume mainly business services. Beijing as the capital of China has a relative advantage in R&D and ICT industries. The Zhongguancun is a famous ICT science park in China, and there are also many excellent universities in Beijing. These are among the reasons that have made Beijing an attractive location for R&D and ICT.

We have further categorized manufacturing into high-tech industries on the one hand and mid- and low-tech industries on the other. Then we have analyzed the

Table 12.4 Demand for different types of KIBS in the Chinese manufacturing (comparison between five regions, year 2007)

	Beijing	Shanghai	Guangdong	Jiangsu	Zhejiang
R&D services	0.0942	0.0080	0.0038	0.0030	0.0028
ICT services	0.0979	0.0042	0.0053	0.0032	0.0059
Financial services	0.0124	0.0035	0.0011	0.0013	0.0019
Business services	0.0285	0.0199	0.0087	0.0082	0.0098
Cultural creative services	0.0160	0.0010	0.0016	0.0014	0.0009

Source: Chinese Statistics Bureau (10,000 of CNY per unit)

Table 12.5 Demand for different types of KIBS in high-tech manufacturing and mid-low-tech manufacturing in China (comparison between five regions, year 2007)

	Type	T-KIBS	P-KIBS	R&D services	ICT services	Financial services	Business services	Cultural creative services
Beijing	High-tech	0.2395	0.0369	0.1035	0.1360	0.0045	0.0262	0.0061
	Mid-low-tech	0.0806	0.1039	0.0722	0.0084	0.0309	0.0339	0.0391
Shanghai	High-tech	0.0172	0.0109	0.0112	0.0060	0.0007	0.0099	0.0003
	Mid-low-tech	0.0014	0.0533	0.0011	0.0003	0.0095	0.0414	0.0025
Guangdong	High-tech	0.0117	0.0095	0.0051	0.0066	0.0002	0.0085	0.0009
	Mid-low-tech	0.0053	0.0145	0.0019	0.0034	0.0025	0.0091	0.0028
Jiangsu	High-tech	0.0085	0.0095	0.0039	0.0047	0.0008	0.0082	0.0005
	Mid-low-tech	0.0033	0.0126	0.0019	0.0013	0.0020	0.0081	0.0025
Zhejiang	High-tech	0.0131	0.0090	0.0016	0.0115	0.0008	0.0071	0.0011
	Mid-low-tech	0.0047	0.0159	0.0040	0.0007	0.0031	0.0122	0.0007

Source: Chinese Statistics Bureau (10,000 of CNY per unit)

demand for KIBS using both the categorization between T-KIBS and P-KIBS and our five categories of KIBS sectors. Table 12.5 shows a clear difference between high-tech manufacturing and mid-low-tech manufacturing in the use of KIBS. High-tech manufacturing industries generally have a closer relationship with

T-KIBS, such as R&D services and ICT services. The mid- and low-tech manufacturing prefers P-KIBS, for instance, financial services, business services, and cultural creative services. Business services seem to be the most important KIBS provider for the mid- and low-tech industries.

As shown above, KIBS and manufacturing industries have a relatively intense relationship between each other, and different kinds of manufacturing industries have different demands for KIBS. Based on these analyses, we will further examine how KIBS contribute to innovation in Chinese manufacturing industries. This analysis helps us to understand the role that KIBS play in the innovation system of China.

4 The Roles of KIBS in the Innovation System of China

4.1 Theoretical Model

4.1.1 KIBS as Knowledge Coproducers in the Chinese Innovation System

Service production is the result of interactions between KIBS and their clients (Bilderbeek et al. 1998). KIBS can provide complementary services or knowledge-based resources to client firms (Czarnitzki and Spielkamp 2003). In other words, knowledge generation is a result of coproduction between KIBS and their clients. As a result, KIBS can generate knowledge in the innovation system through interacting with their client firms (Müller and Zenker 2001). This makes KIBS the coproducers of services (Scarso and Bolisani 2012).

In co-producing an innovative service/product, KIBS occupy a twofold role: first, they may contribute to the creation of new ideas; second, they can help in managing the innovation process. When new ideas are generated, a problem defined by the client firm may become the starting point. After that, KIBS either directly bring solutions based on their professional knowledge or contribute to achieving a solution by analyzing and clarifying the problem. Moreover, initiatives leading to innovation may also spring from KIBS, which strengthen client firms' awareness of changes in the business environment or in the broader economic and societal contexts (den Hertog 2000b). In addition, KIBS' activities are particularly important when they are seen as the interface between explicit and tacit knowledge. In their cooperation with numerous clients or the scientific communities, KIBS combine their professional experiences with information gained from their client firms – information which is produced in clients' daily practices and routines (Antonelli 2000).

The coordination of activities often presupposes that KIBS are aware of the strategic objectives of their client companies, which are related to the solutions and

services they intend to bring forward. The relationship between KIBS and their client companies may go even further. KIBS are no more the ones that strive to understand the strategy of their client firms and develop their operations on this basis. The client firms also adjust their activities to fit the KIBS' concepts. A discernible example is happening in the information technology sector, where certain big consultancy firms aim to extend their influence on the direction of some parts of their customers' business.

4.1.2   KIBS as Knowledge Disseminators in the Chinese Innovation System

The core activities of KIBS are to develop, adapt, and transfer knowledge in the innovation system (Castaldi et al. 2013). Also in China, policy makers and company representatives are becoming increasingly aware about the fact that KIBS may be significant channels for transferring and creating knowledge in the innovation system (cf. Hipp 1999). The ultimate objectives are to contribute to the development of the knowledge base and innovation activities of client firms (Hertog and Bilderbeek 1998).

   In the Chinese economy, like in the developed countries, business networks play an increasing role. KIBS are deemed to be the key nodes that intermediate the knowledge-based network, and they play a positive role in strengthening firms' innovative capabilities and innovation performance (Corrocher and Cusmano 2014). By virtue of their professional network, they can assist client firms to broaden search scopes and to cut down corresponding costs while promoting innovation (Zhang and Li 2010). KIBS play positive roles in promoting clients' knowledge search and improving clients' innovative performance (Wagner et al. 2014). In addition, KIBS help clients to access primary knowledge-based resources and exert dominant influence on their innovative capabilities (Müller and Doloreux 2009). Our study has highlighted the role of P-KIBS in many Chinese regions. Other studies confirm that professional service firms (PSF) as a typical kind of KIBS can help client firms to overcome the localization of knowledge through accessing their own knowledge repository (Corrocher and Cusmano 2014).

   Also empirical studies have shown that networks and cooperation play a central role in KIBS' activities. In the rapidly developing economy of China, KIBS may be in good positions to function as vehicles in innovation distribution. In practice, the distributive activities of KIBS have been found to focus on horizontal linkages between firms, whereas the linkages to universities, research institutes, and public business development organizations are rarer and are found mainly in technological KIBS.

4.2 Methodology

4.2.1 Curve Estimation

Curve estimation is adopted to estimate the relationship between KIBS input and innovation of manufacturing industries. The assumptions of curve estimation are that the data can graphically determine how the independent and dependent variables are related (linearly, exponentially, etc.) and the residuals of a good model should be randomly distributed and normal. Here, we use curve estimation to compare linear and quadratic models for the relationship between KIBS input and innovation of manufacturing industries.

The formula of the linear model is expressed as follows:

$$Y = \alpha + b1 \times X$$

and the formula of the quadratic model is expressed as follows:

$$Y = \alpha + b1 \times X + b2 \times X^2$$

where Y is the innovation of manufacturing industries, and X is the KIBS input.

4.2.2 Sample

We have collected data of KIBS input from nine Chinese input-output tables, which range from 1990 to 2010. We have also collected data of innovation of manufacturing industries from the Chinese Statistical Yearbook on Science and Technology. The year of innovation of manufacturing industries is 3 years later than the year of KIBS input. We take the three kinds of domestic and foreign patents granted to industrial enterprises as a measure of the innovation of manufacturing industries. Summarizing, we have collected past KIBS input figures and the associated innovation of manufacturing industries.

4.2.3 Data Analysis and Results

As shown in Table 12.6, the R-square values indicate strong relationships for both models, and the R-square for the quadratic model is larger. In addition, the significance value of the F statistic is less than 0.05 for both models, which means that the variation explained by each model is not due to chance.

Figure 12.3 illustrates the relationship between KIBS input and manufacturing innovation, as well as the relationship between the square of KIBS input and manufacturing innovation. It shows that the quadratic model follows the shape of the data better than the linear model. In particular, the linear model seems to overestimate innovation of manufacturing industries for cases with small or large

Table 12.6 Model summary and parameter estimates

Equation	Model summary					Parameter estimates		
	R-square	F	df1	df2	Sig.	Constant	b1	b2
Linear	0.840	36.669	1	7	0.001		0.916** (0.001)	
Quadratic	0.929	39.352	2	6	0.000		−0.234 (0.607)	1.189* (0.033)

The independent variable is KIBS input and the dependent variable is innovation in manufacturing industries
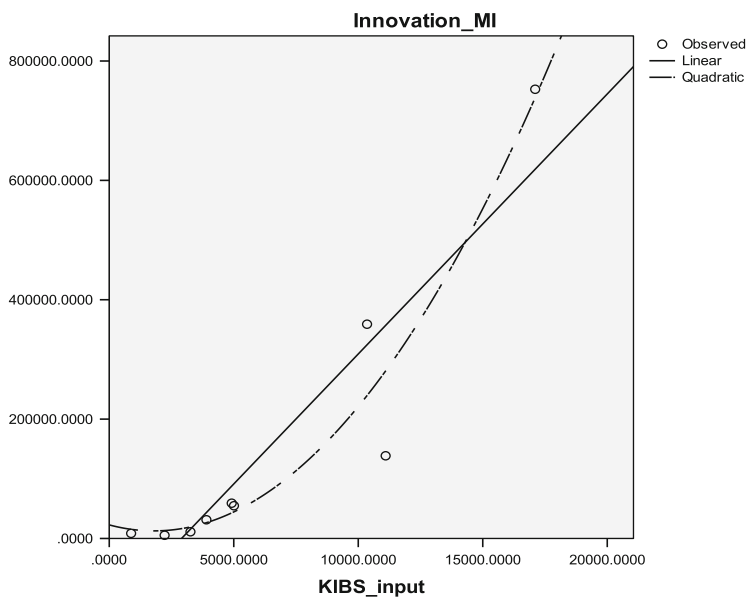
**p < 0.01, *p < 0.05

Fig. 12.3 Relationship between KIBS input and manufacturing innovation: *curve* fit plot for the linear and quadratic models

values of KIBS input and underestimate innovation of manufacturing industries with medium values of KIBS input.

As a further visual check, we continued to look at plots of the residuals versus predicted values for each model. Figure 12.4 reinforces our suspicions from the curve fit plot. There is a clear "U" shape to the points, which means that there is a pattern in the data that is not captured by the linear model.

As shown in Fig. 12.5, these residuals do not show a pattern, thus the quadratic model is acceptable in the sense that the residuals are independent of the fit values.

Thus, according to the analysis above, the quadratic model is adopted to estimate the relationship between KIBS input and innovation in manufacturing industries.
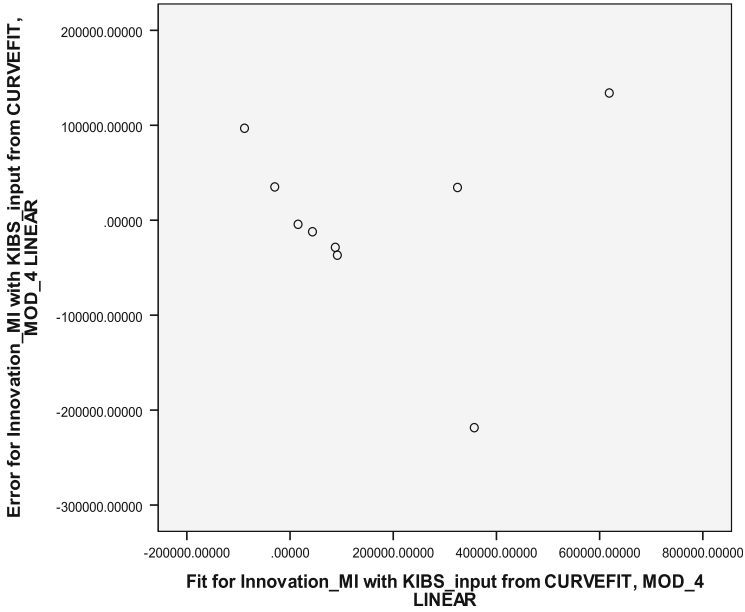
Fig. 12.4 Further examination of the relationship between KIBS input and manufacturing innovation: a scatterplot of residuals for the linear model
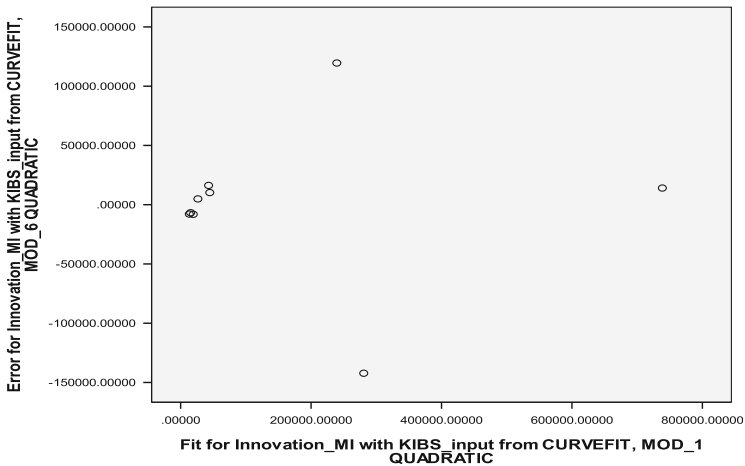

Fig. 12.5 Further examination of the relationship between the square of KIBS input and manufacturing innovation: a scatterplot of residuals for the quadratic model

The quadratic model states that the innovation of manufacturing industries is equal to 1.189* KIBS input squared. The b2 value greater than 0 suggests that the more of KIBS input squared, the bigger the innovation of manufacturing industries.

5   Discussion

Scanty empirical evidence exists concerning the influence of KIBS on the generation and diffusion of knowledge in the innovation system (Mas-Verdu et al. 2011). Many researchers point out that the relationship of KIBS with manufacturing industries is more intensive in comparison to that with other industries (Guerrieri and Meliciani 2005; MacPherson and Vanchan 2010; Preissl 2007). In this chapter, we have tried to identify some specific roles of KIBS in the innovation system from the perspective of manufacturing firms. We have taken China as an example, because manufacturing firms still dominate the country's innovation landscape. Accordingly, we have analyzed the relationship between KIBS input and innovation in the Chinese manufacturing industries to verify the roles of KIBS in the innovation system of this country. We consider that the input-output framework is a proper way to analyze the relationship between KIBS and manufacturing. Industries obtain intermediate and investment goods which are embodied in the innovations of intermediating and investing industries. Inter-sector transactions are supposed to be the carriers of innovation. However, with the data sources available, we have only been able to adopt nine representative input-output tables to examine the relationship between KIBS input and innovation in manufacturing. Though we cannot definitely answer how KIBS act on the Chinese innovation system under the input-output framework, the study reveals some suggestive ideas.

Previous research has discussed the role of KIBS in innovation systems, and KIBS have been regarded as sources, carriers, facilitators, catalysts, etc. in innovation. However, there has been little effort to distinguish among these different roles; in other words, the roles of KIBS in the innovation system are more or less ambiguous and require further clarification. To fill this research gap, our chapter has tried to further specify the roles of KIBS in the innovation system in relation to manufacturing firms. We suggest that in the Chinese innovation system, KIBS mainly play a role of knowledge coproducer and knowledge disseminator. The primary evidence is as follows: (i) most knowledge-intensive services are provided in interaction between KIBS and their clients; thus, services can be viewed as the result of the coproduction between these two parties. (ii) KIBS are located at the intersection of many actors in the innovation system, and KIBS' specialized network role can facilitate clients' search behaviors; hence they probably perform as innovation and knowledge disseminators. As a whole, KIBS basically act on two roles during interactions with manufacturers. They promote the firms' knowledge acquisition and thus act as coproducers of innovation. They also facilitate firms' knowledge search and thus act as disseminators of innovations.

It is increasingly evident that KIBS occupy an important position in the knowledge and innovation infrastructure in parallel with the research, education, and other public institutions. However, much remains to be studied and developed both in the use of KIBS and in their own activities. Our chapter has aimed to enrich such studies.

6 Conclusion and Implications

Using curve estimation under the input-output framework, our chapter revealed that the square of KIBS input is positively related to innovation in manufacturing industries. This means that the more input of KIBS to manufacturing industries, the bigger marginal effect of KIBS input on innovation in manufacturing industries. KIBS act not only as generators of knowledge but also as diffusers of knowledge-based resources. Their impact on innovation will consequently be obvious.

This chapter also provides some practical implications. First, it is important that managers in the Chinese manufacturing firms realize the significance of KIBS. They not only serve as a useful pathway to improve innovation but also as an important contributor to the interactive development of manufacturing industries and services in China. Manufacturing firms are advised to outsource some noncore resources to external KIBS; in this way service suppliers can achieve the economies of scale and promote the development of their clients in turn. Besides, manufacturing firms also need to choose the right type of external KIBS based on their own characters. Second, KIBS should recognize their own roles as both coproducers and disseminators of knowledge-based resources and to help manufacturing firms identify, acquire, and use the external knowledge-based resources to improve their innovative capability during the process of interaction.

This chapter has some limitations that suggest future research possibilities. First of all, the sample size is relatively small. Although Beijing, Shanghai, Guangdong, Jiangsu, and Zhejiang provinces can reasonably represent the current situation of China to some extent, the study is limited and falls short of a big sample analysis. In addition, the most up-to-date Chinese national input-output table is the one of year 2010, while those of regional provinces are of year 2007. These tables may not accurately reflect the current situation. Second, though curve estimation can somewhat testify the role of KIBS in the innovation system, further studies are needed to disentangle in-depth mechanisms.

Appendix

Industry	Subindustry
Manufacturing industries	Food, beverages, and tobacco; textiles; wearing apparel, dressing, and dyeing of fur; wood products and furniture; paper, paper products, and printing; refined petroleum products and nuclear fuel; industrial chemical and drugs; nonmetallic mineral products; fabricated metal products, except machinery and equipment; metal products; machinery and equipment n.e.c.; transports excluding shipbuilding; electrical machinery and apparatus n.e.c.; electrical apparatus and computing machinery and radio, TV, and communication equipment; office and instruments; other manufacturing
KIBS	Information and communication; financial activities; renting and business activities; scientific research and development; technical services; arts, entertainment, and recreation

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Chapter 13
Internationalization as Innovation Driver in Services

Patrik Ström and Robert Wentrup

Abstract The chapter discusses the interaction between internationalization and innovation. These are processes that can enforce each other over time. Received theory on internationalization does not explain how firms within new sectors, such as internet service providers, make use of their internationalization process as a way to compete on innovation. Additionally the chapter brings in the spatial aspects of how internationalization is conducted and what firms are looking for at specific locations to facilitate their innovation process and obtain a sustainable competitive advantage. Two mini-cases of two internet service providers are used to show how new theoretical explanations are needed.

Keywords Internationalization • Innovation • Location • Services

1 Introduction

The global economy has over the last decades developed at a rapid speed. Transformation from an economy dominated by manufacturing firms with a base in the traditional Western economies has transformed into a knowledge-driven economy where services have become the most important part, both in terms of share of GDP and share of employment (Rubalcaba 2007). The change has been most profound in the OECD economies, but developing or emerging markets have also experienced the same development. The manufacturing industry has also changed, and the importance of service value added has increased subsequently. The importance of servitization of industry (Alvstam 2014; EU 2014; Bao and Toivonen 2015) or a service-dominant logic (Vargo and Lusch 2004) has been put forward to explain this ongoing shift. The global economy has generated new possibilities for firms to compete on a wider geographical scale, but also to develop a much more complex and sophisticated production systems or networks, with a regional or global industrial footprint. The increased usage of sophisticated information and communication technologies is also a driving force behind increased competition and

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productivity gains. The global economy facilitates new forms of competition were firms from mature economies now see more activities of firms from emerging markets (Alvstam et al. forthcoming). Internationalization has for decades been a key driver of corporate development. Widening the market reach and market shares abroad was a cornerstone for many of the well-known multinational cooperation brand names that we know of. Technology advancement and liberalization of world trade and foreign direct investment have pushed this development further. Today, it is not unusual that firms are global at conception, a phenomenon often referred to as "born globals" (McKinsey 1993; Knight and Cavusgil 1996; Rasmussen et al. 2001; Madsen and Servais 1997; Gabrielsson et al. 2008).

The relation between internationalization and innovation is symbiotic. Research has shown both that firms that are involved in innovation processes are more likely to internationalize (Cassiman and Golovko 2011; Lamotte and Colovic 2013) and that internationalization has a positive impact on innovation (Ganotakis and Love 2011; Boermans and Roelfsema 2015). Since both internationalization and innovation are two engines for growth, it is difficult to determine the causality. Innovation often spurs an internationalization process, and internationalization often generates ideas and thus leads to more innovation. Important elements in the internationalization process are experiential learning (Penrose 1959) and knowledge building (Johanson and Vahlne 2009).

2 Aim of the Chapter

The chapter aims to combine the fields of economic geography and international business to better understand how the underlying driving forces for internationalization are becoming a cornerstone for innovation in service firms. Internationalization is determined through the strategy of the firms, but also by the geographical environment in which this incremental or instant move takes place. Additionally, the chapter seeks to contribute to the literature by analyzing these developments from different levels of economic activity. The theoretical framework is complemented by empirical material in the form of mini-cases showing some of the most important aspects of internationalization in connection with firm strategy development to sustain the innovative capacity for service firms.

The rest of the chapter is structured as follows. The theoretical framework is presented to show how the development of internationalization has changed over time in relation to new forms of internationalization dominant within the service industry. The following part of the chapter presents the importance of location in relation to how firms expand their geographical reach. Next, a conceptual model is introduced to explain the interconnectedness that exists between innovation and internationalization. The mini-cases are then presented to show how firms are utilizing different aspects of the theoretical framework. Finally, a discussion and conclusion bring the chapter to a close, featuring the main contributions and developing aspects in need of further research.

3 Theoretical Framework

3.1 Received Theory

The starting point for the development of internationalization theory has traditionally been based within trade and FDI theory. Hence much of the work has come from an economics or business economics approach studying firms from mature and advanced economies. The early studies focused on the product life cycle (Vernon 1966) and firm-specific advantages (Hymer 1976). The development of this approach broadened the scope through theories seen as more economic, e.g., internalization theory (Buckley and Casson 1976), and later the introduction of the so-called OLI-paradigm comprising, apart from ownership-specific, also internalization-specific and location-specific advantages (Dunning 1998; Dunning and Lundan 2008). The importance of locational aspects has been stressed further since firms are using the geographical scope to develop new markets and take advantage of competence bases within the globalized economy (Hermelin and Rusten 2007; Rusten and Bryson 2010).

The behaviorally oriented approach toward internationalization developed through the early decades of globalization and regionalization of production, while concentrating on how firms engage with internationalization not only from an economic stance. Instead focus was more related to the difficulties associated to liability of foreignness and the learning and commitment that comes along with activities in foreign markets (Johanson and Vahlne 1977, 2009). This approach is also well in line with the development of network theory to explain the behavior of firms in relationships that spans geographical space, and later contributions have stressed the issue of outsidership in networks (Johanson and Vahlne 2009). Internationalization is a complex and nuanced process that is related to firm-specific settings, as well as the position in the broader context of the international political economy. The rapid development of the world economy and the shifts taking place within specific industries have generated a need for new conceptual contributions for explaining the changing internationalization completion and thus also new forms of internationalization processes (Dunning and Lundan 2008; Dicken 2015).

3.2 New Explanations for Globalization

With increasing global competition, the need for sustained competitive advantage has become even more complex. The growing importance of the service economy or the servitization of the traditional manufacturing industry (Bramklev and Ström 2011; Neely et al. 2011; Bao and Toivonen 2015) has also altered the processes for how firms engage with internationalization through their value propositions (Jensen and Petersen 2014). Difficulties associated with trade in services and FDI has also generated a debate on how to measure this form of internationalization (Daniels

2000). The technological development and the possibilities to enter the global market have also facilitated growth of sectors that was nonexistent two decades ago. For example, online service providers like *Google* and *Facebook* were founded in the early twenty-first century and have within less than a decade thrived to the positions among the world's largest firms with vast geographical reach and societal impact. Business model development has generated new forms of capitalizing on more integrated and growing geographical markets. The received theory on internationalization has proven to only partially explain new modes of internationalization (Mathews and Zander 2007; Ström and Ernkvist 2012).

Technological advancement has lowered entry costs and has in this sense made distance less of a problem in geographical terms, but many of the new sectors within the service industry are highly connected to specific locations in their search for highly educated labor and capital. Although concepts such as "death of distance" (Cairncross 2001) are held as naive and Utopian among economic geographers (Zook 2002; Warf 2013), it is still fair to say that firms have more tools at hand today to reach an international crowd than ever before. The so-called born global firms are not only using the internationalization as a vital factor for growth but are also using the geographical reach as a pivotal factor for innovation (Ström and Ernkvist 2012). The theory of born globals is also connected to the development within the entrepreneurship literature on International New Ventures (INV) (Oviatt and McDougall 1994, 2005), where the entrepreneur is the key actor driving the expansion in relation to locational preferences (Mathews and Zander 2007). New forms of contacts might be established at occasions such as occasional business meetings or industrial fairs. Through these events new ventures could be established with a different company geographical footprint, compared with the incremental approach that many firms used earlier. Technology has made it possible to reach customers at wider distances, and there is also not always a clear development path of how and where the internationalization process might push the firm. Firms with a more footloose business model can more easily reconfigure their position on the global market to take advantage of favorable regulatory environments (OECD 2015) or rapidly changing market developments.

The speed of the internationalization process is one of the most distinct factors that stand out within these new sectors, in comparison with the more traditional development (Oviatt and McDougall 2005). However, studies show that large manufacturing multinational corporations often need to balance their internationalization process on the basis of several factors such as industrial reconfiguration, coordination and the incremental approach of learning and commitment (Vahlne et al. 2011), or where SMEs are trying to build their competitive position by targeting other international firms in distant markets that share a similar business environment background (Ivarsson and Alvstam 2013).

4   Spatial Dynamics of Internationalization

The last decades have seen several calls for bringing international business and economic geography closer for theorizing the various developments that are driving firms across borders to specific locations (Buckley and Gauri 2004; Beugelsdijk et al. 2010), but also to reflect on the different industry characteristics that drive specific sectors such as advanced manufacturing or part of the knowledge intensive service industry (Bryson et al. 2012; Ström 2015; Rubalcaba and Toivonen 2015). The world has also seen a second global shift where more of service industry activities are being conducted in emerging markets through the process of outsourcing and off-shoring (Bryson 2007; Jensen and Petersen 2012). Whereas economic geography traditionally focused on how the external business environment has affected firm location strategy, international business has put the focus more on the internal aspects of the firm in relation to management strategy (Ström and Wahlqvist 2010).

Economic geographers argue that the spatial dimension is fundamental for understanding the innovation process (Asheim and Gertler 2006) and that proximity and agglomeration play a central part in building sustained innovation systems that are key elements for knowledge production. Combined these theoretical and conceptual strands help to catch the magnitude of economic transformation and how firms can use their dynamic capabilities in a way that builds on an evolutionary development approach in relation to internationalization and location (Cantwell et al. 2010; Ström and Wahlqvist 2010; Boschma and Frenken 2011). Since the economy has become more integrated and networks play an important part in internationalization processes, the relationary approach within economic geography has contributed to the understanding of continuous up-grading of firm competitiveness and innovation (Bathelt and Glückler 2003; Narula and Zanfei 2006). The development of global production networks has also facilitated the increased importance of location and the spatial interconnectedness that exists among production sites of goods, services, and know-how (Coe and Yeung 2015). Internationalization is a way of creating new relations and taps into areas of specific competences. Additionally, the ubiquitification of firm input factors has also pushed firms to develop dynamic capabilities that stand out in the competition. The connection to places around the globe among firms within the same industry acts as global pipelines to hook up to industry-specific "buzz" (Bathelt et al. 2004) or the often difficult aspect of "being there" (Gertler 2003). In order to keep up with the competition, internationalization has become a way of securing these capabilities or form new alliances or other forms of noncontractual relations. The importance of space in firm management decision-making has also driven the development of the concept of management geography (Schlunze et al. 2011). This approach develops the firm-level aspects in relation to the external environment, where it is often specific characteristics that determine how a firm engages with internationalization.

Ström and Schweizer (2011) show that personal preferences and sometimes serendipity and coincidence play a role for how a firm chooses to internationalize.

The study shows that decision-makers have specific geographical areas in mind or that they happen to get to know potential partners by studying, visiting as guest researchers, or other forms of relationship-building activities. In the study the rapid internationalization process of newly established firms from Japan and Sweden is compared, and these firms clearly show similarities. Studies on practice among specific groups of professionals also show that this becomes an important aspect for building relations over distances (Jones and Murphy 2010) and that these professionals share a common platform despite being located in very different business environment contexts. This can be an essential factor for facilitating internationalization among firms, through translation of practice from one location to the other. Newly established firms within the service industry such as online service providers can be working on a global scale from the outset, but at the same time, they are tightly connected to specific locations for securing competence or finance that are vital parts for their international success (Ström and Ernkvist 2012). For example, Zook (2002) demonstrated how geographically concentrated the entrepreneurs and venture capitalists in the online industry are to the spatial realm of Silicon Valley. The locational advantages can therefore be turned into an ownership-specific advantage that the firm can utilize when establishing a greater global reach.

5 Innovation and Internationalization: A Mutual Driving Force

Industry characteristics determine modes of internationalization. Advanced manufacturing is dependent on specific knowledge at the production location, whereas knowledge-intensive services are in a constant need of coproduction and hence sporadic or permanent co-location. Innovation in various parts of the service economy is highly dependent on the coevolution processes that exist between the buyer and supplier (Grabher et al. 2008; Perks et al. 2012). Therefore the spatial configuration of a company can influence the possibility to make use of knowledge service clusters (Manning 2013). In addition, global production networks try to achieve a perfect fit for industrial location, and intermediary goods can be distributed in regional or global channels (Coe and Yeung 2015; Dicken 2015).

For services the location pattern is more complex in relation to the character, execution, and performance of the service provided (Illeris 1994; Harrington and Daniels 2006; Manning et al. 2010). This impacts the way the firm engages in internationalization and chooses to deliver the services in host markets (Meyer et al. 2015). Technology has however altered the way firms can engage with customers in distant markets. Even rather sophisticated services can now be distributed and provided over long distances (Rusten and Bryson 2010). Location is therefore more associated with specific industry competences to secure sustained competitiveness or through a market- or asset-seeking investment. The combination of home and host market advantages will determine the competitive advantage of
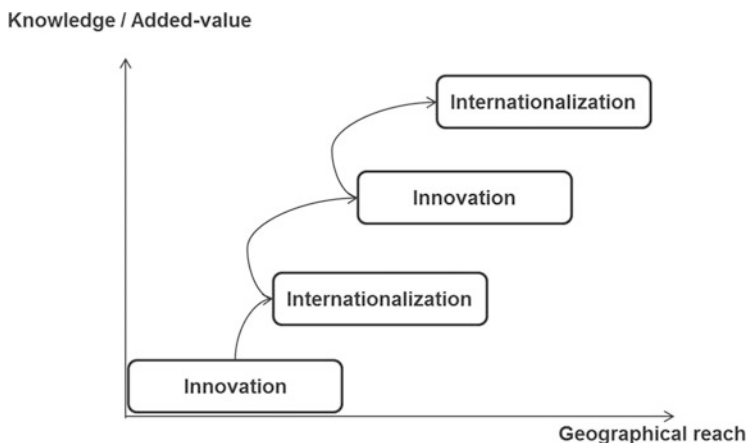
Fig. 13.1 The complementarity of innovation and internationalization in knowledge creation added value and geographical reach

the firm (Dunning and Lundan 2008; Ström and Ernkvist 2012). Without a sophisticated home location in terms of competence and finance, and a dynamic market abroad, it is difficult for born global firms in advanced services to secure sustainable economic growth. Internationalization is therefore a key part for building innovation capacity and sustained competitiveness on the world market.

Research has also shown that firms involved in innovation processes and in early internationalization processes are likely to experience better growth (Boermans and Roelfsema 2015). As illustrated in Fig. 13.1, it is assumed that the intertwined subprocesses of innovation and internationalization will lead to more knowledge and added value along the firm's geographical evolution in the global economy. Innovation has deliberately been put as the first block in the figure since a new product or a new service or a combination of both is often the *raison d'être* for internationalization (Oviatt and McDougall 1994; Knight and Cavusgil 1996). One example is the Israeli start-up *Waze*, an innovative community-based traffic and navigation application, which had millions of users only a few years after it was founded. The combination of the Internet technology, the phenomenon of crowdsourcing, and network effects enabled such rapid internationalization. Along their internationalization process, more innovations were embedded into their offer.

6   Mini-Cases

The mini-cases are used to show that firms work with internationalization in different ways. The innovation can drive the internationalization process and comprise new geographical areas that were not on the agenda from inception of

the firms. In turn, a wider geographical scope could then facilitate further innovation to sustain competitive advantage. The material used is both of primary character obtained through interviews with senior level firm executives and through secondary data comprising company information.

6.1   Case 1: iZettle

The Swedish online service provider, iZettle, offers an online payment solution via an app and a credit card reader device. iZettle's service includes a free iPhone and iPad application and a mini-chip card reader. The idea was evoked as a solution to solve an issue for the cofounder's wife, who was in need of getting paid by credit card for her products while attending fairs, without the hassle to install full credit card machine equipment, which is the standard solution in merchandise stores, restaurants, etc. After much work, and a few years later, iZettle has more than 170 employees and operates in ten international markets apart from their home market. The service has evolved along an ongoing innovation process embedded in the internationalization process. For example, on the Mexican market, which was one of the most recent markets for iZettle to enter, the firm realized that many people lack bank accounts. Together with their local partners *Banco Santander* and *MasterCard*, iZettle can now offer a substitute for a normal bank account, i.e., a virtual bank account via the iZettle solution. The functionality is straightforward: an iZettle user, for example, a vendor of books, gets paid for its sales via the iZettle app and the card reader. Thereafter, the collected money is stored on a virtual iZettle account bound to the iZettle application. This in turn can then be used for making purchases and also for withdrawing money. Had iZettle not initiated its market entry in Mexico, the innovation would not have emerged at this point.

6.2   Case 2: Mobitee

Mobitee is a French mobile application provider offering a GPS golf course application for mobile phones for golf players. The application lets golfers get a visual view of the golf course in order to optimize and calculate the game. Two French entrepreneurs founded the company in 2007. The business idea was to provide a mobile solution of a virtual golf course, which was up till then only found in golf cars, and of low quality.

One of the founders had, via previous professional experience, contacts to skilled and cost-efficient programmers in Belorussia, which directed the choice of setting up the development team of the application in Minsk, Belorussia. Today, the development team consists of 20 developers in Minsk. The management team,

based in Paris, France, consists of the CEO (cofounder) and a project manager. The application was developed for global use over cross-platforms (e.g., *androids*, *iPhone*, *BlackBerry*) from the start. The online platform market enabled a vast geographical spread. Today iTunes and App Store account for 65 % of all sales, and together with android markets, they are regarded as the main distribution channels for Mobitee. Thirty percent of the users are on the home market (France). Other strong and growing markets are the USA, Japan, the UK, Germany, and Sweden. Rather than following a gradual geographical pattern, data metrics, e.g., golf courses per capita, steer the marketing activities. Being physically present is not seen as a critical criteria, instead Mobitee considers itself being "established on a market," i.e., when and where a critical mass of downloads has been made. This corresponds to around 15–20 markets today. According to the CEO, Mobitee has intensive contact with its user community and can be very precise in how it communicates with the community. Information about upgrades, new features, and localization bound events can be directly pushed via messages. The interaction with the virtual community is key engine for service development and innovation, according to Mobitee. By engaging with the virtual community, Mobitee also becomes more local and can adapt features to the geographical context. This is part of Mobitee's strategy in making the application have "a local touch" and thus reduces its liability of outsidership.

Yet, local partners are needed to localize the service and reach a critical mass. In the USA, Mobitee has contracted a special community manager with the objective to persuade the network of golfers via newsletters and other targeted communication. This is an important marketing tool for Mobitee. The geographical trajectory and the speed of it are rather atypical in comparison with conventional manufacturing firms. Mobitee has within a few years of operations already its presence in South Korea, Japan, China and uses local partner to communicate with the users in their own languages. According to the CEO of Mobitee, it is important that the application feels like it is made in their home country. Localized information is a key selling point. Local partners are seen as instrumental when it comes to introduce the application and make it "viral." Once the application has reached a position of top ten of downloaded sports applications on a market, it is considered living its own life, being in "viral" state.

A major part of the internal communication is done online, via Skype. According to the CEO, Mobitee could have been based anywhere. "We are extremely footloose. If we will have an interesting opportunity in another country we could move directly, since our communication and management is independent of location. All our communication is done online via Skype or via mobile phone. We only go to Minsk twice a year. But we put energy in fostering a strong internal virtual community between our offices in Paris and Minsk."

7 Discussion

The theoretical framework stresses that new patterns of internationalization among service firms are particularly difficult to explain by received theory. Rather the international presence and a wide geographical reach are at the core of many firms from inception. There is an ongoing learning process taking place as the firm proceeds business model development and market expansion. In addition the location is still of great importance, but the mode for servicing customers might vary. The technological capabilities of the firm are often highly associated with the location-specific advantages that exist in the home and host market. This can relate to specific competence, finance possibilities at the home market, or a market structure at the host country that can help to facilitate further growth and expansion. Coevolution of the service is therefore highly dependent on the possibility for firms to establish a critical mass or finding problems to which they can apply a service solution. Internationalization becomes a vehicle for developing the innovative capacity for the firm by utilizing the experiences gained in different markets.

Both mini-cases presented show that innovation is an integral part of the expansion abroad. In the case of iZettle, it was essential to develop an innovative solution for customers in Mexico. For Mobitee the possibility to, on the one hand, make use of high-end but low cost development skills, and on the other hand, move into the world's most important markets created a possibility to use co-evolution and engagement with local, albeit virtual communities as a key driver of innovation. This shows that value added in connection to internationalization not always can be measured in monetary terms but also by new experience that will enable firms to move into other distant markets.

8 Conclusion and Further Research

The chapter has tried to show the close interconnectedness that exists between internationalization and innovation within the service industry. Within newly formed companies, it can be difficult to determine what aspect is most important for future growth. The cases show that firms can make use of both processes in order to facilitate geographical expansion. The cases also show that location is pivotal for successful growth. In this respect the firm level connects to the more macroeconomic structures that exist within regions or knowledge clusters. Regional development policy could help both to promote firm development by creating an environment that supports innovation and also improve attractiveness for foreign firms wanting to expand abroad and take advantage of knowledge clusters or centers of excellence.

Further research is needed to better understand the interaction between the firm level and the region. In-depth qualitative case studies would be appropriate to uncover the spatial dynamics that drive the innovative capacity and

internationalization. Comparative studies covering different subsectors of the advanced service industry is also needed, as well as studies comprising both mature and emerging markets.

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